November 2024

Organisation of
Eastern Caribbean States

OHPC Grade 5 Mathematics Curriculum

OVERVIEW OF THE GRADE 5 OECS HARMONISED PRIMARY CURRICULUM

The Grade 5 mathematics curriculum is structured around six key content strands: Number Sense (N), Operations with Numbers (O), Patterns and Relationships (P), Geometric Thinking (G), Measurement (M), and Data Handling (D). It emphasizes the development of crucial mathematical process skills, including problem-solving, reasoning, communication, connection, and representation. These skills are integral to helping learners engage actively with mathematical concepts, justify their reasoning, articulate their ideas, and connect various mathematical ideas across different contexts. Grade 5 math instruction should prioritize fluency in fraction operations, foundational multiplication and division of fractions, division with two-digit divisors, decimal operations to the hundredth place, and volume understanding while addressing all grade-level standards.

- In the Number and Operations – Fractions and Operations and Algebraic Thinking domains, learners embark on a journey of learning that starts with understanding the basics of fractions and ends with them being able to perform addition and subtraction of fractions with unlike denominators. They also become proficient in calculating and estimating the sums and differences of fractions. Additionally, learners explore the concepts of multiplication and division with fractions, learning to explain why certain procedures, such as dividing unit fractions by whole numbers and vice versa, are effective.

- In the Operations and Algebraic Thinking and Number Operations in Base Ten domains, learners delve deeper into their understanding of division and decimals. These domains play a pivotal role in the Grade 5 mathematics curriculum, as they help learners gain a deeper understanding of division by examining base-ten numerals and operation properties. They also work on adding and subtracting decimals to hundredths, developing fluency in decimal computations, and making reasonable estimates. By exploring the relationships between decimals, fractions, and whole numbers, learners learn to explain why multiplication and division of finite decimals are valid.

- In Patterns and Relationships, learners develop a greater understanding that repeating patterns consist of a repeated core sequence, a concept they can apply to music, art, and even computer programming. They recognise that growing patterns involve an increase in elements or their size, while shrinking patterns involve a decrease. Additionally, learners become aware that many real-life objects and events can display multiple types of patterns at the same time.

- In the Measurement, data handling, and Geometry domains, learners are introduced to the concept of volume and recognise it as a characteristic of three-dimensional space. They learn to measure volume using standard units, estimate and solve volume-related problems, and decompose shapes to find the volumes of right rectangular prisms. Learners are able to select and justify the most appropriate graph type, accurately display data with proper titles and labels, and analyze various data presentations. They critically evaluate data, challenge assumptions, and draw conclusions to make informed decisions. Learners assess the chances of events taking place and utilize this data to anticipate future developments.

The comprehensive approach outlined above ensures that learners build a strong foundation in mathematics, preparing them for more complex concepts in the future.

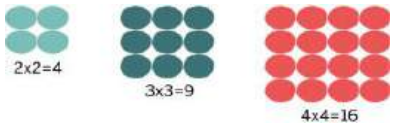
Number Sense

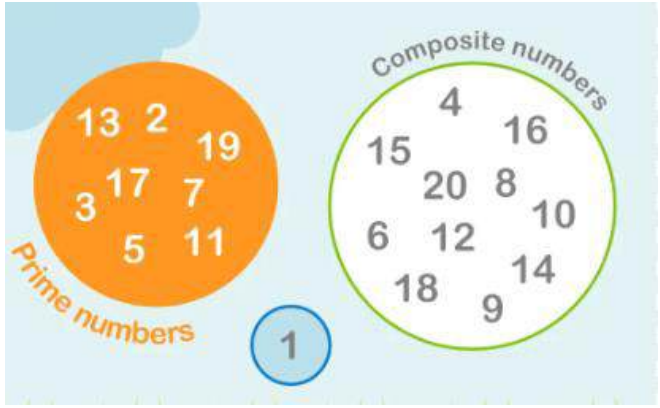
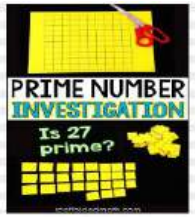
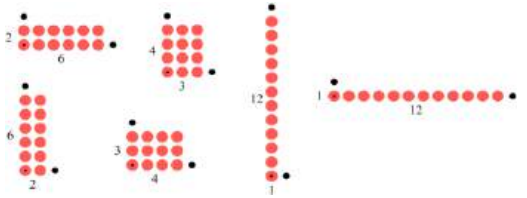
Introduction to the Strand:
Number Sense is an important skill in Mathematics. Learners are expected to develop it gradually over time as they are provided with the opportunities to explore numbers. As learners' experiences are nurtured, they will further understand numbers and show improvement in Mental Mathematics performance. Moreover, as they are exposed to the strategies within this Essential Learning Outcome, learners are expected to develop a better understanding of numbers (good number sense) as opportunities are given to visualize numbers in various contexts and serve as a basis for other concepts in Mathematics.

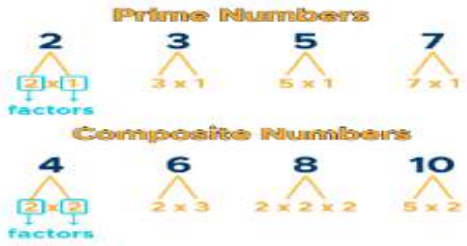
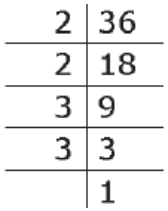
Essential Learning Outcome N1.1. Whole Number – Saying Number Sequence, Meaningful Counting and Skip Counting

Grade 5 Level Expectations:

- Demonstrate an understanding of the meaning of all whole numbers to six digits
- Model, describe, and identify special sets of numbers (E.g., square, prime, and composite)
- Count by 2s, 5s, 10s, 100s, 1000s and 10 000s from any number (to 100 000)

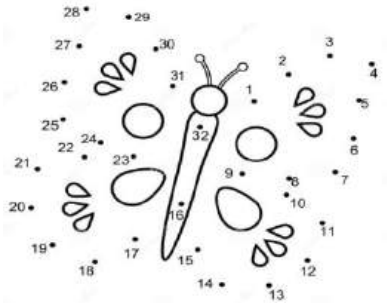
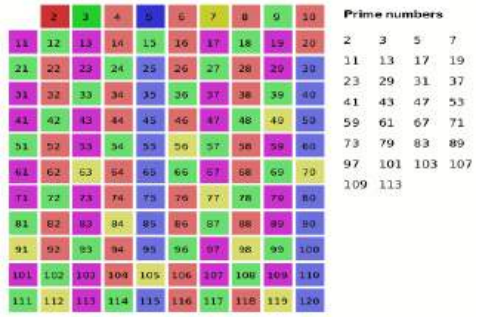
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Identify and describe special sets of numbers (square, prime, and composite) 2. Skip count by 2s, 5s, 10s, 100s, 1000s and 10 000s from any number up to 100 000 3. Complete increasing and decreasing number sequences (including special sets of numbers, such as square, prime and composite), beginning at any point	**Product: Group Work** Have learners work in small groups and use number lines or hundred charts to identify special sets of numbers by inserting, shading or circling the numbers in any order. Observe as learners work together using arrays or factor trees or division tables to determine type of number and complete task. Question learners about their choice of strategy selected to determine type of numbers.	Provide opportunities for learners to investigate special sets of numbers such as odd, even, square, prime and composite numbers; identify and describe them using arrays. For example: Square numbers can be arranged in arrays that form squares. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 4. Model skip counting by 2s, 5s, 10s, 100s, 1000s and 10 000s up to 100 000 using lines, concrete materials, currency. **Values** 5. Discuss and share real - life situations where skip counting by 2s, 5s, 10s, 100s, 1000s and 10 000s up to 100 000 is relevant	**Product** Ask learners to create a Venn Diagram to show the relationship between Prime and Composite / Odd and prime etc. for Whole Numbers from 1 to 20.  Retrieved from https://www.smartick.com/lp/prime-numbers/ **Observation:** Observe and listen to learners skip count by 2's, 5's, 10's, 100's, 1000's, and 10 000's up to 100 000 starting from different points. Check to see what resources they might be using e.g. number lines or charts.	Google images: square-number-arrays-300x119.png (300×119) (artfulmath.com) Prime numbers can be arranged in arrays that form straight lines.  Google images: 2a13120f2ee0034e2bbfb5a3045c304c.jpg (736×1324) (pinimg.com) Composite numbers can be arranged in arrays that form the shape of rectangles.  Google images: arrays2.jpg (1404×576) (sineofthetimes.org) Provide learners with opportunities to identify square, prime and composite numbers by listing factors of numbers and categorizing them using methods of listing, factor tree or division tables.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Observational Checklist **Observation:** Observe as learners model skip counting using concrete materials such as place value blocks, money and counters. Question learners about their sequences. Questions: - What is the next number in this sequence? - How did you determine the order or next term in the sequence? **Product: Exit Cards** Have learners complete work cards with dot to dot puzzles with sequences for skip counting by 2's, 5's, 10's, 100's, 1000's, and 10 000's. Invite them to use number lines or concrete materials and justify the reasons for use of specific material.	For example, Listing: Factors of 8 = 1 x 8 Factors of 5 = 1 x 5 2 x 4 Factors = 1, 5 Factors = 1, 2, 4, 8 Factor Tree  Google images: Prime-Numbers-vs-Composite-Numbers.png (846×705) (curvebreakerstestprep.com) Division ladder  Google images: divisionmethod1.png (223×271) (onlinemath4all.com)

Learner	Behaviour/ Skill	Comment/ Observation

Learner	Skill	Observation

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	For example:  Google images connect-dots-children-educational-drawing-game-dot-to-dot-numbers-game-kids-printable-worksheet-activity-butterfly-104829175.jpg (1600×1690) (dreamstime.com) **Think - Pair - Share:** Observe as learners discuss/talk about their sequences and the pattern shown. question learners about the patterns. Are they increasing or decreasing? What will be the next term? What will be the 5th term? **Product: Game (Puzzles)** Have learners complete puzzles or play games in small groups where they read the situations or story problems about skip counting and use the solutions to complete puzzles/games.	Learners can use the Sieve of Eratosthenes to find all prime numbers from 2 to 100  Prime numbers 2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 Google images: Animation Sieve of Eratosth - Sieve of Eratosthenes - Wikipedia Have learners use concrete materials like money, number lines and place value blocks to skip count by 2's, 5's, 10's, 20's, 100's, 1000's and 10 000's. For example:  Money - counting by 10's and 100's 

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td></td>
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Observe learners as they play. Ensure that they use concrete materials and explain their choices and solutions.

Checklist
<table>
<tr><td>Learner name</td><td>Skill/ Behaviour</td><td>Comments/ Observation</td></tr>
<tr><td></td><td>Uses appropriate materials

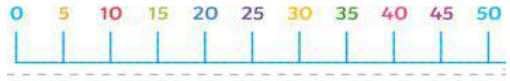
Can explain or give reason for choices made

Provides accurate solutions</td><td></td></tr>
</table>

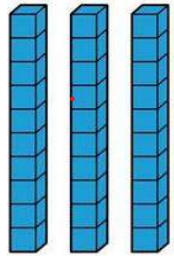
Think - Pair - Share
Have learners work in small groups and discuss a specific counting pattern.
Learners can share ideas about where the pattern is most useful or applicable and justify their answers.
Listen as learners engage in discussion and provide additional prompts or questions

Example:
Why is skip counting necessary?

Identify real - life situations when skip counting skills are most useful and Why?
</td>
<td>
Google images: east-caribbean-dollar-coins.jpg (2000×1505) (manorfx.com)
ESCA100.jpg (285×600) (foreigncurrencyandcoin.com)

Number line for counting by 5's


Google images: https://images.twinkl.co.uk/tw1n/image

Place value blocks - counting by 10's

Google images: 1516273839196948734 9base-ten-rod-clipart.med.png (228×300) (clker.com)
</td>
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Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Provide opportunities for discussion about pattern and order of sequences presented. Invite learners to complete number sequences starting from different points and also including special numbers. For example: 7 960, 7 980, ___, ___ 1 144, 1 142, ___, ___ Invite learners to create or generate story problems and role play skip counting. Provide opportunities for learners to discuss situations where skip counting is useful or applicable. For example: **Skip Counting Puzzles:** Create puzzles where learners must fill in missing numbers in a skip counting sequence. **Pattern Exploration:** Challenge learners to identify and create their own skip-counting patterns. **Skip Counting by Fractions:** Introduce skip counting by fractions, such as 1/2, 1/4, or 1/3.

Additional Resources and Materials

- number lines
- number cards
- counters (beads, stones, pebbles, sticks)
- coins, bills

- hundred charts/mats
- base 10 blocks/ place value blocks

Additional Useful Content Knowledge for the Teacher:

Skip counting is a skill developed over time. Learners will eventually be able to count on, from any number, not just the familiar sequences.
Skip counting is important in developing fluency in calculation, number sense and a foundation for multiplying and dividing.
Skip counting involves adding the same number over and over. For example, 1, 2, 3, 4, 5… (adding 1 each time) and 15, 20, 25 … (adding 5 each time).

Opportunity for Subject Integration:

Mathematics: All topics that requires reading and writing numbers
Money: counting amounts (coins, notes)
Data Handling: Representing data - Tally marks for the tally charts, graphs, numbers for labeling the axis

Language Arts:
Comprehension: Use clues and invite learners to read and make inference/ draw conclusions based on the clues to determine the answer.

General Science:
Body Parts: Fingers/Toes - five on one hand/foot, ten in all, Some parts come in pairs - nostril, eyes, ears, hands, legs, breasts

Essential Learning Outcome N1.2. Whole Number – Representing and Partitioning Quantities

Grade Level Expectations:

- Read, represent and partition any given number to 100 000 concretely, pictorially, and symbolically
- Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form to 100 000.

Specific Curriculum Outcomes

Learners are expected to:

Knowledge

1. Represent/ Model five-digit numbers concretely, pictorially, and symbolically
2. Read and write multi-digit whole numbers up to six digits using base-ten numerals and names
3. Express whole numbers up to 100 000 in expanded form

Values

4. State real - life examples/ situations where expanded notation is used

Inclusive Assessment Strategies

Product:

Invite learners to represent/ model whole numbers up to 100 000 using drawings and concrete materials. Ensure they are using place value and expanded form to help them represent numbers.

Observation:

Listen as learners read numbers up to 100 000 out loud (without using 'and').

Observe them as they write the numbers using proper spacing.

For example:

19 324 - nineteen thousand three hundred twenty-four.

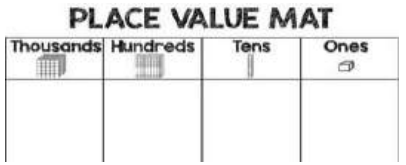
Checklist

Learner	Skill	Observation	Intervention/ Follow - up

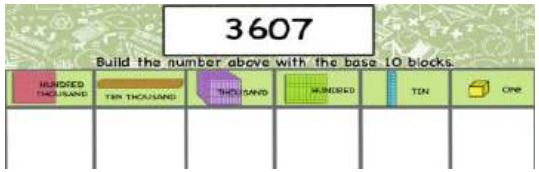
Inclusive Learning Strategies

Provide learners with opportunities to use place value charts, base 10 blocks and expanded notation to model and represent numbers up to 100 000 concretely, pictorially and symbolically.

For example:

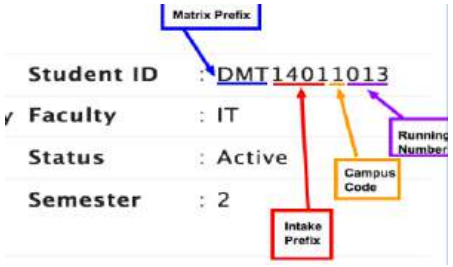


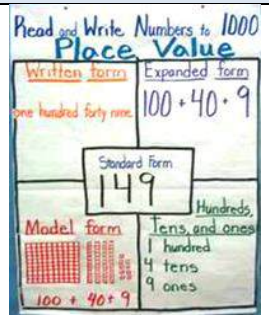
original-2998632-2.jpg (350×247) (teacherspayteachers.com)



Have learners read and write numbers using concrete materials such as base 10 blocks and place value charts.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product: Exit Card Distribute exit cards with various examples of numbers up to 100 000 and invite learners to expand the numbers in one or more ways. For example: Exit Card: Expand the number 14 364 Numerically: / Base 10 blocks: Place Value: **Play Games:** Let learners play games in small groups. Games such as dominoes, tarsia puzzles and use of riddles using the expanded form of numbers Example: 1. Dominoes (matching) **1 392** / **100 +30+ 5** **135** / **5000 + 900** 2. Riddles	Invite for opportunities to read numbers in real-life situations such as invoices, bills, receipts, learners numbers, area codes etc. Example: invoice  Stanford Plumbing & Heating INVOICE Google image: Sample-Invoice-printable.png (612×792) (invoicesimple.com) Example: Area Code 1 758 (SLU)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	I am a four-digit even number with nine hundreds, six tens, three thousands and no ones. Which number am I? **Think - Pair - Share** Have learners work in small groups where they discuss real-life situations/ examples of the use of expanded notation. Listen as learners share real-life examples where expanded notation should be used and justify their responses. Question learners about reasons for and choice of responses.	Example: Learner number  Google image: Info.png (1552×486) Invite learners to expand numbers up to 100 000 numerically and concretely using base 10 blocks, arrow cards, place value charts. provide opportunities for learners to create games and riddles using expanded forms of numbers. Example: Place Value Chart | Thousands (1 000) | Hundreds (100) | Tens (10) | Ones (1) | | --- | --- | --- | --- | | 5 | 3 | 4 | 1 |

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 Google images: 0b6770083a05a5c8c0b920e7b7871b85.jpg (736×981) (pinimg.com) Provide opportunities for learners to discuss and generate real-life examples or situations where expanded notation is used. For example: bank slips invite for some use of expanded notation.

Additional Resources and Materials

- base ten blocks
- place value charts
- number cards
- hundred charts
- dice

Additional Useful Content Knowledge for the Teacher:

Digits are mathematical symbols that are arranged in a specific order to represent numeric values. There are ten different digits in our number system. When writing numbers, we make use of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. The value of each digit depends on the position of the digit within a number. It is the position of each digit within a number that determines its place value. One digit alone can also represent a number.

A number can be represented in expanded form as 34 187 = 30 000 + 4000 + 100 + 80 + 7, or as 3 × 10 000 + 4 × 1000 + 1 × 100 + 3 × 10 + 7, to show place value relationships.

●Numbers can be composed and decomposed in various ways, including by place value.

●Numbers are composed when two or more numbers are combined to create a larger number. For example, the numbers 100 and 2 can be composed to make the sum 102 or the product 200.
●Numbers can be decomposed as a sum of numbers. For example, 53 125 can be decomposed into 50 000 and 3000 and 100 and 25.
●Numbers can be decomposed into their factors. For example, 81 can be decomposed into the factors 1, 3, 9, 27, and 81.
● Numbers are used throughout the day in various ways and contexts. Most often, numbers describe and compare quantities. They express magnitude and provide a way to answer questions such as "how much?" and "how much more?".

Opportunities for subject integration:

Mathematics: All topics that require reading and writing numbers
Measurement- Perimeter, Area, Volume
Money- Total cost, change,

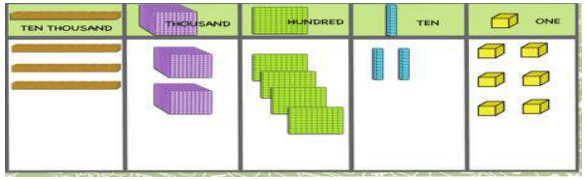
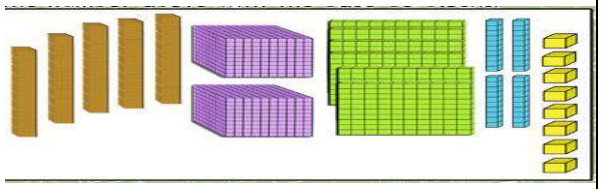
Language Arts:
Writing: Learners can write brief descriptions of numbers, which may include the names and place values, total values, and expanded forms.
Comprehension: Use clues and invite learners to read and make inferences/conclusions based on the clues to determine the answer.

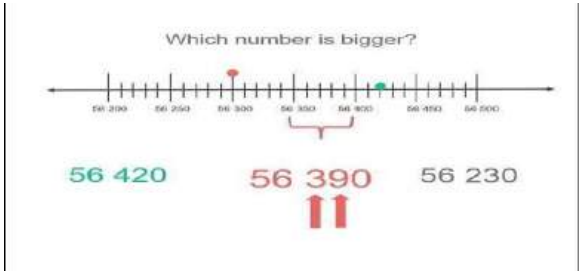
Social Studies:
(Data Handling)
Population; birth rate, death rate
Area of islands of the Caribbean e.g. Saint Lucia

Arts and Craft:
Draw shapes and pictures to use for expanding and for representing numbers.

Essential Learning Outcome N1.3: Whole Number – Comparing and Ordering Quantities
Grade Level Expectations: - Compare two multi-digit numbers based on the meanings of the digits in each place (to five place values), using >, =, and < symbols to record the results of comparisons. - Tell the number that is 100, 1000, 10,000, or 100,000 more or less than a given number. - Apply strategies to contextual situations and create story problems involving the comparison of whole numbers

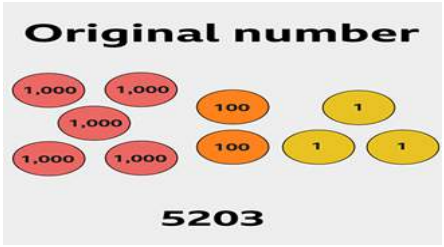
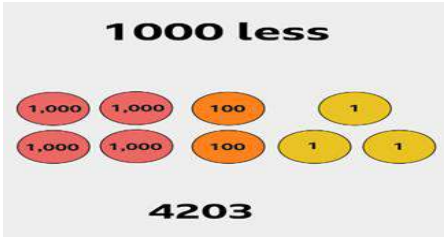
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge:** 1. Compare two whole numbers up to 99 999 using the symbols (>, = and <) 2. Calculate the whole number that is 100, 1000, 10 000 or a 100 000 more or less than a given number up to five digits. **Skills** 3. Arrange a set of five or less whole numbers in ascending and descending order up to 99 999. 4. Create real life story problems, games and puzzles involving the comparison of whole numbers up to 100000. 5. Perform mental calculations for games and puzzles involving whole numbers which are (100, 1000, 10000, 100000) more or less than a given number.	"More, Less, Same" Card Game In pairs, provide each learner with six flash cards. Have each child dip for three, 5-digit numbers, two 4-digit numbers and one 3-digit number. Invite learners to write a number on each card. Invite learners to play the game of "compare," where each child turns over the card that is at the top of his/her stack. The learners compare their flipped cards by comparing the number of digits or using the place value chart to determine who has more. The learner with more gets to keep the cards. If the cards are the same then they get to keep their card. The learners repeat the process until one learner has all the cards. Where do I fit? Puzzle Game.	Comparing Population Size In groups, provide learners with a story problem relating to the populations of two different countries in the Caribbean. Ensure that the population of countries chosen is less than 99999 but similar in terms of the number of digits. Provide each group with two place value charts and manipulatives such as blocks, counters. Have learners represent each population on the place value chart and base ten blocks. Invite them to compare the number of counters in each place value column for both numbers starting from right to left. Invite learners to choose the number with the greater value and explain their reasoning to indicate why one number is more or less than another number.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values 6. Discuss and share strategies to solve contextualized problems and puzzles, based on whole number comparisons up to 99 999.	Teacher will create a puzzle based on the class population. The first and last number should be inserted. The teacher will continue by inserting a number in every sixth slot starting from the first number. Each group will be focusing on numbers that fall between two markers. Members of groups will dip for their numbers. Together, using place value charts, learners will order numbers in ascending or descending order, whichever one that is stipulated by the teacher. When learners are done, each learner will come up to the puzzle board to place their number in the right ordinal position. This will happen on a group-to-group basis for ease of validation. Example of Puzzle  Retrieved from: https://www.kindergartenworksheetsandgames.com/ordinal-numbers-game/ Question, Show and Tell.	*Example: 32426*  Retrieved from: https://images.app.goo.gl/FtWVGQi4eMHih9U1A 52248  Repeat this activity using other numbers. Ensure that there are variations in the use of numbers; for instance: • Two numbers with unequal numbers of digits. Example: 23645 and 8387 • Two numbers with equal number of digits where the first digits are the same. Example: 45763 and 43562

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Learners will be divided in three groups for an in-class competition. Teacher will read the question, while learners calculate the answer mentally and write it on the card given. The learner will raise their card to show and read his answer. A total of 30 seconds will be given to answer each question. Each child will be given the opportunity to answer a question. If the child fails to give the correct answer, another member of his or her group will get a chance to answer for half the mark. The group with the highest total wins the competition. Example of Question: 1. Tom has $34, 568. He bought a phone for $1000. How much money does he have now?	• Two numbers with the same number of digits with only one digit being different. *Example: 53768 and 53968* Can I Complete the Number Line?  Retrieved From: https://images.app.goo.gl/SUdURohianJf3PkDA Invite each child to take a number card from a stack. In groups learners are to figure out the ordinal position of their number in ascending and descending order. Provide each group with a place value chart. Learners will write their number on the chart. Moving from right to left, the learner will compare the face value of numbers under each place value to determine which is the greatest or least. Following the rule for comparing numbers, learners will place their numbers in

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		ascending and descending order, using pegs on a number line. (T-Th) 10,000 / (Th) 1,000 / (H) 100 / (T) 10 / (O) 1 6 9 9 0 1 9 0 6 1 8 0 6 2 1 1 5 8 6 9 0 2 6 9 2 3 Retrieved from: https://www.math-only-math.com/arranging-numbers.html Teacher will repeat steps using numbers with at least one or two of the first set of digits being the same.  Calculator Brains Inform learners that they will be learning a skill set for mental calculations. Learners will be given a story problem asking them to find 100, 1000, 10000 or 100000 less than a given number. Each group will be focusing on a different increase in number. Learners will be provided with place

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		value disks or a spike abacus to help them to complete the task.  Retrieved From: https://images.app.goo.gl/Bs8DutcqJe8KpfQcA https://images.app.goo.gl/QuEtW254fazbAoiP9 Each group will be given an opportunity to present their work and explain their strategy. Probing questions should be asked to guide them to make the generalized statement of subtracting 1 to the thousands column if a number is decreased by 1000, or 1 to the hundreds if the number is to decrease by 100. Questions; 1. How were you able to get the answer when the number was decreased by 1000? Repeat question for 1000, 10000, 100000 respectively

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Provide learners with examples where the number in the 100's, 1000's, 10000's place is zero. Invite them to use the manipulatives to show what needs to be done to find the answer. Provide them with the opportunity to explain their strategy. For struggling groups, revert to the idea of making bundles of 10 to move from 1 place value to the next.   Retrieved from: https://www.bbc.co.uk/bitesize/articles/zw267yc

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Repeat this activity, by asking them to use place value to help them to calculate numbers which are 100, 1000, 10000, 100000 more or less than a given number  Retrieved from: https://www.lbq.org/Search/Mathematics?quickRef=10408

Additional Resources and Materials

Material

Place value disks
Blocks
Counters
Place value charts
Number cards
Puzzle mats
Pegs
string

Books

Alfie the Alligator by: Sundy Turley

Websites

https://www.youtube.com/watch?v=oVa_cAllL-w

https://elementaryedu.com/2022/08/games-for-comparing-numbers.html

Additional Useful Content Knowledge for the Teacher:

Comparing numbers means identifying a number that is smaller or greater than the rest. We can compare numbers using different methods such as a number line, counting, counting the number of digits, or by using place value of numbers.

Step for Comparing Numbers

1. Compare the number of digits. The number with the most digits is the greater number.

2. If the number of digits is the same then compare the higher place values.

3. If the digits are the same at the highest place value, compare the digit in the next place value to the right.

1. Keep comparing with the same place value until you find digits that are different. The one with the highest face value is the greater number.

Ordering Numbers

After comparing numbers, we can arrange them in ascending and descending order.

· Ascending Order: The arrangement of data from the smallest to the largest value.

· Descending Order: The arrangement of data from the largest to the smallest value.

Opportunities for Subject Integration:

Art and Craft

Creating card games

Creating puzzles

Creating board and floor games

Science and Technology

Recording and comparing quantitative data

Link population sizes of countries to the concept of comparing and ordering

Social Studies

Work effectively in groups.

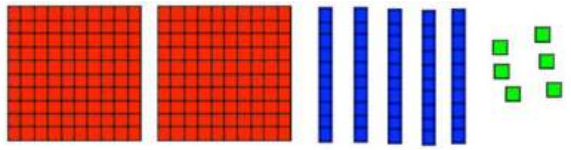
Language Arts

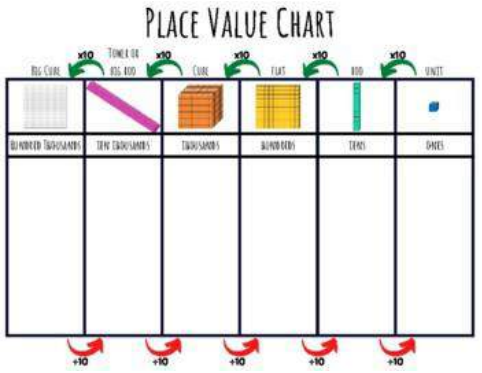
Creating rules for games and puzzles created.

Essential Learning Outcome N1.4: Whole Number – Understanding Place

Grade Level Expectations:

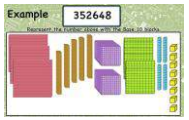
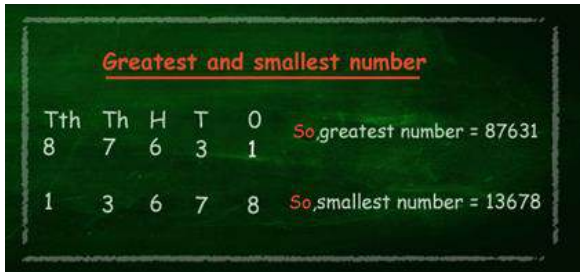
- Recognise that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left;
- Represent the place value of numbers in base-ten groupings concretely, pictorially, contextually, verbally and symbolically;
- Explain the pattern regularity of the place value system; Identify the value of a digit as determined by its position;
- Explain patterns in the number of zeros of the product when multiplying a number by powers of 10 using place value explanations (not "counting" zeros), and explain place value patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10; Use whole-number exponents to denote powers of 10;
- Use place value understanding to round multi-digit whole numbers to ten thousands; Use place value understanding to round multi-digit whole numbers to hundred thousands

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Recognise that in a multi-digit whole number up to 100 000, each place has a value of ten times greater than the place immediately to its right 2. Recognise and apply the principle that in a whole number up to 100,000, each place is 1/10 of what it represents in the place to its left. 3. Express the place value of a numeral within context, up to 100,000, using concrete, pictorial, verbal, and symbolic representation.	**Whole Class Bingo game?** Prepare bingo cards with the values of numbers that are 10 times greater than the value to the right of the number in question. Example: BINGO 30000 | 400000 2000 | 500	**Investigating Place Value**  Retrieved from: https://images.app.goo.gl/oLP7gQLSgqzttvmo9

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
4. State the value of any digit within a whole number up to 100 000 using concrete, pictorial, verbal, and symbolic representations. 5. Explain the pattern of zeros in the product when multiplying a whole number by a power of 10 up to 100000. 6. Explain the patterns in the decimal point placement when a decimal with up to three decimal places is multiplied or divided by a power of 10. 7. Recognise that whole number exponents can be used to denote powers of 10. 8. Round off any whole number up to 100 000 to the nearest 10 000 and 100 000 **Values** 9. Appreciate that tens are nested in hundreds and thousands and use that knowledge to rename whole numbers. 10. Discuss and share the importance of rounding multi-digit whole numbers to a hundred thousand in real-life situations.	**<u>Bingo questions</u>** I am looking for a number with a place value which is ten times the place value of the 3 in the number 3457. **Think Pair Share** Provide learner with a story problem: Example: Peter had 3210 chicks in his brooder last week. After his end-of-month sale, he now has 321 chicks left. Using the concept of place value, explain the similarities and differences in the values of the two numbers. Listen to the discussion and provide learners with an opportunity to share their findings. **Place Value Bingo** Provide each child with a bingo card and counters. Read the place value expanded number and have learners find the corresponding number on their cards. Invite learners to use place value charts if needed. Continue to call numbers until you get a winner. Example of cards:	 Retrieved from:https://images.app.goo.gl/SmJDxubj1NpSwS9g8 Provide each group with a place value chart and a set of place value base ten blocks or disk. Provide learners with a number less than 999999 which has at least two of the same digits next to each other. For example 459922. Invite them to record the number on the place value chart, use base ten block and place value formation to explain the relationship between the highlighted numbers. 2 tens 2 bundles of 10 2x10 =20

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from: https://www.twinkl.co.uk/resource/t2-m-1872-6-digit-number-bingo **Observation** Learners will be observed as they expand numbers and assessed using an observational checklist.	The number 2 in the tens place is 10 times the 2 in the ones place. Whereas the number 9 in the thousands place is ten times the number 9 in the hundreds place. **Working Backward** Through the use of an example, begin the lesson by reviewing the place value of each digit as 10 times greater than the place immediately to its right. Draw learners' attention to numbers on a place value chart. Engage learners in discussions to explain the shift in place value of numbers; Each place is 1/10 of what it represents in the place to its left.

Hth	Tth	Th	H	T	O
		2	0	0	0
			2	0	0
				2	0
					2

Specific Curriculum Outcomes	Inclusive Assessment Strategies			Inclusive Learning Strategies
	Criteria	Y	N	Provide other examples for practice.
	1. Learners used the place value chart to identify the place value of digits in the number 2. Learners use manipulatives or pictorial representation to help understand the task. Example:  Retrieved from: https://images.app.goo.gl/pJrcXTmYPDQDmhcA9 3. Learners were able to express the value of each digit by multiplying it to its corresponding power of 10: A. Hundred thousand B. Ten thousand C. Thousand D. Hundreds E. Tens F. Ones 4. Learners provided accurate explanations for their answers.			**Does Place Value Matter?** In groups, invite learners to choose any six numbers. Invite learners to form the largest or smallest number using their six digits. Provide learners with a place value chart and base ten blocks to visually represent numbers. Have learners explain why their number is the largest number that can be formed. Provide opportunities for learners to explain the value of each digit based on its position. https://images.app.goo.gl/pJrcXTmYPDQDmhcA9  Retrieved from: https://learn.e-limu.org/topic/view/?c=49&t=289

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Exit tickets

Provide learners with exit tickets to assess lesson objectives. It is better to create your own to vary problems given for practice.

Exit Tickets	
$2x10^5 =$	832950 $3x\ 10^n$ N=
$(5 x\ 10^4) + (3 x10^2)$ $=50000 +$ _____	4000 $4 x\ 10^n$

Peer Assessment

Invite each learner to write an equation for their partner to solve. Have learners discuss their solutions and correct each other's work.

Provide learners with other numbers and have them to identify and explain the place value of each digit number.

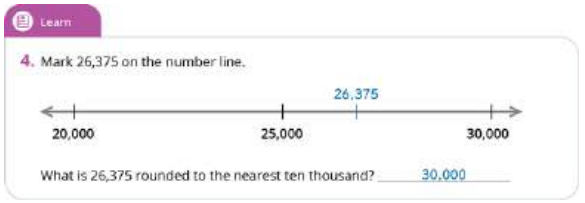
Investigating Patterns in Powers of Ten

In groups, provide learners with a place value chart with a number and expansion using multipliers of 10 and powers of 10 for each digit place value. Learners will observe patterns and discuss.

Th	H	T	O
2	4	3	2
2x1000 2 x 100 x 10 2x10 x10 x10 $2 x\ 10^3$	4x 100 4x10x10 $4x10^2$	3x10 3x10 $3x10^1$	2x 1 2x1 $2x10^0$

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Provide learners with the opportunity to present the work of their peers and explain why their answer was correct or incorrect. **"Kennel Search" Card Game.**  Retrieved from: https://images.app.goo.gl/RPF7fKcjEoigvQKW7 Give each child a sheet with four pups. Write a number on each pup and ask the learner to find the number rounded to the correct 10000. Example: Pup 1: 34896 Kennel number: 30000	In each case, guide learners to provide explanations for using a base 10 and a particular exponent. Provide opportunities for further practice. **Discovering Patterns with Powers of 10** In groups learners will be given a number, an instruction card and a place value chart. Learners will be instructed to: 1. Use their knowledge from the previous lesson to solve each expression. 2. Write each product on the place value chart 3. Answer the questions which follows: a. Compare the products of each expression, What do you notice? b. What changes took place in the place value of the original number as the exponents increased.? $2 \times 10^0 = 2$ $2 \times 10^1 = 20$ $2 \times 10^2 = 200$ $2 \times 10^3 = 2000$ $2 \times 10^4 = 20000$ | Hth | Tth | Th | H | T | O |

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Invite each child to take Four kennel shaped cards from a pile of cards. Place one card in the center. Begin by inviteing anyone who needs the card in the center to take it and drop what he or she does not need. Continue to play until someone has found homes for all their pups. https://www.vectorstock.com/royalty-free-vector/set-of-cartoon-cute-dog-coloring-page-vector-16112643 https://www.etsy.com/in-en/listing/734452222/dog-kennel-mdf-craft-shape-wooden-blank	1. The number (2) is in all the products but they increase in place value. 2. Each time an additional 10 is multiplied the digit moves one place value to the left. **Play Dough Slicing Activity** Begin by modelling repeated division by 10 until 1 is reached. **Use of Manipulatives**: Provide each child with a decimal place value chart, play dough and a plastic knife. Learners will create a model of a square with playdough and divide it by 10. Learners will put 1 in the ones column of the place value chart and record answers on the chart as they continue to divide and move from 1 place value to the next. Encourage learners to make use of powers of 10 in recording answers. Invite learners to examine the patterns of numbers as it is divided.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		$1 \div 10 = 0.1$ $0.1 \div 10 = 0.01$ 0r $1 \div 10^2$ $0.01 \div 10 = 0.001$ / $1 \div 10^3$ Provide opportunities for further practice with division by powers of ten. **Reporting Less or More** In groups, provide learners with a story problem and a number line. Example: The St.Lucia Electricity Service actual profit for the last financial year was $582500. However, the report stated that the profit was $580000. What could be the reason for the disparity in the amounts?  Retrieved from: https://selliliar.live/product_details/474247.html Using the number provided, show and justify your answer.

Additional Resources and Materials

Materials

Place Value Chart
Number lines
Play dough
Plastic Knife
Base 10 blocks
Place Value disks
counters

Websites

https://thirdspacelearning.com/us/math-resources/topic-guides/number-and-quantity/powers-of-10/#common-core

https://www.youtube.com/watch?v=SKrujXYeFcI

Additional Useful Content Knowledge for the Teacher:

Patterns in the Number of Zero's

In teaching patterns between the powers of ten and the number of zeros at the end of numbers, learners may easily make mistakes when dealing with numbers with zeros in between. Example: 103000 0r 1.001 x 10^4. Therefore, it is important to expose learners to these types of numbers and equations to avoid misconceptions.

The base and the exponent

Learners frequently make mistakes by multiplying the base by the exponent. It is important to emphasize the base as the only number being multiplied. The exponent tells us how many times to multiply the base.

Opportunities for Subject Integration:

Art and Craft:
Creating bingo game
Creating Card Games

Science and Technology
Linking income, expenditure, imports and exports to rounding off

Social Studies
Work effectively in groups and follow the rules of the game.

Language Arts
Write their own real life problems and create booklets
Write short paragraphs to explain place value patterns

Essential Learning Outcome N2.1: Fractions, Decimals, and Rational Numbers– Representing Fractions

Grade Level Expectations:

- Represent fractions as simple mixed numbers or improper fractions concretely, pictorially, and symbolically;
- Understand a fraction as part of a whole, part of a set, and measurement;
- Understand a fraction as a quotient and as an operator

Specific Curriculum Outcomes

Learners are expected to:

Knowledge

1. Identify and name mixed numbers and improper fractions using various modes of representation such as the area, linear, set, and technology-based models
2. Write a fraction in the form a/b, where a represents the number of parts of the whole or set shaded and b represents the total number of equal parts the whole is divided into
3. Represent fractions as mixed numbers and improper fractions, using manipulatives such as cutouts and number lines
4. Demonstrate the relationship between mixed numbers and improper fractions using pictures and drawings

Inclusive Assessment Strategies

Observation

Observe learners as they use manipulatives to represent given improper fractions and mixed numbers. Assess them using an observation checklist such as the one below.

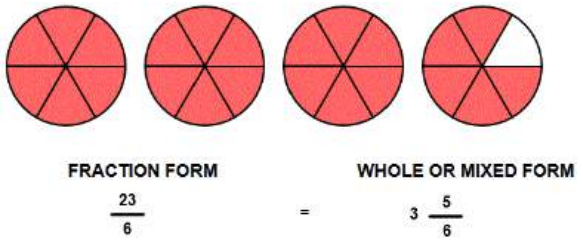
CRITERIA (Applicable to all fraction models)	YES	NO
UNDERSTANDING 1.Learner demonstrates understanding of mixed numbers and improper fractions. 2. Learner uses models correctly. 3.Learner provides accurate explanations for representations of given fractions.		

Inclusive Learning Strategies

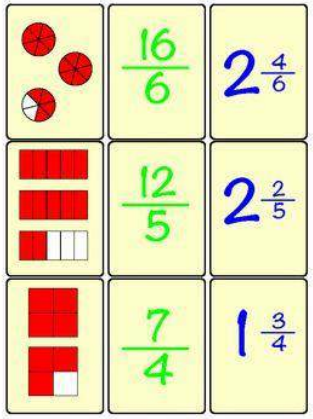
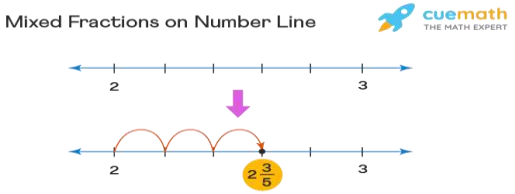
CONCRETE/VISUAL MANIPULATIVES

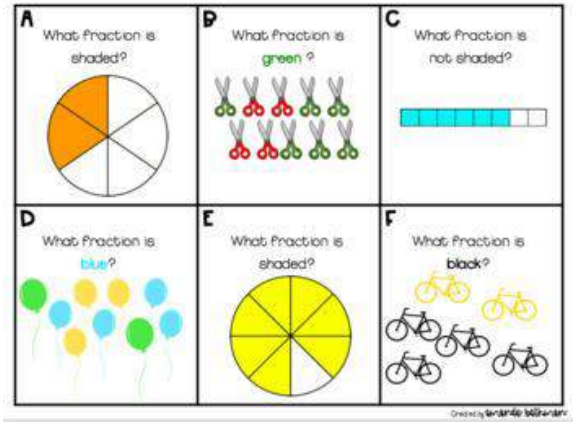
- ***AREA MODEL***

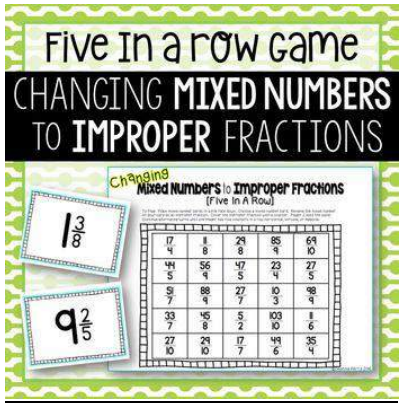
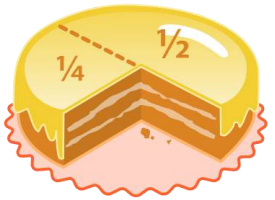
Invite learners to use manipulatives such as fraction bars, fraction circles and fraction tiles to represent and name mixed numbers and improper fractions



SOURCE: https://visualfractions.com/mixed-fractions-circle/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
5. Recognise that a/b means a divided by b, where a is the dividend and b is the divisor **Skills** 6. Convert mixed numbers to improper fractions and vice versa **Values** 7. Identify examples of fractions of wholes and sets in everyday life	4. Learner can demonstrate the relationship between mixed numbers and improper fractions using models. ***PARTICIPATION/INTEREST*** 4. Learner is actively engaged in the use of the fraction model. 5.Learner shows interest and enthusiasm while using fraction models. ***EXIT CARDS*** Provide learners with exit cards at the end of the lesson and have them answer the questions on their cards. SAMPLES OF CARDS:	 SOURCE: https://www.pinterest.com/pin/98023729367394473/ • ***LINEAR MODEL*** Use number lines or tape diagrams to represent mixed numbers and improper fractions  SOURCE: https://www.cuemath.com/numbers/fractions-on-number-line/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 SOURCE: https://www.teacherspayteachers.com/Product/Fractions-of-a-Set-and-Whole-583017 TECHNOLOGY-BASED ASSESSMENT https://www.iknowit.com/lessons/b-fractions-of-sets.html ***GAMES- MATH BINGO*** Play a Bingo game where each learner is provided with a card similar to the one below. Learners will convert each mixed number called out by the teacher to an improper fraction and will highlight the fraction on his/her card. The first player to highlight five fractions in a row wins the game.	*GAMES* Have learners play games where they label missing parts of a number line using either improper fractions or mixed numbers or both. • ***SET MODEL*** Have learners find objects in their environment such as M&Ms, Skittles, mini chocolates, beads, beans and bottle caps. Invite them to use a set of items to form groups with an equal number in each group, where the entire set is regarded as a whole. • ***TECHNOLOGY--BASED MODELS*** Invite learners to manipulate interactive models to deepen understanding of mixed numbers and improper fractions EXAMPLES OF WEBSITES: https://www.geogebra.org/m/c6DFEKDY

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 SOURCE: https://www.pinterest.com/pin/372743306670592419/	***PROBLEM SOLVING*** Use problem solving to name and represent fractions. For example: 1.  A cake is cut into 4 equal pieces. Ryan eats 2 of these pieces. What fraction of the cake does Ryan eat? Write your answer in simplest form (lowest terms). SOURCE OF PICTURE: https://en.wikipedia.org/wiki/Fraction 2.  SOURCE: https://slideplayer.com/slide/14797687/

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td></td>
<td>RUBRIC FOR ASSESSMENT:

<table>
<tr><th>SCORE</th><th>CRITERIA</th></tr>
<tr><td>3

2

1

———-

3

2

1

3

2</td><td><u>ACCURACY/UNDERSTANDING</u>
Learner:
-converts mixed numbers to improper fractions accurately with no errors.

-converts mixed numbers to improper fractions with minimal errors.

-is unable to convert mixed numbers to improper fractions
———————————————————————

-converts improper fractions to mixed numbers accurately with no errors.

-converts improper fractions to mixed numbers with minimal errors.

-struggles to convert improper fractions to mixed numbers
<u>PARTICIPATION</u></td></tr>
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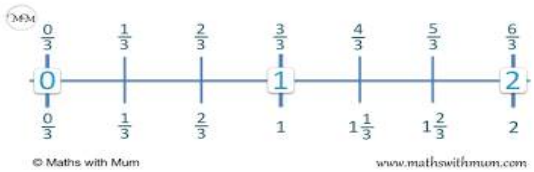
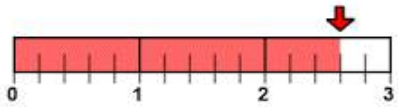
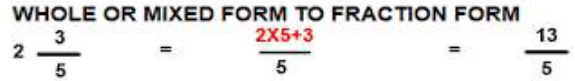
<td><u>SCO #3, 4</u>

https://www.mathswithmum.com/mixed-to-improper-fractions/

<u>PEER GUIDANCE/ COOPERATIVE LEARNING</u>

Invite learners to perform calculations along with their peers. They can also work in small groups of three or four so that the success of each group member determines the success of the group. Use flash cards and other materials to stimulate interest.</td>
</tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	1 -actively participates with a high level of interest and enthusiasm -participates, but with little interest and enthusiasm -is reluctant to participate 8-9: EXCELLENT 6-7: GOOD 4-5: NEEDS IMPROVEMENT 1-3: BELOW EXPECTATION	  SOURCE: https://visualfractions.com/mixed-number-to-fraction/

Additional Resources and Materials

LINEAR MODEL
https://www.khanacademy.org/math/arithmetic-home/arith-review-fractions/mixed-number/v/postive-improper-fractions-on-the-number-line

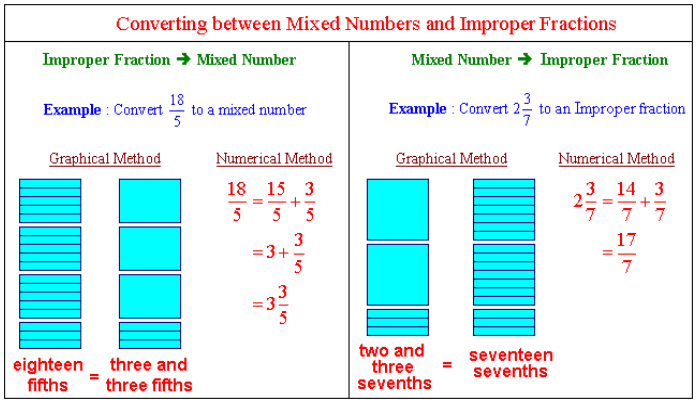
REPRESENTING MIXED NUMBERS AND IMPROPER FRACTIONS
https://www.vasolsuperstars.com/post/understand-mixed-numbers-without-getting-mixed-up

CONVERTING MIXED NUMBERS TO IMPROPER FRACTIONS
https://www.mathswithmum.com/mixed-to-improper-fractions/
https://mathgeekmama.com/convert-improper-fractions-to-mixed-numbers/

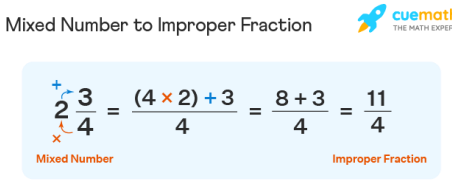
FRACTION OF A SET
https://www.youtube.com/watch?app=desktop&v=C3W1ZdDxPWQ

Additional Useful Content Knowledge for the Teacher:

An improper fraction is a fraction where the numerator is greater than or equal to the denominator. Examples of improper fractions: 4/3, 8/8, 9/2.
A **mixed number** consists of a whole number and a proper fraction. Examples of mixed numbers: 5 ⅓, 3 ½ , 10 ¾.

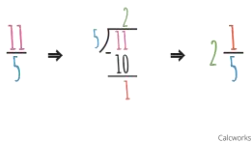


https://cimt.org.uk/projects/mepres/book7/bk7i10/bk7_10i4.htm



https://www.cuemath.com/numbers/mixed-number-to-improper-fraction/

Improper Fraction to Mixed Number



https://calcworkshop.com/fractions/improper-fraction-to-mixed-number/

Opportunities for Subject Integration:

Music –
The lengths of musical notes are usually denoted using fractions.

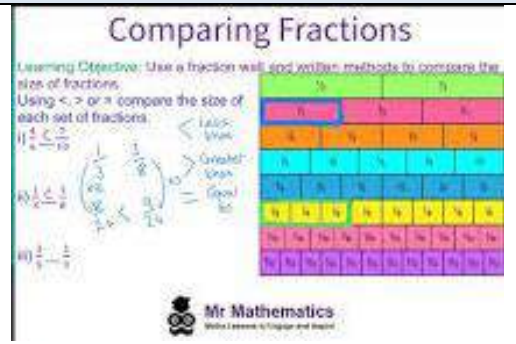
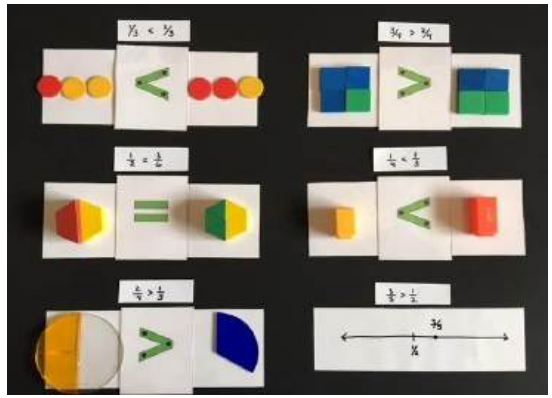
Food and Nutrition –
Measurements in recipes are often written using mixed numbers and improper fractions. Sometimes converting mixed numbers to improper fractions (and vice versa) is required when changing recipes

Essential Learning Outcome N2.2.: Fractions, Decimals and Rational Numbers – Comparing and Ordering Fractions

Grade Level Expectations:

- Compare proper and improper fractions;
- Compare mixed numbers;
- Describe fractions in simplest or least terms

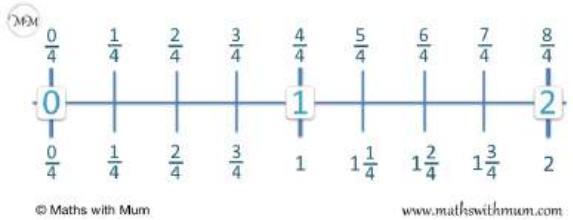
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Compare two proper fractions, improper fractions, and/or mixed numbers with similar and unlike denominators using <, > or = 2. Arrange up to four proper fractions, improper fractions and/or mixed numbers in ascending and descending order 3. Express a fraction in simplest terms by dividing the numerator and denominator by the highest common factor (H.C.F.) 4. Explain why fractions in simplest form represent the same proportion or part of a whole or set	***EXIT CARDS*** Provide learners with fraction strips and invite them to compare given fractions using correct statements or arrange fractions in ascending or descending order using strips. Ensure that they are able to justify their answers. SAMPLES: a. $\frac{2}{3} < \frac{5}{6}$ b. $\frac{1}{2} > \frac{3}{10}$ c. $\frac{6}{8} = \frac{3}{4}$ https://brainly.in/question/24492489	*It is important for learners to understand how to compare and order fractions as there are many real-life applications of this concept.* ***AREA MODEL*** Use **visual models** such as fraction circles, fraction bars or fraction walls and invite learners to represent proper fractions, improper fractions or mixed numbers by colouring/shading, so that they can easily compare.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 5. Differentiate between proper and improper fractions using visual models such as the area, linear, set and technology-based models **Values** 6. Demonstrate understanding of proper fractions, improper fractions and mixed numbers by identifying real life examples	They can also be given cards with fractions that they have to compare. Do this at the end of the lesson and have learners post their cards on the classroom wall, with the correct signs between them (<, > or =). ***GAME***  **Retrieved from** **https://www.teacherspayteachers.com/Product/Fraction-War-Card-Game-4157237** Number of players: 2-4 Learners can play a card game where the deck of cards is shuffled face-down in a stack. In each turn, a player or team flips over two cards from the stack. The players must determine which of the two fractions is greater. If they answer correctly, the player or team keeps the pair of cards. If they don't answer correctly, the player or team turns the cards back over, and it's the next player's turn.	 SOURCE: https://www.youtube.com/watch?v=0bpnpexlivY Have learners **physically compare** two fractions using manipulatives such as fraction strips, fraction tiles, fraction walls and cutouts. Write statements using the appropriate symbols.  SOURCE: https://cindyelkins.edublogs.org/2018/02/10/fractions-part-4-compare-fractions/

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td></td>
<td>
After each turn, players discuss and explain the reasoning for their answer.

Use the scoring rubric below to assess learners as they play.

<table>
<tr><th>CRITERIA</th><th>3 POINTS</th><th>2 POINTS</th><th>1 POINT</th></tr>
<tr><td>ACCURACY</td><td>Learner's answers are accurate all of the time</td><td>Learner's answers are accurate most of the time</td><td>Learner struggles to provide accurate answers.</td></tr>
<tr><td>REASONING AND EXPLANATION</td><td>Learner consistently provides clear reasoning and explanation</td><td>Learner provides reasoning and explanation but may be incomplete or clear at times</td><td>Learner struggles to provide reasoning and explanation</td></tr>
<tr><td>COLLABORATION</td><td>Learner actively collaborates with other players</td><td>Learner occasionally collaborates with other players</td><td>Learner works independently and does not actively collaborate with other players.</td></tr>
</table>
</td>
<td>
<u>NUMBER LINES</u>
Have learners plot fractions on number lines to enable them to visually compare based on their positions. If done in pairs, have them write statements using correct symbols. If more than two fractions are plotted, have them write in ascending or descending order.



SOURCE: https://www.mathswithmum.com/mixed-to-improper-fractions/

<u>PROBLEM-SOLVING</u>
Use real-life scenarios to create word problems involving comparison of fractions. Teach concepts through problem-solving and encourage the use of problem-solving strategies to stimulate critical thinking skills. Embrace this opportunity to integrate other subject areas and other mathematical concepts, for example:

1. <u>Food and Nutrition</u>
</td>
</tr>
</table>

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr><td></td><td>8-9: EXCELLENT
6-7: GOOD
4-5: NEEDS IMPROVEMENT
1-3: BELOW EXPECTATION

<u>PEER ASSESSMENT- USE OF LEARNER ERRORS</u>

• Have learners complete worksheets on simplifying fractions to be corrected by the teacher. Pair learners based on mixed ability and invite them to analyse the errors from corrected scripts. Have them rework the questions and discuss.

• Form mixed ability groups of three or four and have learners write their own examples of fractions. Invite them to simplify these fractions as a group, then exchange with other groups. Teacher observes as she walks around. Use a checklist such as the one below.

<table><tr><th>CRITERIA</th><th>YES</th><th>NO</th></tr><tr><td><u>ACCURACY</u>
-Learners write fractions that can be simplified.

-Fractions are simplified correctly.

-Learners are able to explain how they reduced fractions to lowest terms.</td><td></td><td></td></tr></table></td><td>Jan used 2 ¼ cups of sugar to bake a vanilla cake and 5/2 cups of sugar to make some cookies. Which recipe required more sugar?

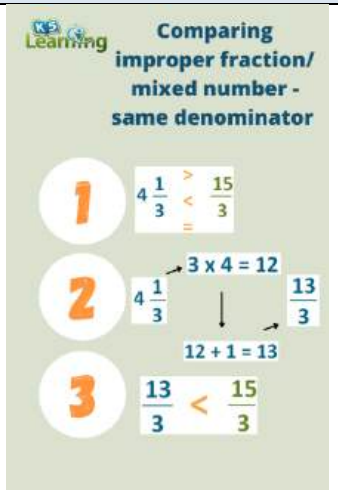
2. <u>Time</u>
Pete took ⅗ of an hour to run a marathon, while Roger took ⅔ of an hour to run the same marathon. Who took more time?

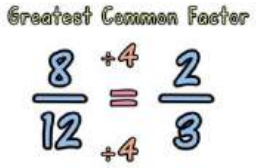
NB. Encourage learners to draw diagrams to represent given fractions when necessary.

Refer to the following website for more word problems.
https://resources.finalsite.net/images/v1591576636/brockton/ogfxkwd7trjwkzljnbps/June9MathGr3-Day2.pdf

<u>NUMERICAL COMPARISON</u>
After developing conceptual understanding through visual models and manipulatives, have learners engage in abstract thinking.

When comparing mixed numbers and improper fractions with similar denominators, encourage learners to convert mixed numbers to improper fractions so that the numerators can be easily compared.</td></tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	PARTICIPATION/INTEREST -Learner is actively engaged in the activity. -Learner shows interest and enthusiasm during activity.	 **SOURCE:** **https://www.k5learning.com/blog/comparing-improper-fractions-mixed-numbers-same-denominator** When denominators are not the same, have learners rewrite them using equivalent fractions with a common denominator before comparing.  SOURCE: https://study.com/academy/lesson/comparing-ordering-mixed-numbers.html

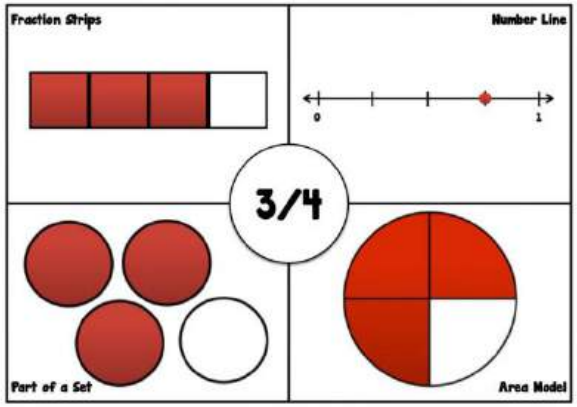
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		PEER TUTORING Pair learners and have them explain the process of reducing fractions to each other using examples. Have them use white boards or any other materials that would stimulate interest and enthusiasm.  SOURCE: https://www.mathsisfun.com/definitions/simplest-form-fractions-.html Provide learners with recipes and have them reduce fractions to lowest terms. Create fraction puzzles where pieces only fit together if the fractions are correctly reduced.

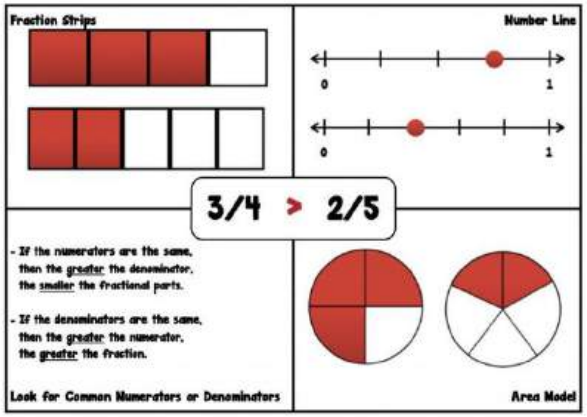
Additional Resources and Materials

PRINTABLE FRACTION STRIPS
https://filefolderfun.com/FirstGradeMath/FractionTiles

Additional Useful Content Knowledge for the Teacher:

It is important to use a variety of models when comparing fractions in order to cater to learners with varying learning styles and abilities. As much as possible teachers should use visual aids as well as manipulatives to enhance learning and to ensure conceptual understanding.





SOURCE:
http://mrnonnemakersinvestigators.weebly.com/our-class-blog/representing-and-comparing-fractions

REDUCING A FRACTION TO SIMPLEST FORM (LOWEST TERMS)

To write a fraction in simplest form, follow the following steps.
1. Find the Greatest Common Divisor (GCD) or the Highest Common Factor (HCF) of both the numerator and the denominator.
2. Divide the numerator and the denominator by this GCD or HCF.

Opportunities for Subject Integration:

Science and Technology –
Comparing fractions of species within an ecosystem.

Social-Studies –
Comparing fractions of a population with different ethnic backgrounds. Reduce to lowest terms when possible.

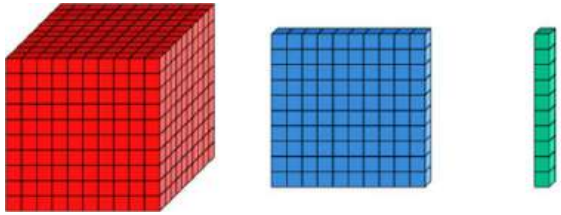
Food and Nutrition –
Use food labels to write nutritional content of given foods in fraction form. Compare fractions and reduce to simplest form.

Language Arts –
Write poems comparing fractions and/or reducing fractions to the simplest form.

Essential Learning Outcome N2.3.: Fractions, Decimals and Rational Numbers – Representing Decimals

Grade Level Expectations:

- Represent decimals using concrete materials and pictorials (tenths, hundredths);
- Describe decimals in context, verbally and symbolically; Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1.Recognise and define decimals (tenth and hundredths) using concrete materials (base -ten blocks, counters, grid paper) and pictorial representations. 2. Write a given fraction with a denominator of 10, or 100 using decimal notation. 3. Express dimensions of objects/shapes in different units (metre, centimetre, millimetre), using decimal notation. **Skills** 4. Measure and record lengths of objects using decimal notation. 5. Design models such as grids, number lines, to	***Group Work*** Learners, in groups of 5, will be given a combination of base 10 blocks made of cubes, flats and rods. Give each group a place value chart. See table below	***Use of Hands-on Manipulatives*** Use base -10 blocks as models.  **Whole** **Flat** **Rod** Retrieved from: https://thirdspacelearning.com/us/blog/what-are-base-ten-blocks/

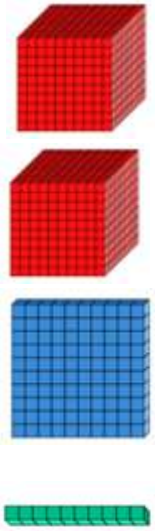
	Whole	tenths	hundredths
Model			
Decimal			
Number =			

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td>represent decimal values.

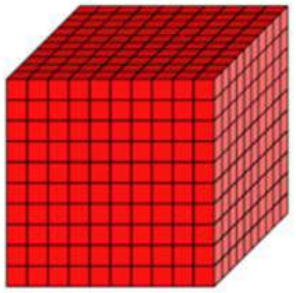
Values

6. State real life situations where decimal notation is used.</td>
<td>Learners will be required to complete the chart based on the combination of base 10 blocks they were given.

Learners are given the charts, as seen below and will be required to complete the chart.

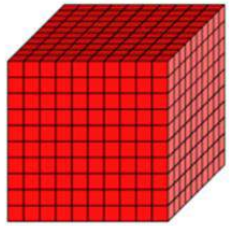
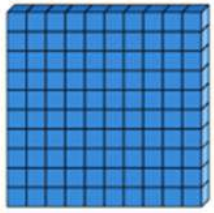
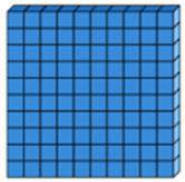
<table>
<tr><td>Model</td><td>Whole</td><td>tenths</td><td>hundredths</td></tr>
<tr><td>  </td><td></td><td></td><td></td></tr>
<tr><td>Decimal</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Number =</td></tr>
</table>
</td>
<td>Distinguish the relationship between the cube, flat and rod. Ten rods make a flat; ten flats make a whole.

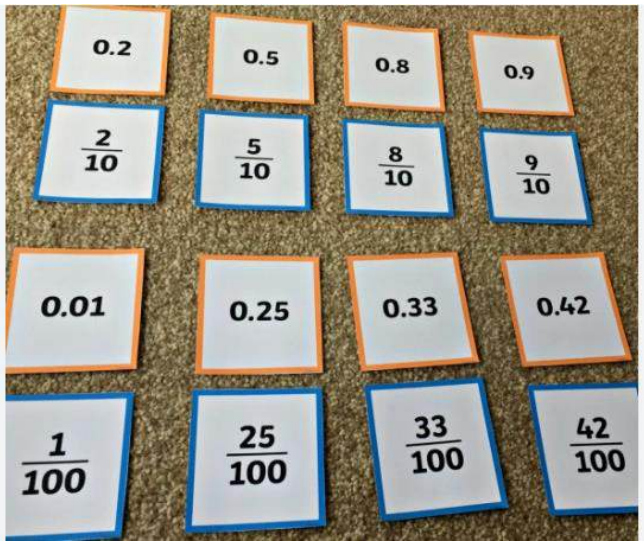
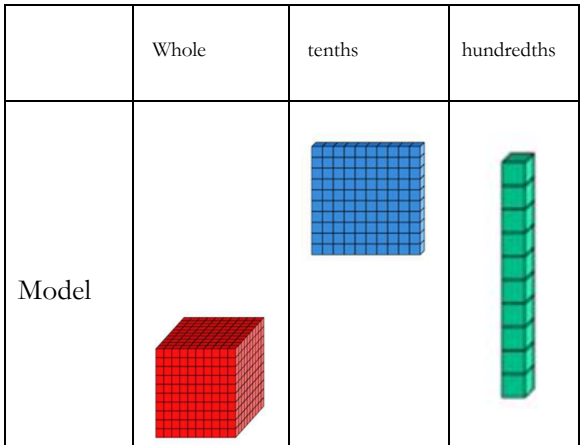
The whole or 1

represents the whole or 1

Display to learners the flat, and the relationship between the flat and the cube. Learners count the number of flats that make up the whole. (Ten flats make up the whole). Inform learners that the flat represents tenths.</td>
</tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	CARD GAME This game has two decks of cards. One deck has fractions with denominators of 10, or 100 and the other is a deck of cards that has decimal equivalents. All cards are shuffled and placed face down in two separate sections.. Learners take turns taking two cards, one from each section. Learners read the fraction on the card and then compare it to the card with the decimal value. Learners decide whether they are equal. If the cards are correctly matched, the learner keeps the pair and then draws another two cards. If the cards are not correctly matched, the cards will be placed face down in their original positions. Learner with the most cards at the end of the game wins.	  represent tenths Learners count the number of rods that make up the flat (Ten rods make up the flat). Inform learners that the rods represent hundredths.   represent hundredths

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from: https://ofamilylearningtogether.com/2017/11/29/decimal-pages/ ***Practical Activity (Pairs)*** Learners measure the dimensions of the objects with appropriate measuring instruments and record their measurements.	Create a chart to show the relationship between the model and the decimal. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

One learner measures, and the other records and checks that the value stated by his classmate is correct. Then, the learners switch roles.

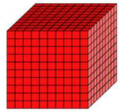
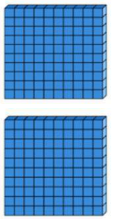
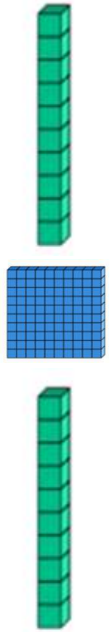
Project

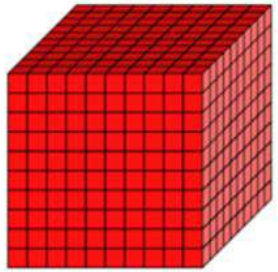
Assign learners different decimal values. Invite learners to create two different models for their assigned decimal (10X10 shaded grid; number line; base ten blocks).

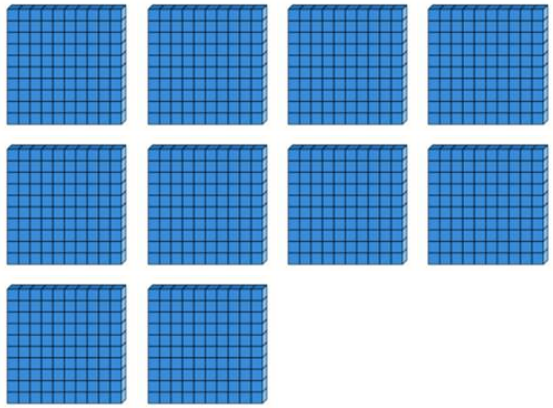
Models must be labelled clearly and learners must write a brief explanation of models chosen, describing how the decimal values were represented.

Real Life Situation

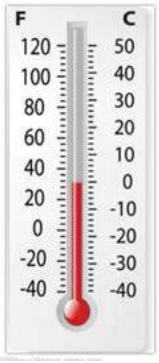
Set up a classroom shop with various items with their prices placed on them. Invite each learner to pick one item from the shop. With play money, the learner has to come up with the exact notes and coins to pay for the item chosen.

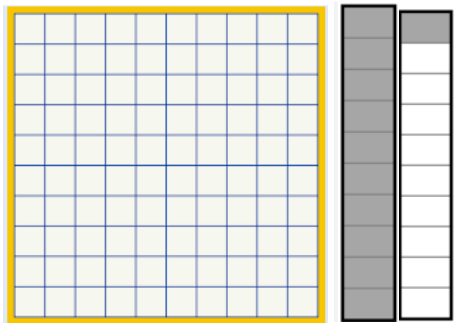
	Whole	Tenths	Hundredths
Model			
Decimal	1	0.3	0.02
Number = 1.32			

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 https://www.teacherspayteachers.com/Product/Free-Classroom-Grocery-Math-Templates-2563236	**Questions:** What is the value in the tenth place? What is the value in the hundredth place? What is the place value of 3 in the number 1.43? ***Use of Hands-on Manipulatives*** **Base -10 blocks** 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 Demonstrate to learners that there are 10 flats that make up a cube and so each flat is 1/10 of a whole and is represented as a decimal notation by 0.1. It is read as one tenth. If there are two flats, it is represented as the fraction 2/10 and in decimal notation as 0.2. Show learners that there are 100 rods that make up a whole, so each rod is 1/100 and is represented by the decimal notation 0.01. This is read as one hundredth.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 1/100 **Questions:** What is the decimal notation of one flat in relation to a cube? What is the decimal notation of one rod in relation to a cube? What is the decimal value of 1/100? ***Demonstration/Group Work*** Give learners measuring instruments: measuring tape, centimetre rulers, metre ruler, thermometer. Demonstrate to learners how to read the values on each measuring instrument. Learners work in groups where they will be given the opportunity to read the values on the measuring instrument.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Demonstrate to learners how to use the measuring instruments to measure the length, height, width of objects and temperature of liquids. In groups, learners will measure and record the dimensions of various objects and the temperature of liquids.  Retrieved from: https://www.shutterstock.com/search/ruler-cm  Retrieved from: https://kids.britannica.com/learners/article/thermometer/277324

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Question: What is the length of the object? Express your answer as a decimal? ***Think, Pair, Share*** Place learners in pairs. Distribute squared paper (10 X 10 grid) to learners to create a model to show decimal values. ***Demonstration of grid*** Explain that the entire grid represents 1 whole; each column or row represents 0.1 and each small square represents 0.01.  whole 0.1 0.01 Retrieved from:

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		https://www.printablee.com/post_10-by-10-grids-printable_402493/ https://study.com/skill/practice/writing-decimals-shown-in-grids-questions.html Learners use their squared paper to shade or colour squares that represent decimal numbers. ***Demonstration on a Number Line*** Draw a number line from 0 to 1, with intervals of 0.1 and 0.05, on a chart. Demonstrate to learners different decimals numbers (e.g 0.3, 0.75) on the number line. Learners create their own number lines using strips of colourful paper. Learners place various decimal numbers on their number line. **Question:** What decimal value does the model represent? ***Discussion and questioning, use of videos*** Engage learners in a discussion on situations where decimals are used. **https://www.youtube.com/watch?v=scdG75TGiPk** **https://www.youtube.com/watch?v=ypVQDZL18SQ**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Use of real-life activities Introduce banknotes ($5, $10) and coins (5 cents, 10 cents, 25 cents, $1.00) to learners. Write the value of the bank notes and coins as a decimal. For example, learners will be shown that $0.25 is equivalent to a 25 cents coin and $1.50 is made up of six 25 cents coins or $1.00 coin and two 25-cent coins. Combine banknotes and coins to attain different amounts, and these will be written as decimals. Example, one $5 note and one 10 cent coin is $5.10. **Question:** Can you identify other real-life situations where decimals are used?

Additional Resources and Materials

Daisy's Decimal Disaster by Joan Diaz
Decimal place value charts
Decimal dice
Fraction circles (divided into tenths and hundredths)
Flashcards

https://mathteachercoach.com/introduction-to-hundredths/
https://nz.ixl.com/maths/year-5/model-decimals-and-fractions
https://nz.ixl.com/maths/year-5/what-decimal-number-is-illustrated

Additional Useful Content Knowledge for the Teacher:

Measurement:

Decimals are commonly used in measurement. Hence, becoming familiar with various units of measurement and how to convert between them is necessary. Also, there must be an understanding on how to use measuring instruments and how to read measurements using decimal notation.

Geometry:

Teachers should understand how decimals are used in the calculation of perimeter, area, and volume.

Statistics:

Decimals are frequently encountered in data analysis and statistics. Teachers should know how to interpret and represent decimal data in graphs and charts, as well as to calculate measures of central tendency and variation.

Opportunities for Subject Integration:

Science:

- Measurement conversions involving decimals, such as centimeters to meters or milliliters to liters.
- data involving decimals, such as temperature, amount of rainfall, windspeed.

Social Studies:

- Currencies, converting between different currencies involving decimals
- Share prices , rate of inflation , prices of goods and services.
- Heights of mountains

Language Arts:

- Write explanations or reports on real-world applications of decimals.
- Prepare a recipe.

Essential Learning Outcomes N2.4.: Fractions, Decimals and Rational Numbers – Comparing and Ordering Decimals

Grade Level Expectations:

- Compare two decimals to hundredths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons and justify the conclusions, e.g., by using a visual model;
- Order decimals to hundredths based on place value understanding. Round decimal numbers to the nearest tenth, in various context.

Specific Curriculum Outcomes

Learners are expected to:

Knowledge

1. Compare two decimal values (hundredths) using appropriate symbols (<, >, =).

2. Arrange decimal numbers in ascending and descending order.

3. Round off decimal numbers to the nearest tenth and hundredth

Skills

4. Use manipulatives and pictorial representations to show decimals (tenths and hundredths) in ascending or descending order.

Values

5. Identify real-life situations when decimals are

Inclusive Assessment Strategies

Observation

Present learners with pairs of decimals numbers and invite them to use comparison symbols (<, >, =) to compare them. Also present them with pairs of amounts of money to do the same.

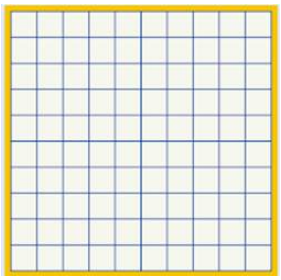
Observation Checklist:

Criteria	Yes	No	Comments
Learner correctly reads the pair of decimals.			
Learner uses a grid or base ten blocks or place value chart effectively to show			

Inclusive Learning Strategies

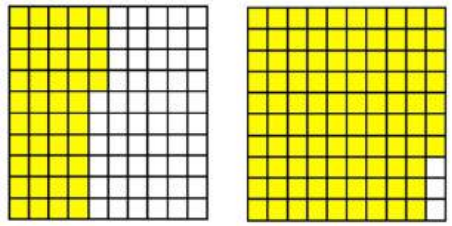
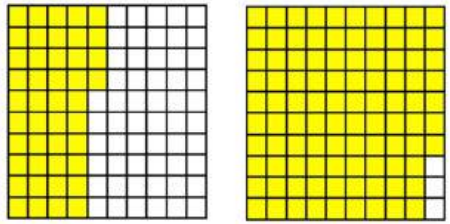
Use of hands-on manipulatives

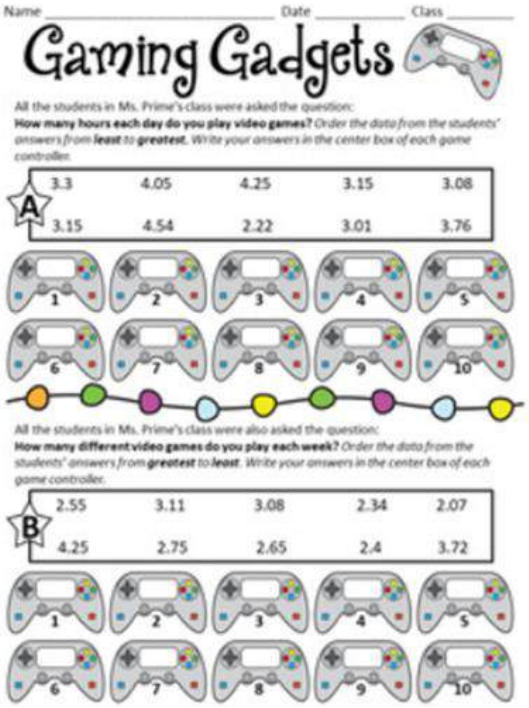
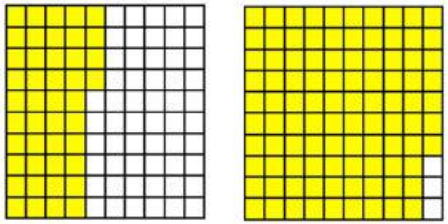
Learners will be given 10X10 grids of similar sizes.

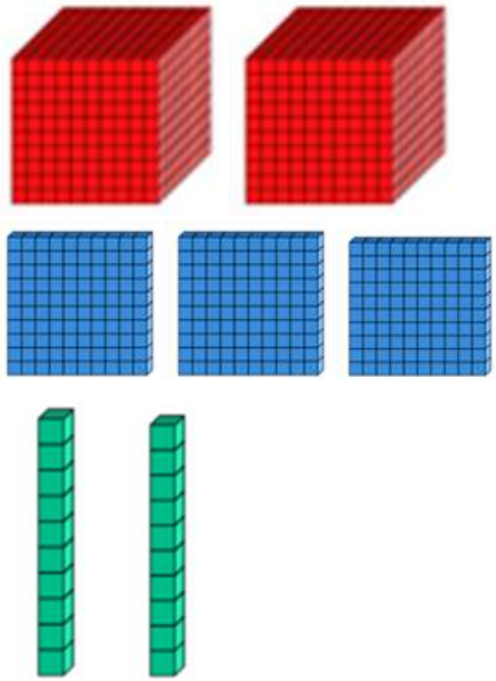


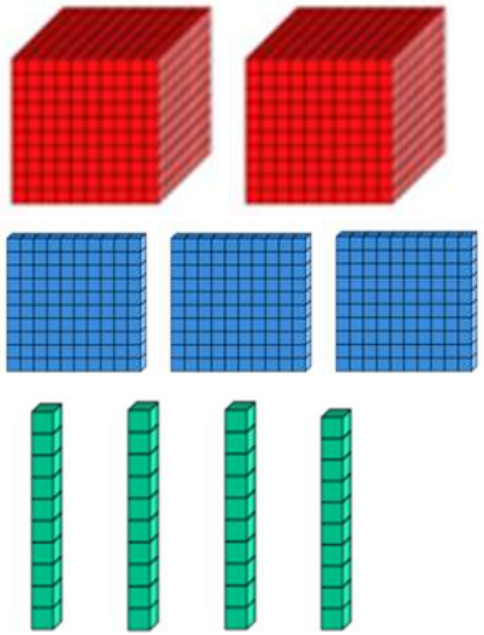
Retrieved from: https://www.printablee.com/post_10-by-10-grids-printable_402493/

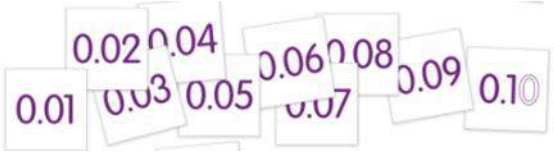
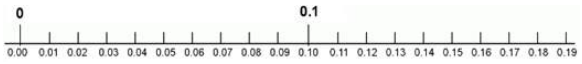
With two 10 X 10 similar grids, learners shade squares to represent decimal numbers, for example, 0.44, 0.97.

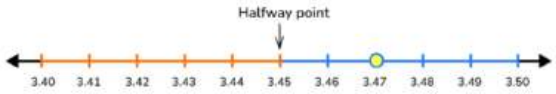
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
used to make comparisons (greater than, less than, equal to) 6. State instances where rounding off is used in everyday life.	the decimals. Learner uses the symbols <, >, = correctly to represent the relationship between the decimals. Learner provides adequate explanations for his choice of symbol. **EXIT CARDS** Provide learners with exit cards at the end of the lesson. The questions on the cards must be answered.	 Retrieved from: https://kgmathminds.com/2015/02/02/decimal-quick-images/ Learners compare the shaded squares on the two cards.  The grid with more shaded squares is the greater of the decimal numbers. The grid with fewer shaded squares is the smaller of the decimal numbers.

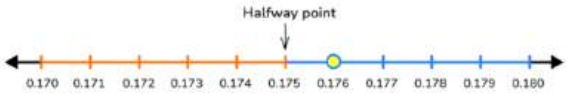
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Sample  Name _____ Date _____ Class _____ Gaming Gadgets All the students in Ms. Prime's class were asked the question: **How many hours each day do you play video games?** *Order the data from the students' answers from* ***least*** *to* ***greatest****. Write your answers in the center box of each game controller.* A: 3.3, 4.05, 4.25, 3.15, 3.08; 3.15, 4.54, 2.22, 3.01, 3.76 All the students in Ms. Prime's class were also asked the question: **How many different video games do you play each week?** *Order the data from the students' answers from* ***greatest*** *to* ***least****. Write your answers in the center box of each game controller.* B: 2.55, 3.11, 3.08, 2.34, 2.07; 4.25, 2.75, 2.65, 2.4, 3.72 https://www.teacherspayteachers.com/Product/Ordering-Decimals-and-Place-Value-Paper-Activities-3962354?st=63618179756d3a080fa161c32559e61c **Additional Online Assessment** https://nz.ixl.com/maths/year-5/put-decimal-numbers-in-order	If the grids have the same number of shaded squares, then the decimal numbers are equal. Learners place the appropriate sign (<, >, =) between the two grids, and then between the two decimal numbers.  0.44 0.97

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	PUZZLE  **https://www.shutterstock.com/search/blank-puzzle-pieces** Provide learners with two puzzle pieces. One of the puzzle pieces would contain a decimal written with tenth place, e.g. 12.7. Invite learners to write two different decimals (with two decimal places), on the second piece of the puzzle, so that when rounded off correctly to the nearest tenth, gives the decimal that was originally given. Repeat this process with the first puzzle piece having a decimal with hundredth place and learners must come up with two decimals (with three decimal places) so that when rounded off, it gives the original decimal.	**Base 10 Blocks** Learners use base ten blocks to compare two decimals (hundredths). Set 1  Retrieved from: https://thirdspacelearning.com/us/blog/what-are-base-ten-blocks/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	GROUP WORK Sports: Cricket Ball Throw Eight learners throw the cricket ball in the marked area on the playing field, from a particular point. Learners measure and record the distance of each throw from the appropriate starting line. Invite learners, in small groups, to compare the results of the throws to determine the longest throw, the shortest throw. Invite learners to round off the lengths measured to the nearest tenth. Invite learners to arrange the lengths in ascending or descending order.  https://www.trackalerts.com/2018/05/thomas-stars-with-record-throw-during-insports-primary-champs/	Set 2  Retrieved from: https://thirdspacelearning.com/us/blog/what-are-base-ten-blocks/ Decimals numbers representing the base 10 black models are written and appropriate signs are placed between them.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Questions: Which decimal is greater, smaller when comparing two values? Which decimal value is greater than 3.27, less than 3.15, equal to 2/10? **Group Work** Divide learners into small groups. Give decimal cards to each group of learners. Each card has a different decimal number.  Retrieved from: https://www.eaieducation.com/Product/506480/Decimal_Pocket_Chart_Cards.aspx  Retrieved from: https://www.homeschoolmath.net/teaching/d/hundredths.php

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Give each group a number line. Learners will place the set of cards in the correct position on the number line. Learners write down the decimal numbers on their cards in ascending order. Learners then write the decimal numbers on their cards in descending order. The two groups then exchange half of their cards and follow the same procedure above to write the new group of decimal numbers in ascending and descending order. Question: What patterns do we notice when arranging decimal numbers? **Games**  https://thirdspacelearning.com/us/math-resources/topic-guides/number-and-quantity/rounding-decimals/#introduction

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Learners work in pairs. Learners take cards with decimal numbers from a deck of cards. Learners place the card on the given number line (above). If the card is placed in the orange section on the number line, the rounded value to the nearest tenth is the first number on the number line. If the card is placed in the blue section on the number line, then the rounded value to the nearest tenth is the last number on the number line. Learners continue until all cards have been placed and rounded off to the nearest tenth. Learners will discuss among themselves what is noticed and write a generalization about rounding off to the tenth place. Repeat activity using the following number line.  https://thirdspacelearning.com/us/math-resources/topic-guides/number-and-quantity/rounding-decimals/#introduction

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Learners work in pairs. Learners take cards with decimal numbers from a deck of cards. Learners place the card on the given number line (above). If the card is placed in the orange section on the number line, the rounded value to the nearest tenth is the first number on the number line. If the card is placed in the blue section on the number line, then the rounded value to the nearest tenth is the last number on the number line. Learners continue until all cards have been placed and rounded off to the nearest hundredth. Learners will discuss among themselves what is noticed and write a generalization about rounding off to the hundredth place. Question: What patterns do we follow when rounding decimals to the nearest tenth? What patterns do we follow when rounding decimals to the nearest hundredth? How is the rounded off number different from the actual number given? Is the rounded off number greater than or less than the original number?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Real Life Situations **Supermarket Shopping** Prepare a list of grocery items with prices in decimal form. List similar items from different brands. E.g. Blue Waters 410 ml, Crystal Clear 410 ml. Learners compare the prices of the different items to determine the cheaper items. **Banking** Learners weigh different objects using a digital scale which gives readings up to hundredths. Learners record the weight of the objects and round off each weight to the nearest tenth. Present learners with foreign exchange rates from a local bank. Learners round off the currencies to the nearest cent. FOREIGN EXCHANGE RATES Updated Friday, 7th June, 2024. COUNTRY / WE BUY CASH / WE BUY CHEQUES / WE SELL US Dollar (USD) / 2.6700 / 2.6882 / 2.7169 Pound Sterling (GBP) / 3.2262 / 3.3838 / 3.5220 Canadian Dollar (CAD) / 1.8871 / 1.9317 / 2.0126 Barbados Dollar (BBD) / 1.3432 / – / 1.3568 Euro (EUR) / 2.7431 / 2.7787 / 3.1022 Trinidadian Dollar (TTD) / – / – / 0.4618 Swiss Franc (CHF) / 2.7710 / 2.8522 / 3.2189

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		https://1stnationalbankonline.com/foreign-exchange-rates/ Question: Can you think of examples where decimals are used in everyday life? How are they used? What professions or industries is knowledge of decimal operations particularly important?

Additional Resources and Materials

Decimal place value charts
Decimal dice

IXL - Compare decimal numbers (Year 5 maths practice)

https://www.commoncoresheets.com/up-to-hundredths/249/download

Additional Useful Content Knowledge for the Teacher:

Place Value: Understanding the concept of place value is essential for working with decimals.

Decimal Operations: A good grasp of basic decimal operations such as addition, subtraction, multiplication, and division. This includes understanding how to align decimal points and carry out calculations accurately.

Estimation: Understand the purpose of estimation and be able to approximate decimal numbers to the nearest tenth and hundredth to make quick calculations and judgments.

Comparing Fractions and Percentages: Relationship between decimals, fractions, and percentages and being able to convert between them.

Real-World Contexts: Real-world contexts and practical application for rounding off and comparing decimals.

Units of Measurement. How to read measuring instruments.

Opportunities for Subject Integration:

Science Integration:
Data Analysis in Experiments: Learners can analyze data from scientific experiments, such as measuring liquid volumes in a beaker, temperatures, or distances in meters. They can compare, order, and round these measurements to better understand the data.
Environmental Science: Use data on water usage, energy consumption, or pollution levels, where learners compare and order decimal values. This reinforces the concept while exploring real-world environmental issues.

Social Studies Integration:
Economics and Currency: Compare and order prices of goods or services in different currencies, particularly when decimals are involved, such as in financial literacy lessons or when discussing different economies. Rounding could apply to budgeting exercises.
Population Studies: When discussing population data, GDP, or other statistics, use decimal numbers. Learners can compare, order, and round these figures to understand trends and patterns.

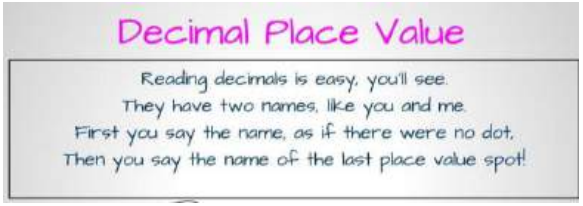
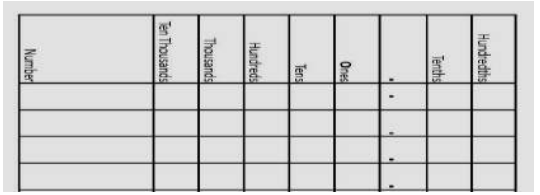
Technology Integration:
Learners can be introduced to writing simple code to compare, order, and round decimal numbers, reinforcing both math and coding skills.
Data Representation: Learners can use spreadsheets to enter data, use functions to round numbers, and visualize comparisons using charts, fostering a connection between technology and mathematics.

Art Integration:
Learners can work with decimal measurements for scaling and proportions, compare dimensions and order sizes, and round to the nearest tenth to create precise designs.

Physical Education Integration:
Sports Statistics: Analyze statistics from sports, such as average times, distances, or scores, where decimals are commonly used. Learners can compare athletes' performance metrics, order them, and round for simplified reporting.

Language Arts Integration:
Technical Writing: Have learners write explanations or justifications for their decimal comparisons and rounding, focusing on clarity and precision in mathematical communication.
Story Problems: Integrate decimal operations into narrative story problems that require comparing, ordering, and rounding as part of the plot or solution.

Essential Learning Outcome N2.5.: Fractions, Decimals and Rational Numbers – Decimal Place Value
Grade Level Expectations: - Extend the positional structure of the place value system to include decimals (tenths, hundredths) - Read and write decimals to hundredths using base-ten numerals, number names, and expanded form, e.g., 347.39 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1.Read and write decimals to hundredths using base-ten numerals, number names, and expanded form, e.g., 347.39 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100 2.Using numerals and place-value counter representations, represent base ten numerals up to hundredths in a place-value chart. **Skills** 3.Convert the expanded form of decimal numbers up to hundredths expressed using base-ten numerals to their representative base-ten numerals. 4.Interpret the representations of decimals up to hundredths on a place value chart, place value counter representations, and write the numeral and	**Presentation/Group Work/Checklist** The learners in groups are presented with the following activity which they will be required to present to the class. Activity 1. Read the given number. 2. Write the given number in words. 3. Write the number in expanded notation. 4. Use any of the place value charts interacted with to explain your solution to the class. 5.Justify your expanded notation representation of the number.	**Use of Place Value Chart** The learners will read, write and represent numbers in a place value chart. 1. The learners learn the following poem to assist with reading and writing decimal numbers.  2. The learner represents given decimal numbers in a place value chart like shown below. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

expanded form version of the value represented.

Values

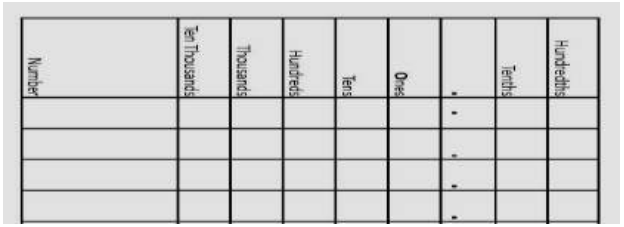
5.Justify the expanded form representations of decimal numbers up to hundredths for given numbers,

Checklist

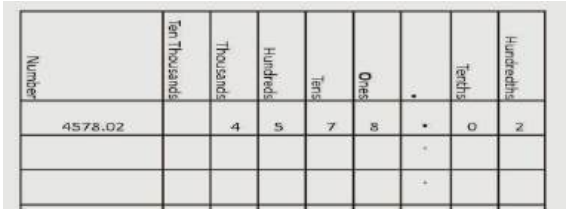
No.	Criteria	Yes	No
1	**Did the learners read the number correctly?**		
2.	**Did the learners write the number correctly in words?**		
3.	**Was the diagram representation used appropriately?**		
4.	**Was the number written in expanded notation correctly?**		
5.	**Were the learners able to justify their response?**		

Observation Using an assessment tool

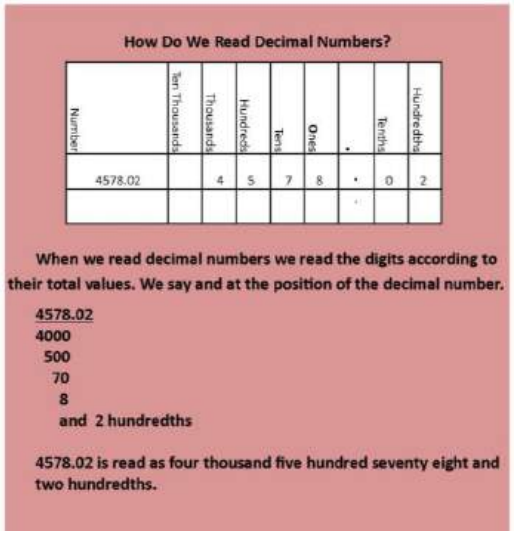
chart.



3. The learner then studies the place values of each digit. For example



4. The learners make the connection between place values and total values of the digits when reading and writing numbers.



<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td></td>
<td>
<table>
<tr><th colspan="6">Observational Checklist</th></tr>
<tr><td>No.</td><td>Criteria</td><td>Yes</td><td>Almost</td><td>No</td><td>Notes/ Feedback</td></tr>
<tr><td>1</td><td>The learner demonstrates understanding of place value.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>The learner has identified all the positions correctly.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>The learner writes the correct number representation for the expanded form given.</td><td></td><td></td><td></td><td></td></tr>
</table>

In a Think, Pair, Share activity, the learners interpret diagram representations of decimal numbers and then write them in numeral and expanded form.
Activity 1
a. Study the diagram.
b. Write the number the diagram represents.
c. Write the number in expanded notation.
</td>
<td>
5. Using the place value chart as a guide, the learner completes the following to write numerals in expanded form.
_____ = (___ x 1000) +(___ x 100) + (___ x 10) + (___ x 1) + (___ x $\frac{1}{10}$) + (___ x $\frac{1}{100}$)
For Example:
4578.02 = (4 x 1000) +(5 x 100) + (7 x 10) + (8 x 1) + (0 x $\frac{1}{10}$) + (2 x $\frac{1}{100}$)

Place Value Chart using Counter Representations
The learners use place value counter representations to help them read and write decimal numbers up to hundredths.

The learners use place value counters to represent a number like shown below.
1. The learner studies the numeral.
2. Identifies the digits in the numeral.
3. Identifies corresponding counters.
4. Uses the place value chart like shown in the diagram below.
</td>
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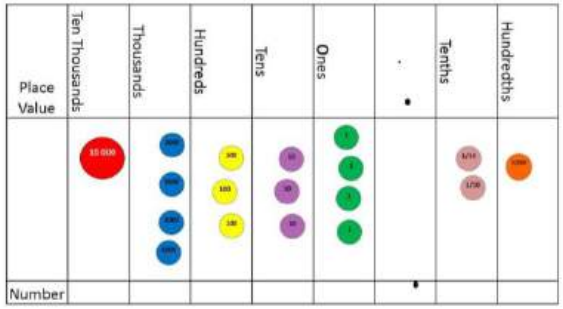
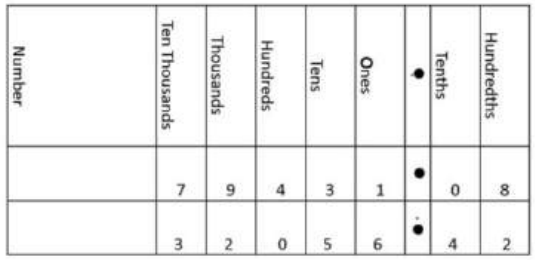
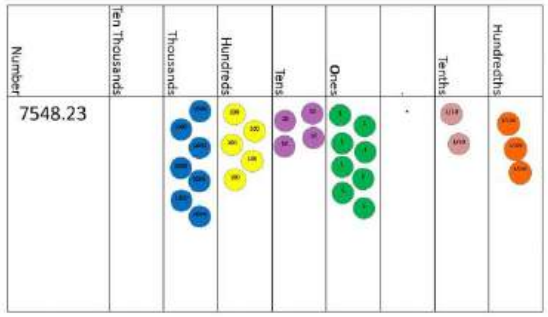
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	d. Justify their responses.  or  The learners do the above individually before pairing to discuss. The pairs are given ten minutes to work on the presentations they are to deliver to the class. The learners' presentations are assessed with the following.	 5. The total values of the digits are then written from the digit with the highest value to the one with the least value for the whole numbers. Then, the number of decimal places following the point is identified. The place value of the digit farthest from the decimal point on the right, determines how the number is read. For example, The digit farthest away from the decimal point is in the hundredths place. Consequently the number after the decimal point will be read as hundredths. In the case of 7548.23, the number is read as: seven thousand, five hundred, forty-eight and twenty three hundredths. ***Note that numbers are written the way they are read in words.*** **SCO 3 Discussion** The learner converts numbers expressed in expanded notation into standard form. 1. The learners are asked how do we express a number in expanded notation?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Criteria		Yes	Almost	No	Notes/ Feedback
Accuracy of the placement of digits in the numeral	ten thousands				
	thousands				
	hundreds				
	tens				
	ones				
	tenths				
	hundredths				
Accuracy of expanded notation	ten thousands				
	thousands				
	hundreds				
	tens				
	ones				
	tenths				
	hundredths				

The learners are asked to explain the process step by step.

2. The learners are then asked what they think should be done to convert a number expressed in expanded notation to standard form.

3. A step by step approach is discussed with the learners:

For example: **7 x 10 000 + 5 x 1000 + 3 x 100 + 2 x 10 + 8 x 1 + 6 x 1/10 + 3 x 1/100**

1st. Work out the total value of each multiplication part of the number sentence.

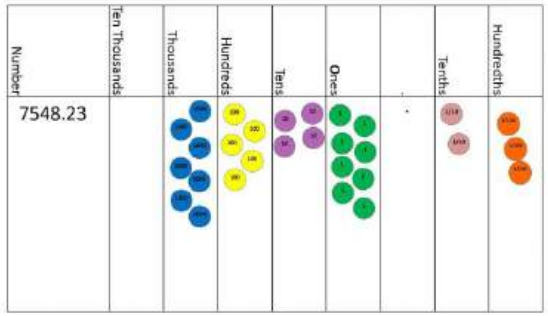
7 x 10 000 + 5 x 1000 + 3 x 100 + 2 x 10 + 8 x 1 + 6 x 1/10 + 3 x 1/100

7 x 10 000 = 70 000
5 x 1 000 = 5 000
3 x 100 = 300
2 x 10 = 20
8 x 1 = 8
6 x 1/10= 6/10
3 x 1/100= 3/100

2nd. Convert the fraction representations to a decimal number.

6/10 = 0.6
3/100 = 0.03

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		3rd. Find the sum of the products of the parts. **70 000** **5 000** **300** **20** **8** **0.6** **+ 0.03** **75 328 .63** The learners are encouraged to talk through the steps. **Use of Graphic Organizer** The learners are guided in using a graphic organizer like the one shown below to represent the values for each place. Place Value Number | 10 000 | 1000 | 100 | 10 | 1 | . | $\frac{1}{10}$ | $\frac{1}{100}$ 7 x 10 000 + 5 x 1000 + 3 x 100 + 2 x 10 + 8 x 1 + 6 x 1/10 + 3 x 1/100 | 7 | 5 | 3 | 2 | 8 | . | 6 | 3 1. The learners write the expanded notation form to be converted. **7 x 10 000 + 5 x 1000 + 3 x 100 + 2 x 10 + 8 x 1 + 6 x 1/10 + 3 x 1/100**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		2. They are then encouraged to underline the number found in front of each multiplication sign. For example: **<u>7</u> x 10 000 + <u>5</u> x 1000 + <u>3</u> x 100 + <u>2</u> x 10 + <u>8</u> x 1 + <u>6</u> x 1/10 + <u>3</u> x 1/100** 3. After, the learners match the underline number to the number it is multiplied by in the graphic organizer. The learner looks at 7 x 10000 for example, and writes 7 under the 10 000 slot in the table since 7 is multiplied by 10 000. The same is done with the other numbers. The numbers are matched to the slot/column which matched the numbers they are multiplied by. The learners interpret the diagram representations to read and write the decimal number represented. 1. The learners will first study the diagram below. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		2. The learners then write the total values found in each place starting with the position with the highest numerical value. In the diagram above, the position of highest value is thousands. The numbers after the point are written as decimal numbers. Example 7000, 500, 40, 8, 0.2, 0.03 3. The learners then find the sum of the numbers. 7000 500 40 8 0.2 + 0.03 7548.23 The learners use any of the processes they have learned or discovered to explain how they come up with the expanded notation form of numbers.

Additional Resources and Materials

https://youtu.be/82kKb093oic

https://youtu.be/EWHM8gMzVck

Additional Useful Content Knowledge for the Teacher:

Reading a Decimal Fraction

- Read the whole number part as usual. (If the whole number is less than 1, omit steps 1 and 2.)
  For example in the number **567**.89, the whole is read as five hundred and sixty seven
- Read the decimal point as the word "and."

For example: five hundred sixty seven **and**

- Read the number to the right of the decimal point as if it were a whole number.
  For example: five hundred and sixty seven and **eighty nine**
- Say the name of the position of the last digit.
  For example five hundred and sixty seven and eighty nine **hundredths**

Expanded Form of Decimal Numbers

Using the place value chart, the digits after the decimal points are represented as tenth (1/10), hundredth (1/100), thousandth (1/1000) and so on.

Opportunities for Subject Integration:

Science Integration:

Measurement and Units: Integrate decimals when measuring length, mass, or volume in science experiments. Learners can express these measurements in base-ten numerals, number names, and expanded form, reinforcing the place value system while engaging in scientific inquiry.

Astronomy: Use the concept of decimals to understand astronomical distances or the size of planets and stars. For example, learners could write the distance from Earth to various planets in decimal form, extending their understanding of place value in a meaningful context.

Social Studies Integration:

Learners could use decimal notation to express coordinates (latitude and longitude) or to describe population densities. They could then practice writing these decimals in expanded form or as base-ten numerals, reinforcing mathematical and geographical understanding.

Economic Data: Explore topics like inflation rates, interest rates, or GDP per capita, which often involve decimals. Learners could practice writing these figures in expanded form and discuss how small changes in decimals can have significant impacts in economic contexts.

Technology Integration:

Introduce basic coding or spreadsheet skills where learners input and manipulate decimals. They can use software to expand or decompose decimal numbers, showing their understanding of place value through digital tools.

Data Management: In a spreadsheet, learners could enter numerical data that includes decimals, use functions to convert these into number names, and explore how decimal place values affect calculations.

Art Integration:
Learners can use decimals to describe dimensions when working on projects involving scale models or proportions. For instance, they could write the length of a scaled-down object in decimal form and then express it in expanded form to understand how small differences impact the overall design.
Perspective Drawing: Learners can apply their understanding of decimals in creating perspective drawings, where accurate measurements are crucial. They can write these measurements using base-ten numerals and expanded forms.

Physical Education Integration:
Fitness Tracking: Use decimals to record and analyze learners' fitness data, such as time laps in running or swimming. Learners can then express this data in expanded form, reinforcing their understanding of decimals through real-world application.
Scoring Systems: In sports like gymnastics or diving, scores often include decimals. Learners can practice reading and writing these scores in various forms, deepening their understanding of place value.

Language Arts Integration:
Descriptive Writing: Have learners write narratives or reports that include numerical data with decimals. They can practice converting these decimals into expanded forms or writing them out as number names within a story or descriptive passage.
Cross-Curricular Math Journals: Learners can maintain a math journal where they regularly practice writing decimals in different forms. They could reflect on how decimals are used in various subjects, reinforcing their understanding of place value through written expression.

Music Integration:
Rhythms and Time Signatures: Explore musical rhythms, where time signatures might include decimal concepts. Learners can write these out using base-ten numerals or expanded forms, linking math with musical timing and structure.
Tempo and Beats: When discussing tempo, learners could use decimals to express beats per minute (BPM) or changes in tempo, practicing how to read and write these decimals in different forms.

Operations with Numbers

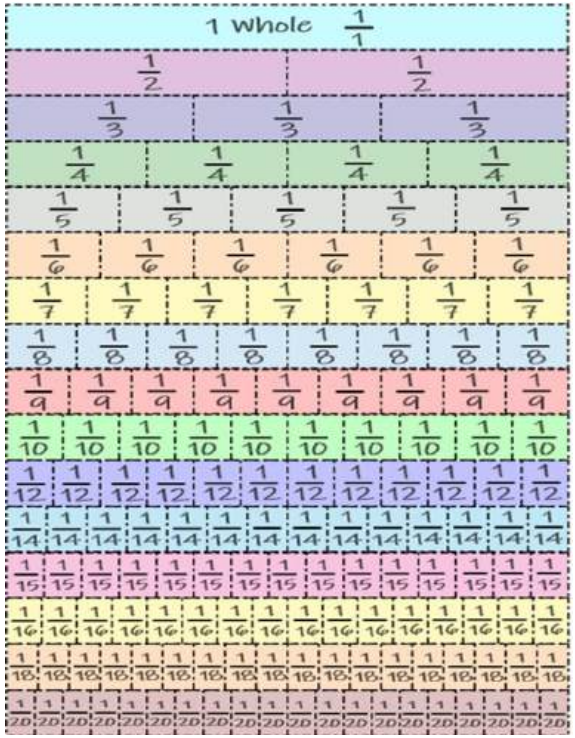
Introduction to the Strand:
Embarking on the journey of teaching addition and subtraction of fractions and decimals lay the cornerstone for mathematical literacy and problem-solving skills. These concepts are evident in the real world and are often regarded as the bedrock of numerical understanding, thus serving as fundamental components for grasping more advanced concepts in mathematics. Beyond the confines of the classroom, fractions and decimals manifest themselves in everyday scenarios, from dividing a pizza among friends to buying snacks. Teaching the addition and subtraction of fractions and decimals equips learners with essential skills for navigating real-world scenarios. Thus, the role of educators is not merely to transmit knowledge but to cultivate inquisitive minds. In this introductory journey, we invite learners to embark on a voyage of discovery, where fractions and decimals serve as guiding stars illuminating the path to mathematical mastery and real-world application. To develop skills in fractions and decimals learners should observe pictures, diagrams and models participate in hands-on activities, provided with the opportunity to make real - life connections, collaborative learning and opportunities to engage in technological activities.

Essential Learning Outcome O1.1: Additive Thinking – Understanding the Meaning of Addition and Subtraction and how they are Related

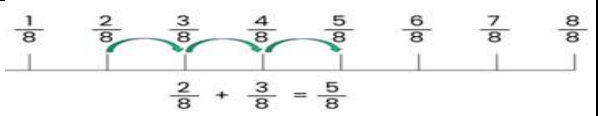
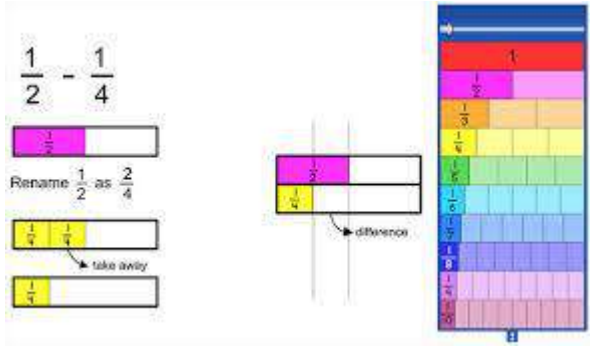
Grade Level Expectations:

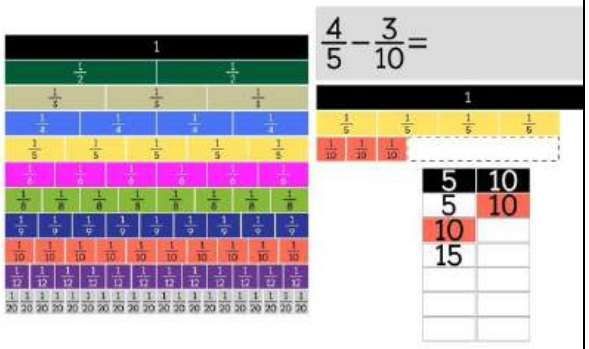
- Understand addition and subtraction of fractions as joining and separating parts referring to the same whole
- Add and subtract decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Recognise addition and subtraction of fractions as combining and separating parts of the same whole. 2. Add and subtract fractions with like and unlike denominators, showing how changes in the numerators or common	***GAMES*** Teaching addition and subtraction of fractions through games can make the learning process enjoyable and engaging. Here are some game ideas: ***Fraction Bingo***: Create bingo cards with fractions on them, such as 1/2, 1/3, 1/4, etc. Call out addition or subtraction problems involving fractions, and players mark	***Manipulatives*** Give opportunities for learners to show that a fraction is part of a whole by cutting appropriate fruit/materials into equal parts such as: halves, quarters etc. Have learners listen and read stories relating to addition and subtraction of fractions.

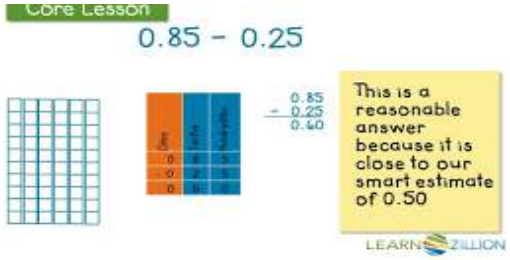
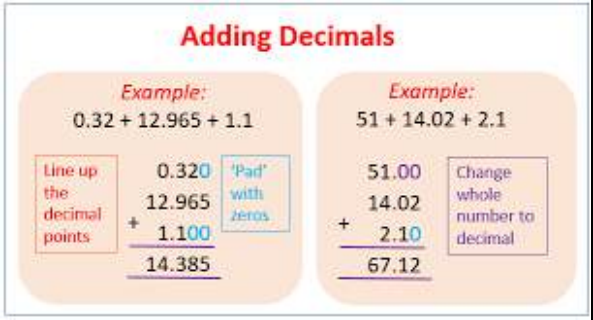
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
denominators affect the sum or difference as it relates to the whole. 3. Use manipulatives and visual aids, such as fraction strips, circle bars, area models, number lines, and technology, to model fraction subtraction. **Skills** 4. Add and subtract decimals to the hundredths place value. 5. Use concrete models or drawings to represent decimal addition and subtraction. 6. Apply commutative and associative properties, to add and subtract decimals. 7. Relate addition and subtraction of decimals to their representations on a number line. **Values** 8. Communicate mathematical thinking clearly and precisely, orally and in writing, when explaining addition and subtraction processes.	the correct answer on their bingo cards. The first to get a line or a full card wins. ***Fraction Board Games:*** Create a board game where players move along a path by correctly solving addition or subtraction problems involving fractions. You can incorporate dice or spinners to determine how many spaces to move. **For example**: Fraction snakes and ladder. ***Fraction Dominoes:*** Create a set of dominoes with fraction addition and subtraction problems on one side and the answers on the other. Players take turns matching the problems with the correct answers, building a chain of dominoes. ***Interactive Games :*** Play interactive games that require them to add and subtract fractions **WEBSITES** https://www.iknowit.com/lessons/d-adding-subtracting-fractions-unlike-denominators.html https://games.legendsoflearning.com/game/fractions-intro-lab/2595?partner=legends-public&media=video https://games.legendsoflearning.com/game/busy-bus-stop/3482?partner=legends-public&media=video ***Checklist To Assess Learners' Understanding of Fractions From Games Played***	In a village pie party, villagers share pies cut into fractions. Lena shares 2 out of 4 pie pieces with Mike, leaving her with 2 pieces. Mike, who has a pie cut into 3 pieces, eats 1, leaving 2 pieces. Activities like "Fraction Action" invite learners to decompose and reassemble fractional parts using strips, tiles, or bars.  https://www.learn-with-math-games.com/fraction-strips-up-to-20.html

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Conceptual Understanding ***Understanding of Fractions:*** - Can the learner identify numerators and denominators? - Does the learner understand proper fractions, improper fractions, and mixed numbers? ***Common Denominators:*** - Can the learner find the least common denominator (LCD) for two or more fractions? **Simplification**: - Does the learner know how to simplify fractions to their lowest terms? ***Procedural Skills*** ***Addition of Fractions:*** - Can the learner add fractions with like denominators? - Can the learner add fractions with unlike denominators by finding the common denominator? - Can the learner simplify the result after addition? ***Subtraction of Fractions:*** - Can the learner subtract fractions with like denominators? - Can the learner subtract fractions with unlike denominators by finding the common denominator? - Can the learner simplify the result after subtraction? ***Problem-Solving Skills*** ***Application to Word Problems:***	Have learners add fractions with like denominators by decomposing a given fraction. E.g. Use part- part- whole diagrams to add and subtract fractions with like denominators. e.g. Have learners use fractional charts, bars, strips and number lines to add and subtraction fractions with like denominators.  https://www.eaieducation.com/Product/533788/Jumbo_Magnetic_QuietShape%C2%AE_Foam_Fraction_Circles_Numbered_-_Set_of_51.aspx ***Fraction Number Lines:*** Number lines marked with fractions help learners visualize the relative size and placement of fractions on a scale. They can be used to compare fractions, locate fractions between whole numbers, and perform addition and subtraction of fractions.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	- Can the learner translate word problems into fraction addition or subtraction problems? - Does the learner solve real-life problems involving fractions correctly? ***Accuracy and Precision*** ***Correct Calculation:*** - Does the learner perform calculations accurately, including all steps? ***Simplification Accuracy:*** - Can the learner consistently simplify their answers correctly? ***Reasoning and Explanation*** ***Justification of Steps:*** - Can the learner explain their process for finding a common denominator or simplifying fractions? ***Error Identification:*** - Can the learner identify and correct mistakes in fraction addition and subtraction problems? ***Use of Tools and Strategies*** ***Utilization of Visual Aids:*** - Does the learner use number lines, fraction bars, or diagrams to aid understanding? ***Use of Mathematical Strategies:*** - Can the learner use strategies such as cross-multiplication for finding a common denominator? ***Engagement and Confidence***	 https://exam-corner.com/topic/practise-adding-and-subtracting-fractions-using-a-number-line/ Provide opportunities for learners to add and subtract fractions with unlike denominators by identifying equivalent fractions on a fraction chart or by using fraction tiles. https://www.youtube.com/watch?v=T5OAS4_hn7c ***Subtraction Activity:*** ***Rolling the Dice:*** Learners roll two dice to get two fractions to subtract. Ensure the first fraction is larger or equal to the second to avoid negative results. **Visual Representation**: As with addition, learners use fraction tiles to model the fractions.  https://support.mathies.ca/en/mainSpace/FractionStripsTool.php

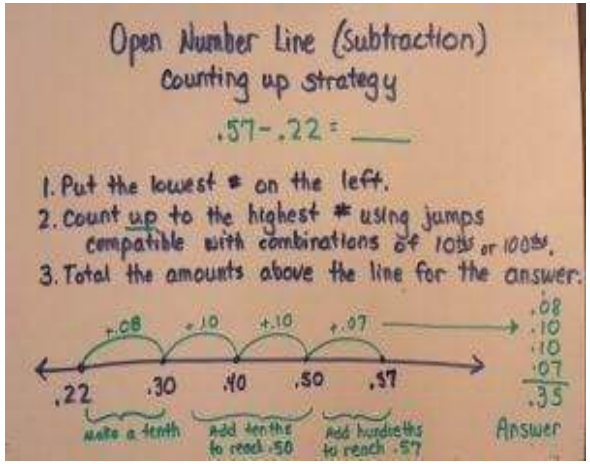
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Engagement in Practice: - Is the learner actively engaged in fraction addition and subtraction activities? ***Confidence in Solving Problems:*** - Does the learner show confidence in solving fraction problems, asking for help only when necessary? ***Decimal Games*** ***Decimal Bingo:*** *Create* bingo cards with decimal numbers on them, such as 0.25, 0.75, 1.50, etc. Call out addition or subtraction problems involving decimals, and players mark the correct answer on their bingo cards. The first to get a line or a full card wins.  https://printablecreative.com/bingo-maker/card/fractions-and-decimals-bingo ***Group Discussion on Properties***	 https://www.youtube.com/watch?v=FpKr2_-sbPk **Addition with Fraction Tiles**: **Select Fractions**: Learners choose two fraction tiles to add. **Aligning Tiles**: Learners physically align the tiles next to each other to visually see the combined length. **Finding Common Denominators**: Guide learners to see how different tiles can represent the same fractional value (e.g., two 1/4 tiles equal one 1/2 tile). **Summing Fractions**: Learners place the tiles together and, if needed, convert to a common denominator to sum the fractions. **Subtraction with Fraction Tiles**: **Select Fractions**: Learners choose one fraction tile and another smaller or equal fraction tile to subtract. **Aligning Tiles**: Learners place the smaller tile on top of the larger tile to see the difference.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	1. In small groups, have learners solve problems using the properties of addition. 2. Encourage learners to explain their reasoning and how they applied the properties. 3. Have groups present their solutions and explanations to the class. ***Number Line Manipulatives*** **Description:** Provide learners with physical or digital number line manipulatives that they can use to represent decimal addition and subtraction. ***Assessment:*** ***Task:*** Given the problem 0.6+0.40 + 0.46+0.4, learners use the manipulatives to visually show the addition process on a number line. ***Check for Understanding*:** Ask learners to explain each step as they move along the number line and label their final position. **Reflection:** Have learners write a short paragraph describing what they did and why it makes sense. ***Math Journals*** **Activity:** Reflective Math Journaling **Description:** Invite learners to maintain a math journal where they write about their problem-solving strategies, challenges, and insights after completing assignments.	**Finding Common Denominators**: Help learners understand how the remaining part can be represented in a common denominator format. **Subtracting Fractions**: Learners remove the smaller tile from the larger tile and determine the resulting fraction.  **https://www.amazon.com/ETA-hand2mind-Rainbow-Fraction-Tiles/dp/B074QY86L5**  https://lauracandler.com/introduce-decimals-with-base-ten-blocks/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Example Prompt: Reflect on how you solved the addition problem 4.57 + 3.89. What strategies did you use, and why?	***SUBTRACT DECIMALS USING BASE 10 BLOCKS***  https://www.youtube.com/watch?v=2kaLBS09i9k  https://www.onlinemathlearning.com/decimals.html#google_vignette ***Applying Properties of Operations to Add and Subtract Decimals*** Understanding and using the properties of operations, such as the commutative and associative properties, can make it easier to add

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		and subtract decimals. Here's how these properties apply: **Commutative Property of Addition** The commutative property of addition states that the order in which numbers are added does not change the sum. **Example:** Add 3.25 and 4.75 using the commutative property. 1. 3.25+4.75=8.00 2. 4.75+3.25=8.00 No matter the order, the sum is the same. **Associative Property of Addition** The associative property of addition states that the way in which numbers are grouped does not change the sum. **Example:** Add 1.5, 2.75, and 3.25 using the associative property. 1. (1.5+2.75) +3.25 o First, add 1.5+2.75=4.25 o Then, add 4.25+3.25=7.50 2. 1.5+(2.75+3.25) o First, add 2.75+3.25=6.00 o Then, add 1.5+6.00=7.50 No matter how the numbers are grouped, the sum is the same. **Commutative Property of Subtraction** The commutative property does not apply to subtraction because changing the order of the numbers changes the result.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Example: Subtract 2.5 from 5.0. 1. 5.0−2.5=2.5 2. 2.5−5.0= **the result will not be 2.5** The results are different, so the commutative property does not apply to subtraction. **Associative Property of Subtraction** The associative property does not apply to subtraction because changing the grouping of the numbers changes the result. **Example:** Subtract 1.5 from the result of subtracting 2.0 from 4.5. 1. (4.5−2.0)−1.5 o First, subtract 4.5−2.0=2.5 o Then, subtract 2.5−1.5=1.0 2. 4.5−(2.0−1.5) o First, subtract 2.0−1.5=0.5 o Then, subtract 4.5−0.5=4.0 The results are different, so the associative property does not apply to subtraction ***Number Line Basics*** Using a number line is a great way to visualize the addition and subtraction of decimals. Here's how to relate these operations to their representations on a number line: **Number Line:** A horizontal line with evenly spaced marks representing numbers.

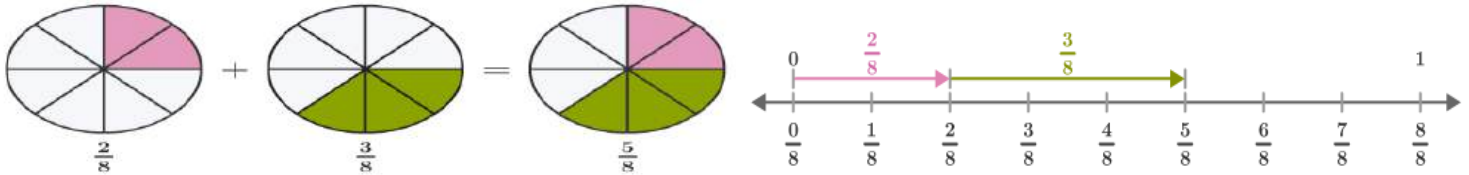
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Decimals: Placed on the number line between whole numbers.  https://cindyelkins.edublogs.org/2017/09/23/discovering-decimals-part-2/ ***Metacognitive Strategies:*** Teach metacognitive strategies such as self-questioning, self-monitoring, and reflection. Encourage learners to think about their thinking process while solving problems, identify errors, and adjust their strategies accordingly. This promotes deeper understanding and independent problem-solving skills. For example ***Think-Alouds*** **Activity:** Think-Aloud Problem Solving **Description:** Provide opportunities for learners to solve math problems out loud, explaining each

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		step of their thought process. This can be done individually, in pairs, or in small groups. **Example Problem:** Subtract 3.74 from 5.86

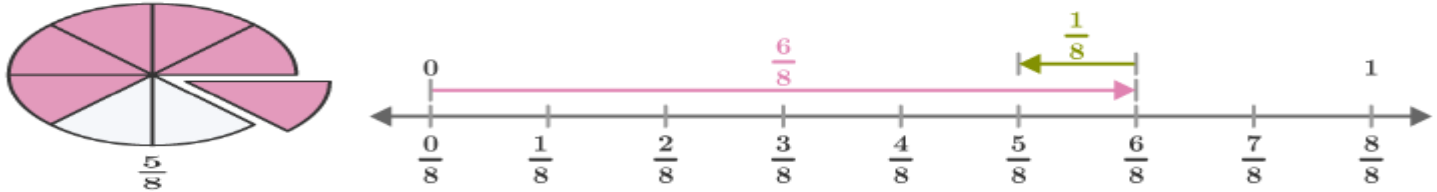
Additional Resources and Materials

Adding fractions refers to finding the sum of two or more fractions with same or different denominators.
Subtracting fractions refers to finding the difference of two or more fractions with same or different denominators.
Addition and subtraction with like denominators

Add or subtract the numerators, and write the result over the same denominator.
Addition of fractions with same denominator:



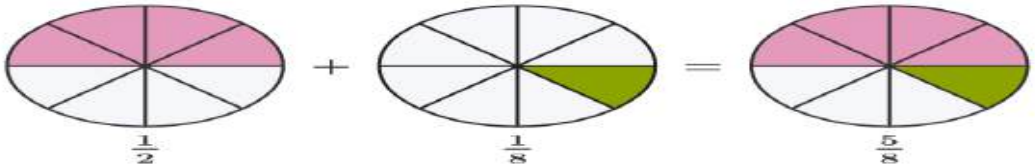
Subtraction of fractions with same denominator



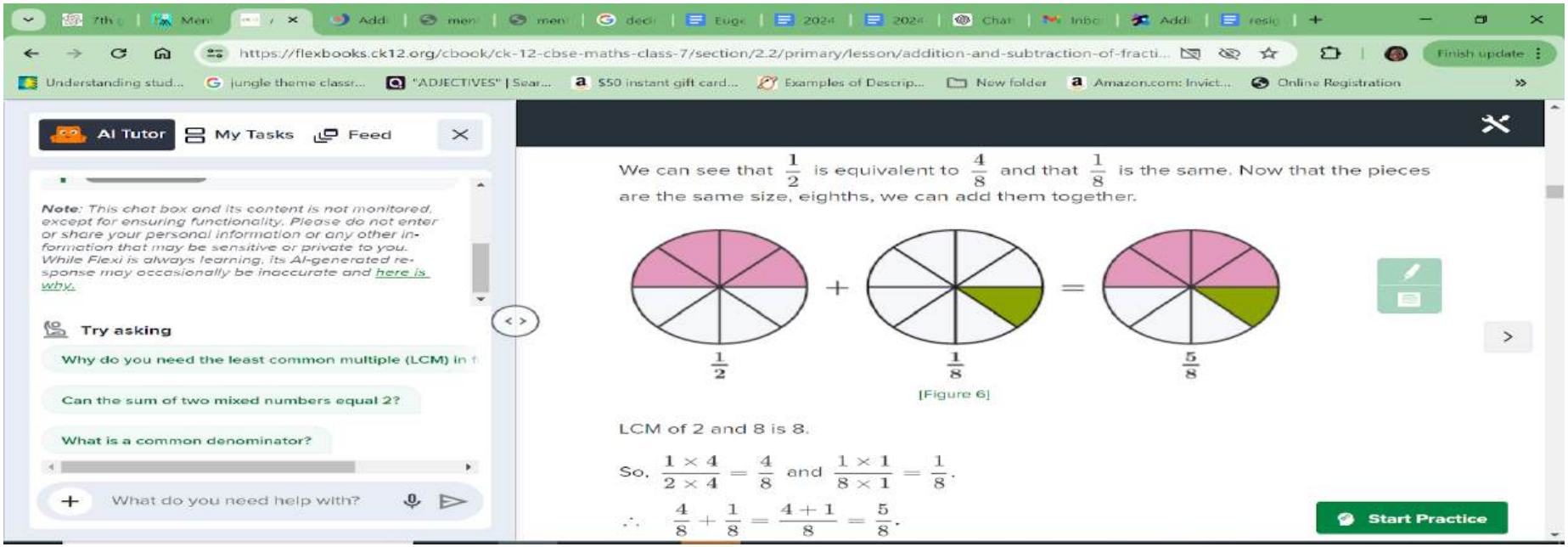
https://flexbooks.ck12.org/cbook/ck-12-cbse-maths-class-7/section/2.2/primary/lesson/addition-and-subtraction-of-fractions/

To add unlike fractions, we first convert them into the corresponding equivalent like fractions and then these are added.

Addition and subtraction with unlike denominators



Since 2 and 8 are both factors of 8, a half and an eighth can be written into eighths.
We can see that 1/2 is equivalent to 4/8 and that ⅛ is the same. Now that the pieces are the same size, eighths, we can add them together

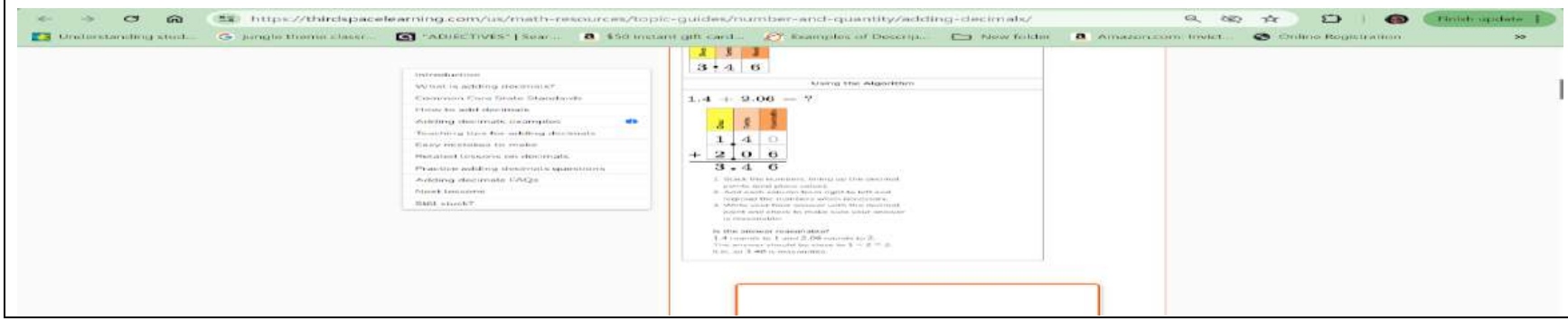


How to add decimals

- Write the numbers in a vertical list, lining up the decimal points.
- If the numbers have a different amount of digits, there may be some gaps in the columns. Fill in any gaps with a zero so that each number has the same number of decimal places.
- Add a decimal point in the answer space, lined up with the others.
- Start at the right, the column with the least place value
- Add the digits in the column.
- If the total is less than 10, enter the digit in the answer space.
- If the total is 10 or more, enter the units digit in the answer space for the column and carry the tens digit to the next column on the left.
- Move left to the next place value column. Add the digits in the column and add any digit that was carried to this column. Repeat the addition process in each column until the calculation is complete.

Addition of Decimals

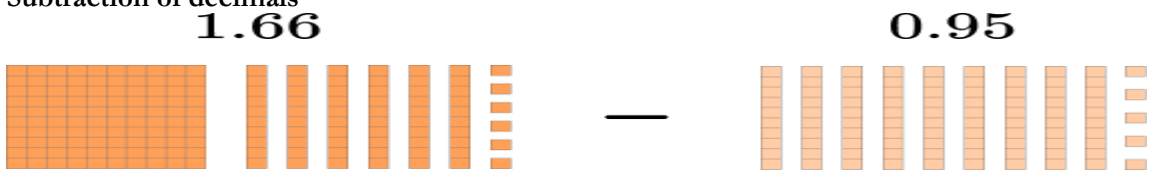
The addition of decimals is done by starting from the right-hand side and then we move on to the left adding each column. For example, let us add 12.5 + 14.9 using the following steps.

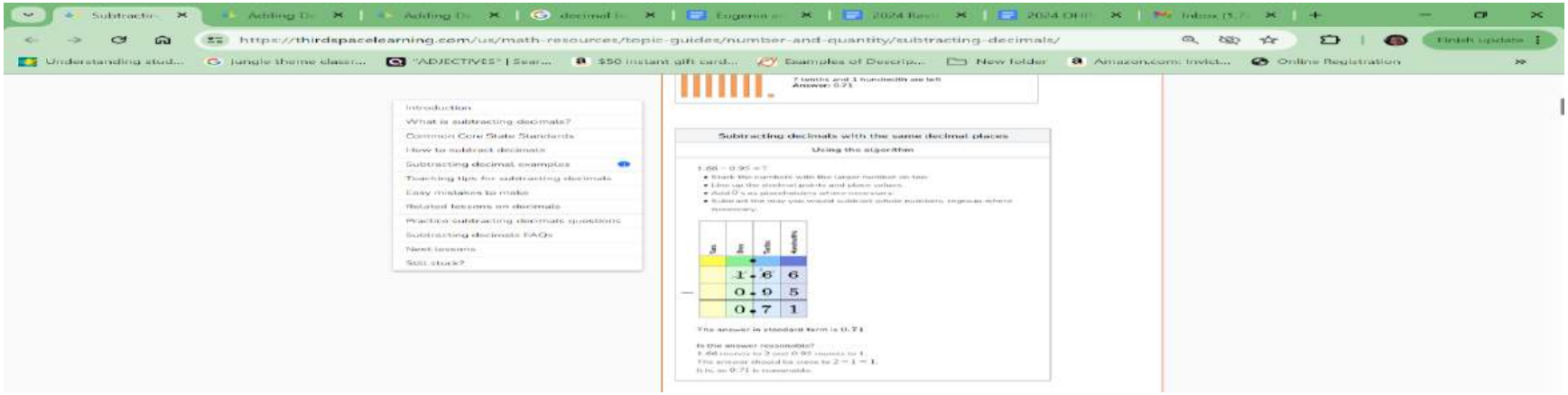


- Step 1: Write the numbers one below the other such that they are aligned as per their place values and the decimal point is placed one below the other.
- Step 2: Now add the decimal numbers to get the sum. In this case, 12.5 + 14.9 = 27.4

https://thirdspacelearning.com/us/math-resources/topic-guides/number-and-quantity/adding-decimals/

Subtraction of decimals





Subtraction of Decimals

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	T	O .	t
	1	5 .	8
-		2 .	7
	1	3 .	1

- Step 1: Write the numbers one below the other such that the larger number is on top and the smaller number is written below it.
- Step 2: Now subtract the decimal numbers starting from the tenth's column, moving on to the ones column, and then the tens column. Copy the decimal as it comes. In this case, 15.8 - 2.7 = 13.1

Additional Useful Content Knowledge for the Teacher:

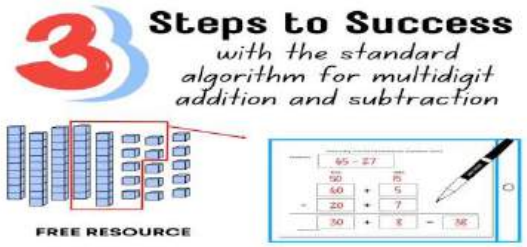
1. Use **real-life objects/manipulatives or situations t**o introduce the concept of fractions and decimals.
For fractions, use items like pizzas, chocolate bars, or measuring cups to demonstrate how a whole can be divided into equal parts.
For decimals, use money, rulers, or measuring tools to show how they represent parts of a whole or quantities along a number line.

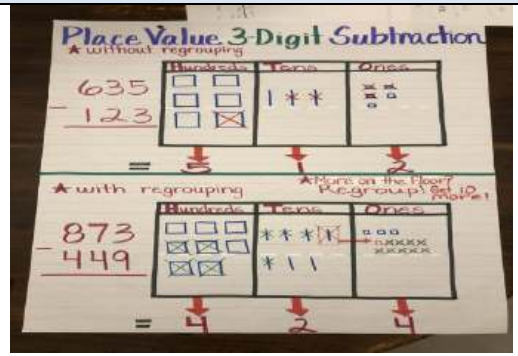
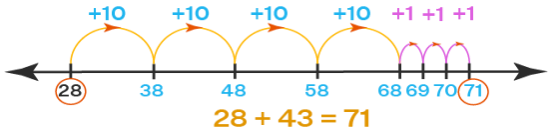
- **Define Fractions and Decimals**: Clearly define fractions and decimals. Explain that fractions represent parts of a whole, with a numerator representing the number of counting parts (parts being dealt with) and a denominator representing the total number of equal parts (naming parts). Similarly, explain that decimals are a way to represent parts of a whole or quantities smaller than one, using a decimal point to separate the whole number part from the fractional part.
- **Visual Representation:** Use visual aids such as fraction bars, fraction circles, or grids to represent fractions and decimals visually. This helps learners visualize the concept and understand the relationship between the numerator, denominator, and the size of the fractional or decimal part.
- **Relate Fractions and Decimals**: Highlight the connection between fractions and decimals. Show how fractions can be represented as decimals and vice versa. For example, demonstrate how the fraction 1/2 is equivalent to the decimal 0.5.
- **Explore Place Value**: Help learners understand the place value system in decimals. Show how each digit in a decimal represents a different place value (tenths, hundredths, thousandths, etc.) and how the position of the decimal point affects the value of the number.
- **Real-World Applications**: Show learners how fractions and decimals are used in everyday life. Provide examples of how they are used in measurements, money, cooking recipes, and other real-world contexts to emphasize their practical significance.
-

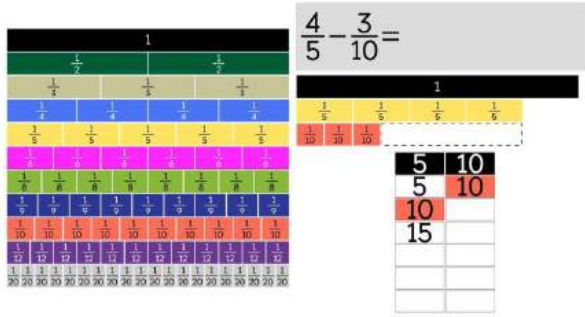
Opportunities for Subject Integration:

Art and craft - Fraction and decimal scrapbook.

Essential Learning Outcome: O1.2: Additive Thinking – Compute Fluently Using Operations (+,-)
Grade Level Expectations: - Fluently add and subtract multi-digit whole numbers, fractions and decimals to hundredths using standard algorithms

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge:** 1. add and subtract multi-digit whole numbers (up to five digits) using the standard algorithm with and without regrouping 2. apply strategies to solve word problems involving addition and subtraction of multi-digit whole numbers. **Skills:** 3. solve word problems involving addition and subtraction of fractions. 4. add and subtract decimals to hundredths using the standard algorithm. 5. demonstrate proficiency in aligning decimal points when adding and subtracting decimals.	***Problem Solving*** Give learners real-world problems that require adding and subtracting multi-digit whole numbers. Assess their ability to apply the standard algorithm in context. The standard algorithm is a step-by-step method used to perform basic arithmetic operations like addition, subtraction, multiplication, and division. These algorithms follow a specific sequence of steps that help ensure accuracy and consistency in calculations. ***Performance Tasks:*** Design tasks that involve real-world scenarios requiring multi-digit addition and subtraction. These tasks assess the application of skills in practical contexts. ***Example*** *You are part of the school events committee responsible for organizing a fundraising event to support a local charity. Your task is to plan the budget for the event by calculating the total costs and expected income using addition and subtraction of whole numbers.* ***Rubric for performance task*** Scoring Levels 4: Exceeds Expectations 3: Meets Expectations 2: Approaching Expectations 1: Below Expectations	***Concrete Manipulatives:*** Provide different colored blocks or objects for learners to represent each place's value (ones, tens, hundreds). By physically arranging the blocks, they can visualize how numbers are constructed and how each digit relates to its place value. . Have Learners practice regrouping by physically exchanging 10 ones for 1 ten, or 10 tens for 1 hundred, using manipulatives. This hands-on approach helps them grasp the necessity and process of regrouping when performing multidigit addition and subtraction.  https://www.mathcoachscorner.com/2023/10/the-standard-algorithm-for-multidigit-addition-and-subtraction-in-3-easy-steps/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Accuracy Level Description 4 All answers are completely correct with no errors. 3 Most answers are correct with minor errors that do not significantly affect the final result. 2 Several answers are incorrect due to calculation errors, indicating partial understanding. 1 Many answers are incorrect, showing a significant lack of understanding of the process. ***Correct Use of the Algorithm*** Level Description 4 The standard algorithm is used correctly and efficiently for all problems. 3 The standard algorithm is used correctly for most problems, with occasional minor errors. 2 The standard algorithm is attempted but with frequent errors in the steps. 1 The standard algorithm is rarely or incorrectly used, showing a lack of understanding. ***Process*** Level Description 4 The learner clearly explains and justifies each step of the process, showing a thorough understanding. 3 The learner explains most steps of the process clearly, with minor omissions or errors. 2 The learner explains some steps but omits key parts or makes frequent errors. 1 The learner provides little to no explanation of the process, showing significant gaps in understanding.	 https://www.pinterest.com/pin/70437481801759/ ***Number Lines:*** Invite learners to create physical number lines using strips of paper or rope. They then use these number lines to explore and practice ordering numbers, performing addition and subtraction, and identifying number patterns through hands-on movement along the line.  **https://www.cuemath.com/numbers/addition-on-number-line/** Have learners use manipulatives like fraction circles, bars, or tiles to physically visualize and handle fractions as parts of a whole. This hands-on approach helps them understand that fractions represent equal parts and invites them to easily compare, add, or subtract fractions by aligning and combining the pieces.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Proper Notation Level Description 4 Correct mathematical notation is used consistently and all work is organized and easy to follow. 3 Generally correct notation is used, with occasional minor mistakes. Most work is organized and logical. 2 Notation is often incorrect or inconsistent, and work may be disorganized or difficult to follow. 1 Notation is incorrect or missing, and work is disorganized or illegible. ***Math Software:*** Incorporate educational software that offers practice problems and tracks learner progress over time. For example, ***Gamification:*** Many math programs incorporate game-like elements to make learning fractions more engaging. Learners can earn rewards or progress through levels as they master fraction concepts, which can motivate them to practice more and improve their skills. ***Interactive Simulations:*** Software often includes interactive activities where learners can "slice" pizzas, "pour" liquids, or "divide" objects to create and compare fractions, making the learning process more fun and relatable ***Websites:*** https://quizizz.com/admin/quiz/5ad09a251039df001a66c5b6/adding-and-subtracting-large-numbers https://www.begalileo.com/math-games/Grade-5/Add-and-Subtract-Fractions/Add-Like-Fractions/1327 ***Error Analysis*** **Peer Review and Discussion** Present learners with a problem that has an error and learners must identify the error, as well as correct the error.	https://funkyfractionsforfifthgrade.wordpress.com/common-core-standards/  https://www.youtube.com/watch?v=FpKr2_-sbPk ***Error Identification*** Have learners review sample problems involving decimal addition and subtraction that contain intentional errors. They identify, analyze, and correct these mistakes, reinforcing their understanding of decimal concepts and the correct procedures for performing these operations. **Activity:** Provide worksheets with intentionally incorrect decimal problems for learners to analyze and correct. **Steps:** • Create or find worksheets with common decimal errors in addition, subtraction, multiplication, and division. • Have learners work individually or in pairs to identify and correct the mistakes. • Discuss as a class why the errors occurred and how to avoid them.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Peer Teaching and Observational Checklist Have learners explain and teach fraction addition and subtraction problems to peers. Assess their understanding based on the clarity and accuracy of their explanations. Self-Assessment Checklist for the Explainer ***Clarity of Explanation*** ☐ I clearly stated the problem and the goal (what we are trying to find). ☐ I broke down the solution into clear, understandable steps. ☐ I used appropriate vocabulary and mathematical terms. ***Accuracy of Explanation*** ☐ I used the correct method and algorithm for solving the problem. ☐ I checked my work to ensure all calculations were accurate. ☐ I correctly simplified the fractions, if necessary. ***Engagement with Peers*** ☐ I asked questions to check if my peers understood each step. ☐ I encouraged my peers to ask questions if they were confused. ☐ I responded to my peers' questions accurately and clearly. ***Use of Visual Aids and Examples*** ☐ I used visual aids (like fraction strips or diagrams) to illustrate the problem. ☐ I provided examples to reinforce my explanation. ***Confidence and Communication*** ☐ I spoke clearly and confidently.	***Example:*** Identify and correct the errors in the following problems: 1. 3.25 + 4.7 = 7.52 2. 5.34 - 2.6 = 2.34 ***Simulation*** Simulation of a shopping experience which forces children to add and subtract decimals to hundredths. For example ***Scenario: School Supplies Shopping*** ***Problem Statement:*** Invite learners to engage in problem solving activities. For example: You have a budget of $30.00 to spend on school supplies. You need to buy various items, each with a specific price. Use decimal operations to determine how much you will spend, how much money you will have left, and make decisions if your total exceeds your budget.

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr><td></td><td>☐ I maintained eye contact and used body language to engage my peers.

Performance Based Assessment
Decimal Simulation Exercise Checklist
<table>
<tr><th>Checklist Items</th><th>Yes</th><th>No</th></tr>
<tr><td>Can the learner identify the place value of digits in decimal numbers?</td><td></td><td></td></tr>
<tr><td>Can the learner correctly add and subtract decimals
using the standard algorithm?</td><td></td><td></td></tr>
<tr><td>Can the learner align whole numbers and decimals correctly when adding and subtracting?</td><td></td><td></td></tr>
<tr><td>Can the learner explain the difference between addition and subtraction of decimals?</td><td></td><td></td></tr>
<tr><td>Does the learner demonstrate understanding of regrouping and borrowing when necessary?</td><td></td><td></td></tr>
<tr><td>Does the learner perform addition and subtraction of decimals accurately?</td><td></td><td></td></tr>
</table></td><td></td></tr>
</table>

Additional Useful Content Knowledge for the Teacher:

Whole Numbers:

Begin with place value, emphasizing the importance of each digit's position (ones, tens, hundreds, etc.).
Teach regrouping (carrying) and borrowing in multi-digit addition and subtraction.
Introduce the standard algorithm: align numbers vertically, add or subtract each place value from right to left, carrying or borrowing as necessary.

Fractions:

Review what fractions represent (parts of a whole) and how to represent them visually.
Teach adding and subtracting fractions with like denominators by adding or subtracting the numerators while keeping the denominators the same.
For fractions with unlike denominators, find a common denominator before adding or subtracting.
Use the standard algorithm: align fractions vertically, find a common denominator if needed, and add or subtract numerators.
Decimals:

Revisit place value, focusing on the tenths and hundredths place for decimals.
Teach aligning decimal points when adding or subtracting decimals.
Demonstrate regrouping with decimals, carrying over or borrowing as needed.
Apply the standard algorithm: align decimals vertically, add or subtract each place value from right to left, carrying or borrowing as necessary.
Integration:

Connect concepts by showing how to transition between whole numbers, fractions, and decimals within the same problem.
Practice adding and subtracting mixed numbers and a combination of whole numbers, fractions, and decimals.
Encourage estimation to check the reasonableness of answers.
Problem Solving:

Provide real-world problems that involve adding and subtracting multi-digit numbers, fractions, and decimals.
Guide learners in analyzing and interpreting word problems, identifying key information, and selecting appropriate operations.
Emphasize the importance of checking solutions for accuracy and reasonableness.

Opportunity for Subject Integration:

Civics :
Sub-strand: Goods and Services
Research and write the number of visitors who entered the country during the previous calendar year.
Compare the volume of Caribbean visitors with number of visitors from countries outside the Caribbean.

Literacy :
Expository writing
Learners use recipes to write expository writing.
Learners write expository writing on how to add and subtract fractions and decimals .

Science and Technology:
Sub-Strand: Ecosystem (ECS)
Collect, using quadrats, data on the number of specific organisms within a habitat.
Design, construct and use discarded materials to make useful items.

Technological Methods (TM)
Design and construct objects to satisfy human needs and to make life easier.

Essential Learning Outcome O1.3: Additive Thinking –Make a Reasonable Estimation When Using Operations
Grade Level Expectations: - Mentally subtracting 1-, 2-, 3-, and multi-digit numbers; Estimating with addition and subtraction of 1-, 2-, 3-, and multi-digit numbers; - Mentally adding and subtracting tenths and hundredths; - Estimating with addition and subtraction to hundredths.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Skills** 1. Estimate the results of addition and subtraction involving 1-digit numbers. 2. Estimate the answers to addition and subtraction problems with 3-digit and larger numbers. 3. Mentally add and subtract decimal numbers with tenths and hundredths without using written algorithms or manipulatives. 4. Use mental strategies such as rounding, compensation, and adjusting to mentally add and subtract tenths efficiently. 5. Extend their mental calculation skills to adding and subtracting decimals to the hundredths place,	***Games:*** Math Dice Games: Activity: Learners roll dice to generate numbers for mental addition and subtraction. Rules are provided to guide the calculations, encouraging strategy development for quick mental math. 2. Math Bingo: Activity: Bingo cards feature a mix of addition and subtraction problems. Learners solve equations mentally and mark correct answers on their cards, reinforcing mental math in a fun, competitive format. 3. Digital Math Games: Activity: Learners engage with interactive online math games that involve adding and subtracting numbers of varying difficulty levels. The games offer immediate feedback and can be customized to meet different skill levels.	***Mental Addition and Subtraction Strategies Understanding Relationships Between Numbers:*** Engage learners in mental math exercises where they break apart and rearrange numbers in different ways. This practice helps them develop a deeper understanding of number relationships, laying the foundation for more advanced math concepts. **1-Digit Numbers** **Addition:** • **Strategy:** Use simple counting or number bonds. • **Example:** 7+5 Think: 7+3=10, then 10+2=12, Thus, 7+5=12 **Subtraction:** • **Strategy:** Count back from the larger number. • **Example:** 9−4 **Multi-Digit Numbers** **Addition:** • **Strategy:** Break into place values (thousands, hundreds, tens, units) and add. • **Example:** 1,235+3,468

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td>6. Estimate the results of addition problems involving decimals to the hundredths place</td>
<td>4. Mental Math Quiz:
Activity: A quiz with a range of addition and subtraction problems, from simple 1-digit to complex multi-digit equations, is designed to assess and reinforce mental math skills at various levels of difficulty.

Checklist for teaching mental addition and subtraction of whole numbers
<table>
<tr><th>CHECKLIST ITEMS</th><th>YES</th><th>NO</th></tr>
<tr><td>Can mentally subtract and add single-digit numbers quickly and accurately.</td><td></td><td></td></tr>
<tr><td>Can mentally subtract and add multi-digit numbers, demonstrating understanding of place value concepts.</td><td></td><td></td></tr>
<tr><td>Demonstrates proficiency in using mental strategies such as counting back, breaking numbers into parts, or using number bonds.</td><td></td><td></td></tr>
<tr><td>Utilizes mental math strategies effectively to solve subtraction and addition problems efficiently.</td><td></td><td></td></tr>
<tr><td>Completes mental subtraction and addition tasks within a reasonable time frame, demonstrating efficiency in problem-solving.</td><td></td><td></td></tr>
<tr><td>Demonstrates proficiency in mentally adjusting numbers to facilitate estimation, such as rounding up or down.</td><td></td><td></td></tr>
</table>
</td>
<td>Think: 1,235+3,000=4,235, then 4,235+400=4,635, then 4,635+60=4,695, and finally 4,695+8=4,703. Thus, 1,235+3,468=4,703.
Subtraction:
• Strategy: Subtract place values separately or round and adjust.
• Example: 5,672−2,348
Think: 5,672−2,000=3,672, then 3,672−300=3,372, then 3,372−40=3,332, and finally 3,332−8=3,324. Thus, 5,672−2,348=3,3245,672 - 2,348 = 3,324.

Digital manipulatives
Provide digital manipulatives for learners who may benefit from interactive visual aids, such as virtual base-ten blocks or online number lines.

Place Value Disks Decimals » Toy Theater | Learn • Create • Play

https://toytheater.com/base-ten-blocks/

Have learners interact with Poems. For example:

The Estimation Rhyme

When you need to add, but the numbers seem too high,
Estimate to simplify, and give it a try.
Round each number to the nearest ten,
Add them up, and then you'll know when.

If it's close to five or higher, round up, you see,
If it's lower than five, round down, easy as can be.
Now add your rounded numbers, quick and fast,</td>
</tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Oral Assessments **Provides Insights into Problem-Solving Strategies** ***Variety of Approaches:*** Oral assessments invite teachers to see the variety of strategies learners use to solve problems. This insight helps in understanding how learners approach mental addition and subtraction tasks and where they might need further instruction. ***Real-Time Problem Solving:*** present problems in real time and observe how learners think through and solve them, gaining a better understanding of their problem-solving processes. *Example:* ***Description:*** Pose problems orally and ask learners to solve them without using paper or calculators. This can be done individually or in small groups. ***Benefits:*** Directly assesses learners' ability to perform mental calculations and think on their feet. **Example:** "What is 7.5 + 3.4?" or "Subtract 2.3 from 5.6." ***Oral assessments to be graded using a rubric.*** ***Rubric for Assessing Mental Addition and Subtraction of Decimals*** This rubric is designed to evaluate learners' proficiency in mentally adding and subtracting decimals. Each criterion is rated on a scale from 1 to 4, where 1 is "Needs Improvement," 2 is "Approaching Proficiency," 3 is "Proficient," and 4 is "Advanced." **Criteria:** ***Accuracy*** 1 - Needs Improvement: Frequently makes errors in calculations, with correct answers less than 50% of the time.	Estimation helps, it's a skill that will last. Subtracting too can be done this way, Round the numbers first, then take away. Estimation makes math less of a chore, Practice it often, you'll learn more and more. **Verbal and Auditory Techniques**: Use mnemonic devices, chants, or rhymes to help learners remember subtraction facts and reinforce mental computation skills. *Use Storytelling to engage learners with addition and subtractions, for example* The Adventure of Jaden and Anaya: The Nutmeg Treasure Hunt. In the lush island of Grenada, siblings Jaden and Anaya discover a treasure map under a nutmeg tree. Following the clues written in the Grenadian dialect, they use addition and subtraction to navigate the island. Chapter 1: They find a map and decipher the first clue involving adding steps from a mango tree and a cocoa house, totaling 81 steps. Chapter 2: They subtract the number of spice baskets from their total, leaving them with 54 steps. Chapter 3: The next clue requires halving their last answer and adding 15, leading to 42 steps. Chapter 4: They subtract the number of fishermen's huts from 42, arriving at 24 steps. Chapter 5: At the final location, they dig up a chest containing coins, beads, and a letter from their late grandfather.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	2 - Approaching Proficiency: Sometimes makes errors, with correct answers between 50% and 70% of the time. 3 - Proficient: Usually accurate, with correct answers between 70% and 90% of the time. 4 - Advanced: Consistently accurate, with correct answers 90% of the time or more. ***Speed*** 1 - Needs Improvement: Takes significantly longer than average to complete calculations. 2 - Approaching Proficiency: Takes slightly longer than average, but within a reasonable time frame. 3 - Proficient: Completes calculations within an average time frame. 4 - Advanced: Completes calculations quickly and efficiently, often faster than average. ***Understanding of Place Value*** 1 - Needs Improvement: Shows little understanding of place value, leading to frequent mistakes. 2 - Approaching Proficiency: Shows some understanding of place value but occasionally makes mistakes. 3 - Proficient: Demonstrates a good understanding of place value, making few mistakes. 4 - Advanced: Shows a deep understanding of place value, rarely making mistakes. ***Strategy Use*** 1 - Needs Improvement: Rarely uses strategies or uses ineffective strategies. 2 - Approaching Proficiency: Sometimes uses effective strategies but not consistently. 3 - Proficient: Usually uses effective strategies to solve problems.	The letter read, "To my dear Jaden and Anaya, I hope you enjoyed this adventure. Remember, with mental math, you can solve any problem and find any treasure. Love, Grandpa." Jaden and Anaya smiled, knowing their grandfather had given them more than just a treasure. He had taught them the power of mental math. **Strategies for Estimating Decimal Calculations** **Rounding** **Rounding** is the most common technique for estimating decimal calculations. Depending on the required precision, decimals can be rounded to the nearest whole number, tenth, hundredth, etc. **Examples:** ● 4.67≈5(rounding to the nearest whole number) ● 3.24≈3.2(rounding to the nearest tenth) ***Front-End Estimation*** **Front-End Estimation** focuses on the most significant digits (the digits in the largest place value) and adjusts the remaining digits. **Examples:** ● For 56.789+34.234, use 56+34=90. Adjust by considering the decimal parts, so the estimate might be slightly above 90. ● For 78.6−43.27, use 78−43=35. Adjust by considering the decimal parts, so the estimate might be slightly above 35.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	4 - Advanced: Consistently uses highly effective strategies, demonstrating flexibility and efficiency. ***Mental Math Fluency*** 1 - Needs Improvement: Struggles to perform calculations mentally, often resorts to written methods. 2 - Approaching Proficiency: Can perform some calculations mentally but lacks confidence. 3 - Proficient: Performs most calculations mentally with confidence. 4 - Advanced: Performs all calculations mentally with high confidence and accuracy. ***Application of Concepts*** 1 - Needs Improvement: Has difficulty applying decimal addition and subtraction concepts to different contexts. 2 - Approaching Proficiency: Can apply concepts to familiar contexts but struggles with unfamiliar ones. 3 - Proficient: Can apply concepts to both familiar and unfamiliar contexts with minimal difficulty. 4 - Advanced: Easily applies concepts to a variety of contexts, including complex and unfamiliar situations. Error Analysis 1 - Needs Improvement: Unable to identify or correct errors in their own work. 2 - Approaching Proficiency: Sometimes identifies errors but struggles to correct them. 3 - Proficient: Usually identifies and corrects errors in their own work. 4 - Advanced: Consistently identifies and corrects errors, demonstrating a thorough understanding of the concepts.	***Compatible Numbers*** **Compatible Numbers** are numbers that are easy to compute mentally and close to the original numbers. ***Examples:*** ● For 6.73+3.28, use 6.7+3.3 because they are easy to add mentally: 6.7+3.3=10. Invite learners to solve problems through songs. For example **"Decimal Addition Boogie"** (Tune: "Hokey Pokey") Verse: You put the decimals in, you line them up right, You add the tenths and hundredths, and hold your answers tight. You move from right to left, and then you write it out, That's what it's all about! Chorus: You do the decimal boogie and you turn yourself around, That's what it's all about! 2. **"Subtracting Decimals Song"** (Tune: "Twinkle, Twinkle, Little Star") Verse: Subtracting decimals isn't hard, Line up the dots, then you'll go far. Borrow if you need to, don't forget, Start from the right, you won't regret.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Confidence 1 - Needs Improvement: Lacks confidence in their ability to perform mental math with decimals. 2 - Approaching Proficiency: Shows some confidence but is easily discouraged by mistakes. 3 - Proficient: Generally confident in their abilities and recovers well from mistakes. 4 - Advanced: Highly confident in their abilities and rarely discouraged by mistakes. ***Scoring:*** 32-28 points: Advanced 27-23 points: Proficient 22-18 points: Approaching Proficiency 17-8 points: Needs Improvement **Math Relay:** Divide learners into teams and set up a relay race format where each team member solves either an addition or subtraction whole numbers and decimals problem before passing the baton to the next teammate. Include a mix of addition and subtraction of whole numbers and decimal problems with varying difficulty levels. Encourage collaboration and teamwork as learners work together to complete the relay. **Think-Pair-Share** Description: Learners solve a mental math problem individually, then discuss their solutions and strategies with a partner, and finally share with the class. Benefits: Encourages collaborative learning and invites learners to explain their thinking process. Example: "Mentally calculate 5.13 + 2.09. Discuss your method with a partner and be ready to share."	Chorus: Subtracting decimals, one by one, Practice makes it really fun. **"Rounding Decimals" (Tune: "Twinkle, Twinkle, Little Star")** Verse: When you round a decimal, Look at the digit, don't be dull. If it's five or more, move up the score, Four or less, keep the rest. Chorus: Rounding decimals, it's so fun, Now you know how it's done

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Mental Math Journals Description: Learners keep a journal where they record their mental math strategies and reflections on their problem-solving processes. Benefits: Promotes metacognition and helps teachers understand learners' thought processes. Example: "Today I solved 8.5 - 3.6 by thinking of 8.5 as 8.50 and subtracting 3.60, which gave me 4.90." **Exit Tickets** Description: At the end of a lesson, give learners a quick mental math problem to solve before they leave (estimation or solve fully). Benefits: Provides immediate feedback on the day's learning and identifies areas needing review. Example: "Solve 9.6 - 4.1 mentally and write your answer on an exit ticket."	

Additional Resources and Materials

Mental math strategies:
https://www.nms.ac.uk/media/1157965/mental-maths-strategies.pdf

Additional Useful Content Knowledge for the Teacher:

Estimation in mathematics is finding an approximate value reasonably close to the exact value.

Key Concepts of Estimation
Rounding: Simplifying numbers to a particular place value to make calculations easier. For example, rounding 487 to the nearest ten gives 490.

Front-End Estimation: is a reasonable strategy to estimate sums and differences when all or most numbers have the same number of digits. To use this strategy, add or subtract the front digits of the number (or the digits in the greatest place), then make adjustments based on the numbers in the next greatest place.

Example 1, in adding 456 + 378, you might use 400 + 300 = 700.

Example 2 : 345 + 416 + 298. Add the 3, 4, and 2 hundreds (numbers in the greatest place) to estimate 900. Adjust by adding the numbers in the next greatest place which are 4, 1, and 9 tens to get 140. 900 + 140 gives you a front-end estimation of 1,040.

Compatible Numbers:.is a useful strategy when adding more than 2 addends, or typically a long list of numbers. With this strategy, you look for 2 or 3 numbers that can be combined to create 10 or 100 to make it easier to determine an estimate.

EXAMPLE 1 When dividing 98 by 4, you might adjust it to 100 divided by 4, which is 25.

EXAMPLE 2: When adding 18 + 39 + 71 + 27 + 78 + 62, I can estimate the sum as 300 by combining numbers that estimate to 100: 18 and 78; 39 and 62; 71 and 27.

Clustering: When numbers in a set are close in value, you can estimate by rounding them all to a common value. For example, estimating the sum of 48, 52, and 50 by rounding each to 50 and then adding 50 + 50 + 50 = 150.

Using Benchmarks: Referring to known values or benchmarks to make a quick estimate. For instance, knowing that 50% of 80 is 40 can help estimate percentages close to 50%.

https://smathsmarts.com/strategies-for-estimating-sums-and-differences/

Rounding

• Rounding is used to determine the nearest 10, 100 or 1000 to the whole number to estimate a sum or difference, many times to give you a closer approximation.

The first step in estimating a sum or a difference is to round the numbers, by changing them to the nearest power of ten, hundred, thousand

Example: 328 + 74. Rounding to the nearest ten I estimate 330 + 70 = 400.

Round each number BEFORE you subtract.

Example 1:
47 rounds to 50 26 rounds to 30

50- 30 = 20

Addition of two numbers, one of which ends in 8 or 9

We're going to add 26 + 9.

Since 9 is close to 10, we can replace the 9 with 10 – 1. This way, we are left with 26 + 10 – 1.

Now we add 26 + 10 = 36, and we are left with 1 to subtract: 36 – 1 = 35.

Therefore, 26 + 9 = 35.

Addition of two numbers, one of which ends in 1 or 2
We are going to add 24 + 11.

Since 11 is close to 10, we can replace the 11 with 10 + 1. And we are left with 24 + 10 + 1.
Now we add 24 + 10 = 34. Lastly, we add the 1 that was leftover: 34 + 1 = 35.

Therefore, 24 + 11 = 35.

Subtraction of two numbers with the subtrahend ending in 8 or 9
We are going to subtract 54 – 28.

Since 28 is close to 30, we can write the 28 as 30 – 2, and we are left with 54 – (30 – 2).

Given there is a negative sign in front of the parentheses, the operation would be 54 – 30 + 2.

No we subtract 54 – 30 = 24. Lastly, we add 24 + 2 = 26.

Therefore, 54 – 28 = 26.

Subtraction of two numbers, with the minuend ending in 8 or 9
We are going to subtract 29 – 14.

Since 29 is close to 30, we can write 29 as 30 – 1. This way we are left with 30 – 1 – 14.

Now we are going to subtract 30 – 14 = 16. Lastly, we subtract the 1 that was leftover 16 – 1 = 15.

Therefore, 29 – 14 = 15.

Subtraction of two numbers, with the minuend ending in 1 or 2

We are going to subtract 32 – 24.

Since 32 is close to 30, we can write it as 30 + 2. Which leaves us with 30 + 2 – 24.

Now we subtract 30 – 24 = 6. Lastly, we add the 2 that was leftover 6 + 2 = 8.

Therefore, 32 – 24 = 8.

https://www.smartick.com/blog/mathematics/addition-and-subtraction/estimate-a-sum/

Partitioning

Calculations with whole numbers which do not involve crossing place value boundaries. E.g. 23 + 45= ? by 40 + 5 +20 + 3 or 40 + 23 + 5

Calculations with whole numbers which involves crossing place value boundaries. E.g. 49 – 32= ? by 49 – 9 – 23 or 57 + 34 = ? by 57 + 3 + 31

Calculations with decimal numbers which do not involve crossing place value boundaries 5.6 + 3.7= ? by 5.6 + 3 +0.7 or 540 + 380= ? by 540 + 300 + 80 or 540 + 360 + 20

Calculations with decimal numbers which involve crossing place value boundaries. E.g. 1.4 + 1.7= ? by 1.4 + 0.6 + 1.1 and 0.8 + 0.35 = ? by 0.8 + 0.2 + 0.15

Compensating and adjusting
Compensation involves adding more than you need and then subtracting the extra.

This strategy is useful for adding numbers that are close to a multiple of 10, such as numbers that end in 1 or 2, or 8 or 9.

The number to be added is rounded to a multiple of 10 plus or minus a small number.

For example, adding 9 is carried out by adding 10, then subtracting 1. A similar strategy works for adding decimals that are close to whole numbers.

These are the ways you can help your class to progress with compensating and adjusting:
Compensating and adjusting to 10. (e.g. 34 + 9=? by 34 + 10 – 1 or 34 – 11= ? by 34 – 100 – 1 = ?)
Compensating and adjusting multiples of 10. (e.g. 38 + 68= ? by 38 + 70 – 2 or 45 – 29 = 45 – 30 + 1)
Compensating and adjusting multiples of 10 or 100. (e.g. 138 + 69= ? by 138 + 70 – 1 or 299 – 48 = 300 – 48 – 1)
Compensating and adjusting multiples with decimals. (e.g 2 ½ + 1 ¾ by 2½ + 2 – ¼ or 5.7 + 3.9 by 5.7 + 4.0 – 0.1)

Calculating using near doubles

When children have an automatic recall of basic double facts, they can use this information when adding two numbers that are very close to each other.

Near Doubles:
Near doubles to numbers under 20. E.g. 18 + 16 is double 18 and subtract 2 or double 16 and add 2.
Near doubles to multiples of 10. E.g. 60 + 70 is double 60 and add 10 or double 70 and subtract 10 or 75 + 76 is double 76 and subtract 1 or double 75 and add 1.
Decimal near doubles to whole numbers. E.g. 2.5 + 2.6 is double 2.5 add 0.1 or double 2.6 subtract 0.1.

https://thirdspacelearning.com/us/blog/mental-math-strategies/

Opportunities for Subject Integration:

Literacy:
Construct a song, jingle or a poem on the steps in rounding off whole numbers and decimals when estimating sum or difference
Make a presentation on the steps in rounding off whole numbers and decimals when estimating sum or difference

Science and Technology:
Sub-Strand: Ecosystem (ECS)
Collect, using quadrats, data on the number of specific organisms within a habitat.
Design, construct and use discarded materials to make useful items.

Technological Methods (TM)
Design and construct objects to satisfy human needs and to make life easier.

Essential Learning Outcome O 2.1: Multiplicative Thinking – Understanding the Meaning of Multiplication and Division and How They Relate
Grade Level Expectations: - Multiply and divide decimals (tenths and hundredths), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between multiplication and division; relate the strategy to a written method and explain the reasoning used.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Multiply decimal numbers by decimals. 2. Multiply decimal numbers by whole number 3. Divide decimal number by decimals. 4. Divide decimal number whole numbers 5. Use inverse operations to simplify division problems (e.g., using multiplication to check division 6. Apply the commutative, associative, and distributive properties to multiply decimals.	***Performance Assessment*** ***Supports Development of Transferable Skills*** ***Real-Life Skills:*** The skills practiced in performance assessments, such as budgeting, calculating discounts, or measuring areas, are transferable to real-life situations. This helps learners see the value of their learning beyond the classroom. ***Application of Decimal Operations:*** Understanding how to multiply and divide decimals effectively prepares learners for future academic and life situations where these skills are required. ***Example:*** **Construction Project Task:** **Description:** Learners are tasked with determining the total area of a construction project and the cost of materials. **Instructions:** ● Provide measurements of the construction project in decimals (e.g., length and width of a floor). ● Ask learners to calculate the total area using multiplication.	***Modelling/ Interactive Demonstrations*** ***Promoting Collaborative Learning*** **Group Activities:** Use modeling and interactive demonstrations in group settings where learners collaborate to explore decimal operations. This collaborative approach fosters peer learning and discussion. **Shared Exploration:** Learners can work together to use models and interactive tools, discussing their observations and strategies with peers, which enhances their understanding through social interaction. Use hands-on demonstrations to engage learners in understanding decimal operations. ***Example Activity: Demonstrating Decimal Multiplication with Grid Paper*** ***Steps:*** 1. **Pose a Problem:** "Let's multiply 1.5 by 0.4 using grid paper." 2. **Guide the Demonstration:** ● "How can we represent 1.5 on the grid paper?" ● "Now, let's represent 0.4. How do these two areas overlap?"

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
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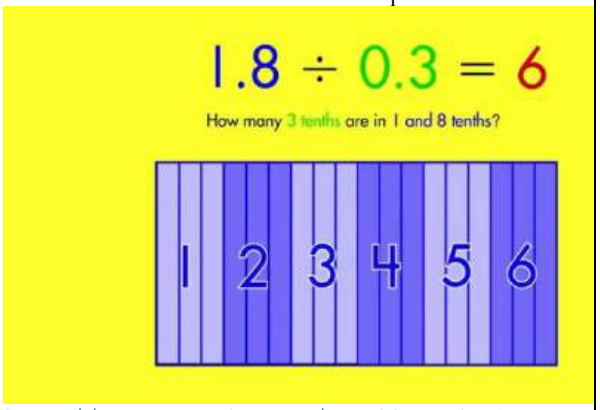
Provide the cost per square unit and ask learners to calculate the total cost using multiplication and division.
Show their work using concrete models, area models, or other visual aids.
Write a short explanation of their reasoning.

Scoring Rubric
<table>
<tr><td>Criteria</td><td>Advanced (4)</td><td>Proficient (3)</td><td>Basic (2)</td><td>Below Basic (1)</td></tr>
<tr><td>Accuracy</td><td>All calculations are correct with no errors.</td><td>Most calculations are correct with minor errors.</td><td>Some calculations are correct, but there are several errors.</td><td>Many calculations are incorrect, showing a lack of understanding.</td></tr>
<tr><td>Use of Models</td><td>Effectively uses concrete or area models to represent problems and solutions.</td><td>Uses concrete or area models to represent most problems and solutions.</td><td>Uses models with some accuracy, but representation is incomplete or unclear.</td><td>Struggles to use models accurately and effectively.</td></tr>
</table>
</td>
<td>
3. Encourage Learner Participation:

"Who would like to come up and help draw the overlapping sections?"
"What do we get when we count the total shaded area?"

4. Discuss the Results:

"What does this shaded area represent in terms of our multiplication problem?"
"How does this visual help us



https://www.youtube.com/watch?v=HbmZBLstwz0

Dividing a Decimal by a Whole Number
</td>
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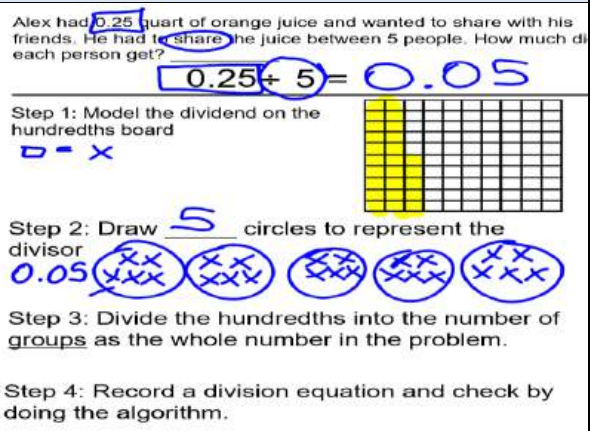
Specific Curriculum Outcomes	Inclusive Assessment Strategies					Inclusive Learning Strategies
	Understanding Place Value	Demonstrates a thorough understanding of place value in all calculations.	Demonstrates a clear understanding of place value in most calculations.	Shows partial understanding of place value, with occasional errors.	Shows limited understanding of place value, with frequent errors.	 https://baltesbuzz.weebly.com/math.html ***Think-Pair-Share*** **Steps:** 1. **Think:** • Pose a problem: "Divide 2.4 by 0.6 using an area model." • Ask learners to think about how they would solve it individually. 2. **Pair:** • Have learners pair up to discuss their thoughts and methods. • Encourage them to explain their reasoning to their partner. 3. **Share:** • Ask pairs to share their solutions and reasoning with the class. • Facilitate a class discussion on the different methods used and their effectiveness.
	Explanation and Reasoning	Provides clear, thorough explanations and reasoning for all solutions.	Provides clear explanations and reasoning for most solutions.	Provides partial explanations and reasoning, with some gaps.	Provides minimal explanations and reasoning, showing limited understanding.	
	Problem-Solving Skills	Demonstrates strong problem-solving skills and applies decimal operations accurately in	Demonstrates good problem-solving skills and applies decimal operations accurately in	Demonstrates basic problem-solving skills with noticeable errors.	Struggles with problem-solving and frequently makes errors in applying decimal operations.	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

	complex and real-world problems.	most problems.		

Observational Checklist

Checklist for Multiplication of Decimals Using Manipulatives or Area Models

Understand Place Value:

- Recognise the place value of digits in the decimal numbers being multiplied.

Use a place value chart if necessary.

Prepare the Manipulatives or Area Models:

- Gather base-ten blocks, grid paper, or an area model template.
- Ensure each block or section of the grid represents a specific place value (e.g., tenths, hundredths).

Set Up the Problem:

- Write the numbers being multiplied.
- Use the manipulatives or draw an area model to represent each decimal number.

Use the Area Model:

- For each decimal number, shade or place blocks to represent its value.

Using Inverse Operations to Check Decimal Division Problems

While inverse operations primarily help in verifying answers rather than simplifying the division process itself, they are crucial for accuracy.

Example 1:

- Division problem: 12.5 ÷ 2.5 = 5
- Inverse operation (multiplication): 5 * 2.5 = 12.5
- Since the multiplication results in the original dividend (12.5), the division is correct.

Example 2:

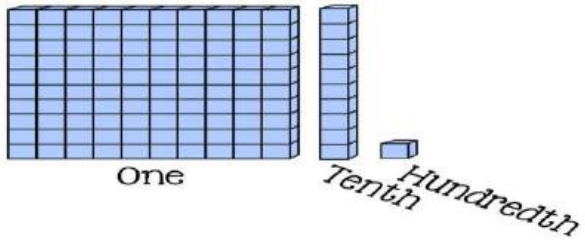
- Division problem: 36.9 ÷ 3 = 12.3
- Inverse operation (multiplication): 12.3 * 3 = 36.9

Again, the multiplication verifies the division result.

***Use of Manipulatives and Visual Aids*:**

Incorporate tools such as base-ten blocks, grid paper, or interactive digital tools to visually represent decimal operations. This helps learners understand the place value and the mechanics of the operations.

Example: Use grid paper to illustrate the multiplication of decimals, showing how the areas correspond to the products.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• Combine the shaded areas or blocks to visualize the product (e.g., shade 0.4 of a grid and then shade 0.3 of that area). **Multiply the Numbers:** • Perform the multiplication using the manipulatives or area model. • Count the overlapping shaded sections or combined blocks to determine the product. **Place the Decimal Point:** • Determine the total number of decimal places in the factors. • Place the decimal point in the product accordingly. **Check Your Work:** • Use estimation to verify if the product makes sense. • Compare the answer to a rough estimate of the product. **Explain the Strategy:** • Be able to explain how you used the manipulatives or area model to arrive at the answer. ***Checklist for Division of Decimals Using Manipulatives or Area Models*** **Understand Place Value:** • Recognise the place value of digits in the decimal numbers being divided. • Use a place value chart if necessary. **Prepare the Manipulatives or Area Models:** • Gather base-ten blocks, grid paper, or an area model template. • Ensure each block or section of the grid represents a specific place value (e.g., tenths, hundredths).	 **Example Questions:** • "How did you decide to divide 2.4 by 0.6?" • "What steps did you take in your area model to represent the division?" • "Did your partner use a different method? How did it compare to yours?" ***Applying Properties to Multiply Decimals*** ***Commutative Property*** This property states that the order of factors does not change the product. • **Example:** 3.2 * 4.5 = 4.5 * 3.2 **Associative Property** This property states that the grouping of factors does not change the product. • **Example:** (2.1 * 3) * 5.6 = 2.1 * (3 * 5.6) **Distributive Property** This property states that multiplying a number by a sum is the same as multiplying the number by each addend and then adding the products. • **Example:** 4.2 * (3 + 5) = (4.2 * 3) + (4.2 * 5) .

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Set Up the Problem: • Write the division problem. • Use the manipulatives or draw an area model to represent the dividend. **Use the Manipulatives or Area Model:** • Place the blocks or shade the grid to represent the dividend. • Divide the shaded area or blocks into equal parts to visualize the division. **Perform the Division:** • Divide the shaded area or blocks into groups equal to the divisor. • Count the number of groups to determine the quotient. **Place the Decimal Point:** • Place the decimal point in the quotient directly above where it appears in the dividend. **Check Your Work:** • Use multiplication to verify the quotient (e.g., multiply the quotient by the divisor to see if it equals the dividend). • Estimate to see if the quotient makes sense. **Explain the Strategy:** • Be able to explain how you used the manipulatives or area model to arrive at the answer. ***Error Analysis*** **Objective:** Help learners learn from mistakes by analyzing and discussing errors. ***Example Activity: Analyzing Missteps in Decimal Division*** ***Steps:*** **Present a Problem with an Error:** • "Here's a learner's work on dividing 4.8 by 1.2, but there's a mistake. Can you find it?"	

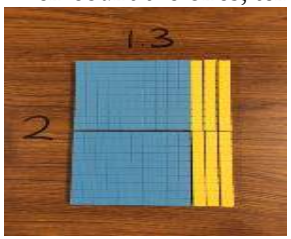
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Discussion and Questioning: • "What do you notice about the steps taken?" • "Where do you think the error occurred?" • "How would you correct this mistake?" **Encourage Reflection:** • "Why do you think this error happened?" • "What can we learn from this mistake to avoid it in the future?" **Example Questions:** • "If you divided 4.8 by 1.2 and got 0.4, what might have gone wrong?" • "What should the correct quotient be, and why?" ***Summative Assessment*** **Identify the property:** Which property is illustrated by the equation 3.2 * 4.5 = 4.5 * 3.2? **Justify the use of a property:** Explain how using the distributive property can help you mentally multiply 7.3 * 9. **Apply properties to solve problems:** Calculate 2.5 * 1.6 * 4 in the most efficient way possible. Explain your reasoning. **Create examples:** Write a multiplication problem that demonstrates the associative property.	

Additional Resources and Materials

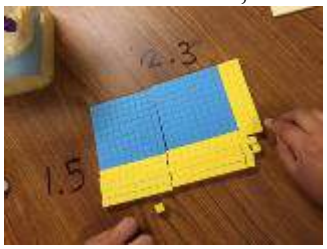
MULTIPLICATION OF DECIMALS

How to multiply decimals using base ten blocks?

Use base ten blocks to represent 2 hundredths vertically and 1.3 as 130 hundredths horizontally to make rectangle.
After using the ones and tenths, complete the rectangle by adding hundredths.
Then count the ones, tenths and hundredths.



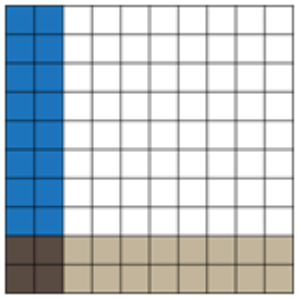
Use base ten blocks to represent 2 hundredths vertically and 1.3 as 130 hundredths horizontally to make a rectangle.
After using the ones and tenths, complete the rectangle by adding hundredths.
Then count the ones, tenths and hundredths.



AREA MODEL

- Shade the row with one decimal and the column with the other decimal.
- The squares on the grid that overlapped in the shaded region is the solution to the problem.
- Count the squares

The grid below represents the multiplication of 0.2 x 0.2 = 0.4. 4 squares overlapped in the shaded region, therefore, the result will be 4/10 =0.4



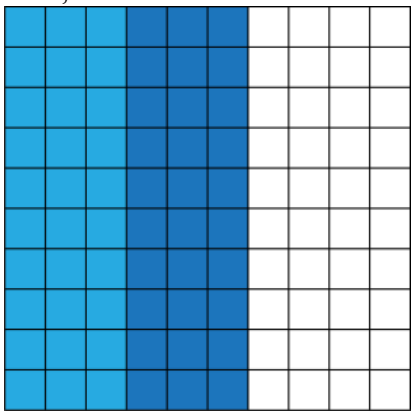
https://byjus.com/us/math/multiplication-of-decimals-by-models/

Multiplication of whole numbers and decimals using models

Example: Find the product of 2 x 0.3 using models.

We can write 2 x 0.3 as 2 x 3/10 or 2 x 3 tenths.

Now, we have to shade 3 columns 2 times.



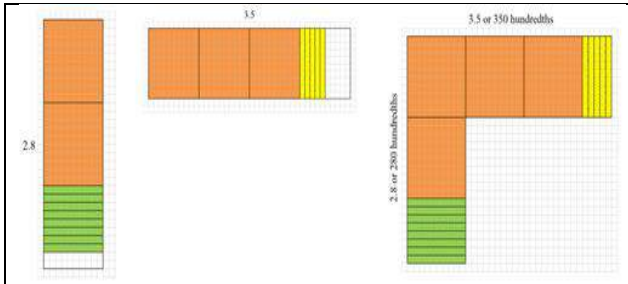
There are 60 shaded grids in the above-shown model.

Shaded grid = 60 x 1/100 = 0.6.

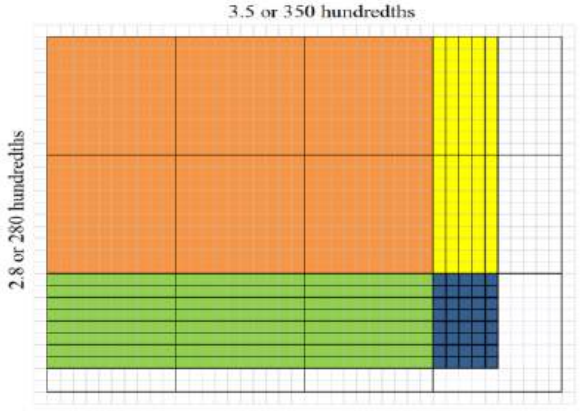
https://byjus.com/us/math/multiplication-of-decimals-by-models/

2.8×3.5

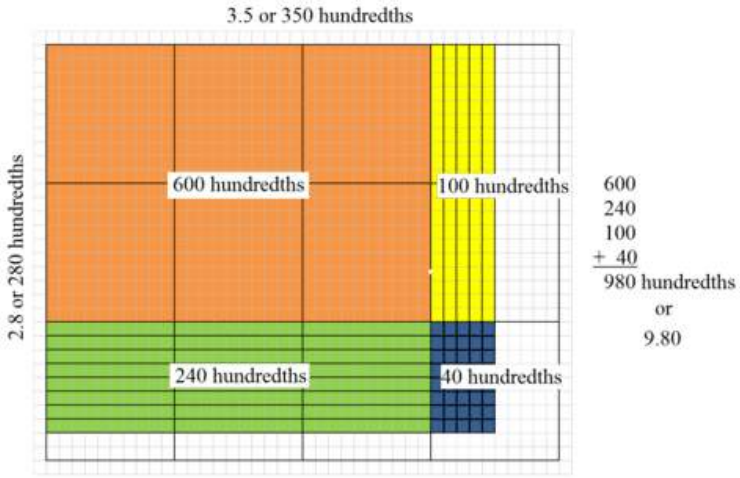
Represent 2.8 as 280 hundredths vertically and 3.5 as 350 hundredths horizontally on the same area model.



Then, fill in the area to complete the rectangle.



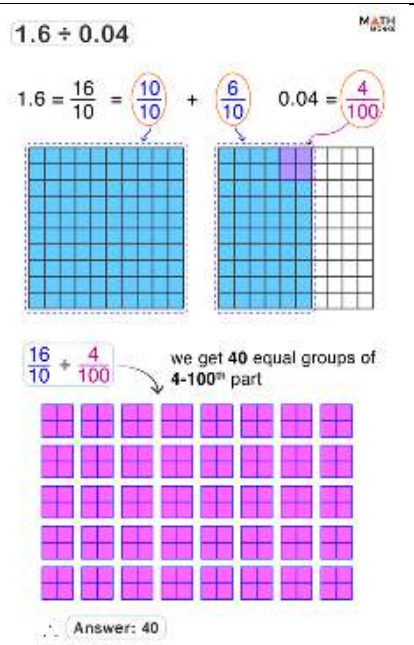
[Figure 4]
Next, add up the number of units from each section.



600
240
100
+ 40
980 hundredths
or
9.80

https://flexbooks.ck12.org/cbook/ck-12-interactive-middle-school-math-6-for-ccss/section/4.3/related/lesson/area-models-for-decimal-multiplication-msm6/

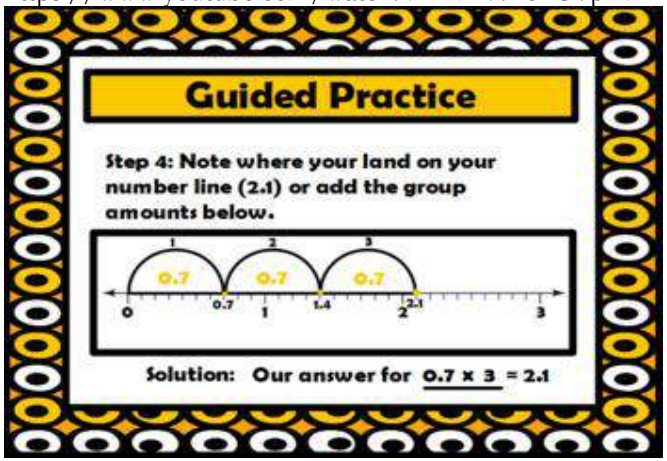
DIVISION OF DECIMALS BY WHOLE NUMBER


1.6 ÷ 0.04
1.6 = 16/10 = 10/10 + 6/10
0.04 = 4/100
16/10 ÷ 4/100
we get 40 equal groups of 4-100th part
∴ Answer: 40

Additional Useful Content Knowledge for the Teacher:

https://www.youtube.com/watch?v=TfTTTAtWFGM&t=31s
https://www.youtube.com/watch?v=dOHEhTuDQQc
https://www.youtube.com/watch?v=IWTC4hYAz7M
https://ecdn.teacherspayteachers.com/thumbitem/Multiplying-and-Dividing-Decimals-on-a-Number-Line-5014768-1573412094/original-5014768-3.jpg

https://www.youtube.com/watch?v=MAV9I6hO7pM



Decimals can be divided or multiplied using the number line

Opportunities for Subject Integration:

Science:
In science experiments, use measurements that involve decimals, such as recording the growth of plants in centimeters or mixing solutions in liters. Learners can multiply or divide these measurements to predict outcomes or analyze data.
For example, if a plant grows 0.5 cm per day, learners can calculate its growth over several days using multiplication. If they have a solution that needs to be divided into smaller quantities, they can use division.

Social Studies:
Introduce learners to basic economic concepts by having them create budgets or manage money in scenarios that involve decimals. For example, calculating the total cost of goods, dividing expenses among a group, or adjusting prices with discounts.
Simulate real-world activities like planning a trip where learners need to multiply and divide decimals to budget for transportation, lodging, and food.

Language Arts:
Ask learners to write their own word problems that incorporate multiplying or dividing decimals. This enhances their comprehension and invites them to practice math in a narrative context.

Vocabulary Building:
Introduce math-specific vocabulary like "product," "quotient," "decimal point," and "place value" within reading assignments. Encourage learners to use these terms correctly in their writing.
Write an expository essay on the steps to multiply or divide decimals
Write jingles or poems on the steps to multiply or divide decimals

Essential Learning Outcome 2.2: Multiplicative Thinking – Compute Fluently with Operations (x&÷)
Grade Level Expectations: - Use strategies fluently to recall multiplication and related division facts - Compute 1, 2, and 3-digit by 2 or 3-digit multiplication and division problems.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Recall and apply multiplication and division facts of 1, 2, and 3 digits by 2- or 3-digit numbers. 2. Multiply 1-digit numbers by 2, and 3-digit numbers and their relationship with division fluently. **Skills** 3. Solve multi-step word problems efficiently and accurately. **Values** 4. Demonstrate the ability to collaborate effectively with peers to enhance their fluency in multiplication facts and proficiency in multi-digit multiplication and division by participating in group activities	**Observation Checklist** ***Learner's observation checklist (Think, pair, share) Multiplication and Division Fluency*** Learner's Name: Date of Observation: Criteria for Assessment: ***Recalling Multiplication Facts*:** Can the learner recall multiplication facts up to **12x12** fluently? **Yes No** How quickly and accurately can the learner recall multiplication facts? • Fluent (answers within 3 seconds) • Moderately fluent (answers within 5-7 seconds) • Slow (answers take more than 7 seconds) Does the learner use effective strategies (e.g., skip counting, using known facts, recognizing patterns) to recall multiplication facts? **Yes No** ***Related Division Facts:*** Can the learner efficiently recall division facts corresponding to multiplication facts? Yes No How well does the learner apply strategies learned for recalling multiplication facts to solve related division problems? • Effectively	***Think-Pair-Share through multiplication and division* games:** **Example:** **(Think)**Provide a multiplication or division problem to learners. Invite them time to individually solve the problem . **(Pair)**Then, have them pair up with a classmate to discuss their strategies and solutions . **(Share)**Finally, invite pairs to share their approaches with the class, encouraging diverse perspectives and strategies **Real world connections** **Encourages Exploration and Inquiry** **Investigative Learning:** Encourage learners to investigate, experiment, and discover solutions, fostering a deeper understanding of multiplication and division. **Creative Problem-Solving:** Have learners explore multiple approaches to solving real-world problems, which promotes creative thinking and innovation in applying mathematical concepts.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• Somewhat effectively • Ineffectively ***Computing Multiplication and Division Problems:*** Can the learner accurately compute 1, 2, and 3-digit by 2 or 3-digit multiplication problems? **Yes No** Can the learner accurately compute 1, 2, and 3-digit by 2 or 3-digit division problems? **Yes No** How efficiently does the learner solve multi-digit multiplication and division problems? • Efficiently (minimal errors, uses appropriate strategies) • Moderately efficiently (some errors, occasional use of strategies) • Inefficiently (frequent errors, struggles with strategies) **Maths Journal Evaluating Checklist** https://s3.eu-west-1.amazonaws.com/cdn2.mathsnoproblem.com/wp-content/uploads/2020/01/Maths-Journal-Evaluating-Checklist.pdf **Performance tasks** **Task Overview:** Learners will plan a classroom garden. They will need to calculate the total number of plants in the garden and determine how many plants each row will have if they are equally distributed. This task integrates multiplication and division skills. **Instructions:** **Garden Layout Design:** Each learner receives a grid representing the garden plot.	***Example*** **Grocery Store Math** ***Scenario Setup:*** Provide each learner with a shopping list with various items and prices. Items are listed in different quantities, requiring multiplication to find the total cost per item. **Multiplication Task:** have learners multiply the quantity of each item by its price. **Division Task:** have learners determine how to divide items equally among family members or friends. **Reflection and Presentation:** have learners write a brief reflection on how they solved the problems and present their findings to the class. Discuss different strategies used and any challenges faced. **SCO 3** ***Differentiated Instruction*** ***Multiple Representation*** Differentiated instruction tailors instruction to meet the diverse needs, abilities, and learning styles of all learners. It may involves varying teaching methods, materials, and assessments to accommodate different learners and ensure that each learner can access and engage with the content. ***For example,*** ***Formats:*** Offer problems in different formats (e.g., visual aids, manipulatives, text, and audio). Some learners may benefit from seeing the problem visually or hearing it read aloud. **Flexible Grouping**: Group learners based on their current understanding and skills. Invite for

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Plant Allocation: Each learner will choose different plants to fill the garden. The number of plants per type must be a multiple of the same 1-digit number. **Multiplication Task:** Calculate the total number of plants for each type by multiplying the chosen 1-digit number by 2- or 3-digit numbers. **Division Task:** Distribute the total number of each type of plant evenly across the rows. **Reflection and Explanation:** • Learners write a short reflection explaining how they used multiplication to find the total number of plants and division to ensure equal distribution across rows. • Discuss any patterns or relationships they noticed between multiplication and division during the task. **Presentation:** • Learners present their garden layout, showing calculations for both multiplication and division. • Explain the process and any challenges faced. **Assessment Criteria:** • Accurate use of multiplication algorithms. • Correctly calculated total number of plants. • Proper use of division to distribute plants evenly. • Clear explanation of the relationship between multiplication and division. • Presentation and clarity of the garden layout and calculations.	fluid movement between groups as learners' proficiency levels change. Invite each group to come up with at least three different ways to solve the real life problem to cater for differentiated instructions and present their strategies to the whole class. Learners are left on their own with minimum teacher involvement to do the problems.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Differentiated Assessments **Tiered Problems**: Offer problems at varying levels of complexity. Learners can start with simpler problems and progress to more complex ones, ensuring they are challenged appropriately based on their skill level. **Tier 1: Basic Problems** **Multiplication** **Problem**: Sarah buys 7 packs of crayons. Each pack has 12 crayons. How many crayons does she have in total? **Steps**: 7 * 12 **Division** **Problem**: There are 84 candies and 4 friends want to share them equally. How many candies will each friend get? **Steps**: 84 * 4 **Tier 2: Intermediate Problems** **Multiplication** 1. **Problem 5**: A factory produces 134 toys every day. How many toys will it produce in 23 days? **Steps**: 134 * 23 **Division** **Problem**: A shipment of 912 books needs to be distributed equally among 16 libraries. How many books will each library receive? **Steps**: 912 ÷ 16 **Tier 3: Advanced Problems** **Multiplication** **Problem**: A company sells 546 computers each month. How many computers will it sell in 321 months? **Steps**:546 * 321 **Division** **Problem**: A warehouse has 7344 boxes of goods to be packed into containers. Each container can hold 24 boxes. How many containers are needed? **Steps**:7344 ÷ 24	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Tier 4: Challenging Problems **Multiplication** **Problem 13**: A car rental company rents out 487 cars each day. How many cars will it rent out in 129 days? **Steps**: 487 * 129 **Division** **Problem 15**: A total of 17856 liters of water needs to be distributed equally among 144 water tanks. How many liters of water will each tank receive? **Steps**: 17856 ÷ 144	

Additional Resources and Materials

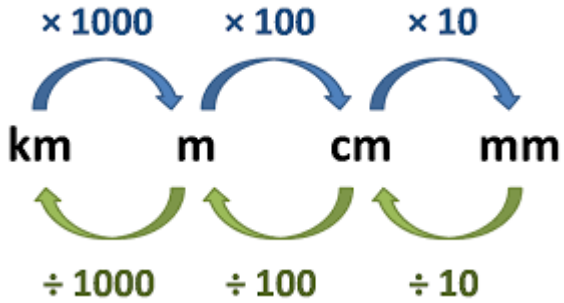
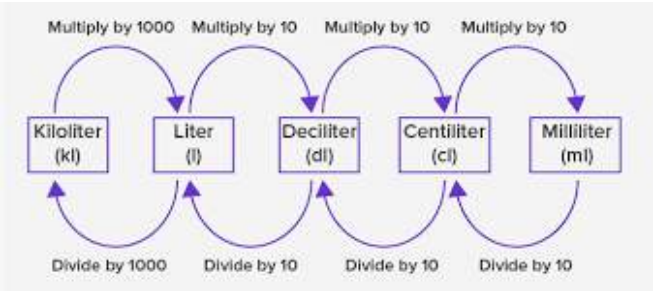
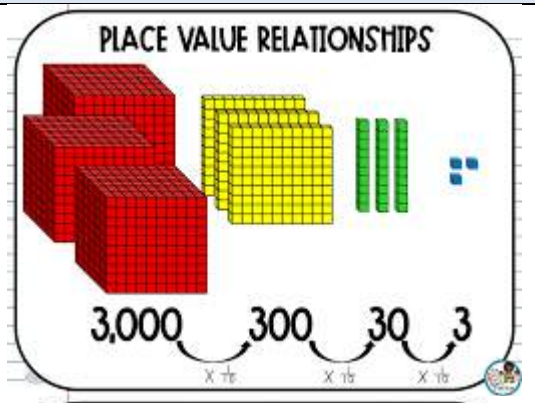
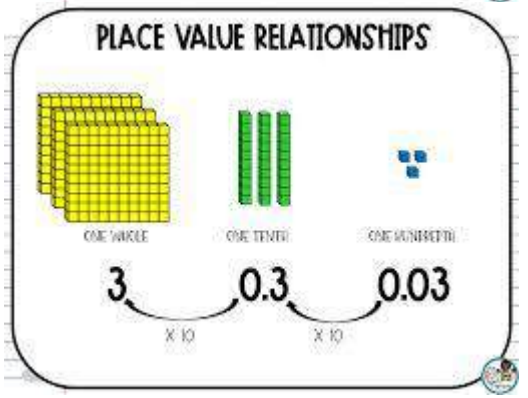
Number Lines
Games and Puzzles

Opportunities for Subject Integration

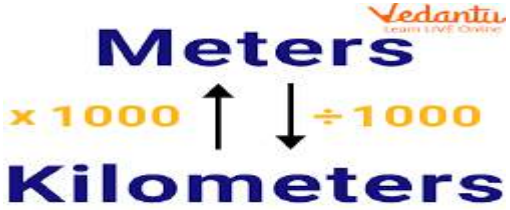
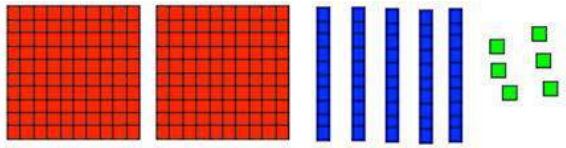
Data management in identifying the correct scales to use on the y-axis
Number concept in reading and writing numbers
Measurement in money conversion.

Essential Learning Outcome: O 2.3: Multiplicative Thinking – Make Reasonable Estimation When Using the Operation (x&÷)
Grade Level Expectations: - Mentally multiplying and dividing by 10, 100, and 1 000 - Mentally multiplying with 2-, 3-, and multi-digit numbers - Estimating with multiplication of 2-, 3-, and multi-digit numbers by a 1-digit number.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. show that multiplying by 10, shifts digits to the left of its place and dividing by 10, shifts digits to the right of its place, and the same concept applies for multiplying and dividing by 100 and 1000 **Skills** 2. Interpret and solve word problems that require multiplying or dividing quantities by powers of 10. 3. Apply mental multiplication and division skills to solve problems involving measurements, conversions, and scaling. 4. Interpret and solve word problems that require multiplying or dividing quantities by powers of 10 accurately	***Digital Assessments:*** Use online quizzes and interactive tools that provide instant feedback. These can include drag-and-drop activities to place digits in the correct columns after multiplication or division. For example **Nearpod: https://nearpod.com/** Nearpod offers interactive lessons and assessments that include a variety of question types, such as drag-and-drop, multiple-choice, and open-ended questions. It provides instant feedback and detailed reports. • **Features**: Interactive lessons, formative assessments, multimedia integration. • **Pros**: Engaging, versatile, supports diverse learning styles. ***Variety of Assessment Formats*** ***Written Assessments:*** Include word problems that require multiplying or dividing by 10, 100, and 1000. Ensure problems are presented in clear, concise language. ***Oral Assessments:*** Invite learners to explain their thought process and solutions verbally. This can be recorded or presented to a teacher or peer. *For example:*	***Encouraging Metacognition*** Encourage metacognition when multiplying using powers of 10. It helps learners reflect on their thinking processes and understand the strategies they use. Here are some strategies: ***Visual Models:*** Use place value charts and base-ten blocks to visually demonstrate how multiplying by powers of 10 shifts digits. Have learners draw their own models and explain how they work. **Reminder**: reinforce place value and the concept that the each place is 10 time the place to its right

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values 5. Show appreciation for the practical applications of mental calculation techniques and their role in mathematical problem-solving by	***Problem:*** *A* warehouse has 10,000 items that need to be packed into boxes, each box holding 100 items. How many boxes are needed? ***Project*** Assign projects where learners must use instruments such as measuring tape, meter ruler, cm ruler to record measurements of things in and around the classroom. Also, have learners change measurements from larger units to smaller units and vice versa.  https://www.cuemath.com/learn/mathematics/arithmetic-length-area-volume-conversions/  https://www.splashlearn.com/math-vocabulary/measurements/liquid-measurement-chart	  https://www.therouttymathteacher.com/place-value-relationships/ ***Reflection Journals:*** Have learners keep journals where they reflect on their problem-solving process, challenges faced, and strategies used. ***Think-Alouds:*** Encourage learners to verbalize their thought process while solve ***Multiple Strategies:*** ***Division Algorithm***

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Math in the News: **Activity**: Have learners read a news article involving numbers (e.g., statistics, sports scores) and use mental math to interpret or analyze the data. Learners explain technique used and also how mental math strategies help them in their calculations. **Assessment**: Evaluate their ability to apply mental math techniques to real-world data.	Set up the division problem: 10,000 ÷ 100. ***Place Value Approach*** Recognise that dividing by 100 shifts the decimal point two places to the left. https://www.youtube.com/watch?v=RssSPp_3YTc **Repeated Subtraction** **Step 1**: Start with 10,000 items. **Step 2**: Subtract 100 items at a time: · 10,000 - 100 = 9,900 · 9,900 - 100 = 9,800 · Continue until reaching 0. **Step 3**: Count the number of subtractions performed: 100 subtractions. ***Visualization with Manipulatives*** **Step 1**: Use base ten blocks to represent 10,000 items. **Step 2**: Group the blocks into sets of 100 to represent each box. **Step 3**: Count the number of sets: 100 sets.  ***Array Model*** **Step 1**: Create a grid or array with 10,000 items. **Step 2**: Group items into arrays of 100 each. **Step 3**: Count the number of groups or arrays: 100 groups.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Fraction Approach **Step 1**: Express the problem as a fraction: 10,000 ÷ 100 is equivalent to 10,000 / 100. **Step 2**: Simplify the fraction: 10,000 / 100 = 100. ***Estimation and Adjustment*** **Step 1**: Estimate how many boxes would be needed if there were 10,000 items and each box held 100 items. **Step 2**: Estimate: 10,000 is 100 times 100. **Step 3**: Confirm the exact number by calculating: 10,000 ÷ 100 = 100. Learners use base ten blocks to count in tens and hundreds. Work in groups to discover linear measurement such as 100cm=1m 1m=1000km  https://www.vedantu.com/maths/convert-metre-into-kilometre Solve real life problems on work sheets  https://www.researchgate.net/figure/The-number-256-represented-using-base-ten-blocks_fig37_27530408

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Article Selection: **Example**: An article about a recent sports game with scores and player statistics. **Activity Instructions**: **Read the Article**: Learners read the article and highlight key numbers and statistics. **Tasks**: **Basic Task**: Calculate the total score of a game from given points. **Intermediate Task**: Determine the average score per game over a season. **Advanced Task**: Compare the performance of two players using given statistics.

Additional Resources and Materials

Online Tools and Apps:

1. Prodigy: prodigygame.com/main-en/
2. SplashLearn SplashLearn: Fun Math & English Program for Preschool to Grade 5

Classroom Activities

1. Mental Math Drills
2. Games and Puzzles

Opportunities for Subject Integration

Science

- Measurement and Conversions
- Scientific Notation

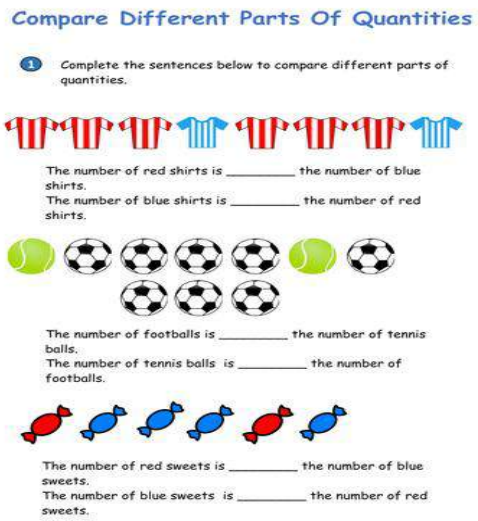
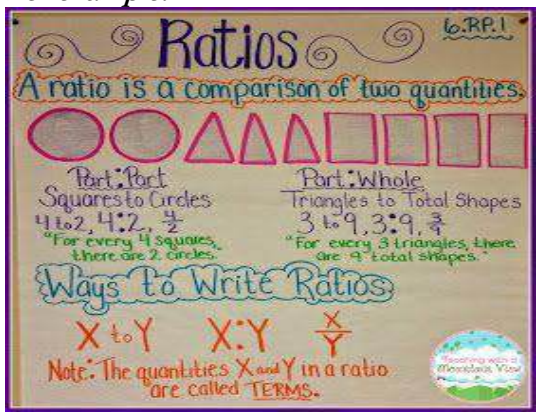
Social Studies

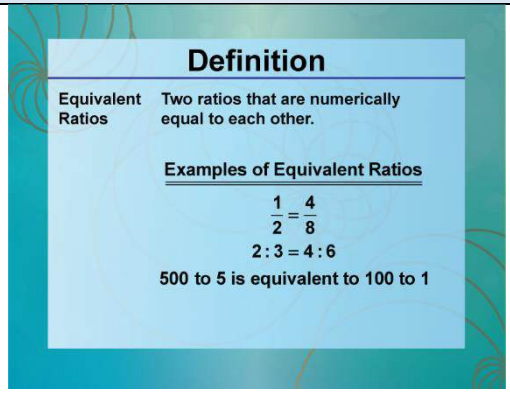
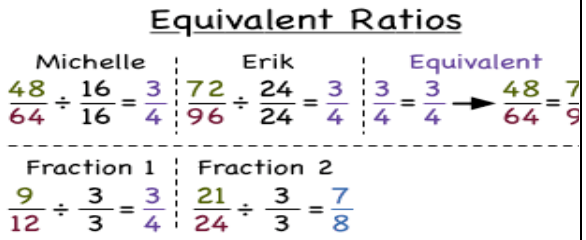
- Population and Demographics
- Historical Dates and Timelines

Language Arts

- Data Interpretation
- Reading Comprehension
- Writing Projects

Essential Learning Outcome O3.1: Proportional Reasoning – Representing and Working with Rates and Ratios
Grade Level Expectations Use ratio and rate reasoning to solve real-world and mathematical problems

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Explain a ratio as a comparison of two quantities. 2. Represent ratios using different notations (e.g 3:2, 3 to 2, 3/2) 3. Explain the concept of equivalent ratios and how to determine if two ratios are equivalent. 4. Define a proportion as an equation stating that two ratios are equivalent. **Skills** 5. Create and interpret ratio tables to solve the problem 6. Solve multi-step everyday problems using ratios and proportions. 7. Explain reasoning and approach to solving problems involving ratios and proportions.	***Exit Tickets:*** At the end of the lesson, ask learners to write a ratio that compares two quantities (e.g., number of apples to oranges in a basket). **https://www.cazoommaths.com/ks1-ks2-maths-worksheet/using-ratio-notation-worksheet/**  .https://www.tes.com/teaching-resource/y6-ratio-white-rose-spring-week-10-11830319	***Visual Aids:*** Use diagrams, pictures, and charts to represent ratios and rates. Tools like ratio tables, double number lines, and bar models can help learners visualize the relationships. ***For example:***  https://www.pinterest.com/pin/225180668636309997/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Interactive Activities for Understanding Equivalent Ratios Interactive activities can make learning about equivalent ratios engaging and hands-on. Here are some examples of activities that involve matching cards with equivalent ratios and using manipulatives to create visual representations of ratios. ***Matching Cards with Equivalent Ratios*** **Objective:** Learners will identify and match equivalent ratios. **Materials:** • Index cards or printed cards with ratios written on them. • Pairs of equivalent ratios on separate cards. **Preparation:** Create pairs of cards with equivalent ratios. For example: o ½ and 2/4 o ¾ and 6/8 o 5/6 and 10/12 Ensure you have enough pairs for the whole class. **Activity:** 1. Shuffle the cards and distribute them among the learners. 2. Have learners walk around the room to find their matching pairs. 3. Once pairs are found, ask each pair to explain why their ratios are equivalent. 4. Collect the cards and redistribute for additional rounds. **Variation:** Make it a timed activity where learners have to find their pairs within a certain time limit.	 https://www.media4math.com/library/definition-ratios-proportions-and-percents-concepts-equivalent-ratios  https://virtualnerd.com/middle-math/ratios-proportions-percent/ratios-rates/equivalent-ratios-definition ***Creating and Interpreting Ratio Tables to Solve Problems*** Have learners create and use ratio tables to identify patterns and solve problems. By filling in the tables, they can clearly see how ratios relate to one another, making it easier to understand and work with proportional relationships.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Create and Interpret Ratio Tables ***Problem :*** A school is planning a field trip and has a ratio of 5 learners for every 1 chaperone. If 25 learners are going, how many chaperones are needed? **Solution:** Initial ratio: 5 learners to 1 chaperone (5:1 Green / Red 2 / 6 3 / 9 5 / 15 6 / 18 10 / X Using the Ratio Table above, have learners calculate the value of the unknown in the different colour column . What is the value of X in the Red column? , **Solve and explain solutions** 1. Solve for y in the proportion 5/9=y/27 2. A map has a scale of 1 inch representing 50 miles. If the distance between two cities on the map is 3 inches, what is the actual distance between the cities? ***Think-Pair-Share:*** This strategy encourages learners to think individually about a problem, discuss their ideas with a partner, and then share with the larger group, providing multiple ways to process and articulate their understanding. • Since 140=140, the proportion 7/10=14/20is true.	***Example Problem and Solution*** **Problem:** A recipe calls for 3 cups of flour for every 2 cups of sugar. If you want to make a larger batch using 9 cups of flour, how much sugar do you need? **Step-by-Step Solution:** 1. **Identify the Initial Ratio:** The initial ratio is 3 cups of flour to 2 cups of sugar (3:2). 2. **Set Up the Ratio Table:** **Flour (cups)** / **Sugar (cups)** 3 / 2 3. **Generate Equivalent Ratios:** Multiply both parts of the ratio by the same number to create equivalent ratios. **Flour (cups)** / **Sugar (cups)** 3 / 2 6 / 4 9 / 6 4. **Interpret the Table:** From the table, you can see that if you use 9 cups of flour, you will need 6 cups of sugar **Contextual Learning**: Relate ratios and rates to real-life situations that are relevant to learners' experiences, such as cooking, shopping, or sports. This makes learning more meaningful and engaging. John is making a fish pie. He is using the Recipe Below.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Think (5 minutes): ● Present the following problem to the class: "A recipe calls for 4 cups of flour for every 6 cups of sugar. If you want to make a batch with 8 cups of flour, how much sugar do you need?" ● Ask learners to think about the problem and write down their solution and reasoning. ***Pair (5 minutes):*** ● Have learners pair up and share their solutions with their partners. ● Encourage them to discuss the steps they took to solve the problem and compare their answers. ***Share (10 minutes):*** ● Invite several pairs to share their solutions with the class. ● Write the different solutions on the board and discuss the methods used. ***Quick Checks****:* Use short, frequent quizzes or polls (digital tools like Kahoot! or Quizizz can be engaging) to gauge understanding and provide immediate feedback.	**Solving Proportions** Invite learners set up proportions and use cross-multiplication to solve for the unknown value. This hands-on practice helps them understand how to establish and solve proportional relationships effectively. **Example Problem:** ● Solve for x in the proportion $3/4=x/8$. **Solution:** 1. Set up the proportion: $3/4=x/8$ 2. Cross-multiply: $3\times8=4\times x$. 3. Simplify: $24=4x$ 4. Solve for x: $x=24/4=6$. So, $x=6$. **Problem:** ● Verify if $7/10=14/20$. **Solution:** ● Cross-multiply: $7\times20=140$ and $10\times14=140$. ● Since $140=140$, the proportion $7/10=14/20$is true.

Additional Resources and Materials

Manipulatives(counters), Number Lines, Maths Story Books, Educational Games (card games, board games, Math War, Online Math Games. Graph papers, Diagrams.Using Technology: Online Games.

Additional Useful Content Knowledge for the Teacher

Ratios compare quantities and show the relationship between them.

There are three ways of writing ratios. Using a colon e.g. 4: 3 As a fraction 2/5 or 3 to 4.
When it comes to writing, ratio order is significant.
The ratio should always be written in its simplest. e.g., the ratio 4:6 can be simplified to 2:3.

Equivalent Ratios have different numbers but show the same comparison or relationship. They are very similar to equivalent fractions. We can use multiplication and/or division to find equivalent ratios. Whenever we multiply or divide the terms by the same number, we have created equivalent ratios.

Simplifying Ratios means reducing ratios to a form where the only divisible common factor is one.
There are six mangoes to 8 apples in a box. What is the ratio of apples to mangoes?
Share $30 between Tom and Peter in the ratio 2:3. How much money does each boy get?

Opportunities for Subject Integration

Language Arts:

- Reading word problems that involve math operations.
- Writing word problems to reinforce understanding.
- Practicing mathematical vocabulary.
- Mathematics Storybook Form

Science:

- Measuring and recording data, then performing basic calculations.
- Studying patterns and sequences in nature that involve math concepts.
- Using math in science experiments and data analysis

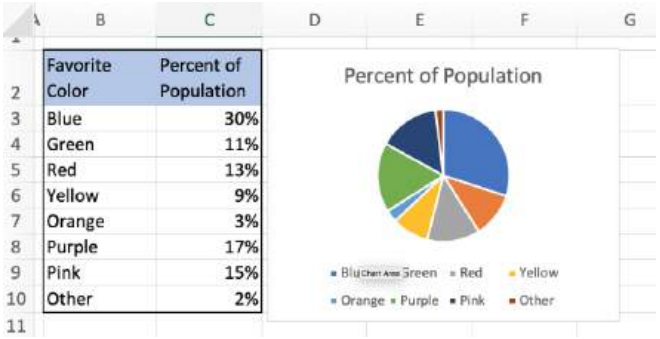
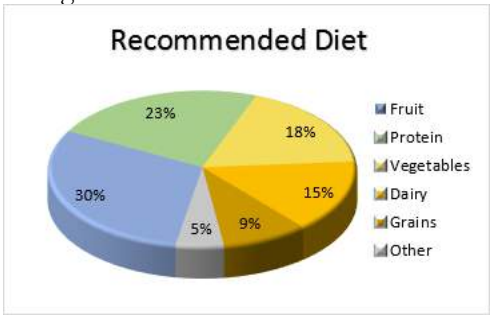
Social Studies:

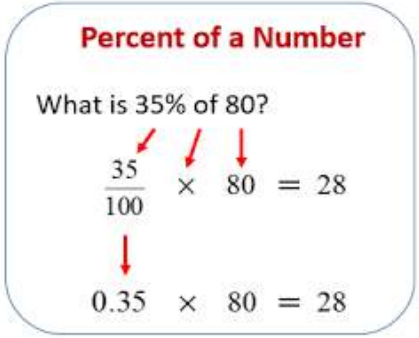
- Cooperative learning among learners in completing group projects.
- Promoting social interaction among learners as they learn.
- Sharing of ideas, strategies when solving real life problems

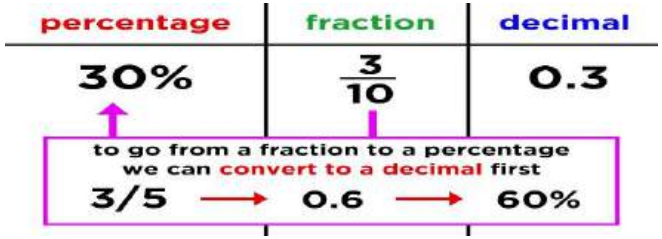
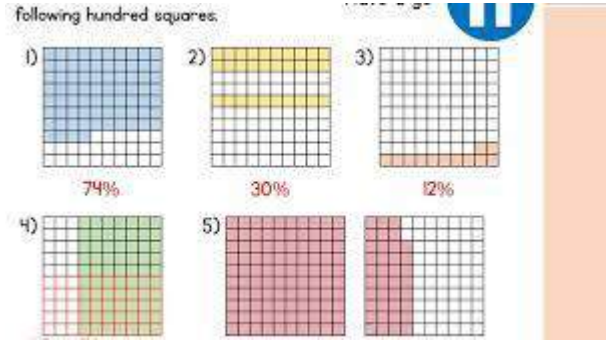
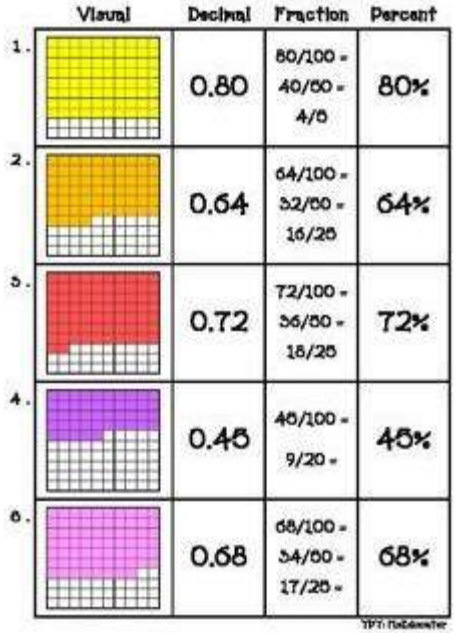
Essential Learning Outcome O3.2: Use a variety of representations and models of percentages to solve real-world mathematical problems.

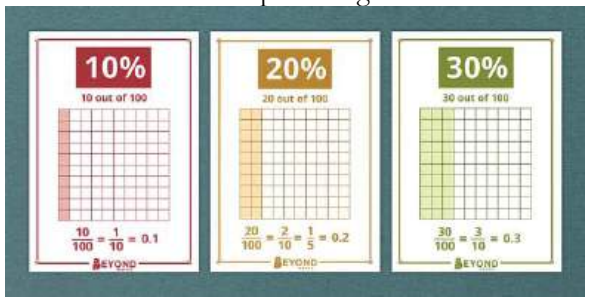
Grade Level Expectations:

- Use a variety of representations and models of percentages to solve real-world mathematical problems
- Represent and create equivalent ratios and rates, using a variety of tools and models, in various contexts

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Define a percent as a part of 100. 2. Express a number as a percentage of another number. **Skills** 3. Calculate a percentage of a given quantity. 4. Use different methods to convert percent to decimals and fractions, and vice versa. 5. Create and interpret visual models of percentages, such as pie charts, bar graphs, and 100 grids. 6. Solve word problems involving percentages in contexts such as shopping, cooking, and finance.	***Choice Boards:*** Provide learners with a choice of activities to demonstrate their understanding of percentages. For example, learners could choose to create a pie chart, write a word problem involving percentages, or develop a digital presentation.  Favorite Color / Percent of Population Blue 30% Green 11% Red 13% Yellow 9% Orange 3% Purple 17% Pink 15% Other 2% This list of percentages add up to 100%, so our pie chart is an accurate representation of the percentages. If they didn't add up to 100%, then the wedges of the pie chart would be different from the percentages listed. https://content.byui.edu/file/b8b83119-9acc-4a7b-bc84-efacf9043998/1/Excel-1-3-3.html	***Visual Aids:*** Use pie charts, bar graphs, and percentage grids to visually represent percentages. Visual aids help learners who learn best through seeing information.  https://www.ablebits.com/office-addins-blog/make-pie-chart-excel/ ***Expressing a Number as a Percentage of Another Number*** • **Focus:** Comparing two numbers to find out what part one number is of the other. • **Process:** 1. Divide the first number by the second number.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
7. Set up and solve proportions to find the part, whole, or percentage in real-world contexts. **Values** 8. Choose to explain their reasoning and approach to solving percentage problems, both in writing and orally. .	***Real-World Problem Solving:*** • **Sports Statistics:** Use sports data to calculate percentages of wins, losses, or player performance **Basketball** **Free Throw Percentage:** Calculate the percentage of free throws made by a player. • **Example**: A player makes 12 out of 15 free throws. What is their free throw percentage? • **Calculation**: (12 ÷ 15) × 100 = 80% ***Data Collection:*** Learners can collect their own data on their favorite sports teams or players. **Real-World Connection:** Discuss the importance of percentages in sports and how they are used by coaches, players, and fans. Have learners use the data on the percentage of the table to construct a diagram of a pie chart. ***Real-World Application:*** **Description:** Present contextualized problems that involve calculating percentages in real-life scenarios. This can motivate learners and make the learning process more relevant. ***Example:*** Pose a scenario where learners calculate a discount. For instance, they can find the final price of a $20 item with a 10% discount (discounted price = $2)	2. Multiply the result by 100 to convert it to a percentage. • **Example:** If you have 20 red apples out of 50 total apples, you would calculate (20/50) * 100 = 40%. So, 20 red apples are 40% of the total apples. **Steps to Express a Number as a Percentage of Another** 1. **Identify the two numbers**: The part (or the number you are comparing) and the whole (the number you are comparing it to). 2. **Divide the part by the whole**: This gives you a decimal. 3. **Multiply the result by 100**: This converts the decimal into a percentage. **Formula** Percentage=(Part/Whole)×100  https://www.onlinemathlearning.com/percent-of-a-number.html

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Manipulatives: • Provide physical objects like fraction strips, percentage circles, or grid papers to help learners visualize percentages and solve problems hands-on. • Have learners write a percentage as a fraction out of 100. eg 20% is written as 20/100. reduce to 2/10. As a decimal=0.2  https://www.youtube.com/watch?v=-Xt4UDk7Kzw **Worksheets**  https://vimeo.com/414894706 What percentage of the diagram is . Shaded . Unshaded	Have learners use different types of manipulatives to calculate percentages of a given quantity. For Example: Find 25% of 200 marbles. Learners will group manipulatives and solve the problem. 25% means 25 out of every 100 25 for the first 100 marbles 25 for the second 100 marbles **25…… 100** **25……100** **Total = 50 ……...200 marbles** **So 25% of 200 marbles=50**  https://www.pinterest.com/pin/fractions-decimals-percents-freebie--466967055089767706/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Group Projects: Have learners work in groups to solve real-world problems involving percentages. They can present their findings through posters, slideshows, or oral presentations, inviteing for different forms of expression. *Learners in groups of fives will conduct an interview with learners in grades 2, 3, 4, and 6 at St. Ann Junior Academy about their means of transportation to get to school.* *Each group will collect the data for a given grade, analyse the date and make their presentation using percentages.* ***Exit Tickets:*** At the end of a lesson, ask learners to solve a quick problem involving percentages and explain their method. This can provide immediate feedback on their understanding. ***For Example :*** Percentage word Problem Jeff scored 28/40 in a Science test and 17/25 in a Math test. In which subject did he score the highest percentage?	Learners will use Visual aid and charts to explain the relationship among fractions, decimals and percent. ***100 Grids*** ***Color Coding:*** Use different colors to represent different categories or percentages on a 100 grid. ***Shading Activities:*** Have learners shade in squares to represent percentages of a whole. ***Pattern Recognition:*** Explore patterns within the 100 grid to understand percentage relationships. ***Estimation and Calculation:*** Use 100 grids to estimate and calculate percentages.  https://www.twinkl.com.au/resource/fraction-decimal-and-percentage-grid-posters-au-n-1688631902 ***Group Work:*** Encourage collaborative problem-solving through group projects and discussions. Group work invites learners to learn from each other and see multiple approaches to the same problem Place learners in groups of three (3) Each group will be tasked with finding the cost of a certain

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		item in Five named Stores in the parish and their percentage discount. Each group will collect their data and compile the information in a table. Each group will make their presentation to the class. ***Learner Choice:*** Invite learners to choose how they demonstrate their understanding of percentages, such as through written explanations, drawings, or digital presentations.

Additional Resources and Materials

Manipulatives(counters) Number Line,, Maths Story Books, Educational Games (card games, board games, Math War, Online Math Games. Graph papers, Diagrams. Using Technology: Online Games. Percentage Chart

Additional Useful Content Knowledge for the Teacher:

Percent means for every hundred. The symbol % is read as percent and it shows you are dealing with a percentage.
A Percentage is a fraction with a denominator of 100. For example 60/100 = 60%.
100% is the whole. 100/100 =1
5/100 can be written as 0.05 or 5% As a fraction = 5/100. As a decimal= 0.05 As a percentage = 5**%**

Opportunities for Subject Integration:

Mathematics:
Percentages: Calculate discounts, tax, and tip amounts during a simulated shopping experience.
Ratios: Use ratio tables to scale recipes or convert between different units of measurement.
Rates: Solve speed problems, such as calculating how long it will take to travel certain distances at different speeds.

Science:
Chemical Mixtures: Use ratios to mix solutions of different concentrations and calculate the percentage concentration of each component.
Population Growth: Calculate growth rates of bacteria or plant populations using percentages and represent the data using graphs.

Nutrition Labels: Analyze food labels to understand the percentage of daily values of nutrients, using ratios to compare different products.

Social Studies:
Census Data: Analyze population data to calculate growth rates, and use percentages to understand demographic distributions (age, income, etc.).
Economics: Compare inflation rates, unemployment rates, and interest rates, using ratios and percentages to understand economic trends.
Elections: Analyze election results by calculating percentage votes, and using ratios to represent voter turnout across different regions.

Art:
Scale Drawings: Create scale models or drawings using ratios to maintain proportion.
Color Mixing: Use percentages to mix paint colors accurately, understanding how ratios of primary colors affect the outcome.
Design Projects: Develop a project where learners design patterns or tessellations using geometric shapes, incorporating ratios to ensure symmetry and balance.

Patterns and Relationships

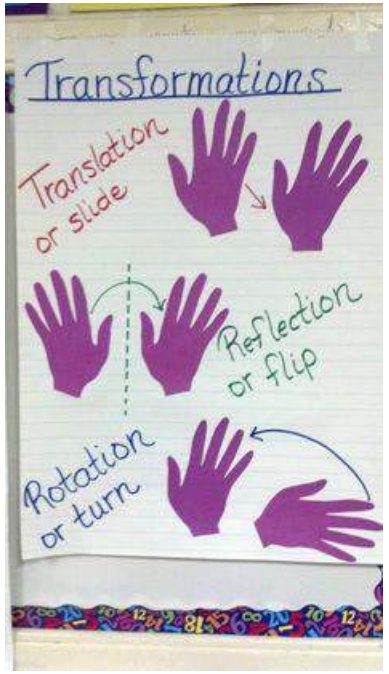
Introduction to the Strand:
Patterns are central to mathematics; children have intuitive ideas about patterns. As children become more confident in making patterns and seeing connections, they can talk out loud about what they have noticed. Children will start to identify the mathematical relationships and connections around them in the home, your setting, and outside of nature. Patterning supports the foundations for recall of the counting sequence and understanding number operations. Learning about patterns and connections will help children to make their own predictions and form logical connections. It's an essential foundation for later mathematical thinking and reasoning.
retrieved from: https://help-for-early-years-providers.education.gov.uk/mathematics/patterns-and-connections

Essential Learning Outcome P1.1.: Recognizing, describing and extending patterns – Repeating Patterns

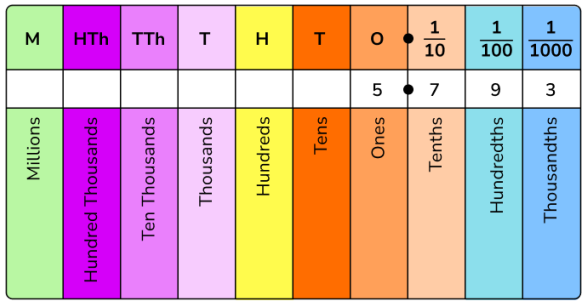
Grade Level Expectations:

- Identify and describe generalized place value patterns of decimal numbers, relationships in polygons and patterns in transformations

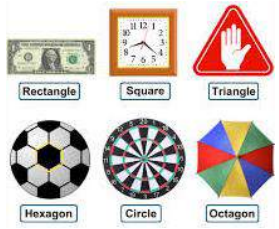
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge:** 1. Identify and analyze transformation patterns, such as reflections, rotations, and translations. 2. **I**dentify and name the place value of given digits within decimal numbers. 4. Recognise and explain the relationship between place value positions in decimal numbers.	**Observation** Listen to learners as they discuss what positions the polygons should move to line up on top of the other.	**Flip it, Slide it, Turn it** Introduce the term **Transformation**. and explain that the flip, turn and slide are called transformations. Relate the 'new names' to the previous name. Flip =reflection turn=rotation

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skill 5. Analyze patterns in transformations by identifying the changes in position, orientation, or size of shapes. **Values** 6. Utilize knowledge of place value patterns, polygon relationships, and transformation patterns to address real-world challenges.	<table><tr><th>Behavioural Criteria</th><th>E</th><th>S</th><th>NI</th></tr><tr><td>1. Identifies the type name of the polygon 2. Is it a regular or irregular Polygon? 3. Identifies the polygon's attributes. 4. Identifies the action need to line up the shape. .</td><td></td><td></td><td></td></tr></table> *E -Excellent, S- Satisfactory, NI- Needs Improvement* Have learners complete the following worksheet in groups or individually. In groups, learners can race to complete the worksheet first and correctly, by writing both of the names of the transformation on the paper. ***Transformation worksheet*** https://www.tutoringhour.com/files/transformation/slide-flip-turn/labeling-1.pdf Flip =reflection turn=rotation	 slide=translation https://www.pinterest.com/pin/417849671650115575/ **Have learners watch the following video for further consolidation.** **https://www.youtube.com/watch?v=YD3HIMUae_4**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	slide=translation Starting with the basic name, then adding the sophisticated name for transformation next to it, invites for better retention. Play the following game for further consolidation . **Transformation Game** https://wordwall.net/resource/57744063/maths/transformations Think-Pair-Share Activity: Place Value in Decimal Numbers Step 1: Think (Individual Activity) Take a moment to think about the following questions: 1. What is the place value of the digit 5 in the number 76.452? 2. How does the position of the digit 7 differ in the numbers 3.27 and 0.73? 3. Can you explain the relationship between the place values of digits in the numbers 4.56 and 45.6? Step 2: Pair (Partner Activity)	1. I can slide, but I don't change my size. What transformation am I? 2. I turn around a point, making a full circle. What transformation am I? 3. I flip over a line and change my direction. What transformation am I? Transformation Slides https://docs.google.com/presentation/d/1pXMFNiStvy7qW4EuYMvrOr33YOUAGQwGHnMyNsH_lRs/edit#slide=id.g20df9b5ade3_0_18 Show learners the shapes on the slides above using the link. For each shape, have learners identify the polygon by counting its sides and vertices. Then have learners identify which action would invite them to line up the shapes on each other. Learners will state if they have to flip it turn, or slide it. For each 'Transformation, assign a physical action to match. (Example: slide it-  translation

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Pair up with a classmate and discuss your answers to the questions. Make sure to explain your reasoning behind your responses and listen to your partner's explanations as well. Step 3: Share (Whole Group Discussion) Share your answers with the class. Be prepared to explain your thought process and reasoning behind your responses. Listen to your classmates as they share their insights and ask questions to clarify any confusion. Group Work worksheet Along with the place value chart, have learners complete the worksheet. https://www.mathworksheets4kids.com/place-value/decimals/underline-thousandths-1.pdf **Exploration Station** **Station 1:** **Decimals: That's the Point**	flip it -  reflection turn it -  rotation **Decimal Place Value** To pique learners' interest and activate prior knowledge. 1. Begin by displaying a variety of decimal numbers on the board (e.g., 5.67, 0.84, 3.25). 2. Ask learners to identify the value of specific digits in each number, using the following chart. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	To Review the concept of place value in decimal numbers, have learners observe examples of decimals in real life. Then, they will use the decimal chart to identify the place and value. 1. Identify and list the place values in decimal numbers. 2. Create examples of decimal numbers with varying place values. 3. Discuss and identify any patterns or relationships found in the place values of decimal numbers. 4. Prepare a presentation to explain place value patterns in decimal numbers to other "Experts."   	3. Engage learners in a brief discussion about the importance of understanding place value in decimal numbers. Discussion Questions 1. What is the significance of place value when working with decimal numbers, and how does understanding place value help in correctly identifying the value of specific digits? 2. Can you explain the relationship between the different place value positions in a decimal number, such as tenths, hundredths, and thousandths? **Exploration Station** Create different exploration stations. divide the class into teams. have teams rotate at each station. Each group will present their findings and knowledge to the other groups. Encourage discussions on how understanding place value patterns, relationships in polygons, and patterns in transformations connect and relate to each other.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Station 2 **One LittleTwo, Little Three Little Polygons** 1. Research and list different types of polygons Within and outside the classroom and school environment. 2. Identify the properties of each type of polygon. 3. Discuss the relationships between sides and angles in polygons. 4. Explore the concept of symmetry in polygons and provide examples. 5. Classify polygons based on their properties and discuss unique characteristics. 6. Prepare a presentation to explain polygon relationships to other "Experts."  	Invite time for questions and clarifications from other groups. Encourage collaboration and sharing of insights between all "Experts." Learners will have a comprehensive understanding of place value patterns of decimal numbers, relationships in polygons, and patterns in transformations. Emphasize the interconnected nature of these mathematical concepts and how they build upon each other. Encourage learners to apply their knowledge to real-world scenarios to deepen their understanding. Reflect on the learning process and discuss any challenges or insights gained from the Activity.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Station 3 **Transformations: More than Meets the Eye** Using polygons in the classroom to include school supplies and teacher's resources to model transformations. Create cards with the following images represented on them. Learners will pull random cards and use polygons in the classroom to show the transformation pulled. **Use multiple polygons to:** slide it-  translation flip it -  reflection turn it -  rotation 1. Define and explain different types of transformations (translations, rotations, reflections). 2. Identify patterns in transformations of shapes and discuss any similarities or differences. 3. Provide examples of applying transformations to polygons.	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	4. Discuss the relationship between the original shapes and their transformed counterparts. 5. Prepare a presentation to explain patterns in transformations to other "Experts."  	

Additional Resources and Materials

Polygons Game
https://wordwall.net/resource/28633943/polygons

Transformation worksheet
https://www.tutoringhour.com/files/transformation/slide-flip-turn/labeling-1.pdf

Transformation Game
https://wordwall.net/resource/57744063/maths/transformations

Transformations video
https://www.youtube.com/watch?v=YD3HIMUae_4

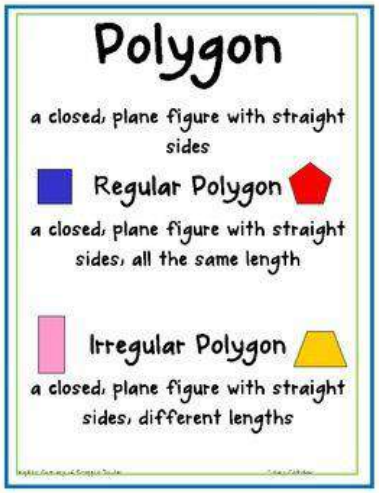
Transformation Slides
https://docs.google.com/presentation/d/1pXMFNiStvy7qW4EuYMvrOr33YOUAGQwGHnMyNsH_lRs/edit#slide=id.g20df9b5ade3_0_18

Place value worksheet

https://www.mathworksheets4kids.com/place-value/decimals/underline-thousandths-1.pdf

Additional Useful Content Knowledge for the Teacher

A Polygon is a **closed** figure whose sides are line segments that intersect only at their endpoints. In a **Regular polygon**, all the angles have the same measure and all the sides have the same length.



Regular and Irregular Polygons

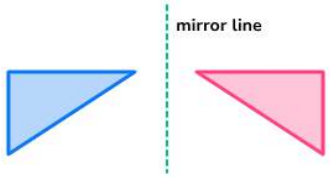
Name	Regular	Irregular	Number of Sides
Triangle			3
Quadrilateral			4
Pentagon			5
Hexagon			6
Octagon			8

Name	No. of sides	Sum	Pattern
Triangle	3	180^0	1×180^0
Quadrilateral	4	360^0	2×180^0
Pentagon	5	540^0	3×180^0
Hexagon	6	720^0	4×180^0
Heptagon	7	900^0	5×180^0
	...		
	...		
n-gon	n		$(n - 2) \times 180^0$

Polygon	Graphics	Sides	Angles	Vertices	Diagonals	No of Triangles
Triangle		3	3	3	0	1
Quadrilateral		4	4	4	2	2
Pentagon		5	5	5	5	3
Hexagon		6	6	6	9	4
Heptagon or Septagon		7	7	7	14	5
Octagon		8	8	8	20	6
Nonagon or Novagon		9	9	9	27	7
Decagon		10	10	10	35	8
Dodecagon		12	12	12	54	10
n-gon	---	n	n	n	$\frac{1}{2}n(n-3)$	$(n-2)$

Reflections involve a mirror line, also known as a line of reflection.

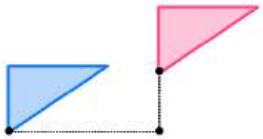
E.g.



The shapes are congruent.

Translations involve a move in a horizontal direction and a move in a vertical direction.

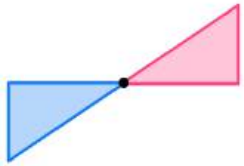
E.g.



The shapes are congruent.

Rotations involve a **centre of rotation**, an **angle of rotation** and a **direction of rotation** (clockwise or anticlockwise).

E.g.



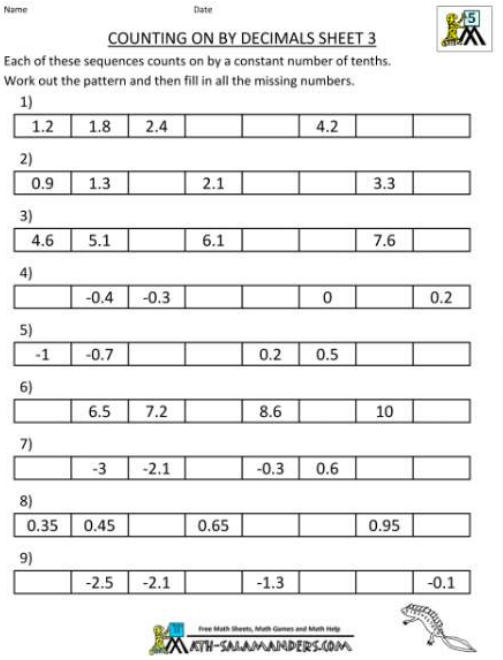
The shapes are congruent.

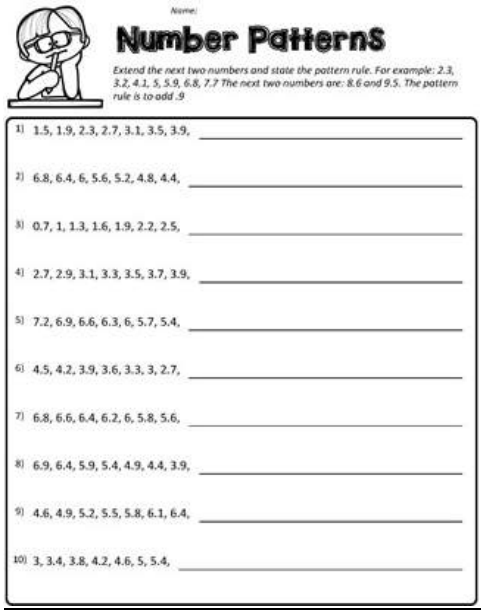
Essential Learning Outcome P 1.2.: Recognizing, describing and extending patterns – Increasing and Decreasing Patterns
Grade Level Expectations: - Demonstrate an understanding of the role of patterns in addition/subtraction situations involving decimal numbers. - Create and describe patterns to illustrate relationships among whole numbers and decimal tenths

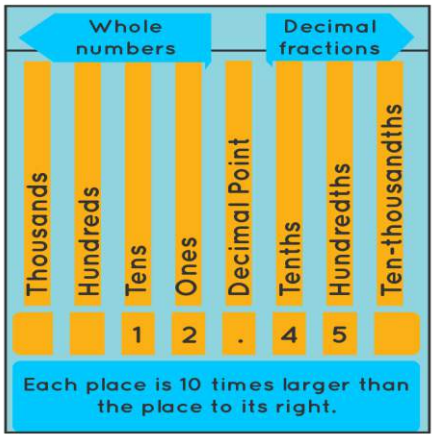
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Recognise and describe patterns in addition and subtraction situations involving decimal numbers. 2. Recall examples of a pattern in an addition or subtraction situation involving decimal numbers. 3. Explain how patterns in decimal addition and subtraction work. 4. Identify elements of a given pattern involving whole numbers and decimal tenths.	**Think Pair Share** Learners will think about what the pattern is. They will pair up in groups of twos or threes and share within their groups how they came up with the rule of the pattern. **Short Investigation** Learners will create an addition or subtraction word problem which must highlight a pattern. They will solve the problem in steps and show how they got their answer. Example: **Problem:** Sarah is saving money to buy a new book. She saves money every day, and she notices a pattern in the amount she saves. On the first day, she saves $0.50. Each day after that, she saves $0.10 more than the previous	Provide learners with a series of decimal addition and subtraction problems (e.g., 0.5 + 0.3, 1.4 - 0.2) and have them identify patterns such as consistent changes in decimal places or predictable results. Learners can use a table to record their observations and describe the patterns they find. Create charts with decimal numbers arranged in rows and columns (e.g., a 10x10 grid of decimal numbers increasing by 0.1). Have learners perform addition and subtraction operations using numbers from the chart and describe any observable patterns **Examples:** The "Step" column indicates each step in the addition process. The "Expression" column shows the operation performed at each step.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
5. Explain the relationship between whole numbers and decimal tenths. **Skills** 6. Demonstrate the use of patterns to simplify the process of adding and subtracting decimal numbers. 7. Apply patterns in decimal addition/subtraction to solve word problems. 8. Identify and explain the patterns in relationships among whole numbers and decimal tenths. **Values** 9. Generate a plan for using patterns to solve addition/subtraction problems with decimal numbers.	day. How much money will Sarah have saved in total after 7 days? Steps to Solve the Problem: 1. Identify the pattern in Sarah's savings. 2. Calculate the amount saved each day. 3. Sum the amounts saved over the 7 days. **Rubric** **Criteria** / **4 Point** / **6 Points** / **10 Points** Problem Accuracy / The problem is somewhat accurate / The problem is mostly accurate / Problem is accurate Identification of Pattern / Pattern somewhat identified / Pattern mostly identified / Pattern identified Explanation of Pattern / The explanation is unclear or incomplete / The explanation is somewhat clear / The explanation is clear and detailed **Sticky Note Discussion**- Have learners answer the following questions on a sticky note. They will post their answers on the wall for their classmates to view. They will then have a class discussion to see how well the understood the concept. 1. I am a set of numbers that follows a sequence. When you add me to a whole number, the result is always a decimal tenth. What am I? 2. I am a pattern that repeats every 0.1. What am I?	The "Result" column shows the outcome of each operation. **# 1: Adding a Constant Decimal Pattern: Adding 0.5** **Step** / **Expression** / **Result** 1 / 0.5 + 0.5 / 1.0 2 / 1.0 + 0.5 / 1.5 3 / 1.5 + 0.5 / 2.0 4 / 2.0 + 0.5 / 2.5 **#2: Subtracting a Constant Decimal Pattern: Subtracting 0.2** **Step** / **Expression** / **Result** 1 / 1.0 - 0.2 / 0.8 2 / 0.8 - 0.2 / 0.6 3 / 0.6 - 0.2 / 0.4 4 / 0.4 - 0.2 / 0.2 Develop a set of cards with decimal addition and subtraction problems on one set and their solutions or pattern descriptions on another. Learners match problems with their corresponding solutions or pattern descriptions, reinforcing their ability to recall and apply patterns. Use number lines marked with decimal increments (e.g., 0.1, 0.2, etc.). Learners perform addition and

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
10. Compare different patterns in addition/subtraction situations involving decimal numbers. 11. Create an addition/subtraction problem with decimal numbers that highlights a specific pattern to solve the problem. 12. Evaluate the effectiveness of using patterns in decimal addition/subtraction in real-world problems. 13. Create a visual representation of the pattern using whole numbers and decimal tenths	3. I am a number relationship that increases by the same amount each time. What kind of relationship am I? **Quiz:** **Solve the problems below. Draw a picture to represent the decimal patterns found. Show your workings.** **1.** Maria saves $0.75 every day. How much will she have saved after 7 days? a)Write the pattern of daily savings. b) Calculate the total savings after 7 days. 2. John runs 1.2 miles on Monday, 1.4 miles on Tuesday, and 1.6 miles on Wednesday. If he continues to increase his running distance by 0.2 miles each day, how far will he run on Friday? a)Identify the pattern in the running distances. b) Calculate the distance for each subsequent day. 3. A plant grows 2.3 cm in the first week, 2.8 cm in the second week, and 3.3 cm in the third week. If this pattern continues, how much will the plant grow in the fifth week? a) Identify the pattern in the growth increments. b) Calculate the growth for the fifth week. 4. Emily drinks 0.5 liters of water at 8 AM, 1.0 liters at 10 AM, and 1.5 liters at noon. If she	subtraction problems and plot the results on the number line, noting patterns in the results as they progress through the operations **<u>Activity</u>** **Decimal Number Line Hop** Draw a large number line on the floor with a chosen interval (0.1, 0.2, 0.5, etc). Have each learner pick an index card with a decimal problem, such as "+0.3" or "-0.2". The learner will start at a specific number on the number line (e.g., 1.0) and physically hops the distance indicated by the problem on the card. Markers or stickers to mark the spot where the learner lands can be used. Let the other learner observe and discuss the pattern as learners perform multiple hops. Ask learners to predict future positions based on the pattern observed.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	continues to increase her water consumption by 0.5 liters every 2 hours, how much water will she have consumed by 6 PM? a) Identify the pattern in the water consumption. b)Calculate the total water consumption by 6 PM.	**Worksheet**  Name Date COUNTING ON BY DECIMALS SHEET 3 Each of these sequences counts on by a constant number of tenths. Work out the pattern and then fill in all the missing numbers. 1) 1.2 1.8 2.4 _ _ 4.2 _ _ 2) 0.9 1.3 _ 2.1 _ _ 3.3 _ 3) 4.6 5.1 _ 6.1 _ _ 7.6 _ 4) _ -0.4 -0.3 _ _ 0 _ 0.2 5) -1 -0.7 _ _ 0.2 0.5 _ _ 6) _ 6.5 7.2 _ 8.6 _ 10 _ 7) _ -3 -2.1 _ -0.3 0.6 _ _ 8) 0.35 0.45 _ 0.65 _ _ 0.95 _ 9) _ -2.5 -2.1 _ -1.3 _ _ -0.1 MATH-SALAMANDERS.COM **Video** **Identifying Patterns in Decimals** **Word Problems** 1. Bob is a Fifth Grade learner. He grows 0.6 inches each month. We are in the month of June and Bob is 44.2 inches tall. How much taller will Bob grow by October?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		2. It is summer time and the child drinks plenty of water. They are drinking from a 2.5 L bottle. Every hour they come and drink 0.5L of water. If 4 hours pass, how many water would they have left to drink? **Modeling** Demonstrate the process of adding and subtracting decimals using patterns with a visual aid. **Worksheet**  Name: Number Patterns Extend the next two numbers and state the pattern rule. For example: 2.3, 3.2, 4.1, 5, 5.9, 6.8, 7.7 The next two numbers are: 8.6 and 9.5. The pattern rule is to add .9 1) 1.5, 1.9, 2.3, 2.7, 3.1, 3.5, 3.9, _____ 2) 6.8, 6.4, 6, 5.6, 5.2, 4.8, 4.4, _____ 3) 0.7, 1, 1.3, 1.6, 1.9, 2.2, 2.5, _____ 4) 2.7, 2.9, 3.1, 3.3, 3.5, 3.7, 3.9, _____ 5) 7.2, 6.9, 6.6, 6.3, 6, 5.7, 5.4, _____ 6) 4.5, 4.2, 3.9, 3.6, 3.3, 3, 2.7, _____ 7) 6.8, 6.6, 6.4, 6.2, 6, 5.8, 5.6, _____ 8) 6.9, 6.4, 5.9, 5.4, 4.9, 4.4, 3.9, _____ 9) 4.6, 4.9, 5.2, 5.5, 5.8, 6.1, 6.4, _____ 10) 3, 3.4, 3.8, 4.2, 4.6, 5, 5.4, _____

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Decimal Place Value Chart  **Activities** **Quick Draw:** Provide learners with a whiteboard marker and have them draw a pattern using whole numbers and decimal tenths within 2 minutes. Encourage creativity and attention to detail. **Pattern Puzzles:** Display a series of patterns on the board using whole numbers and decimal tenths. Challenge learners to identify the pattern and the next element in the sequence in under 3 minutes. **Pattern Relay:** Create a relay race where learners have to run to a board, add a number or decimal

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		tenth to an existing pattern, and run back to tag the next teammate. The team to complete the pattern correctly in the shortest time wins.

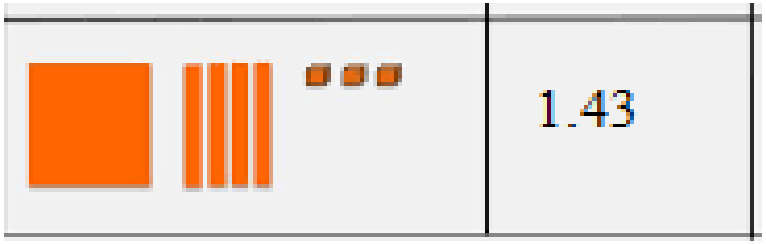
Additional Resources and Materials

Geo board and rubber bands

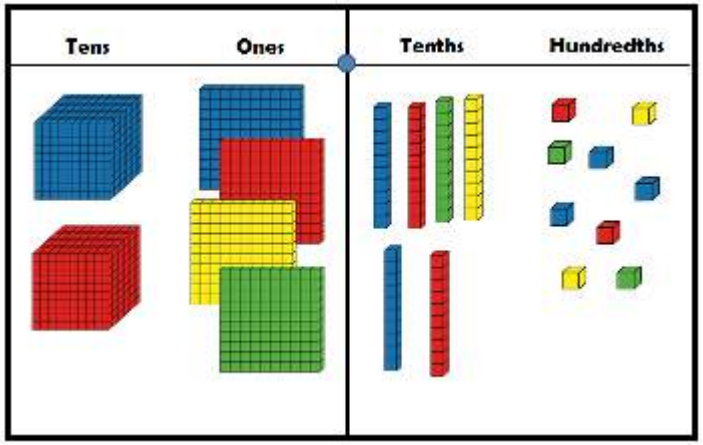
Building blocks/ Tiles

Additional Useful Content Knowledge for the Teacher

Once learners have modelled addition and subtraction of decimal numbers with base-ten blocks, they will likely understand that they are combining like place values (tenths with tenths, hundredths with hundredths, etc.) without needing to memorize or be taught rules. e.g



Above the number 1.43 is modeled using base ten blocks.



Above the number 24.69 is modeled using base ten blocks.

Opportunities for Subject Integration

Language Arts

Spelling & Vocabulary -Learners can use new words learned to find the definition and be able to spell them.

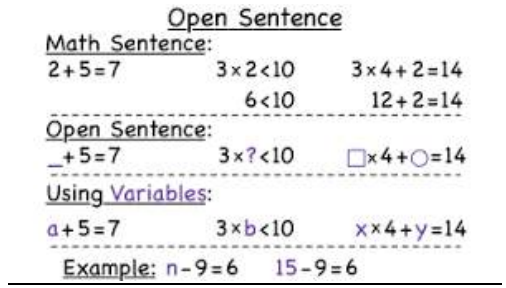
Summarizing- Learners can make journal entries by summarizing what they learned about patterns in adding and subtracting decimals.

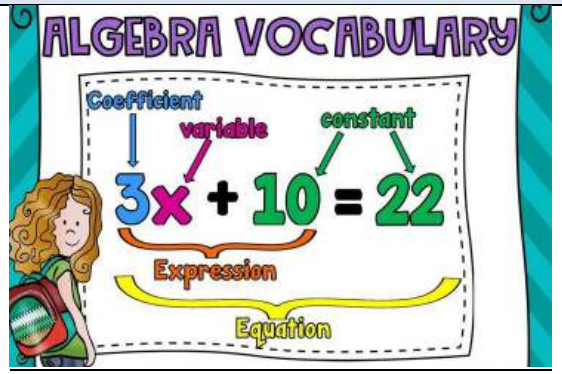
Expository Writing - Learners will explain how to solve a problem that involves finding patterns in adding and subtracting decimals.

Science

Decimal patterns can be shown to display the increase or decrease when measuring volume, capacity or mass.

Essential Learning Outcome: P 2.1. Variables and Relationships – Representing Unknowns
Grade Level Expectation: Demonstrate an understanding of open sentences in all four operations with whole numbers.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Identify the variables and constants in an open sentence. 2. Explain how to solve an open sentence with each of the four operations with whole numbers. **Skills** 3. Solve open sentences involving addition, subtraction, multiplication and division of whole numbers. 4. Apply understanding of open sentences to real-world word problems. **Values** 5. Compare and contrast open sentences with different operations with whole numbers.	**Quiz** **Directions:** State whether the open sentence is true or false. If it is false, make the sentence true by solving it correctly. a. m + 13 = 48 m = 25 b. 50 - x = 70 x = 20 c. 6 x a = 24 a = 8 d. 56 ÷ 8 = s s = 5	Provide opportunity for learners to demonstrate the understanding of open sentences. Take them outside of the classroom and let them choose a number of items with at least two different varieties. Invite them to make up their open sentences using gathered materials. Example: Use the items below to make a number sentence 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
6. Design a set of open sentence problems that incorporate all four operations with whole numbers.	**Think-Pair-Share** **Open Sentences with Different Operations** ***Step 1: Think (5 minutes)*** Think about the following questions: • How are addition open sentences different from subtraction open sentences when working with whole numbers? • Can you provide an example of a multiplication open sentence and a division open sentence using whole numbers? ***Step 2: Pair (5 minutes)*** Find a partner and discuss your answers to the questions. Share your examples and explanations with each other. ***Step 3: Share (10 minutes)*** Share your partner's responses with the class. Discuss the similarities and differences between open sentences with different operations using whole numbers. **Project: Real-life Problems** Using a poster board, the learners will create one open-sentence word problem with each of the operations. They will then create one two-step open-sentence word problem. They should have the solution to their problem on their board. Learners can display creativity by drawing pictures to visualize their problem. .	 Invite learner to solve one and two step open sentences with an unknown. Example: Represent the story problem with an equation containing an unknown and then solve the equation. John was gifted a pack of crayons. He gave 13 crayons to his friend Rhea and was left with 11 crayons. How many crayons did the pack contain? **Videos** How to Solve One-Step Equations | One-Step Equation Steps | Math with Mr. J Solving Two-Step Equations | Algebra Equations Solving word problems in Algebra (math test) Algebraic Word Problems

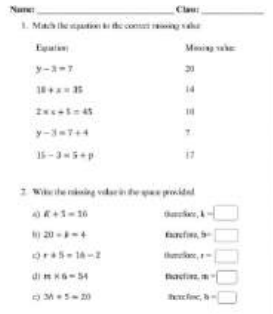
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Project Rubric

Criteria	1 Point	2 Points	3 Points
Incorporation of all four operations	Missing 1 operation	Includes 2-3 operations	Includes all 4 operations
Accuracy of the open sentence problems	Several incorrect problems	Few incorrect problems	All problems are correct
Clarity and coherence of the problems	Hard to understand or follow	Somewhat clear and coherent	Clear and coherent
Neatness and organization of the assignment	Sloppy and disorganized	Fairly neat and organized	Neat and well-organized

Worksheet

https://www.liveworksheets.com/w/en/math/2250776



https://www.liveworksheets.com/w/en/math/2013962

Games

Riddles - Have the learners solve each riddle independently for 30 seconds, then reveal the answer. Each learner solving all the riddles will receive a token.

Riddle 1: I am an operation that makes numbers smaller when I'm used. What am I?

Riddle 2: I am an operation that combines numbers to make them bigger. What am I?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Riddle 3: I am an operation that helps you figure out how many groups you can make from a total number. What am I? **Operation Puzzles**: Create puzzle pieces with open sentences missing the operation. Learnerswill match the correct operation to each sentence to complete the puzzle. **Worksheet** https://www.liveworksheets.com/w/en/math/1964427 (have learners solve the problems after sorting) **Math Puzzle Solving** Learners will wprk in 3 groups. They will be given a puzzle that requires solving open sentence problems to uncover a hidden message or image. The first group to solve all the problems correctly wins.

Additional Resources and Materials

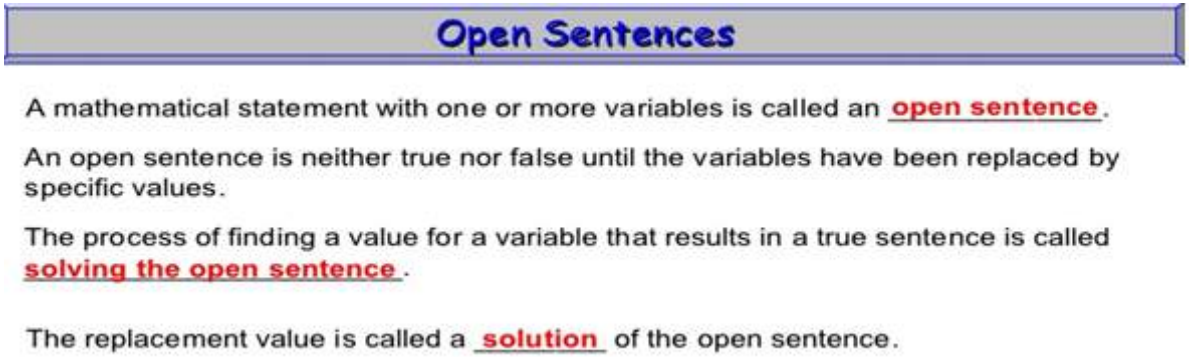
Interactive Notebooks

Equation Puzzles
Equation Cards
Algebra Tiles
Balance Scales

Equation Solvers: Use apps that invite learners to input open sentences and solve them step-by-step.

Online Games: Engage learners with online games that focus on solving open sentences and equations.

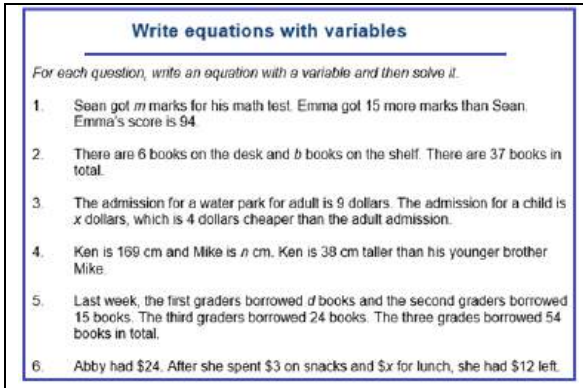
Additional Useful Content Knowledge for the Teacher



Vocabulary

Open Sentences - Are mathematical statements with one or more variables or unknown.
Example: a + 5 = 7

Variable -is a symbol that doesn't have a fixed value. Examples of variables in Math are a,b, x, y, z, m, etc.

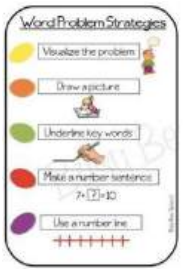


Write equations with variables

For each question, write an equation with a variable and then solve it.

1. Sean got *m* marks for his math test. Emma got 15 more marks than Sean. Emma's score is 94.
2. There are 6 books on the desk and *b* books on the shelf. There are 37 books in total.
3. The admission for a water park for adult is 9 dollars. The admission for a child is *x* dollars, which is 4 dollars cheaper than the adult admission.
4. Ken is 169 cm and Mike is *n* cm. Ken is 38 cm taller than his younger brother Mike.
5. Last week, the first graders borrowed *d* books and the second graders borrowed 15 books. The third graders borrowed 24 books. The three grades borrowed 54 books in total.
6. Abby had $24. After she spent $3 on snacks and $x for lunch, she had $12 left.

Constants are symbols that have a fixed numerical value. All numbers are constants



Opportunities for Subject Integration

Music

Explore mathematical patterns and sequences in music. Learners can create rhythmic patterns using fractions and open sentences to describe the beats.

Technology

Use educational apps and software to practice open sentences and equations through interactive simulations and games.

Physical Education
Incorporate math into physical activities and sports. Learners can solve equations related to scoring, distances, or times.

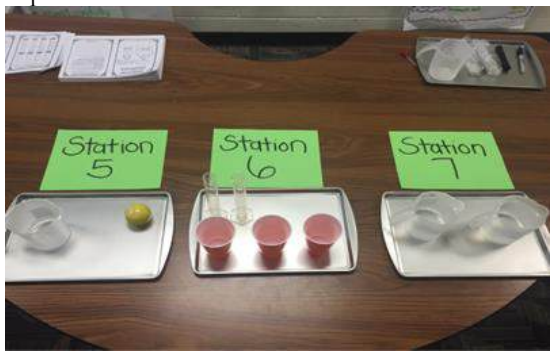
Art
Use geometric patterns and symmetry to create and solve equations. Learners can explore patterns in art and relate them to open sentences and mathematical operations.

Language Arts
Have learners write their own word problems or stories that involve open sentences and equations. This activity integrates language arts with math by inviteing learners to practice writing skills while solving mathematical problems.

Essential Learning Outcome P 2.2: Variables and Relationships - Understanding and Representing Equivalence

Grade Level Expectation:

Determine equality and inequality in measures of volume and capacity using a variety of strategies, measures of currency and angles using a variety of strategies, expressions involving multi-digit multiplication and division, expressions involving addition and subtraction of decimals and fraction equivalence and comparison.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Compare and contrast different volumes and capacities using direct measurement, and the appropriate tools and units to determine equality and inequality 2. Show equivalence in amounts of money using strategies such as counting and exchanging coins and notes. 3. Compare/measure size of angles to determine if two angles are equal or unequal. 4. Evaluate/compare results in two expressions involving multiplication and division to determine equality or inequality (50÷5 is greater than 30÷5, and 12×3=6×6).	**Observational Assessment:** **Description:** Teachers observe learners as they engage in measurement activities at each station. **Implementation:** • Use a checklist or rubric to note learners' use of measurement tools, accuracy in reading measurements, and ability to estimate and compare volumes. • Pay attention to learners' problem-solving approaches and interactions with peers. • Provide on-the-spot feedback and support as needed. ***Sample Checklist*** **Learner Name:** _____ **Criterion** | **Yes** | **No** | **Comments** **Uses Measurement Tools Correctly** | | | **Accurately Reads Measurements** | | | **Effectively Estimates Volumes** | | |	***Hands-On Activities:*** ***Measurement Stations:*** Set up different stations with various containers and liquids. Provide measuring tools (like graduated cylinders, measuring cups, beakers) and instruct learners to measure and record the volumes and capacities.  https://mrswests3rdgrade.weebly.com/classroom-blog/volume-volume-more-volume ***Water Play:*** Use water or sand for practical measurement activities. Invite learners to pour, measure, and compare volumes of substances in the different containers. Record findings and

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td>Skills

5. Simplify fractions by dividing or generating equivalent fractions by multiplying to show equivalence.

6. Using common denominators or visual models, compare fractions to show inequalities.

7. Illustrate when two expressions involving addition and subtraction of decimals are equivalent</td>
<td>
<table>
<tr><td>Compares Volumes Accurately</td><td></td><td></td><td></td></tr>
<tr><td>Reflects on Estimations and Measurements</td><td></td><td></td><td></td></tr>
</table>

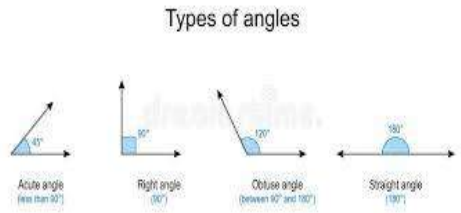
Self-Assessment:
Description: Learners assess their own understanding and performance.
Implementation:
● Provide learners with a self-assessment checklist to evaluate their own work at each station.
● Include questions that prompt learners to reflect on their accuracy, use of tools, and estimation skills.
● Encourage learners to set personal goals for improvement based on their self-assessment.

<u>Self-Assessment Checklist</u>
Learner Name:
Date:
Activity:
</td>
<td>discuss patterns, such as which tools provide the most precise measurements.

Real-World Connections
Description: Connect learning to real-life situations.
Implementation:
● Organize field trips to local stores where learners can practice counting and exchanging money.
● Invite guest speakers, such as bank tellers or store managers, to talk about money handling.
● Create projects where learners manage a small budget for a classroom event or fundraiser.
Provide a variety of containers with different shapes and sizes (e.g., jars, bottles, boxes).

Instructions:
Learners use a standard measuring cup or</td>
</tr>
<tr>
<td></td>
<td>Use of Measurement Tools
I used the measurement tools correctly.
o ☐ Always
o ☐ Sometimes
o ☐ Rarely
Accuracy in Reading Measurements
I read the measurements accurately.
o ☐ Always
o ☐ Sometimes
o ☐ Rarely
Estimating Volumes
I made accurate estimates of volumes.
o ☐ Always</td>
<td>graduated cylinder to measure the capacity of each container.
Sort containers into groups based on their capacities (e.g., small, medium, large).
Compare and contrast the capacity of containers in each group, discussing why some containers hold more or less. Discuss the differences and similarities in liquid capacities and explore patterns, such as how larger containers hold more liquid.

Use containers with volumes that follow a pattern (e.g., 50 mL, 100 mL, 150 mL, 200 mL).
Instructions:</td>
</tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	○ ☐ Sometimes ○ ☐ Rarely **Comparing Volumes** **I compared volumes accurately.** ○ ☐ Always ○ ☐ Sometimes ○ ☐ Rarely **Reflection on Estimations and Measurements** **I reflected on my estimations and measurements.** ○ ☐ Always ○ ☐ Sometimes ○ ☐ Rarely **Reflective Questions** 1. What did you find easy or challenging about these activities? 2. How did you make your estimates? 3. Why might there be differences between your estimates and actual measurements? 4. What will you do differently next time? ***Role-Play Activities*** **Description:** Engage learners in role-play scenarios where they act as cashiers and customers in a store setting. **Implementation:** ● Assign roles where learners must calculate totals, handle payments, and give change. ● Evaluate their ability to accurately count money, provide correct change, and explain their calculations. ● Assess their understanding of money equivalence through their interactions and transactions.	Learners measure and record the volumes of containers following the given pattern. Identify and describe the pattern in the volume measurements (e.g., each container holds 50 mL more than the previous one). Create a chart or graph to visualize the pattern and discuss how it helps in comparing different volumes. ***Differentiated Instruction*** **Description:** Tailor instruction to meet diverse learning needs. **Implementation:** ● Provide different levels of complexity in angle comparison tasks.  https://www.dreamstime.com/illustration/types-angles.html ● Offer additional support materials (e.g., step-by-step guides, visual aids) for struggling learners. ● advanced learners with more complex angle measurement problems ● Discuss patterns observed, such as common angle sizes found in different objects.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Differentiated Instruction Rubric

Criterion	Basic Level	Intermediate Level	Advanced Level
Accuracy in Angle Measurement	Measures angles accurately using a protractor.	Measures angles accurately and classifies them by type (acute, obtuse, etc.).	Measures angles accurately, classifies them, and solves for unknown angles.
Understanding of Angle Relationships	Identifies if angles are equal, greater than, or less than each other.	Classifies angles by type and identifies relationships within geometric shapes.	Applies geometric principles to justify conclusions and solve complex angle problems.
Use of Support Materials	May need frequent guidance and visual aids.	Uses visual aids and step-by-step guides effectively to assist in understanding.	Utilizes support materials independently to enhance learning and solve challenging problems.

Performance Tasks

Description: Design tasks that require learners to demonstrate their understanding through application.

Implementation:

Problem-Solving Stations: Set up stations with different pairs of expressions. Learners rotate through stations, solve the problems, and write their conclusion**s. For example**

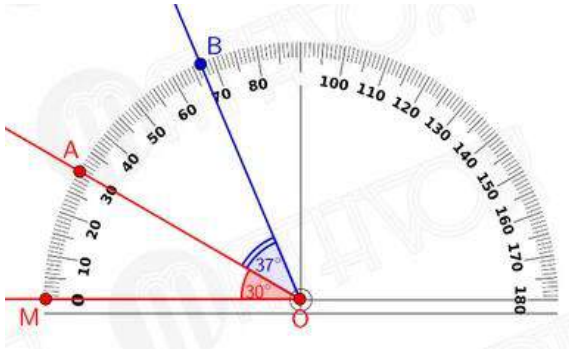
Station 1: Plot Area Comparison

Sample Activity - Angle Comparison Challenge

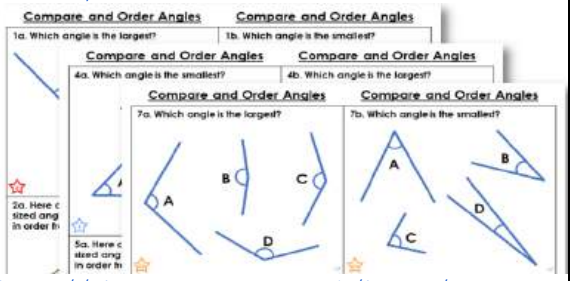
Instructions:

Basic Level:

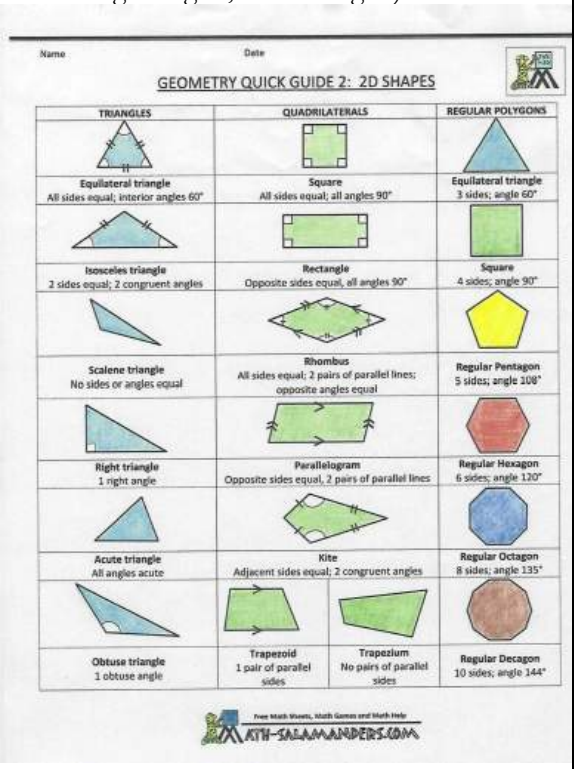
- Provide pairs of angles and ask learners to use a protractor to measure and compare them.
- Identify whether each pair of angles is equal, greater than, or less than each other.

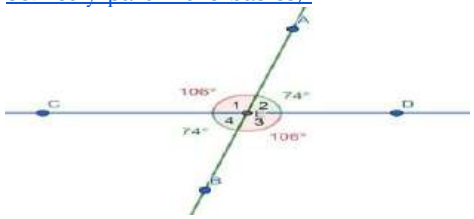
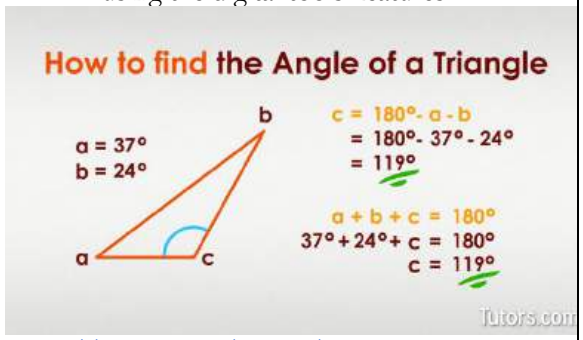


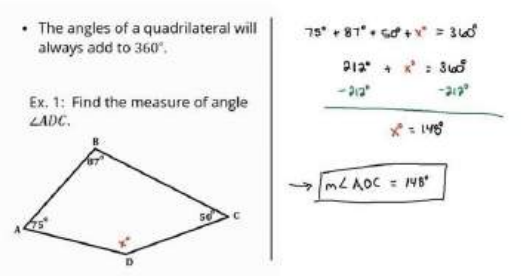
https://mathvox.com/geometry/basic-concepts-and-figures-of-plane-geometry/chapter-2-angles-types-of-angles-and-their-properties/the-comparison-of-angles-2nd-method/

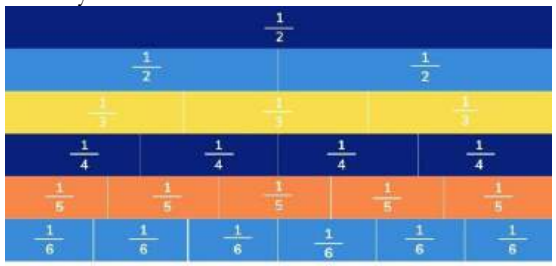


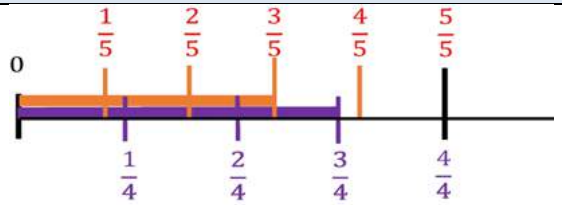
https://classroomsecrets.co.uk/lesson/year-4-compare-and-order-angles-lesson/

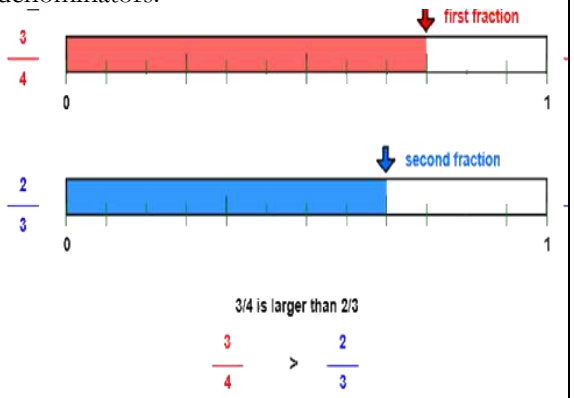
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	1. **Plot A:** Length = 10 metres Width = 8 metres Area of Plot A: 10×8=80 square metres 2. **Plot B:** Length = 15 metres Width = 6 metres Area of Plot B: 15×6=90 square metres **Station 2: Snack Pack Comparison** 1. **Store X:** Total cost for 5 granola bars: $10 Price per granola bar: 10/5=2 dollars 2. **Store Y:** Total cost for 8 granola bars: $16 Price per granola bar: 16/8=2 dollars ***Real-Life Scenarios:*** Present scenarios where learners must use division and multiplication to compare quantities (e.g., determining which sale price is better or comparing areas of rectangular plots). ***Determining the Better Sale Price*** **Scenario:** Two stores are having a sale on T-shirts. Store A is selling 3 T-shirts for $18, and Store B is selling 4 T-shirts for $24. Determine which store has the better price per T-shirt. **Steps:** **Store A:** · Total cost for 3 T-shirts: $18 · Price per T-shirt = 18/3=6 dollars **Store B:** · Total cost for 4 T-shirts: $24 · Price per T-shirt = 24/4=6 dollars **Comparison:** Both stores have the same price per T-shirt, so either store is equally good in terms of price.	**Intermediate Level:** ● Include angles formed by intersecting lines or angles within geometric shapes (e.g., triangles, quadrilaterals). ● Ask learners to classify angles as acute, obtuse, right, or straight based on measurements. ● Discuss patterns found, such as how certain angle measures are related (e.g., right angles, obtuse angles). 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Interactive Digital Tools ***Fraction Comparison Games:*** Use educational software or online games that focus on fraction comparison. These can include interactive number lines, fraction bars, and pie charts. Fraction Fling • ABCya! Fraction Bars | Math Playground IXL | Compare fractions | 5th grade math Fractions Games for 5th Grade Online (splashlearn.com) ***Virtual Manipulatives:*** Tools like the National Library of Virtual Manipulatives provide an interactive way for learners to engage with fractions. ***Differentiated Worksheets*** **Provide worksheets with varying levels of difficulty.** **Example:** **Level 1**: Compare simple fractions like ½ and ¼. **Level 2:** Compare more complex fractions like ⅗ and ⅔ using common denominators. **Level 3:** Include fractions with larger denominators and mixed numbers. ***Peer Tutoring and Group Work*** Pair learners for peer tutoring or small group activities to encourage collaboration and peer learning. **Example Activity:** Have learners work in pairs to solve and verify the equivalence of expressions. One learner can solve 2.5+3.2 and another can solve 5.7, then they can compare their results.	https://cindyelkins.edublogs.org/2019/01/05/geometry-part-1-the-basics/  https://study.com/learn/lesson/angles-formed-intersecting-lines.html **Advanced Level:** • Introduce geometric proofs or scenarios where learners must solve for unknown angles using given angle measurements. • Challenge learners to explain their reasoning and justify their conclusions about angle relationships. • Analyze patterns in angle measurements using the digital tools' features.  https://tutors.com/lesson/how-to-find-the-angle-of-a-triangle

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 https://study.com/skill/learn/how-to-find-the-sum-of-the-angle-measures-of-a-quadrilateral-explanation.html ***Concrete Manipulatives and Models*** **Description:** Use physical objects and manipulatives to represent and solve multiplication and division problems. **Implementation:** ● Provide learners with counters, cubes, or other tangible objects to model division problems like 50÷5 and 30÷5. ● Use arrays or grouping to demonstrate multiplication expressions such as 12×3 and 6×6. ● Encourage learners to physically group and count objects to verify results and compare them. Discuss how Patterns emerge in the array structure, such as rows and columns forming a grid. Learners can observe that increasing the number of rows or columns leads to proportional changes in the total number of counters.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Visual Representations ***Fraction Bars:*** Use fraction bars to compare fractions visually. Have learners color the bars to show different fractions and compare them directly.  Patterns emerge in how fractions of the same denominator can be directly compared by their sizes. • **Pattern Example:** Fraction bars for 1/2, 1/4, and 1/8 show that 1/2 is twice as large as 1/4 and four times as large as 1/8. This demonstrates the concept of equivalent fractions and relationships between fractions. ***Number Lines:*** Plot fractions on a number line to see their relative sizes. This helps learners understand the concept of fractions as numbers with specific values.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 https://link.springer.com/article/10.1007/s42330-023-00278-x Ask learners to identify any patterns in the placement of fractions on the number line. Have them note how fractions with the same denominator are spaced evenly, while fractions with different denominators are placed according to their size. Example: Learners might notice that fractions with the same denominator (e.g., 1/4, 2/4, 3/4) are evenly spaced, showing a consistent pattern.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Task 1: ***Comparing Fractions Using Common Denominators*** **Scenario:** Compare 2/3 and ¾ using common denominators.  https://visualfractions.com/compare-fractions-line/ Facilitate a discussion about the patterns learners observed in the placement of fractions. Discuss how these patterns help in understanding the relative sizes of fractions and how fractions can be compared and ordered. **Task 2:** ***Comparing Fractions Using Visual Models*** **Scenario:** Compare ½ and 2/5 using visual models. **Steps:** 1. Draw two identical rectangles. 2. Shade ½ of one rectangle and 2/5 of the other. 3. Visually compare the shaded areas. than 2/5

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Visual Models and Drawings Encourage learners to draw visual models such as bar models or area models to represent decimal addition and subtraction. Example: Bar Model: Draw a bar to represent 2.5+3.2 and another bar for 5.7. Compare the lengths of the bars to show equivalence. Pattern in Fraction Size: The visual model reveals that 1/2 is larger than 2/5. This pattern shows how fractions with a greater numerator or fewer pieces of the same whole represent larger portions. Pattern in Division: The pattern observed is that dividing a whole into more parts (like 5 parts) results in smaller individual pieces than dividing it into fewer parts (like 2 parts). Decimal Addition and Subtraction: Pattern in Addition: The visual model shows that the sum of decimal numbers (2.5 + 3.2) aligns exactly with another decimal number (5.7), demonstrating equivalence and reinforcing the concept of addition. Pattern in Lengths: The pattern observed is that equivalent sums or values can be represented by bars of equal length, aiding in understanding the equivalence of decimal operations.

Additional Useful Content Knowledge for the Teacher

Denomination is a proper description of a currency amount, usually for coins or banknotes

Measurement: Volume and Capacity

Volume:

Definition: Understanding that volume is the amount of space occupied by a 3D object, typically measured in cubic units (e.g., cubic centimeters, cubic meters).

Calculation: Knowledge of formulas for finding the volume of common shapes (e.g.,

Volume of a rectangular prism=length×width×height).

Units of Measurement: Familiarity with different volume units, including metric (cubic meters, liters) and customary units (cubic feet, gallons).

Capacity:

Definition: Capacity refers to the maximum amount a container can hold, usually measured in liquid units (e.g., liters, milliliters, gallons).

Conversion: Understanding how to convert between units of volume and capacity (e.g., 1 liter = 1000 milliliters).

Currency

Basic Arithmetic with Currency:

Addition, Subtraction, Multiplication, and Division: Ability to perform operations with currency, including making change and calculating totals.

Conversion: Knowledge of currency exchange rates and how to apply them to convert one currency to another.

Rounding: Understanding how to round currency amounts appropriately, especially when dealing with prices and change.

Angles

Types of Angles:

Acute, Right, Obtuse, and Straight Angles: Definitions and characteristics.

Angle Measurement: Using a protractor to measure angles in degrees.

Angle Relationships: Knowledge of complementary (sum to 90°) and supplementary angles (sum to 180°), as well as angles formed by intersecting lines (e.g., vertical angles are equal).

Angle Construction:

Tools: Ability to use a compass, straightedge, and protractor to construct angles.

Angle Comparison: Techniques for comparing angles visually and numerically.

Essential Learning Outcome P2.3: Variables and Relationships - Writing Expressions and Equations
Grade Level Expectations Create story problems using one-step variables in all four operations.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Construct story problems based on real-life scenarios involving a single variable that requires one operation to solve **Skill** 2. Use various strategies to solve real-life problems involving basic operations. **Values** 3. Explain and justify the solutions to problems involving one-step equations.	***Differentiated Assessment Methods:*** Use a variety of assessment methods, including written responses, oral explanations, and visual representations. Invite learners to choose how they want to demonstrate their understanding. ***Sample Higher-Level Problem*** The school is organizing a charity run to raise money for new sports equipment. Each participant will donate $15, and 128 learners have signed up to participate. The event organizers want to know how much money they will raise in total. **Questions** . How much does each participant donate? . How many learners have signed up? . How much money will the school raise in total? **Solution** *Multiplication: $15×128=$1920* **Differentiated Assessment Methods** ***Written Response*** Write out the multiplication problem and solve it. Show all your work and explain your reasoning in a short paragraph. ***Oral Explanation*** Explain how you solved the problem to the teacher or a peer. Include why you chose the method you used.	**Story Problems** **Clear and Structured Presentation:** • Present the problem in a clear, structured manner, breaking it into manageable parts. • Use bold or italics to highlight key information. **Sample Story Problems** *The learner council is organizing a school fair and has set up various booths. One booth sells both snacks and drinks. The booth earned $125 in the morning and $98 in the afternoon from snack sales. In addition to snacks, they also sold drinks, earning $45 in the morning and $55 in the afternoon. The learner council wants to calculate the total earnings from the booth for the entire day to plan for the next event and determine what percentage of the earnings came from drinks* **Questions:** • How much money did the booth earn in the morning? • How much money did the booth earn in the afternoon? • What are the total earnings for the day? The pattern is that the total number of items is distributed evenly across packs. The single

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Visual Representation Create a chart or diagram to show how the total amount of money raised is calculated. Use groups or an array to represent multiplication. ***Manipulatives*** Use counters, blocks, or other manipulatives to represent the problem. Group them to show the total amount raised. ***Group Work*** Work in a group to solve the problem. Discuss and agree on the solution, then present it to the class with a visual aid (e.g., poster, PowerPoint). **Performance-Based Assessments** **Purpose:** To assess learners' ability to apply skills and knowledge to real-world tasks. **Strategies:** • **Role-Playing:** Learners role-play scenarios where they need to solve problems involving basic operations. • **Task-Based Assessments:** Provide tasks that require learners to use manipulatives or other tools to solve problems. • **Math Stations:** Set up different stations with various problems related to real-life scenarios. **Example:** • **Role-Playing:** Set up a mock store where learners use play money to buy and sell items, requiring them to use addition, subtraction, multiplication, and division. • **Math Station:** One station could involve calculating the total cost of items in a shopping	variable represents the unknown quantity in each pack, and the operation used (division) helps solve for this quantity. ***Visual and Hands-On Learning:*** ***Manipulatives:*** Use physical objects like counters, blocks, and number lines to model problems. ***Example using Manipulatives*** ***Problem:*** A farmer has 240 apples and wants to pack them into boxes. Each box can hold 12 apples. How many boxes will the farmer need? Additionally, if the farmer decides to sell each box for $15, how much money will they make in total? ***Introduction:*** Explain the problem to the learners. "A farmer has 240 apples and wants to pack them into boxes. Each box can hold 12 apples. How many boxes will the farmer need? If each box sells for $15, how much money will the farmer make?" ***Modeling with Manipulatives:*** • Give each learner (or group) 240 counters to represent the apples. • Provide small containers to represent the boxes. • Ask learners to place 12 counters into each container until all apples are packed.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	cart, another could involve dividing a set number of items equally among a group. ***Observational Assessment:*** ***Anecdotal Record:*** Observe and take notes on how learners interact during group work and their problem-solving process. ***Checklist:*** Use a checklist to monitor if learners identified the variable, performed the correct operations, and reached the correct solution.	***Counting and Solving:*** • Have learners count the total number of filled containers to find the number of boxes. ***Calculating Revenue:*** • After determining the number of boxes, use play money to represent the sale of each box at $15. • Multiply the number of boxes by $15 to find the total revenue. ***Discussion:*** Ask learners to explain what they did and how they found the number of boxes and total money urgent to write the division and multiplication equations and solve them on paper. The pattern in solving the equation involves isolating the variable on one side of the equation by performing the inverse operation of addition, which is subtraction. This helps in finding the value of the variable that satisfies the equation. **Scaffolded Instruction:** **Step-by-Step Guidance:** Break down the process of solving one-step equations into smaller, manageable steps. **Worked Examples:** Provide worked examples that demonstrate each step of solving an equation and the reasoning behind it. Connection with Patterns Story Problems: The pattern involves using a single variable to represent an unknown quantity and solving it through a specific operation.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Various Strategies: The pattern shows that different methods (division and repeated subtraction) can be applied to solve problems involving basic operations. One-Step Equations: The pattern is the use of inverse operations to isolate and solve for the unknown variable, highlighting a consistent approach in solving algebraic equations.

Additional Useful Content Knowledge for the Teacher

Solving Algebra Equations with Addition and Subtraction

The Equation

One of the basic concepts of algebra is the equation. The main thing to know about an equation is that everything on one side of the equal sign (=) must equal everything on the other side of the equal sign.

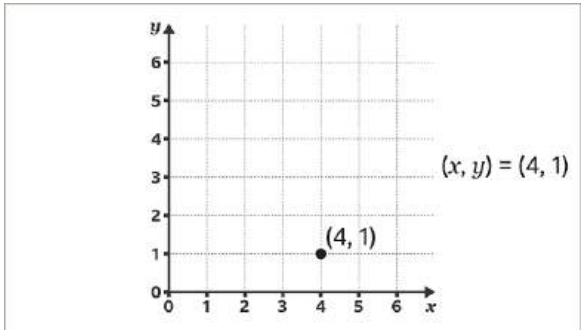
Variables

Variables are things that can change or have different values. In algebra, we are usually trying to find the value of one or more variables. In algebraic equations, the variable is represented by a letter.

Essential Learning Outcome P3.3: Modelling Quantitative Relationships and Analyzing Change – Solving Problems with Functions and Relationships
Grade Level Expectations: - Generate two numerical patterns using two given rules. - Identify apparent relationships between corresponding terms. - Form ordered pairs consisting of corresponding terms from the two patterns - Graph the ordered pairs on a coordinate plane.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Generate two numerical patterns using two given rules. 2. Identify apparent relationships between corresponding terms. 3. Form ordered pairs consisting of corresponding terms from the two patterns. **Skills** 4. Graph the ordered pairs on a coordinate plane.	***Performance Task:*** ***Strategy:*** Assign a performance task where learners apply what they have learned to new rules and patterns. ***Implementation:*** Provide learners with two new rules (e.g., Rule 1: Start at 2, add 5 each time; Rule 2: Start at 3, add 6 each time). Have them generate the first five terms for each pattern. Identify relationships between the patterns. Form ordered pairs. Graph the ordered pairs on a coordinate plane. Include a reflection component where learners explain the relationship they observed	***Real-Life Connections*** ***Contextual Learning:*** • Relate patterns to real-life situations, such as daily schedules, counting money, or planning events. • Example: "If you save $2 every day, how much will you have saved after 5 days?" ***Story Problems:*** Create story problems that involve generating and identifying numerical patterns. ***Example:*** "A garden starts with 3 plants and adds 4 more each week. How many plants will there be after 5 weeks?" ***Explicit Instruction and Modeling*** ***Direct Explanation:*** Begin with a clear explanation of what it means to identify relationships between corresponding terms in two patterns. For example. ***Understanding Corresponding Terms:***

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist for Summative Performance Task ***Objective:*** Learners will generate two numerical patterns using given rules, identify relationships between corresponding terms, form ordered pairs, and graph the ordered pairs on a coordinate plane. ***Instructions for Learners:*** Use this checklist to guide you through the performance task. Make sure to complete each step and check it off as you go. 1. *Generating Numerical Patterns* 2. *Identifying Relationships* 3. *Forming Ordered Pairs* 4. *Graphing Ordered Pairs* 5. *Reflection and Explanation* • Write a reflection on your findings: • What did you observe about the relationship between the two patterns? • Was there a consistent relationship or trend? • Did you encounter any challenges while completing the task? How did you overcome them? ***Teacher's Checklist for Assessment*** Use this checklist to evaluate learners' performance on the task. ***Generating Numerical Patterns*** Learner correctly generated the first five terms for Pattern 1.	In two patterns, each term in one pattern has a matching term in the other pattern. These matching terms are called corresponding terms. ***Identifying the Relationship****:* To identify the relationship, you observe how each term in one pattern relates to the corresponding term in the other pattern. This could involve adding, subtracting, multiplying, dividing, or some other operation. **Finding a Rule**: Once you've identified how each pair of corresponding terms is related, you can often describe this relationship as a rule that applies to all pairs of terms in the patterns. ***Application****:* Understanding these relationships helps in predicting future terms in the patterns, solving problems, or even creating new patterns based on the identified rules. • Use simple language and concrete examples to describe how to look for relationships. ***Modeling:*** Demonstrate how to identify relationships using specific examples. *Example:* Pattern 1: Start at 2, add 3 each time (2, 5, 8, 11, 14). Pattern 2: Start at 1, add 4 each time (1, 5, 9, 13, 17). Show how to compare each pair: (2, 1), (5, 5), (8, 9), (11, 13), (14, 17).

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Learner correctly generated the first five terms for Pattern 2. ***Identifying Relationships*** Learner identified the correct relationships between corresponding terms. Learner provided a clear and accurate description of the relationship. ***Forming Ordered Pairs*** Learner correctly formed ordered pairs from the corresponding terms. ***Graphing Ordered Pairs*** Learner accurately drew and labeled the coordinate plane. Learner correctly plotted all ordered pairs. Points are connected (if required) to show the trend. ***Reflection and Explanation*** Learner wrote a thoughtful reflection on their findings. Learner identified observations and trends accurately. Learner reflected on challenges and solutions effectively.	Highlight that each term in Pattern 2 is one more than the corresponding term in Pattern 1 plus a multiple of 4. **PLOTTING ON A COORDINATE PLANE**  https://www.bbc.co.uk/bitesize/articles/zvvmtv4#zmttn9q **Invite learners to plot coordinates, see instructions below** **Plotting the Point (4, 1)** 1. **Identify the coordinates:** (4, 1) 2. **Locate the x-coordinate:** Start at the origin (0, 0). Move 4 units to the right. 3. **Locate the y-coordinate:** From the position (4, 0), move 1 unit up. 4. **Mark the Point:** · Place a dot at the position (4, 1). · Label the point as (4, 1). Ordered pairs represent each term of Pattern A with its corresponding term in Pattern B. These

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		pairs show a clear pattern of how each term in one sequence relates to the term in another sequence. The graph of the ordered pairs will show a straight line, indicating a linear relationship between the two patterns. This visual representation helps learners understand how the two sequences are related and how one pattern consistently translates to the other.

Additional Useful Content Knowledge for the Teacher

A line graph can be used to visually show a consistent relationship, like the one between two sequences. In order to make a line graph, you need to be able to write ordered pairs using the corresponding terms from the two numerical sequences you are comparing

The corresponding terms from two numerical sequences can be compared, and used to write ordered pairs.

Ordered pairs can be graphed on a 4-quadrant graph.(Focus on the positive part)

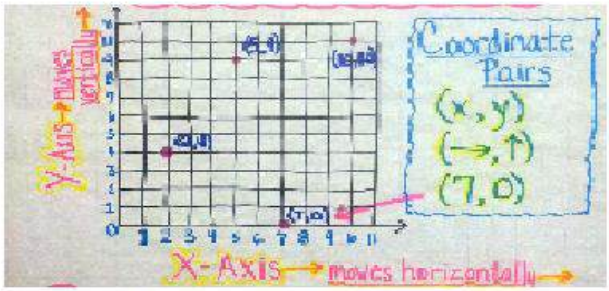
The first number in an ordered pair tells how far across left or right to go on the X line.

The second number in an ordered pair tells how far up or down to go on the Y line. Each point is drawn where X and Y cross.

A line is drawn to connect the points.

Coordinate system

A method for finding points on a coordinate plane(flat surface)



To name a coordinate pair, first travel across the x-axis, then travel up the y-axis. List the points in that order, separated by a comma and inside parentheses.

Inclusive Resources and Materials

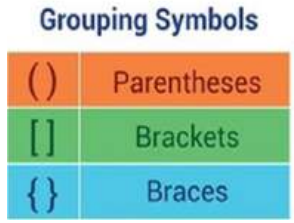
String, rope

Geoboards and rubber bands

Graph paper

Essential Learning Outcome P 3.2: Modelling Quantitative Relationships and Analyzing Change – Representing Functions and Relationships

Grade Level Expectation:
Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Identify and correctly use parentheses, brackets, and braces in numerical expressions to indicate the order of operations. 2. Evaluate numerical expressions with multiple grouping symbols in the correct order. 3. Write numerical expressions using parentheses, brackets, or braces based on given verbal descriptions or scenarios. **Skills** 4. Apply the order of operations, including the use of parentheses, brackets, and braces, to solve problems accurately. 5. Create their own numerical expressions using a combination of parentheses, brackets, and braces to meet specified criteria.	***Formative Assessments*** ***Exit Tickets:*** **Description:** At the end of a lesson, have learners solve a problem involving grouping symbols as their "ticket" out of class. **Example:** Solve $3+\{2\times[5-(2+1)]\}$. ***Think-Pair-Share:*** **Description:** Learners first solve a problem individually, then discuss their solution with a partner, and finally share with the class. **Example:** Evaluate $4+[2\times(3+1)]$. ***Math Journals with Reflective Prompts*** **Strategy:** Use math journals for learners to write down and reflect on their problem-solving processes. **Implementation:** After solving an expression, learners write a short paragraph explaining the steps they took and why each step was necessary. **Example Activity:** Solve the expression $2\times[3+(4\times2)]$ by performing the operations inside the parentheses first, then inside the brackets, and finally the multiplication outside. *Use this information to write a paragraph.*	***Think-Aloud Strategy*** **Strategy:** Model the think-aloud strategy by verbalizing your thought process as you solve problems. **Example:** Solve $5+\{3\times[2+(1+1)]\}$ out loud, explaining each step and why you perform operations in a certain order. ***Use of Visual Aids and Manipulatives*** ***Strategy:*** Incorporate visual aids such as color-coded grouping symbols and physical manipulatives to help learners understand and organize the expressions. **Implementation:** Provide colored markers to highlight different types of grouping symbols (e.g., parentheses in red, brackets in green, and braces in blue).  ***Expression: 5+{3×[2+(1+1)] }***

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Collaborative Learning: ***Think-Pair-Share:*** Have learners think individually about a verbal description, then pair up to discuss their thoughts, and finally share with the class. **For example**, "Add 8 to the product of 2 and 6, then subtract 5." Learners write: $8+(2\times6)-5$	Use physical manipulatives like number and operation cards that learners can arrange and group physically to better understand the structure of expression **Think-Pair-Share** **Think:** Present the verbal description: "Add 5 to the product of 3 and 4, then subtract 2." Give learners 2-3 minutes to write down their individual expressions. **Pair:** Pair learners and provide 3-5 minutes to discuss their expressions. Encourage them to explain their thinking process and listen to their partner's reasoning. **Share:** Have pairs present their expressions to the class. Facilitate a class discussion on the different approaches and correct any misunderstandings. ***Meeting a Target Value*** Learners practice creating and evaluating expressions while applying the order of operations. This approach also reinforces their understanding of mathematical grouping symbols and their role in modifying the outcome of an expression. *Example* **Problem:** Create an expression using the numbers 2, 3, 5, and 7, along with parentheses, brackets, and braces, to get a target value of 50. Using Grouping Symbols: Patterns involve structuring expressions to manage the sequence of operations clearly. Evaluating Expressions: The pattern of solving from the innermost to the outermost grouping

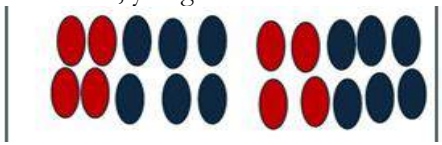
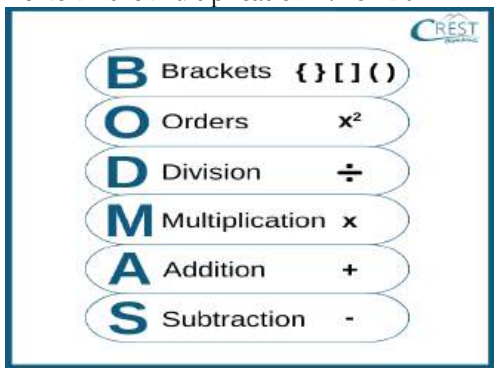
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		symbols helps maintain the correct order of operations. Writing Expressions: Translating verbal descriptions into expressions highlights how grouping symbols structure mathematical relationships. Applying Order of Operations: Following a consistent pattern in solving expressions shows how grouping symbols guide the calculation sequence. Creating Expressions: Designing expressions with multiple symbols helps understand how to organize and solve complex problems systematically. These activities help learners recognise and understand patterns in how grouping symbols affects mathematical operations, ensuring they can accurately solve and create expressions.

Essential Learning Outcome P3.3: Modelling Quantitative Relationships and Analyzing Change – Solving Problems with Functions and Relationships

Grade Level Expectations:

- Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7).
- Recognise that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Translate real-life situations to numerical expressions. 2. Interpret numerical expressions without evaluating them.	***Writing Expressions from Scenarios*** **Description:** Provide learners with various real-life scenarios and ask them to write corresponding numerical expressions. **Example Scenario:** "You have 4 apples and buy 3 more. Then, you give 2 to a friend. Write an expression for the total number of apples left." **OR** Learners can create various real-life scenarios and write corresponding numerical expressions. ***Interpreting Expressions*** ***Description*:** Give learners numerical expressions and ask them to interpret the meaning without calculating. **Example Expression:** 2×(5+3) **Expected Interpretation:** "Two times the sum of five and three."	***Use Real-Life Contexts:*** **Strategy:** Provide real-life scenarios that require learners to write and interpret numerical expressions. **Example Activity:** "If you buy 3 packs of pencils, each containing 5 pencils, and then get 2 more pencils from a friend, write an expression to represent the total number of pencils." (3X5) +2 The pattern involves translating real-life situations into expressions by identifying repeated actions or groupings. This reveals how real-life problems can be systematically converted into mathematical expressions. ***Visual Aids and Manipulatives:*** **Strategy:** Use visual aids, such as diagrams, number lines, and physical manipulatives to help learners understand the structure of expressions. **Example Activity:** Use counters to show the steps in the expression 4×(2+3). To evaluate the expression 4×(2+3), follow these steps:

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Identify the parts of the expression: The expression contains a multiplication operation 4×and an addition operation inside the parentheses (2+3). **Evaluate the expression inside the parentheses first:** According to the order of operations (PEMDAS/BODMAS), operations inside parentheses/brackets should be performed first. 2+3=5.  **Multiply the result by 4:** After simplifying the expression inside the parentheses, you get 4×5.  Perform the multiplication: 4×5=20.  https://www.crestolympiads.com/topic/bodmas-rule

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Interpreting expressions without evaluating them involves recognizing the pattern of operations and groupings. This helps in understanding the structure and intended calculations within the expression.

Additional Resources and Materials

Interactive Tools:

Desmos: A free online graphing calculator that can be used to model real-life problems and visualize expressions.
Desmos

2. Interpreting Numerical Expressions Without Evaluating Them

Math Playground: Offers interactive games and activities focusing on understanding and interpreting expressions without solving them.
NRICH: Provides problems and activities designed to help learners explore and understand the structure of numerical expressions.
NRICH - Understanding Expressions

Interactive Tools:
Wolfram Alpha: Learners can input and explore different expressions to understand their structure and relationships.

Additional Useful Content Knowledge for the Teacher

Parentheses, brackets, and braces are sometimes referred to as "round," "square," and "curly" brackets, respectively

Using the order of operations to solve word problems is essential because these problems apply to many real-world situations. If the order of operations is not applied correctly, the answer will be incorrect.

Using a table to model an increasing/decreasing pattern can help learners organize

their thinking. It can also help them generalize the patterns symbolically. Two types of generalizations (rules) can be made: recursive and explicit. A **recursive generalization** tells how to find a term's value given the value of the preceding term. An **explicit generalization** expresses the relationship between the value of the term and the term number. For example, consider this pattern.

Term	1	2	3	4
Term Value	1	4	7	10

The recursive generalization that describes this pattern is $n + 3$, since the value of each term is three more than the preceding term. If the pattern were continued, the value of the fifth term would be 13 since $10 + 3 = 13$.

The explicit generalization that describes the pattern is $3n - 2$.

When helping learners recognise patterns, it is important to remember that they may not see the pattern in the same way as you. Therefore, it is essential that you ask learners to explain their thinking. Giving learners opportunities to describe their reasoning can also help them realize that, often, there is more than one way to look at a pattern.

Inclusive Resources and Materials

Geoboards and rubber bands
Blocks
Graph paper
Counters
Match sticks
Popsicle sticks

Essential Learning Outcome P3:4: Learners will explore, recognise, represent, and analyze patterns and relationships that model mathematical concepts and problems.
Grade Five Level Expectation: Describe quantitative relationships between corresponding terms

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** **1.** Write simple expressions that record calculations with numbers **Skills** **2.** Interpret numerical expressions without evaluating them **3.** Use a pattern rule to make predictions about subsequent terms.	**Group work** Divide the learners into two groups. Provide one group with numerical expressions and the other group with matching word phrases. Instruct learners to circulate around the room to find the partner whose word phrase matches their numerical expression. For instance, a learner holding a slip that says "add 19 and 17" will seek out the learner who holds the slip with "19 + 17." **Individual work, Quizzes** Give learners a pair of numeric expressions and ask them to interpret them without evaluating them. E.g: - 4500+3010 and 4500+3001 - 125-99 and 126 -100 - 713+810 and 731+ 810	Encourage learners to write basic expressions that represent calculations using numbers. Invite them to use mathematical terminology to describe these numerical expressions. For example, the expression 18 x 5 can be described as "18 times 5," "18 multiplied by 5," or "the product of 18 and 5." - Provide opportunities for learners to understand and describe numerical expressions without performing the actual calculations. For instance, they should be able to represent the instruction "add 5 and 3, then multiply by 4" as $4 \times (5 + 3)$. Provide multiple opportunities for learners to identify relationships between expressions without

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td></td>
<td>
- 343-25 and 344-26
- 519+31 and 520 + 31
- 16 x 12 and 32 x 6

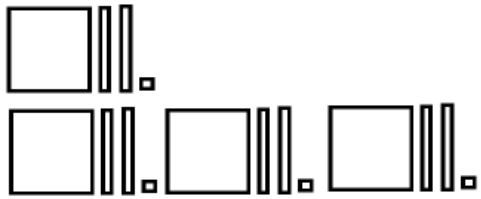
Listen to learners as they make comparisons.

Are they using the correct vocabulary to describe the relationships?
Can they explain why their comparisons are correct/incorrect?

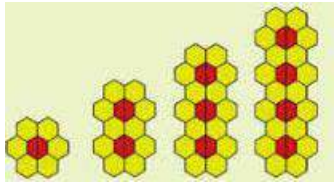
<table>
<tr><td>Year</td><td>Number of persons</td></tr>
<tr><td>2013</td><td>120</td></tr>
<tr><td>2014</td><td>240</td></tr>
<tr><td>2015</td><td>480</td></tr>
</table>

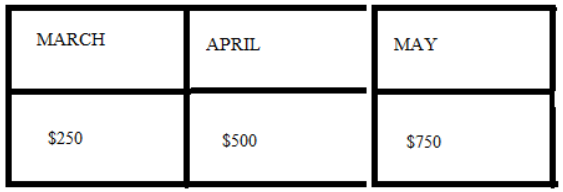
If the pattern continued, what was the attendance in 2017?

Explain how you arrived at your answer.
</td>
<td>
calculating the sum or product. For example, they should recognise that 5 × (45128 + 507) is five times greater than 45128 + 507. Start by using concrete tools, such as base ten blocks, to help learners visualize these relationships. For instance, demonstrate that 3 × (100 + 20 + 1) is three times greater than 100 + 20 + 1.



- Encourage learners to practice extending patterns using physical materials and drawings, and then translate the elements of these patterns into a table or T-chart. Have them explain the process of how the pattern evolves and how each new step is connected to the previous one. For example, let learners
</td>
</tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Quizzes - oral and written Give learners patterns ask them to make predictions about subsequent terms. Ask them to state whether a specific term would be even or odd, prime or composite, divisible by 3, etc. Ask them to explain their reasoning. E.g 3,6,9.. . state two properties of the 12^{th} term 2, 6,10, 14, 18,22…what number will the 20^{th} term end with?	construct the flower pattern using hexagons.  no. Red Hexagons / no. Yellow Hexagons 1 — 6 2 — 10 3 — 14 - Have learners describe, using mathematical language (e.g., two more, five less) and symbolically (e.g., n + 2, p – 5), a pattern represented concretely, pictorially, or from a chart.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Abdul's savings in three consecutive months  Ask learners to use mathematical language to compare the savings of two consecutive months, e.g: -His savings in April increased by $250 from March. - His savings in April grew by $250 from March. -His savings in April rose by $250 from March. Present learners with a pattern and ask them to predict the next terms in the sequence. For example, with the sequence 1, 3, 6, 10…, have them identify specific terms, such as the 5th or 10th term. Encourage learners to make

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		additional predictions, such as whether a particular term will be even or odd, prime or composite, or divisible by 3. Ask them to explain the reasoning behind their predictions. Have learners verify whether or not a particular number belongs to a given pattern. E.g Identify the number that does not belong to the pattern below? Explain your choice. 3,6,12,26,48

Additional Useful Content Knowledge for the Teacher:

It's important to explain to learners that they use language every day that expresses calculations with numbers. For example, when learners ask someone for "four more chips," they are expressing the operation "add 4".

It's important for learners to understand that not all expressions can be compared without evaluating. The teacher can encourage them to look for parts of the expressions that are the same or equivalent. Understanding of the Commutative and Associative Properties of Addition and multiplication is important for this outcome.

E.g: 123+ 1000=1000+ 123 (Commutative property)

(16 + 80)+23=16 + (80 + 23) (Associative property)

Below are some trategies that the learners can use to compare expressions.

Without calculating answers, use <, > or = to make these statements true:

53 + 62 _____ 54 + 61 (compensation)

138 + 267 _____ 140 + 265(compensation)

673 – 428 _____ 675 –430 (constant difference)

12 x 5 _____ 6 x 10 (halving and doubling)

The ability to create, recognise and extend patterns is essential for making generalizations, seeing relationships, and understanding the order and logic of mathematics (Burns, 2007; p.144).

Patterns can be used to model or represent a situation and to solve problems. There are several strategies that can be used to extend patterns (concrete materials, drawings, calculations). They can also be described using mathematical language. When discussing a pattern, learners should be encouraged to determine how each step in the pattern is different from the preceding step.

Inclusive Resources and Materials

Hundred Chart

Counters: rocks, corks, beans, etc.

Geoboards and rubber bands

Blocks

Graph paper

Base Ten Blocks

Opportunities for Subject Integration

Art and Craft:

Drawing and colouring shapes

Creating shapes of plants and animals

Creating colourful hand bands, rekenreks, number lines using cut straws and beads

Weaving increasing and decreasing patterns with grass, straws, strings, etc

Creating mats, picture frames, scrap book covers showing patterns in transformation

Creating mats, picture frames, scrap book covers using polygons in various forms and orientation.

LanguageArts:

Learning adjectives to describe shapes, patterns, objects and models created

Reading stories about place values, patterns and relationships

Composing stories and poems of shapes and solids

Making concept maps using 2D shapes

Writing reports for models and projects created

Social Studies:

Relating shapes to objects/structures (or parts of them) in the environment

Creating patterns to show cultural affiliations

Making hand bands, mats projects and models to show cultural affiliations

Settlement patterns, road grids.

Science:

Relating shaped to the earth, moon and moon phases

Planetary movements

HFLE:

Learning to appreciate colleagues when working in groups, irrespective of ethnicity, colour or cultural associations

Accepting challenges when making presentations

Adopting problem solving strategies

Developing rational argument and reasoning

Healthy Habits (patterns of behaviour

Geometric Thinking

Introduction to the Strand:
Geometric thinking describes a learner's understanding of the properties of geometric shapes and spatial relationships. Geometric thinking is essential to how learners make sense of shapes and spatial relationships (where an object is in relation to another). This kind of reasoning requires learners to analyze geometric concepts and formulate arguments based on their observations. Learners engage in deductive reasoning, problem-solving, and critical thinking while enhancing their ability to conceptualize and utilize geometric shapes and relationships in different ways. Geometric thinking is foundational to advancement in science, technology, engineering, and mathematics (STEM) in school and STEM careers.

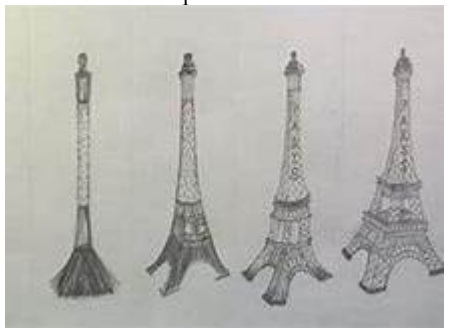
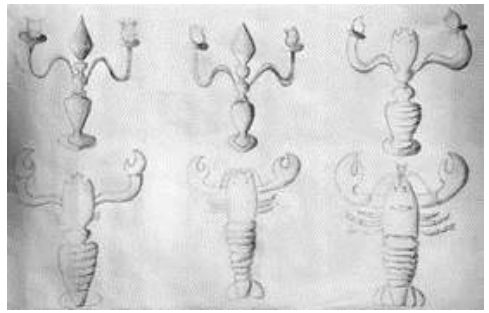
Essential Learning Outcome G1.1: Explore and Analyse Geometric Shapes and Relationships - Developing a spatial sense

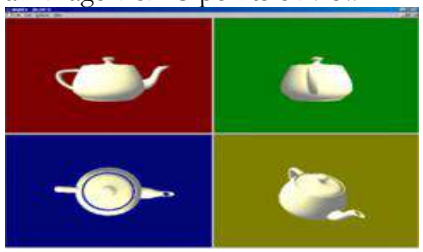
Grade Level Expectations:

Use language and gestures that describe shape, objects, and space orally and in writing to describe a picture or object in real-world contexts or an object undergoing a transformation
Recognise a shape or object seen from various points of view and various distances (3D objects from isometric drawings)
Draw a picture or build a model from a description and vice versa (isometric drawing, 2D shapes by combining and dissecting and 3D from isometric drawing)
Make predictions based on spatial reasoning (2D shape by combining and dissecting shapes and as a result of a single transformation)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Describe shapes, objects orally and in writing, using language and gestures 2. Identify specific shapes from a picture or object in world contexts	**<u>Observation</u>- to diagnose the extent learners are able to recognise the attributes of a shape.**  Each learner will be given a picture as shown above which they will describe to the class.	Learners should be able to identify and describe shapes in a real-life setting. ***Conceptual Understanding*** Provide opportunities for learners to develop descriptive language skills and enhance understanding of functions and properties of everyday objects. For example: Present a mystery bag of objects and shapes. Each learner picks an item and without the rest of the

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
3. Describe an object undergoing transformation 4. Make predictions based on spatial reasoning (3D shape by combining and dissecting shapes and as a result of a single transformation) 5. Recognise a shape or object seen from various points of view 6. Describe a shape or object seen from various distances (e.g. 3D objects from isometric drawings) **Skills** 7. Write a description of a picture (e.g. isometric drawing, 3D shapes combining and dissecting) 8. Draw a picture or build a model from a picture or description **Values** 9. Respect the point of view of others by paying attention to specific details.	Retrieved from https://ecdn.teacherspayteachers.com/thumbitem/Real-Live-Objects-2D-3D-Shapes-Sort-2188641-1466626738/original-2188641-3.jpg **Checklist** Learners can describe using at least one property (2D) and one ability (roll, stack etc) if it is 3D. • Yes • No **Conversation (peer assessment) - to invite learners to share different perspectives in describing objects.** In small groups, each group will select a specific family of 3D shapes from the picture below e.g. One group will identify the cylinders while another the cuboids and cubes. Groups assess each other's categorisation.  Retrieved from https://media.baamboozle.com/uploads/images/200839/1611889309_247232	class seeing the item, mentions the item's primary function and purpose along with characteristics, texture and any other additional information. Learners suggest what is being described. e.g. a football is dipped - it is round, spherical, has embedded pentagonal shapes, used for kicking ***Conceptual Understanding*** Enhance Learners's ability to identify specific shapes in real-world contexts and use spatial adjectives accurately. For example: Have learners identify the picture on the wall within seen shown. Encourage learners to use spatial adjectives and pay attention to detail. sample picture  Retrieved from **https://i.pinimg.com/originals/5f/fb/a0/5ffba0c8439bff84fc99a2f5f315116e.jpg**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	<u>Checklist</u> Each group identifies 2 or more objects in the correct category. ● Yes ● No **<u>Observation</u>/self assessment - to describe transformed objects** Identify the finished object and describe the transformation process.  Retrieved from https://portfolio.newschool.edu/jingxuanzhao/files/2021/01/WechatIMG1637-1024x646.jpeg **<u>Checklist</u>** I can identify the object ● Yes ● No I can write a short description of the transformed shape including at least two shapes involved ● Yes ● No	***Discovery Learning*** Provide opportunities to enhance learners' ability to observe, describe, and understand the transformation of objects, focusing on changes in shape, size, color, and other properties. For example Provide learners with square cut-outs and ask to proceed to create a cube, or use triangles to create a pyramid to understand the transformation of the shape. Pictures such as seen below can also be given to learners to see how the transformation of a picture can evolve into a new image. Learners will then describe the process paying attention to detail  ***Tactile Learning*** Provide learners with the opportunity to develop spatial awareness and ability to recognise shapes or objects from different perspectives. For example:

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	<u>Product</u> - to test learners' ability to recognise objects from different points of view (outcome 2d, 3a) Look at each image and explain the point of view of the viewer and give reasons. Create a similar collage depicting an image from 3 points of view.  Retrieved from https://th.bing.com/th/id/R.607de6caca95803c15a36c7eaa0faf83?rik=BIXy2bfM%2fGj8bQ&riu=http%3a%2f%2fwww.fairyengine.com%2farticles%2fmultiviews%2fsample.jpg&ehk=MQi%2fKUbu3HQDF9akziZ0qoRNS6YJ9XPVAW90uhgE0gw%3d&risl=&pid=ImgRaw&r=0&sres=1&sresct=1 **<u>Checklist</u>** Learner can state 1 or more reasons • Yes • No Learner can create a simple collage showing 3 points of view (face of object can be sketched for non artistic learners) • Yes • No	Have learners stand on the opposite side of a number 6 and ask them what they see. (as shown in the picture below. ask learners "Who is correct?" the person saying 9 or the one saying 6. give reasons for their answer. The same exercise will be done for a u. Learners will say if they see letter 'u' or letter 'n' when they look at the letter from where they stand. Get learners to realise that an image /object can be thwarted based on the point of view and this must be appreciated. Invite learners give other instances where point of view can affect outcome or answers presented.  Retrieved from https://beyondplm.com/wp-content/uploads/2021/03/fff.jpg ***Discovery Learning*** Invite learners opportunities to describe and understand how the appearance of shapes or objects changes when viewed from different distances. For example: Have learners go into the playground and look at buildings and other items that are close to them and far away. Let them explain or draw the difference between the objects.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	<u>Peer Assessment</u> - to test learners' ability describe changes in the appearance of objects based on distance Each learner will state one comparison between the images closer, to those further away. They will then explain why the road and trees seem to become smaller with distance. Peers will assess each other's response.  Retrieved from https://i.ytimg.com/vi/64F7mNiN-UI/maxresdefault.jpg **<u>Checklist</u>** Learner can state one comparison • Yes • No Learner can give a valid explanation • Yes • No	Learners will come up with reasons for the phenomena. Learners can imagine then draw a bird or plane from near and at different distances to depict the change as the object goes further away from view (as shown on the left)

Additional Resources and Materials

- 2D shapes and 3D Shapes geometrical shapes
- Flash cards related to geometrical shapes and properties
- 2D and 3D shapes bingo cards
- 2D and 3D shapes Charts

Additional Useful Content Knowledge for the Teacher

Transformation: a process by which an object, expression, or shape is converted into another.

Point of view: The position from which something or someone is observed

As an object gets closer, the visual angle increases, so the object appears larger. As the object moves farther away, the visual image angle decreases, making the object appear smaller.

https://www.twinkl.com/teaching-wiki/geometric-shapes

Top Tips for Teaching 2D Shapes

Opportunities for Subject Integration

Mathematics & Language Arts:

- **Oral and Written Descriptions**: Learners can practice using precise language to describe shapes, objects, and spatial transformations. This can be tied to writing exercises in language arts, where they describe objects in detail or provide instructions for constructing or transforming shapes (e.g., descriptive writing, technical writing).
- **Vocabulary Development**: Use geometry-based vocabulary (e.g., rotation, symmetry, transformation) in language lessons to enhance learners' understanding of mathematical and linguistic concepts.

Mathematics & Art:

3D Object Representation: Learners can use isometric drawings to explore shapes from different perspectives, integrating artistic skills such as sketching and model-building. Art classes can focus on drawing 3D objects, incorporating lessons on perspective and form, while math lessons reinforce the geometric principles behind these drawings.

Model Building: Creating 3D models from descriptions ties art and math together as learners visualize and construct objects using geometric shapes. This can also involve hands-on projects like sculpture or design.

Mathematics & Science:

Spatial Reasoning in Physics or Engineering: In science, learners can explore spatial reasoning in real-world applications such as predicting motion or structural stability based on transformations (e.g., rotations, translations). This can relate to engineering projects like designing simple structures or understanding molecular models in chemistry.

Mathematics & Technology:

Technology Integration: Use digital tools or software like CAD (Computer-Aided Design) programs that invite learners to manipulate 3D objects and shapes. This integrates mathematics with technology education, teaching learners to visualize and create complex structures using spatial reasoning and geometry.

Mathematics & Agricultural Science

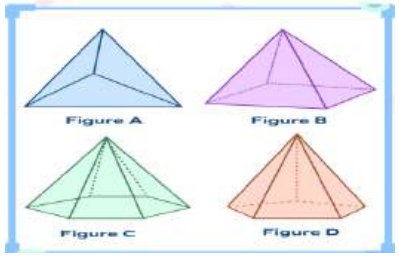
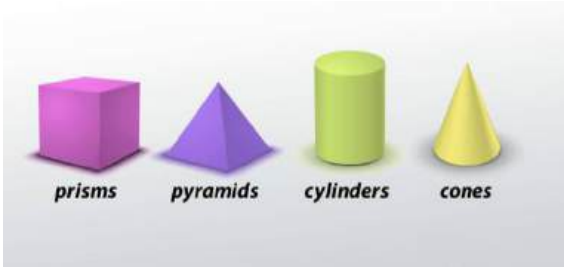
- classifying leaves based on their shape.
- building seed boded and also raised garden beds
- building animal shelters

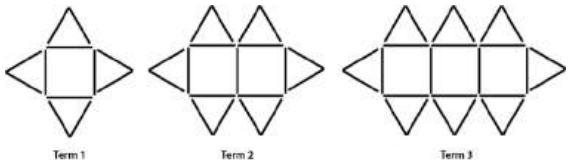
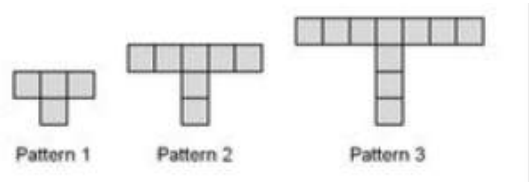
Mathematics & Sport: In different sports, disciplines require a sense of direction and angle to aim the ball to score a perfect goal. From being alert on the field to recognizing their angles, geometry plays a vital role in daily life.

"Math is the only place where truth and beauty mean the same thing." - Danica McKellar

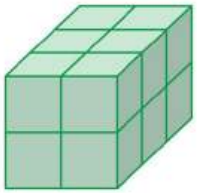
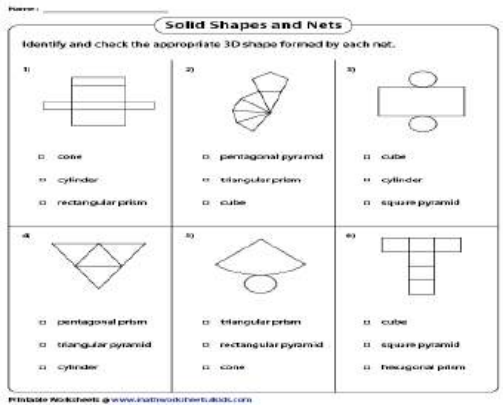
Essential Learning Outcome G1.2: Explore and Analyze Geometric Shapes and Relationships -Sorting, patterning, and building with 2D & 3D Shapes
Grade Level Expectations: Represent, construct, and deconstruct shapes and objects (pyramids, prisms, cylinders, and cones) Sort and create patterns with shapes and objects (pyramids, prisms, cylinders, and cones) Build objects using nets, skeletons, and isometric drawings. Draw acute, obtuse, and right angles

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Identify pyramids, prisms, cylinders and cones based on their attributes 2. Identify three types of angles (obtuse, acute and right) in various geometric shapes 3. Explain the characteristics of right, obtuse and acute **Skills** 4. Sort objects as being pyramids, cylinders, prisms and cones	**Entrance Slip/self assessment** - **Learners should be able to identify shapes based on given descriptions. Video will be paused periodically to invite for identification.** 3D Shapes Song (Cone and Cylinder) | Tutway Identifying Prisms and Pyramids | Grade 2 & 3 | Math | 3d Shapes **Discussion to test learners ability to identify solids based on a description** A description of a shape will be read to learners and they will be asked to determine the shape.	Provide opportunities to develop learners' skills in representing, creating, sorting, and patterning 3D shapes using guided discovery, independent learning, manipulatives, and critical thinking. ***Guided Discovery*** Guide learners to identify real world objects that are examples of pyramids ,prisms , cones and cylinders. Present a variety of 3D shapes to the learners and briefly explain their properties. 

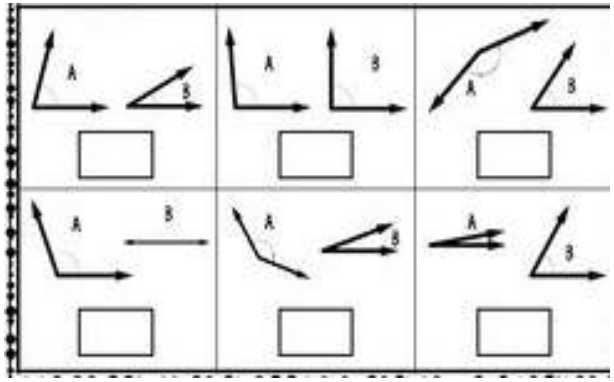
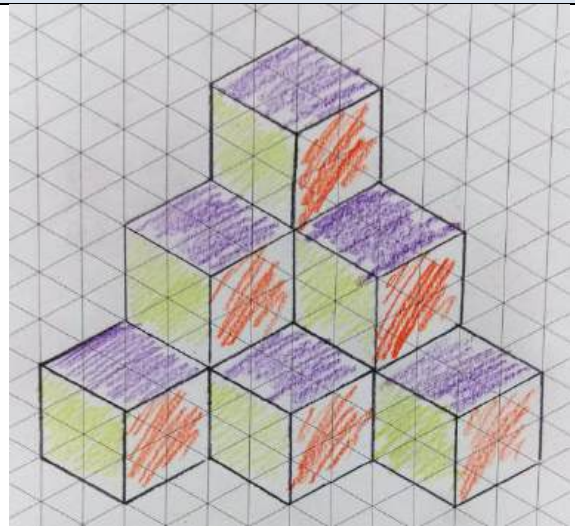
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
5. Create and complete patterns using objects 6. Construct 3-d objects using nets and skeletons 7. Deconstruct 3-D objects using nets 8. Create 3D shapes from isometric drawings 9. Draw acute, right and obtuse angles **Values** 10. Make connections with shapes and types of angles by comparing them with actual objects in the environment	e.g. I am the shape of an object that was first built in Egypt . I am pointed at the top but I am not flat. My base is never round. Learners were able to correctly identify shapes based on their description Yes No Somewhat **<u>Think, Pair, Share /Peer Assessment</u>- to invite peers to assess each other's ability to sort solids.** Learners in pairs will be given groups of sorted shapes and asked to discuss and determine whether they are correctly sorted. Toilet paper rolls, match boxes etc. Invite pairs to share and justify their findings. Class will critique each pair. e.g True /False. All these shapes are square based pyramids.  Retrieved from https://www.splashlearn.com/math-vocabulary/wp-content/uploads/2023/11/Identifying-hexagonal-pyramid-example.png	 Retrieved from https://shop.luckylittlelearners.com/wp-content/uploads/2023/03/Lucky-to-Learn-Math-Unit-8-Geometry-and-Fractions-Anchor-Chart-3D-Shapes-in-Real-Life.jpeg ***Independent Learning*** Give learners cut out shapes and ask them to stick the shapes. Use manipulatives to demonstrate how to build different shapes and explore their properties (e.g., number of faces, edges, vertices). Guide learners through a series of questions to discover these properties on their own. **(pyramid, prism ,cone or cylinder)** 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist Pair can discuss shapes based on their attributes yes somewhat no Pair was able to correctly identify the odd shape(s) out in a given group yes somewhat no **Observation and Discussion - to determine learners' ability to complete patterns** Learners will be given a pattern involving objects. Listen as learners discuss their observations in order to determine the pattern rule. e.g.  https://nzmaths.co.nz/sites/default/files/inline-images/matches-10.png	Retrieved from https://study.com/cimages/videopreview/rirubt9efn.jpg ***Critical Thinking*** 1. Invite learners to describe the rule for given pattern for eg. (horizontally add 2 Vertically add 1)  Retrieved from https://l.imgt.es/resource-preview-imgs/3629a476-5250-4747-b5ee-eda4428d9603/cover.jpg?profile=max500x190 2. Invite learners to create a similar pattern with their own rule. Use pattern blocks or shape cards to create and extend patterns involving 3D shapes. Ask learners to identify the rules of the patterns and predict the next shapes in the sequence.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Ask learners questions such as What do you think the next object in the pattern will be ? Learners could determine the rule: ☐ easily ☐ with help ☐ could not identify the rule for a given pattern. Learners were able to determine what comes next in a given pattern? yes no **<u>Group Work</u>- to invite learners to express their construction and deconstruction skills** Learners in small groups will be given cut out pieces of shapes, glue / tape and pictures of various pyramids, prisms, cylinders and cones. Learners will be asked to use the pieces to construct the nets of the given nets. Have groups present their constructed shapes to their peers Have peers identify the shapes that were used to create the nets. **<u>Checklist</u>**	Pose problems that require learners to apply their understanding of 3D shapes to solve (e.g., "If you stack these cubes, how many different shapes can you create?"). Encourage learners to explain their reasoning and solutions. ***Independent Learning*** Provide stimulus for learners to develop learners' ability to construct and deconstruct 3D objects using nets and skeletons, starting by explaining that a net is a 2D pattern that can be folded into a 3D shape. Show examples of nets and the 3D shapes they create. For the construction activity, provide nets for specific shapes (e.g., cubes, pyramids), have learners cut, fold, and assemble the shapes, and discuss the correspondence between the nets and the 3D shapes, including their properties. For deconstruction, explain that it involves unfolding a 3D object into its 2D net form. Provide pre-assembled 3D objects, instruct learners to carefully unfold them into nets, and have them draw and label the nets. Compare these with pre-made nets and discuss challenges and insights.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Learners are able to correctly construct the nets of given shapes yes somewhat no Learners can identify the shapes used to create the nets yes somewhat no **<u>Product</u> - to make unique isometric creations** Learners will be given images of isometric shapes and be asked to create the shape using cutouts or blocks. Eg. Use the necessary amount of blocks to create the rectangular prism below  Retrieved from https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcRnj7M3FhwQ1aJJuHTry_dhEtEaDtDBXcHWtwJ0Xm5wpKvUqk-ULjX9_CCH_xa_Qn64zGY&usqp=CAU **<u>Checklist</u>** Learners were able to accurately create given 3 d shapes from an isometric drawing. yes no	Introduce skeletons as 3D structures made of edges without faces. Provide materials for building skeletons (e.g., straws and connectors) and guide learners in constructing them. For deconstruction, have learners observe and sketch their skeletons, then break them down into 2D nets. Discuss how skeletons and nets relate, reinforcing the connection between 2D and 3D forms. Also, provide worksheets to match the net to its 3D shape.  Retrieved from: https://i.pinimg.com/736x/7d/c5/a6/7dc5a68494b00d59137123c8a46b0e77.jpg **Discovery through Manipulatives** Help learners understand isometric drawings, explain that these drawings represent three

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	<u>Peer assessment</u>- to determine learners' ability to identify types of angles around them Have learners listen and sing along to the following Angles Song | Acute, Obtuse, & Right Angles | 3rd & 4th Grade <u>Angles Hunt - Group Work</u> Divide the class into small groups and send each group to find as many examples of each type of angle they can, recording where it was found. After the allotted time, bring learners back together and ask each group to share their angles they discovered during the activity. With the teacher's guidance, peers will assess accuracy of each group's findings. Discuss any findings that might have been unique to one particular group. **<u>Checklist</u>** Learners could identify at least 2 examples of acute angles in their environment yes no Learners could identify at least 2 examples of obtuse angles in their environment yes no Learners could identify at least 2 examples of right angles in their environment yes no	dimensions on a 2D surface, with axes drawn at 30-degree angles. Show examples of isometric drawings, such as cubes or pyramids, and demonstrate how these 3D shapes are translated into 2D drawings. Provide learners with isometric grid paper and guide them in drawing simple 3D shapes, like cubes or rectangular prisms, using rulers for accuracy. Once learners are familiar with creating isometric drawings, transition to constructing 3D shapes based on these drawings. Provide materials such as building blocks, clay, or paper modeling kits, and instruct learners to build the shapes according to the isometric drawings. Have learners compare their constructed shapes with the drawings and discuss any challenges faced in the process. Give isometric drawings of 3 D shapes and ask to use blocks or cutouts to create it based on a given view

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	<u>Product</u> (Drawing angles) - to test learners' ability to sketch sample angles. Learners will be asked to use rulers to assist them to sketch given angles and be asked to label them as being as acute, right or obtuse **<u>Exit Ticket</u>** Learners will be shown pictures of two angles and be asked to identify what type of angle each is . Learners will then be asked to identify the larger of the two.  Retrieved from https://images.google.com/	 Rertrieved from https://th.bing.com/th/id/R.1390a848a9222b9e9fc8df684b5dbee9?rik=U79EreZ9SeD8aA&riu=http%3a%2f%2flmtn.weebly.com%2fuploads%2f2%2f5%2f6%2f4%2f25647388%2f2017-11-16-11-48-10_orig.jpg&ehk=7JkNBG1pmZbTaMLZbd7Zr9hoEmDiXnHDsQfEvHap6Rs%3d&risl=&pid=ImgRaw&r=0 ***Real Life Application*** **Identifying Angles:** Provide opportunities for learners to define angles and introduce the three types: acute (less than 90

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		degrees), right (exactly 90 degrees), and obtuse (greater than 90 degrees but less than 180 degree. Use angle cards to sort angles into acute, right, and obtuse categories. Show real-world examples and have learners identify the angle types. Engage learners in a whole class to discuss the properties of each angle type and any challenges learners face Demonstrate how to use a protractor to measure and draw angles, focusing on acute, right, and obtuse angles. Have learners practice drawing these angles on graph paper and then independently on blank paper, labeling each with its degree measure. Conduct a peer review where learners measure and check each other's angles with a protractor. Review the accuracy of the drawings and discuss any difficulties encountered. Provide tasks like drawing angles to specific measurements or creating designs using acute, right, and obtuse Organize a scavenger hunt to find and photograph angles in the environment. Then,

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		create a matching game in which angle cards are paired with their definitions and measurements. Show pictures of common objects that can be found in their school environment and ask them to identify as many angles as possible in them.  ***Critical Thinking*** Have learners complete the activity using angles to create a shape .

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Draw a shape with 4 right angles  Draw a shape with 4 acute angles  Draw a shape with 4 obtuse angles  Retrieved from https://images.google.com/

Additional Resources and Materials

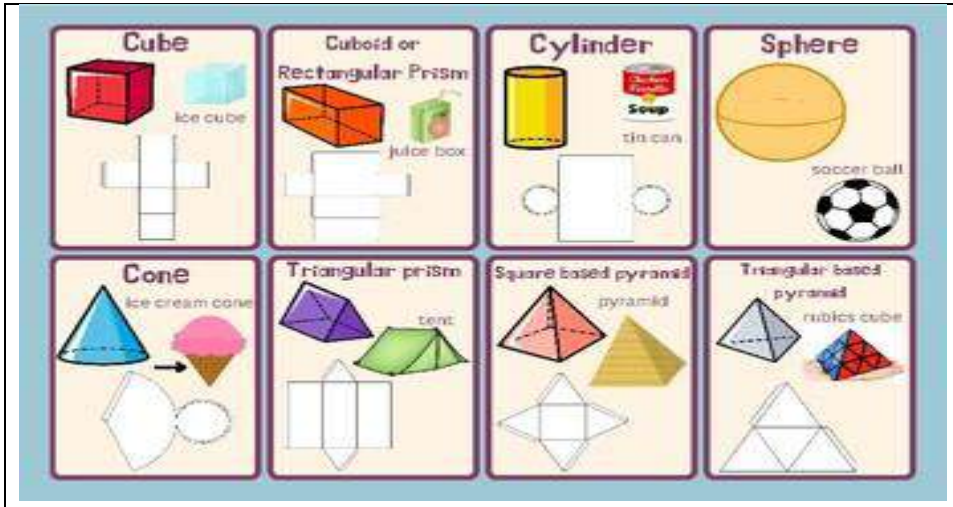
https://teach.files.bbci.co.uk/skillswise/ma343dsh-l1-w-everyday-shapes.pdf
https://teach.files.bbci.co.uk/skillswise/ma33angl-e2-w-drawing-angles.pdf
https://www.turtlediary.com/game/nets-of-3d-shapes.html
https://www.mathgames.com/skill/6.23-nets-of-3-dimensional-figures

https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Geometric-Solids/

Cereal boxes, match boxes, toilet paper rolls, party hats, dice
3D shape manipulatives (e.g., cubes, spheres, cones, pyramids).
Drawing paper and pencils.
Sorting trays or containers.
Pattern blocks or shape cards.
Nets for various 3D shapes (e.g., cubes, pyramids, prisms) printed on paper.
Scissors.
Glue or tape.
Rulers
Pre-assembled 3D objects (e.g., cubes, pyramids, prisms).
Skeletons of various 3D shapes (e.g., straws, pipe cleaners, or 3D modeling software).
Connecting materials (e.g., connectors for straws or software tools).
Isometric grid paper.

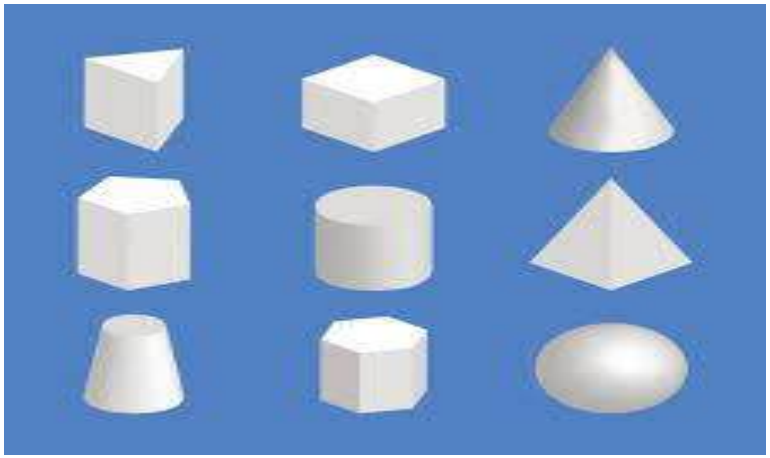
Additional Useful Content Knowledge for the Teacher

A net is what a 3D shape would look like if unfolded. You can draw and fold nets to make 3D shapes. A 3D shape can have more than one possible net.

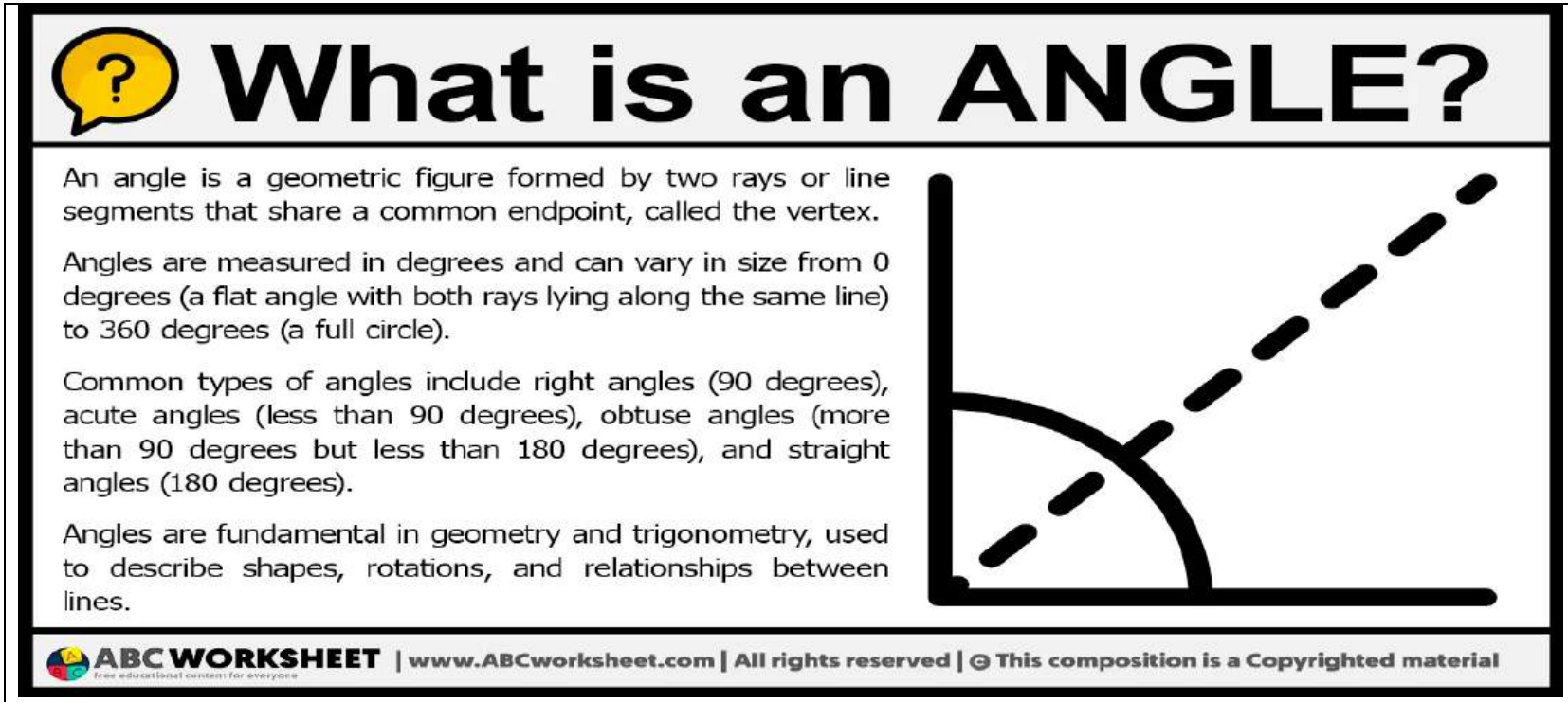


Retrieved from https://ecdn.teacherspayteachers.com/thumbitem/3D-Shapes-and-Nets-Anchor-Chart-11143836-1708778565/original-11143836-1.jpg

An isometric drawing is **a pictorial representation of a 3 D object in which all three dimensions are shown.**



Retrieved from https://media.istockphoto.com/id/670498854/vector/simple-geometric-figures-isometric-vector-illustration.jpg?s=612x612&w=0&k=20&c=MFR6U5EKsV4kFCggGwiCMG8EndKjFrQfSPPq8gNNI1U=



Retrieved from https://i0.wp.com/www.abcworksheet.com/wp-content/uploads/2023/10/What-is-an-Angle.jpg?fit=1200%2C707&ssl=1

Opportunities for Subject Integration:

Representing and constructing shapes connects geometry and measurement. Sorting and creating patterns links symmetry, tessellation, and transformations. Building objects using nets and isometric drawings reinforces spatial reasoning and 3D geometry while drawing angles integrates trigonometry and angle properties. These activities promote connections across math topics for deeper understanding.

Art:

Explore perspective drawing techniques and how distance affects depth and detail perception. Explore artistic designs and structures using nets and skeletons. Incorporate isometric drawing techniques into art projects, focusing on perspective and spatial design.

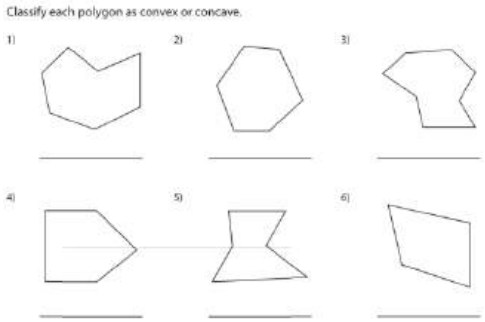
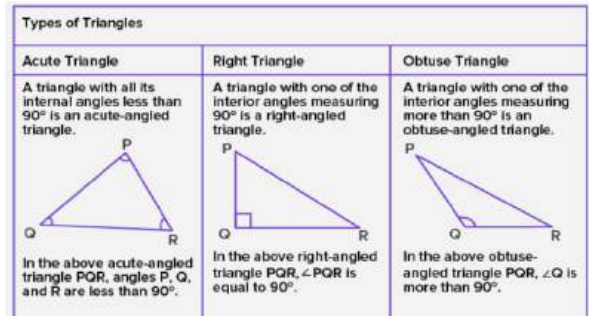
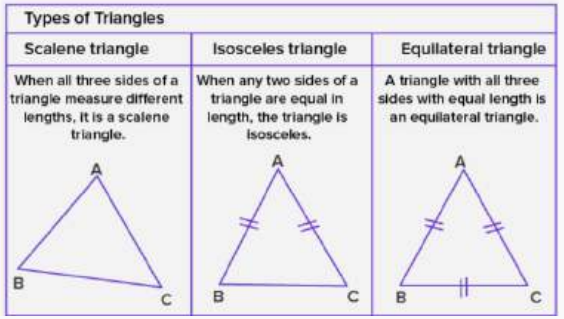
Science:

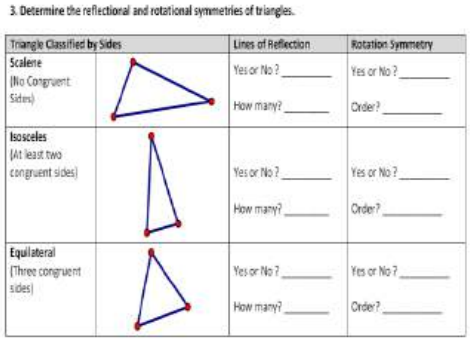
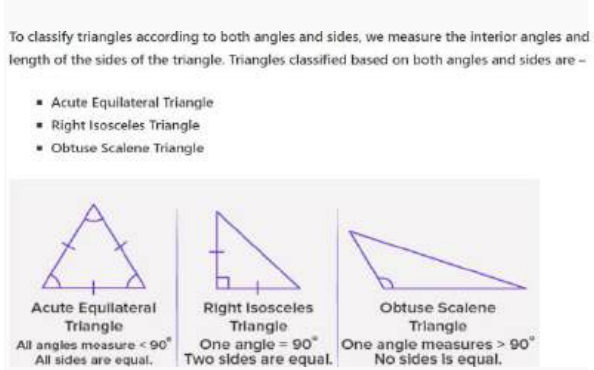
Explore how scientists and engineers use models and drawings to represent objects and structures in natural and built environments. Study natural structures and their geometric forms (e.g., crystal formations, molecular structures).

Essential Learning Outcome G.2.1 : Recognizing, Naming and Describing Shapes - Analysing and describing shapes
Grade Level Expectations: Recognise and describe characteristics and attributes of triangles according to sides, angles, and symmetries (acute, obtuse, right, scalene, isosceles, equilateral) Recognise polygons both regular and irregular, including non-convex) according to sides, angles, parallel sides, diagonals, lines of reflective symmetry, order of rotational symmetry, perpendicular lines, bisectors of line segments and angles, and perpendicular bisectors of segments. Recognise and describe attributes and characteristics of prisms, pyramids, cylinders and cones according to faces, edges, vertices, curved surfaces, parallel and congruent bases and congruent faces

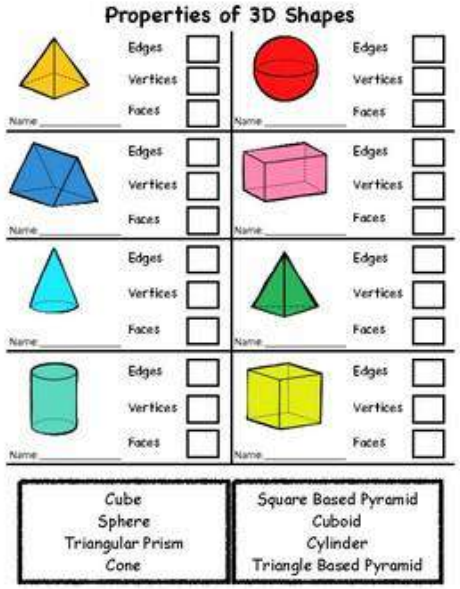
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. State the characteristics of triangles based on sides, angles and symmetries 2. Define acute, obtuse, Right, Scalene, Isosceles and equilateral triangles. 3. Differentiate between Acute, Obtuse, Right, Scalene, Isosceles and Equilateral triangles. 4. Identify different types of triangles based on their properties. 5. Recognise different types of triangles based on their properties.	**<u>Product Entrance Slip</u> - To determine whether learners can identify triangles' attributes and characteristics** Triangle identification Game- Create flashcards with different types of triangles, (include different orientations) and have learners match triangles to their attributes **<u>Checklist</u>** Learners can accurately match all triangles to attributes accurately Yes / No **<u>Observation /Self assessment</u>: To determine if learners can recognise triangles based on properties.**	**Learners will be using guided discovery to outline the attributes and characteristics of triangles.** ***Chart Creation and Video assisted learning*** Have learners review previous knowledge by creating a chart with three columns: "By Sides," "By Angles," and "By Symmetry." In each column, let learners list the characteristics and draw examples of each type of triangle. Provide learners with sample triangles. Have them measure the sides using rulers and the angles using protractor. Based on their measurements, learners classify each triangle by sides (equilateral, isosceles, scalene) and by angles (acute, right, obtuse).

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
6. Describe triangles according to their side, lengths, angle measure, and symmetries 7. a. State the characteristics of regular polygons. b. Outline the attributes of regular polygons. 8. State the properties of sides in regular and irregular polygons. 9. a. Name the types of angles in regular and irregular polygons to include non-convex. b. Count the angles within regular and irregular polygons. 10. Identify parallel sides in regular and irregular polygons including non-convex. 11. Identify diagonals in regular and irregular polygons. 12. Identify lines of reflective symmetry in regular and irregular polygons. 13. Recognise the order of rotation in regular and irregular polygons. 14. a. Recognise the attributes of prisms, pyramids, cylinders, and cones based on their bases, edges, vertices, curved surfaces	Have learners take turns to dip triangle images from a bag. Have them classify it based on their sides, angles and symmetries. **Checklist** I am able to accurately classify the triangle I dipped . Yes/ No **Exit Ticket/Peer Assessment** Match the Triangle to its description- Have one learner orally describe a triangle and another make a sketch of the triangle being described. Learners can also identify different triangles in the environment. **Observation /peer assessment - To determine whether learners can identify polygons based on properties** 1. Create a game where learners identify different polygons based on their properties for e.g one learner will identify a polygon from the face of a solid in the classroom, while another will identify which type of polygon, number and type of angles in it.	Have learners check for reflective symmetry by folding or using a mirror to see if the triangle can be divided into two equal halves. Learners record their findings in a table, noting the side lengths, angle measures, and symmetry properties. Give learners the opportunity to learn the attributes of different triangles. For example, provide learning with a set of triangles, and have them sort the triangles. Invite learners to tell what makes the triangles different. Guide learners into activities to help differentiate triangles based on sides and angles. e.g have them look at a video. Video can be paused periodically for discussion. Retrieved from https://youtu.be/fNFR7YWOMI4?si=VIXATNshBtY3ZKC9 Provide learners with the opportunity to sort triangles based on their attributes. For example provide learners with attribute cards and sample triangles. Have learners place the attribute cards in the correct sections of the sorting mat or paper, matching them with the corresponding sample triangles. Or

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
b. Identify parallel and congruent bases and congruent faces of prisms, pyramids, cylinders and cones. 15. a. Describe the attributes of prisms, pyramids, cylinders, and cones based on their bases, edges, vertices, curved surfaces b. Describe parallel and congruent bases and congruent faces of prisms, pyramids, cylinders and cones. **Skills** 16. Categorize triangles according to their sides, lengths, angle measures, and lines of symmetry. 17. Solve geometric problems involving triangular properties 18. Determine the order of rotational symmetry in regular and irregular polygons. 19. Recognise perpendicular lines within regular and irregular polygons. 20. Identify angles that are perpendicular to bisectors of line segments in regular and irregular polygons.	**Checklist** Learner can identify at least one type of polygon yes/ no Learner can accurately count all angles yes/no Learner can name all angles counted yes/no Invite learners to classify polygons as convex and concave  Learners can identify at least 4/6 polygons as convex and concave yes/ no	***Conceptual Understanding*** Discuss the different types of triangles. Have learners formulate a working definition for each type of triangle based on properties  Retrieved from https://images.google.com/ **Types of Triangles based on size** The types of triangles based on the length of the sides are – ▪ Scalene triangle ▪ Isosceles triangle ▪ Equilateral triangle 

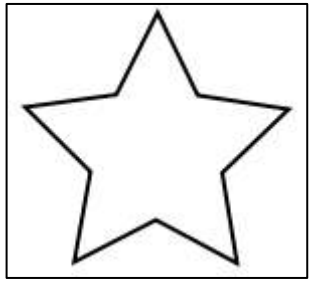
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
21. Highlight perpendicular lines within regular and irregular polygons. 22. Highlight bisectors of line segments within regular and irregular polygons. **Values** 23. Cultivate an appreciation for the beauty and complexity of geometric shapes and patterns when categorizing triangles. 24. Design a tessellation booklet that shows the attributes of regular and irregular polygons	**Product** **Learners will be assessed on their ability to efficiently mark out the diagonals in a given polygon.** **Checklist** Learners are able to accurately mark-off the diagonals in a given polygon. yes / partially / no **Product**  3. Determine the reflectional and rotational symmetries of triangles. Triangle Classified by Sides / Lines of Reflection / Rotation Symmetry Scalene (No Congruent Sides) — Yes or No ?_____ How many?_____ — Yes or No ?_____ Order?_____ Isosceles (At least two congruent sides) — Yes or No ?_____ How many?_____ — Yes or No ?_____ Order?_____ Equilateral (Three congruent sides) — Yes or No ?_____ How many?_____ — Yes or No ?_____ Order?_____ **Checklist** Learners are able to correctly determine the rotational and reflexive lines of symmetry in polygons for at least ⅔ polygons. yes ___- no __	 To classify triangles according to both angles and sides, we measure the interior angles and length of the sides of the triangle. Triangles classified based on both angles and sides are – ▪ Acute Equilateral Triangle ▪ Right Isosceles Triangle ▪ Obtuse Scalene Triangle Acute Equilateral Triangle — All angles measure < 90° All sides are equal. Right Isosceles Triangle — One angle = 90° Two sides are equal. Obtuse Scalene Triangle — One angle measures > 90° No sides is equal. **Symmetrical Attributes** Have learners complete the activity by matching the name and definition of each triangle to its image. Learners will then draw lines of symmetry on the image. This will help them to notice that equilateral triangles have three lines of symmetry, isosceles triangles have one and scalene triangles have zero. Provide additional practice, and have learners discuss how triangles can be classified using their symmetry.

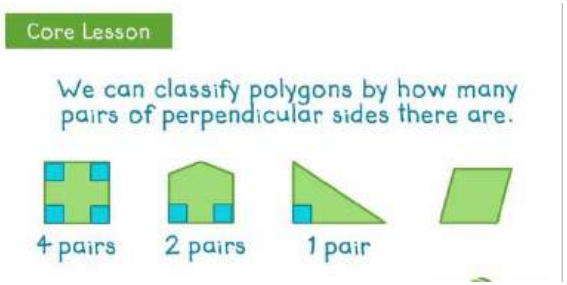
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	<u>Product/Discussion</u> - to demonstrate ability or recognise perpendicularity In pairs learners will identify 1 example in the classroom which depicts perpendicularity. For e.g. the square face of tiles and /or carpet squares has 2 perpendicular lines and 4 perpendicular angles. **<u>Checklist</u>** Pair can identify at least 1 example yes/no Pairs can outline perpendicular sides and angles. yes/no	***Discovery Learning*** Engage learners in introduction and class discussion on characteristics of regular polygons and group activity to identify and present characteristics of polygons using printed examples. Guide learners in discovering polygons. The teacher presents different images of shapes. Have learners discuss what they see in terms of the number of sides and use it as a guide to help name the different polygons, as well as categorize them as regular and irregular polygons. ***Video-assisted learning*** Present the following video https://youtu.be/DUGkQMLowXA?si=DTLOYXF8xYUD-C0o Once learners can identify polygons, invite them to state the properties of the different polygons. From the video, invite learners to categorize polygons based on attributes, e.g parallel sides, reflective symmetry Provide learners with printed templates of various regular polygons. Using rulers and protractors, let learners measure and record the side lengths and angles of each polygon. Have learners compare the attributes of different regular polygons and

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	<u>Product</u>- to test learners' knowledge of the attributes of prisms, cylinders and cones. (outcomes 24 and 25) Learners will complete the worksheet and identify which ones are prisms.  Retrieved from https://ecdn.teacherspayteachers.com/thumbitem/Properties-of-3D-Shapes-Worksheets-8880051-1670872041/original-8880051-1.jpg	note the similarities and differences. Have learners fold their printed polygons to find and draw the lines of symmetry. Engage learners in a class discussion about the importance of symmetry in defining regular polygons. Have learners Create art projects using various regular polygons; label polygons with their characteristics and present and explain art projects to the class. Conduct scavenger hunts to find examples of regular polygons. Have learners record and discuss findings, noting characteristics of found polygons. ***Video-assisted learning*** Review the definitions and visual examples of acute, right, and obtuse angles. Explain that polygons can have different types of angles and these need to be identified. Provide learners with worksheets and printed polygon examples. Instruct learners to count the number of angles in each polygon and record their findings. Have learners identify and mark the parallel sides in each polygon using colored pencils or markers and discuss the findings, emphasizing the presence

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist Learner can state the properties of at least 6 /8 solids yes/no Leaner can identify all prisms yes/no	or absence of parallel sides in different types of polygons. Have learners search for regular and irregular polygons around the classroom or school. They will either take photos or draw the objects they find, noting the types of angles and parallel sides. They will record these details on a worksheet and then share their findings with the class, discussing interesting examples and observations. Distribute printed examples of different polygons to each learner or group. Provide protractors for measuring and counting angles. Instruct learners to count the number of angles in each polygon and record their findings on the worksheet. Have learners compare their results and discuss any patterns observed (e.g., the consistency between the number of sides and angles). Review the findings as a class, highlighting any unusual polygons or common mistakes. Explain what parallel sides are and how to identify them in polygons. Parallel sides are lines that run in the same direction and never intersect. Provide learners with printed polygons and rulers. Have learners use rulers to identify and mark pairs of parallel sides in each polygon using colored pencils or markers. Let learners complete a worksheet where they list the polygons and note

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		the number of pairs of parallel sides they identified. Provide opportunities for learners to share their findings with the class, discussing which polygons had parallel sides and any challenges faced. Review the differences between regular and irregular polygons regarding parallel sides. ***Video-assisted learning*** Present a video on the Diagonals of Polygons. Give learners cut-outs of polygons and have them draw diagonals. Invite learners to formulate a working definition for diagonals. https://youtu.be/XO6t7Cqa_p4?si=dV4z460jCHWu9CqY ***Guided learning-*** Guide learners into understanding the concept of reflective symmetry in regular and irregular polygons. Present learners with a video on reflective and rotational symmetry. https://youtu.be/-0wDI6xM3zw?si=UDMxZPux1jfvTzB2

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Guide learners into practical activity on: **Order of Rotational Symmetry** Provide learners with cut-out shapes like stars, squares, and triangles. Have them rotate each shape around a central point, noting how many times it looks the same as its original position before completing a full 360-degree turn. Ask learners to record the number of times the shape appears identical to its starting position. This number is the shape's order of symmetry.  Discuss with learners, "If we consider the order of symmetry for a regular hexagon it is equal to 6 since it has 6 equal sides and is rotated with an angle of 60 degrees". ***Conceptual Understanding*** Create various examples of perpendicular lines and guide learners in describing their spatial relationship (e.g., intersecting at a right angle, forming four equal angles).

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Present a visual with multiple examples of perpendicular angles highlighted. Facilitate a class discussion to elicit the definition of perpendicularity based on the common attributes observed in the shaded areas. Subsequently, learners will create their own polygons, identify and shade perpendicular angles, and visually emphasize perpendicular lines using color coding.  **Retrieved from** https://i.ytimg.com/vi/Glq51xdm2MI/maxresdefault.jpg ***Learning through manipulation*** Invite learners to collect from home at least one item that represents a cylinder, cone, pyramid, etc., as shown below.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		3-Dimensional Geometric Shapes  Retrieved from https://i.pinimg.com/originals/41/59/e6/4159e6c92f0c3ba5af9a5396d744dd96.png Lead learners to manipulate similar objects to differentiate the prisms from the pyramids and cones

Additional Resources and Materials

- https://thirdspacelearning.com/gcse-maths/geometry-and-measure/types-of-triangles/https://byjus.com/maths/types-of-angles/
- https://www.splashlearn.com/math-vocabulary/geometry/regular-polygon
- https://www.bbc.co.uk/bitesize/guides/zshb97h/revision/6

Cutouts, matchsticks, popsicle sticks, rulers

Additional Content Knowledge for the Teacher

What is Reflective symmetry?

Reflective symmetry is where a shape or pattern is reflected in a mirror line or a line of symmetry. The shape that has been reflected will be the same as the original, it should also be the same size and it will be the same distance away from the mirror.

What is Rotational symmetry?

The act of rotational symmetry is where a shape or pattern can be turned or 'rotated' around a central point and remain the same. Certain shapes have rotational symmetry of order X - this means that certain shapes can be rotated around a point and remain the same consistently, like a circle.

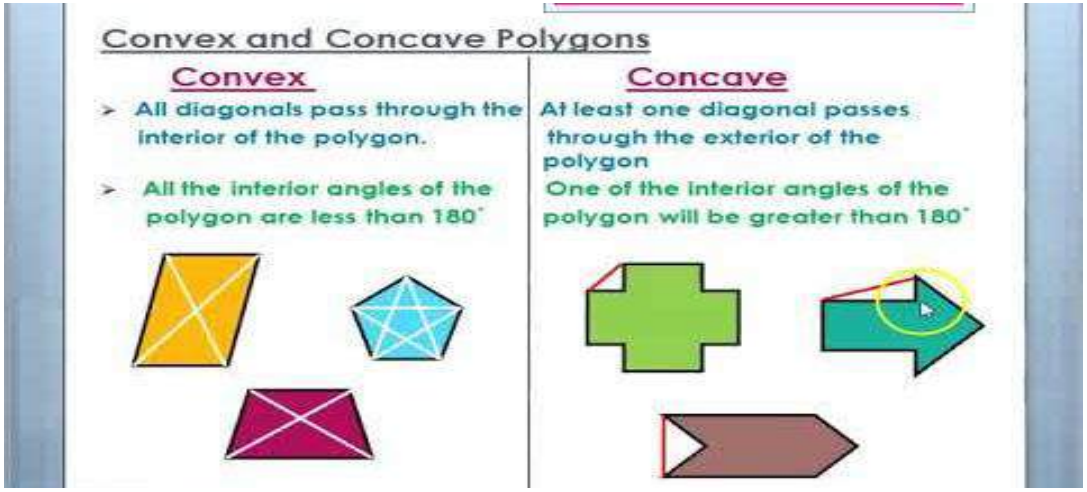
Perpendicular lines are two lines that meet or intersect at right angles (90 degrees)

Perpendicular bisector is a line ray or segment that divides the given segment into two congruent segments

A pyramid in geometry is a three-dimensional shape with the following characteristics:

- It has a flat polygon base.
- All other faces are triangles and are called lateral faces.
- The point above the base is called the apex.
- The edges are formed by connecting the base to the apex

A prism is a solid figure that has two parallel congruent sides that are called bases that are connected by the lateral faces that are parallelograms. There are both rectangular and triangular prisms.



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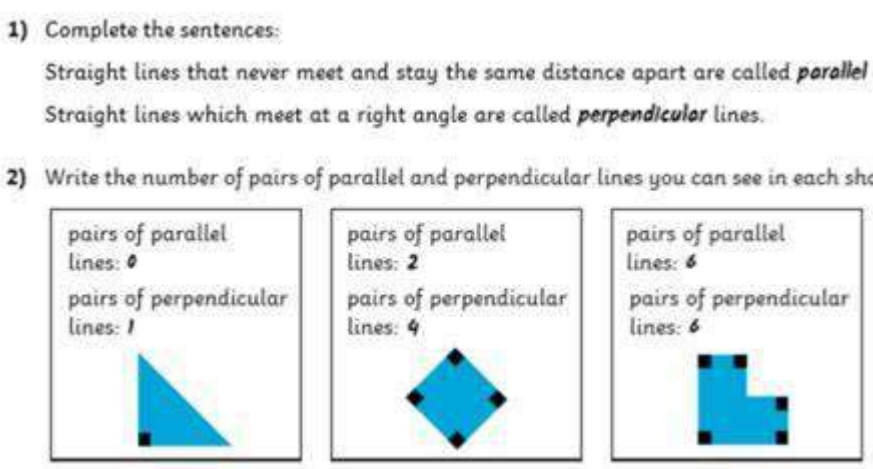


Retrieved from https://th.bing.com/th/id/OIP.3rqNdlbxvU-ltJagODRjfAAAAA?rs=1&pid=ImgDetMain

Opportunities for Subject Integration:

Within Other Areas of Mathematics:

Identifying angles when reading time on an analog clock
Useful in Spatial Reasoning
Geometry - Tessellation patterns of 2D shapes
Patterns and sequences

Art:

Incorporate geometric shapes into design and artistic projects.

Science:

Explore the role of geometric shapes in natural formations and engineering designs.

Language Arts:

Reading Passages: Incorporate passages or short texts that describe various geometric concepts. Follow up with comprehension questions related to the shapes and their attributes.

Text Analysis: Analyze texts that use geometric shapes in metaphors or symbolism. Discuss how shapes might be used to represent different ideas or themes in literature.

Create role-playing activities where learners act out scenarios involving different shapes. For instance, a scene where characters represent different triangles or polygons and have to work together to solve a problem.

Social Studies:

Architectural Analysis: Study famous architectural structures like the Pyramids of Egypt, the Parthenon in Greece, or the Great Wall of China. Analyze the geometric shapes and properties of these structures.

Have learners create presentations or reports on how geometric principles were used in the design and construction of these landmarks.

Building Models: Construct models of historical buildings using geometric shapes. For example, recreate the pyramids using triangular prisms or the Parthenon using columns and rectangles.

Historical Architecture Project:

Prompt: "Research the geometric design of the Colosseum in Rome. Create a model and describe how the geometric shapes and principles were used in its construction."

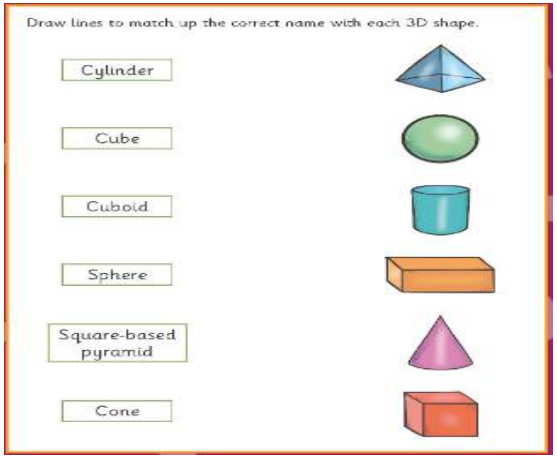
Cultural Artifacts Report:

Prompt: "Investigate geometric patterns in African textiles. Write a report on how these patterns are used in cultural designs and their significance."

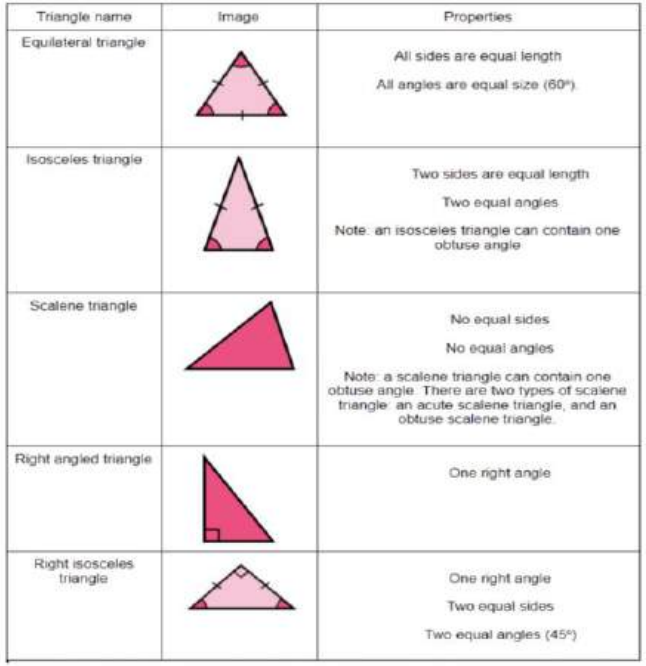
Map Creation Assignment:

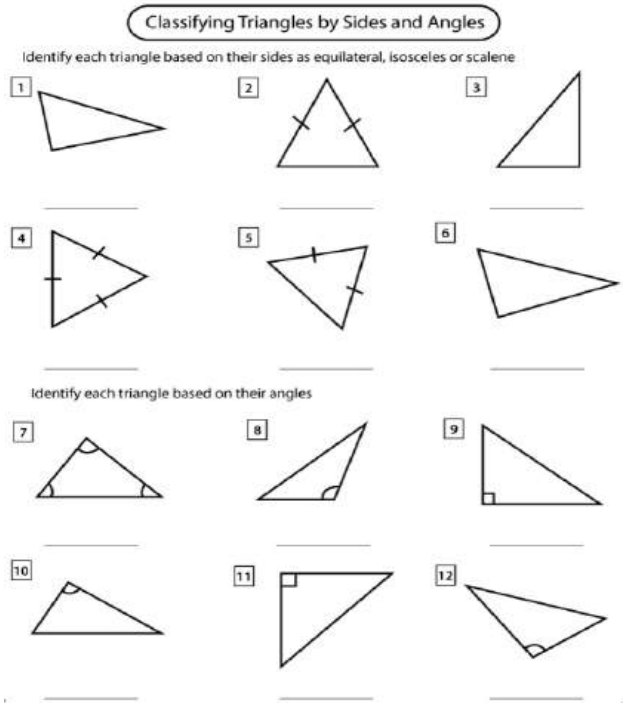
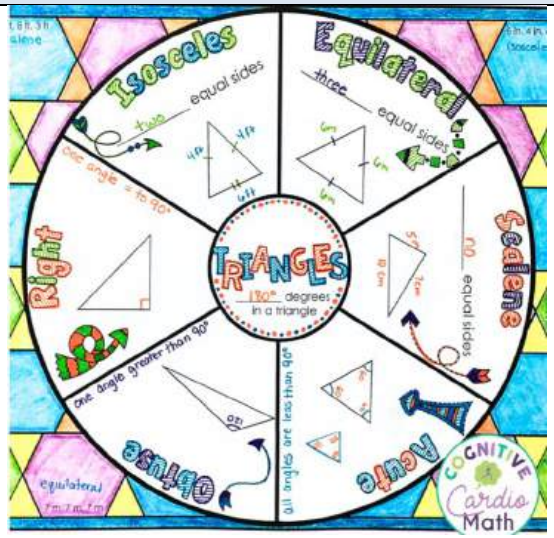
Prompt: "Design a fictional map of a newly discovered land. Use different geometric shapes to represent landmarks and natural features, and explain your choices."

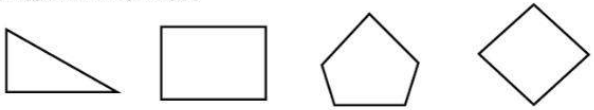
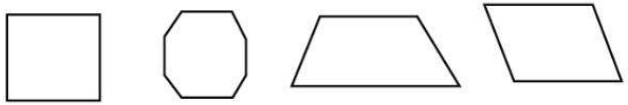
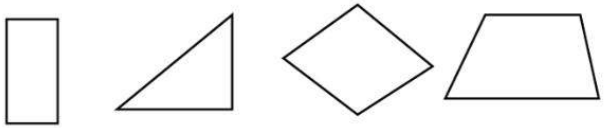
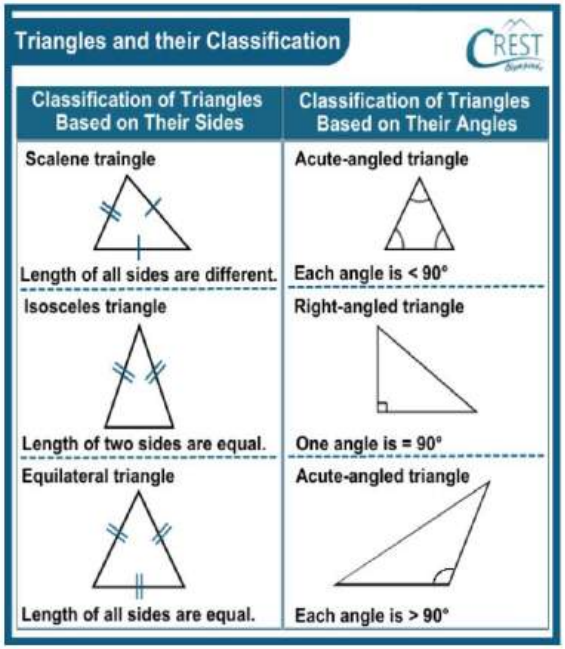
Essential Learning Outcome G2.2: Recognizing, Naming and Describing Shapes - Naming 2D & 3D shapes
Grade Level Expectations: Recognise, name and classify: - 3D shapes based on their properties. - triangles by their side lengths and angle measures. - polygons based on their properties. - types of angles.

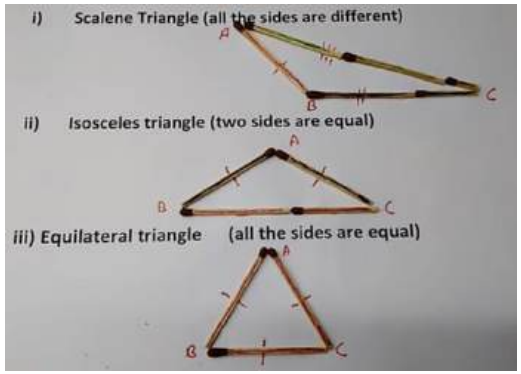
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to*:* **Knowledge** 1. Recognise prisms, pyramids, cylinders, and cones based on their bases, edges, vertices, curved surfaces, parallel and congruent bases, and congruent faces. 2. Name prisms, pyramids, cylinders, and cones based on their bases, edges, vertices, curved surfaces, parallel and congruent bases, and congruent faces. 3. Recognise angles as acute, obtuse and right. 4. Name angles as acute, obtuse and right.	**<u>Product: Entrance Slip-</u> To diagnose to what extent learners are able to recognise different 3D shapes.**  Retrieved from https://www.cgpplus.co.uk/primary/ks1/maths/m1whc8966-3d-shapes-stretch-year-2	**Learners will be guided into recognizing various 3d shapes, triangles, polygons and angles in different spaces and orientations.** ***Discovering through manipulatives*** Use manipulatives to invite learners to discover the properties of the different solids as well as sort them based on their attributes For example: Use physical models or images and attribute cards to classify prisms, pyramids, cylinders, and cones on sorting mats. Discuss and explain the distinguishing attributes. Measure and count the bases, edges, vertices, and surfaces of physical models. Let learners fill out attribute recording sheets and compare findings with classmates..

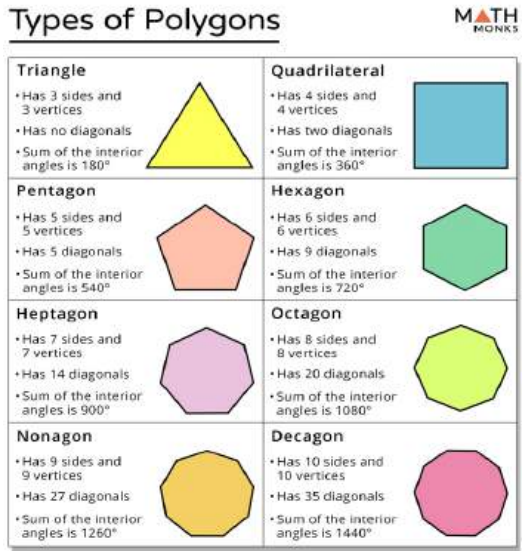
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
5. Recognise triangles by their side lengths as isosceles, scalene, and equilateral. 6. Name triangles by their side lengths as isosceles, scalene, and equilateral. 7. Recognise triangles by their angle measures as acute, obtuse, right, or both, e.g., right scalene, right isosceles. 8. Name triangles by their angle measures as acute, obtuse, right, or both, e.g., right scalene, right isosceles. 9. Recognise polygons based on their number and length of sides, number and type of angles, lines of reflective symmetry, and order of rotational symmetry. 10. Name polygons based on their number and length of sides, number and type of angles, lines of reflective symmetry, and order of rotational symmetry. **Skills** 11. Classify prisms, pyramids, cylinders, and cones based on their bases, edges,	**Checklist:** The learner is able to correctly match the 3D shapes. ● All ● 3-5 ● Less than 3 **Observation: To determine whether learners can sort everyday 3D shapes** Tape pictures of various everyday 3D shapes on the board and call on random learners to sort these 3D shapes into the categories written on the board.  Retrieved from https://primarylearning.org/worksheet/sorting-activity-for-3d-shapes/ **Checklist:** Learners are correctly able to sort 3D shapes into given categories. ● Yes ● Somewhat	 Retrieved from https://tunstallsteachingtidbits.com/2016/01/8239.html ***Video-assisted learning*** Invite learners to view videos classifying 3D shapes based on their attributes (see example below). Ask questions such as what properties do the cube and cuboid have in common? Sorting 3D Shapes based on their attributes Use templates to construct prisms, pyramids, cylinders, and cones from construction paper. Label the attributes and present the shapes to the class. Conduct a shape hunt around the classroom or school, recording findings on a worksheet. Share and discuss the results. Use games to help learners differentiate between attributes of 3D shapes. For example, use bingo cards with attributes of the shapes. Show images or models and call out attributes, covering the

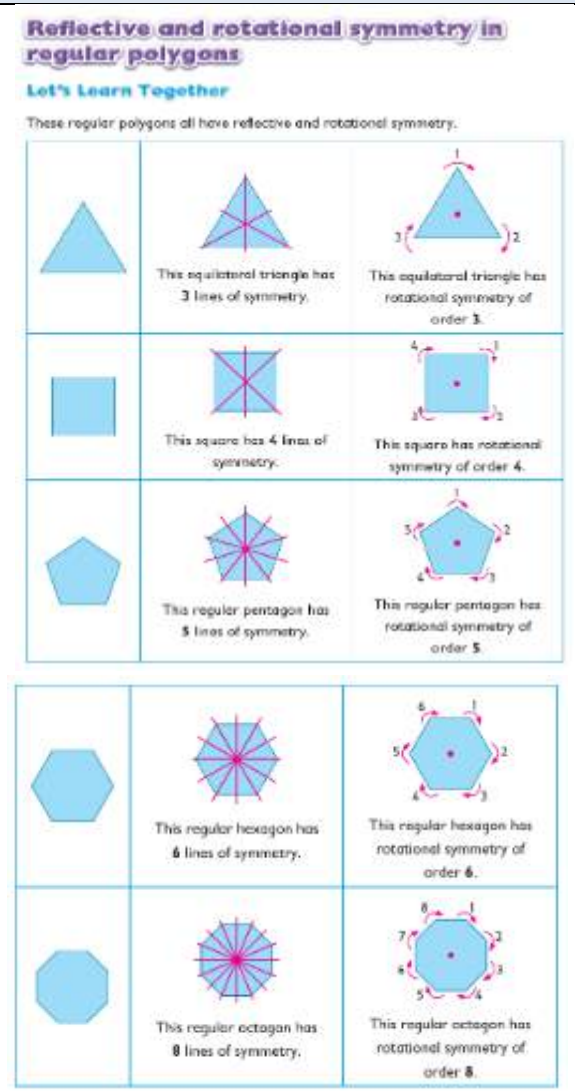
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
vertices, curved surfaces, parallel and congruent bases, and congruent faces. 12. Classify triangles by their side lengths as isosceles, scalene, and equilateral. 13. Classify triangles by their angle measures as acute, obtuse, right, or both, e.g., right scalene, right isosceles. 14. Classify angles as acute, obtuse and right. 15. Classify triangles by their side lengths as isosceles, scalene, and equilateral. 16. Classify triangles by their angle measures as acute, obtuse, right, or both, e.g., right scalene, right isosceles. 17. Classify angles as acute, obtuse and right. 18. Classify polygons based on their number and length of sides, number and type of angles, lines of reflective symmetry, and order of rotational symmetry.	• No **<u>Conversation</u>: To discuss the types of triangles and their attribute** Ask learners to identify the angle or triangle being described.  Retrieved from https://thirdspacelearning.com/gcse-maths/geometry-and-measure/types-of-triangles/ **<u>Checklist</u>:** Learners are correctly able to identify the various types of triangles based on their descriptions.	corresponding squares on the cards. Discuss the matching shapes when a learner wins. ***Math Wheel*** Use the math wheel to review the types of angles and triangles. Create a math wheel with your class on the types of angles and triangles and their attributes, including their angle measures.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values 19. Write a class journal on the properties of using triangles and 3D shapes in our environment. 20. Recognise the importance of various types of angles (acute, right, obtuse) and triangles (equilateral, isosceles, scalene, acute, right, obtuse) through the completion of different exercises. 21. Appreciate the use of polygons on buildings and objects in the environment	• All • Some • None **<u>Product</u>: Peer activity- To check that learners can classify triangles by their sides and angles.**  Retrieved from https://mathmonks.com/wp-content/uploads/2020/12/Classifying-Triangles-by-Sides-and-Angles-Worksheet.jpg	 Retrieved from https://cognitivecardiomath.com/cognitive-cardio-blog/types-of-triangles-math-doodle-notes/ ***Video-assisted learning and note-taking*** Show learners this video on how to identify types of triangles by their angles. Different Types of Triangles, Classifying Triangles based on Sides and Angles Invite learners to copy a table classifying triangles based on their attributes.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist: Learners are correctly able to classify triangles by their sides and angles. • All • More than half • Less than half **Product: To determine whether learners are able to identify polygons based on their attributes.** Color the appropriate polygon with desired properties A) Polygon with all right angles  B) Polygon with two pairs of parallel sides  C) Polygon with one pair of parallel sides  D) All the sides are the same length, and all the angles are of same measure 	 Retrieved from https://www.crestolympiads.com/topic/class-9-triangles-and-its-properties ***Triangle construction with matchsticks*** Place learners in small groups and give each group a set of matchsticks. Instruct groups to construct various types of triangles based on their side lengths and angles, e.g., obtuse, acute, right scalene, and right isosceles. Learners should label each triangle based on its attributes.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Retrieved from https://mathmonks.com/wp-content/uploads/2021/03/Properties-of-Polygons-Worksheet.jpg **Checklist:** Learners are correctly able to identify polygons based on their attributes. • All • Some • None **Observation: To observe learners using GeoGebra to discover the order of rotational symmetry of various polygons.** Invite learners to work in small groups using Geogebra to discover the rotational symmetry of polygons. The teacher must familiarize themselves with the activity to give instruction to learners. Symmetries of Regular Polygons - Rotational Symmetry – GeoGebra **Checklist:** Learners are correctly able to identify the order of rotational symmetry of the polygons. • All • Some • None	 Retrieved from https://hussellvs.best/product_details/52141428.html

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Polygon Chart- Review types of polygons and their attributes using charts  Retrieved from https://mathmonks.com/polygon

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 Retrieved from https://pango.education/maths-resource/9755/max-maths-year-5-learn-together-

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		reflective-and-rotational-symmetry-in-regular-polygons-1 ***Video-assisted learning:*** Use this video to invite learners to differentiate between reflectional and rotational symmetry. Reflectional Symmetry and Rotational Symmetry | Don't Memorise

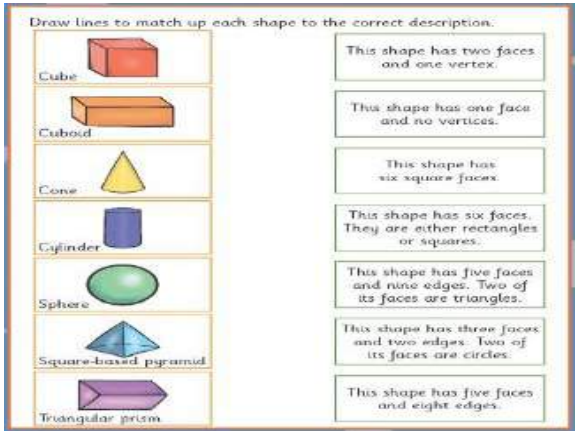
Additional Resources and Materials

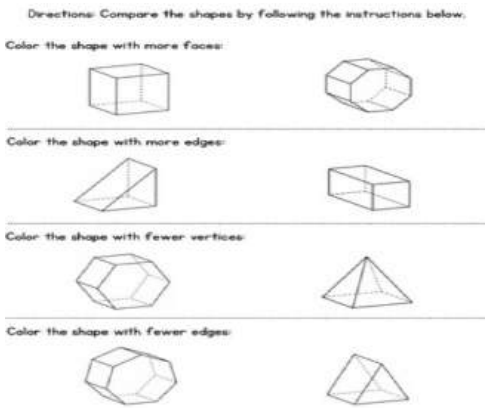
Manila paper, match sticks, popsicle sticks, markers, 3D manipulatives

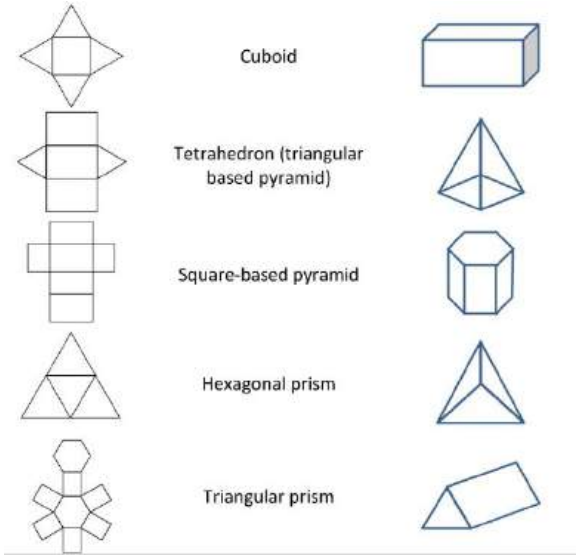
Additional Content Knowledge for the Teacher:

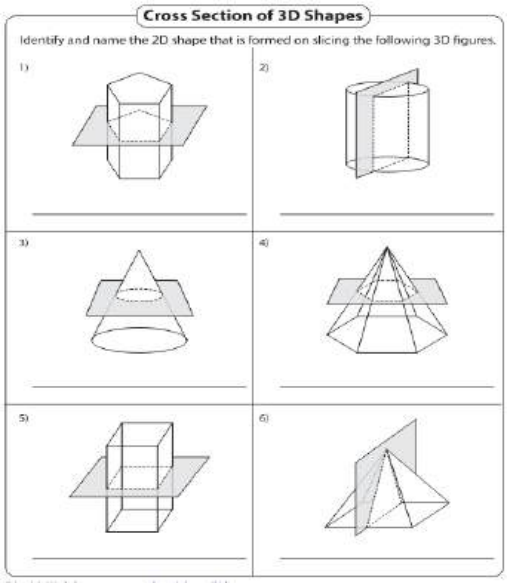
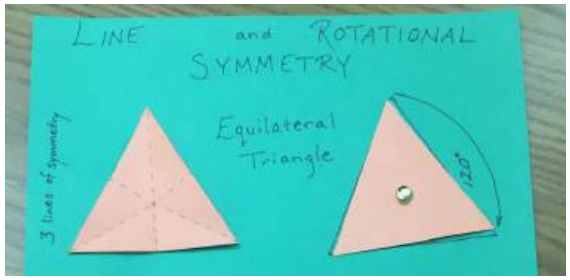
Reflectional symmetry means that an object will look exactly the same if it's reflected across a line of symmetry. Rotational symmetry means that an object will look exactly the same if it's rotated the right amount.
Retrieved from https://www.expii.com/t/symmetry-of-an-object-1059#:~:text=Reflectional%20symmetry%20means%20that%20an,it's%20rotated%20the%20right%20amount.

Essential Learning Outcome: G2:3 Recognizing, Naming, and Describing Shapes – Describing relationships between and among shapes
Grade Level Expectations: Recognise, describe, and compare attributes and characteristics of prisms, pyramids, cylinders, and cones. Make and test conjectures about the properties of some 2D and 3D shapes. Predict which nets will form a prism or pyramid and which 2D shapes can be made by slicing them. Recognise and compare the characteristics of various types of triangles and their symmetries. Classify polygons based on their properties and compare properties within them.

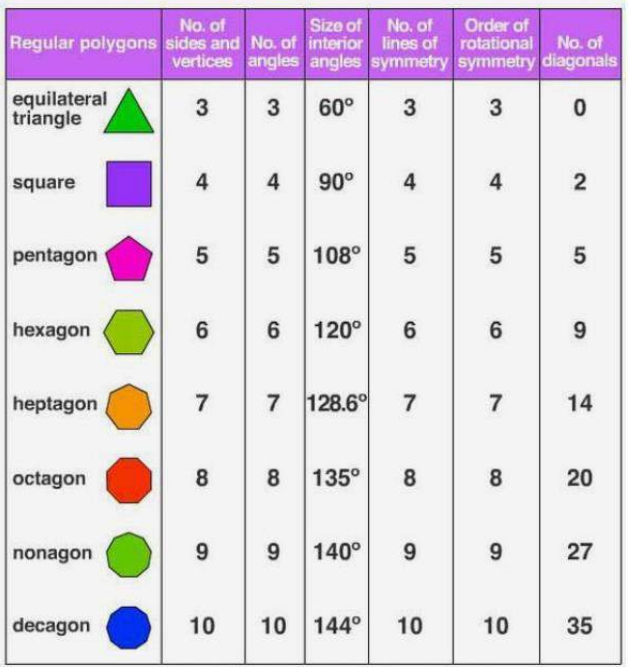
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Recognise the attributes of prisms, pyramids, cylinders, and cones. 2. Describe the attributes of prisms, pyramids, cylinders, and cones 3. Recognise the attributes of various triangles (acute, obtuse, right, scalene, isosceles, and equilateral) 4. Describe the attributes of various triangles (acute, obtuse, right, scalene, isosceles, and equilateral). 5. Recognise the rotational and reflective symmetry of triangles.	**<u>Product: Entrance Slip</u>- To diagnose to what extent learners are able to recognise the attributes of 3D shapes.**  Retrieved from https://www.cgpplus.co.uk/primary/ks1/maths/m1wac8938-3d-shape-match-up-year-2	**Learners will be guided into recognizing the attributes of 3D shapes, triangles, polygons and angles in different spaces and orientations.** ***Discovering 3D Shapes around us*** Ask learners to identify 3D shapes in their environment (eg. cupboards, toilet paper roll, tent) and classify them as prisms, pyramids, cylinders, and cones based on their attributes. ***Comparing 3D shapes*** Place learners in groups. Give each group a set of 3D manipulatives and have them compare their attributes. E.g., • pyramids vs prisms • cones vs cylinders

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
6. Describe the rotational and reflective symmetry of triangles. **Skills** 1. Compare the attributes of prisms, pyramids, cylinders, and cones. 2. Make conjectures about which nets will or will not form a given prism or pyramid. 3. Test conjectures about which nets will or will not form a given prism or pyramid. 4. Make conjectures about which 2D faces can be seen by slicing a given prism or pyramid. 5. Test conjectures about which 2D faces can be made by slicing a given prism or pyramid. **Skills** 6. Compare the attributes of various triangles (acute, obtuse, right, scalene, isosceles, and equilateral).	**<u>Checklist</u>:** The learner is able to correctly match the 3D shapes to their attributes. ● All ● 4-7 ● Less than 4 **<u>Product</u>: To check that learners can compare 3D shapes.**  Retrieved from https://www.tes.com/teaching-resource/properties-of-3d-shapes-coloring-and-comparing-faces-edges-and-vertices-12740297 **<u>Checklist</u>:** The learner correctly compared the 3D shapes ● Yes ● Somewhat ● No **<u>Conversation</u>: To invite learners to make conjectures on nets of prisms and pyramids**	● cylinders vs prisms ● cones vs pyramids ***3D nets using GeoGebra*** Invite learners to test conjectures on 3D nets on GeoGebra.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
7. Compare the rotational and reflective symmetry of triangles. 8. Compare polygons based on these properties: number of sides, angles, rotational and reflective symmetry. 9. Make conjectures about the properties of triangles and polygons. 10. Test conjectures about the properties of triangles and polygons. **Values** 11. Show an appreciation for the properties of various triangles and polygons by making creative posters 12. Make and test conjectures about the attributes of various 3D shapes, such as edges, vertices, and faces."	Place a chart on the board showing different nets of pyramids and prisms. Discuss with learners which prism or pyramid each net will form. In small groups, invite learners to fold given nets to determine the accuracy of their conjectures.  Retrieved from https://www.math-salamanders.com/image-files/math-nets-worksheets-match-the-nets-1.gif **Checklist:** The learner made accurate conjectures on which prisms and pyramids the nets would form. • Yes • Somewhat • No	***Geometry B: Folding Nets of 3D Shapes – GeoGebra*** ***Discovering through testing*** Place learners in groups and give each group a firm cheese triangle (pyramid). Ask learners to form conjectures on which 2D shape can be made if it is sliced vertically. Invite learners to slice the cheese using a disposable knife to test their conjecture. Use manipulatives of other prisms and pyramids and ask learners to make conjectures about them. *Learners should recognise that when you slice a prism or pyramid, the 2D shape you see depends on how you cut it.*  Retrieved from https://depositphotos.com/photo/cheese-triangles-on-white-67013391.html

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	<u>Product</u>: To determine if learners are able to guess the 2D shape that is formed from slicing the 3D shape -focus on prisms & pyramids  Retrieved from: https://www.mathworksheets4kids.com/solid-shapes/cross-section/identify-3d-shapes.pdf **<u>Checklist</u>:** The learner was able to accurately determine which 2D shapes will be made by slicing the prisms and pyramids. • All • Some • None	***Learning by doing*** Draw the three types of triangles on a cardboard chart (equilateral, scalene and isosceles). Place an exact cut-out of each triangular face over its drawing, fastened with a thumb tack in the middle. Have different learners come to the board to turn the cut-out over the drawing to find the order of rotational symmetry of each triangular face.  Retrieved from https://www.pinterest.com/pin/quick-line-and-rotational-symmetry-project-this-home-school--298996862774251492/ Give learners cut-outs of the different types of triangles and have them fold them in different ways to find the lines of reflective symmetry.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Observation: Peer practice- To invite learners to work online together to recognise types of triangles based on their attributes. **Interactive Math Lesson | Classifying Triangles (Equilateral, Isosceles, or Scalene)** **Interactive Math Lesson | Classifying Triangles (Right, Acute, Obtuse)** **Checklist:** The learners correctly identified the different types of triangles based on the given attributes. ● Yes ● Somewhat ● No **Observation:** ***To discover if learners are able to fill in an empty table such as this one with the correct attributes for each polygon.***	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	regular polygons ... fact chart  **Retrieved from** https://www.pinterest.com/pin/39195459240836472/ **Checklist:** The learners correctly completely at east ⅝ rows. • Yes • No	

Regular polygons	No. of sides and vertices	No. of angles	Size of interior angles	No. of lines of symmetry	Order of rotational symmetry	No. of diagonals
equilateral triangle	3	3	60°	3	3	0
square	4	4	90°	4	4	2
pentagon	5	5	108°	5	5	5
hexagon	6	6	120°	6	6	9
heptagon	7	7	128.6°	7	7	14
octagon	8	8	135°	8	8	20
nonagon	9	9	140°	9	9	27
decagon	10	10	144°	10	10	35

Additional Resources and Materials

Manila paper, thumbtacks/fasteners, cheese wedges, 3D shapes manipulatives

Additional Content Knowledge for the Teacher

Website for additional information on slicing 3D shapes:
https://www.pbslearningmedia.org/resource/muen-math-g-slicing3dfigures/slicing-three-dimensional-figures/

Opportunities for Subject Integration

Geometry & Measurement: Compare and calculate the surface area and volume of 3D shapes like prisms and cones.

Algebra & Geometry: Test conjectures about shape properties, exploring relationships between sides, angles, and dimensions.

Spatial Reasoning: Predict nets and 2D cross-sections of 3D shapes to enhance visualization skills.

Symmetry & Transformations: Compare triangles and explore transformations like reflections and rotations.

Classification**:** Classify polygons based on properties using diagrams to explore relationships.

Mathematics & Art: Recognise and describe attributes of prisms, pyramids, and other shapes, then create artistic models or drawings, blending geometry with creative design.

Mathematics & Science: Make and test conjectures about 2D and 3D shapes, tying into physics or engineering by exploring how shapes impact structures or stability in real-world applications.

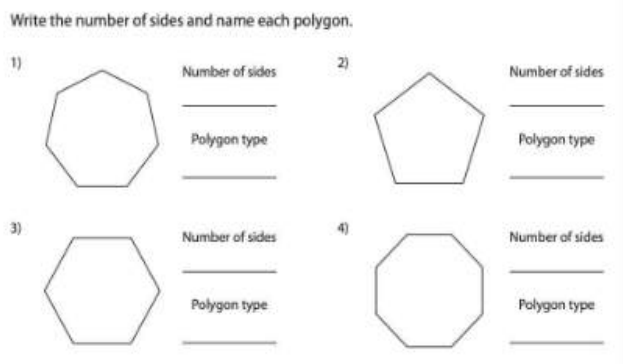
Mathematics & Technology: Predict which nets will form prisms or pyramids using technology like 3D modeling software to experiment with shape construction and transformations.

Mathematics & Physical Education: Compare characteristics of triangles and their symmetries, applying this knowledge in sports or movement analysis where angles and symmetry affect performance.

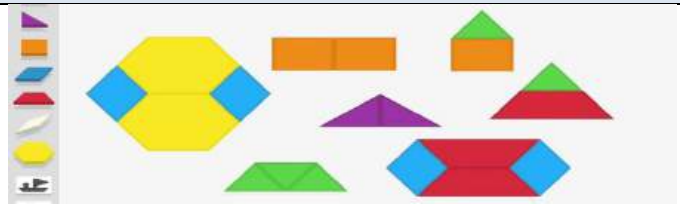
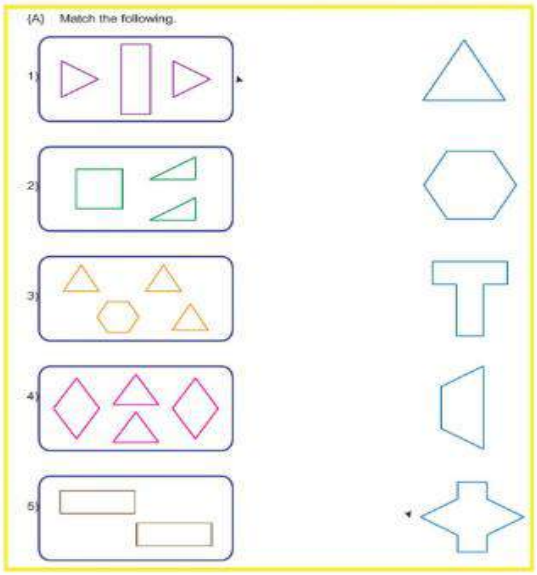
Mathematics & Language Arts: Classify polygons and compare properties, encouraging learners to use precise mathematical language to describe and explain their reasoning in written or oral presentations.

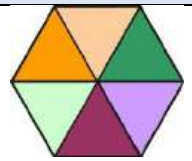
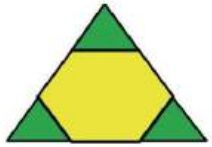
Essential Learning Outcome G 3.1: Composing, Decomposing and Transforming Shapes - Combining Shapes
Grade Level Expectations: Construct composite objects (various prisms, pyramids, cylinders and cones) from other shapes Construct composite shapes (various polygons including triangles) from other polygons.

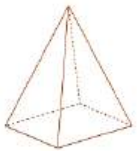
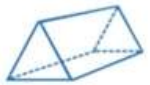
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Recognise polygons and non-polygons 2. Name polygons 3. Identify prisms, pyramids, cylinders and cones with further accuracy 4. Describe composite shapes and objects, including how they are formed by combining simpler geometric shapes. 5. Identify shapes making up the composite shapes or objects **Skills** 6. Draw polygons to create composite shapes that are other polygons(including triangles)	**Product Entrance Slip** **To determine whether learners can correctly identify polygons** Learners sing along to the polygons song The Polygon Song | Polygons for Kids | Polygons Geometry | Silly School Songs Learners will then be shown images of shapes and be asked to determine whether they are polygons or not  **Observation /Self Assessment** **To determine whether learners can name polygons based on their sides**	**Learners will use real life application, technology, play and independent learning to identify and construct composite shapes using various 3d shapes and polygons** ***Guided discovery using real-life application*** Give pictures of everyday items and be asked to determine what polygon their faces most look like 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
7. Create composite shapes such as various prisms, pyramids, cylinders and cones using other shapes **Values** 8. Write a reflection on the importance of different shapes in their environment 9. Display the value of simpler shapes in constructing compound geometrical figures.	Observe learners as they count the sides of given polygons . They will then determine the name of each polygon based on the number of its sides.  Retrieved from https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.liveworksheets.com%2Fw%2Fen%2Fmath%2F2289186&psig=AOvVaw2NHzd7Igd_oFC2Eci6FAFM&ust=1717537423135000&source=images&cd=vfe&opi=89978449&ved=0CBAQjRxqFwoTCIDXydKzwIYDFQAAAAAdAAAAABAE **Checklist** I able to name ☐ all ☐ most ☐ some ☐ none of the shown polygons correctly ?	Retrieved from Google Images ***Discovery through Play*** Shapes Bingo

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Talking Circles **To diagnose to what extent learners can recognise various 3D shapes and their attributes** Learners will be seated in a circle, a bag will be passed with images of prisms , pyramids , cones and cylinders. Learners will select an image. Teacher will listen to learners as they explain the object in their picture based on its attributes (faces , base, vertices, edges) Learners can identify and describe objects as cones,pyramids, prism and cylinders) using their attributes ☐ Yes ☐ No ☐ Somewhat **Think, Pair , Share /Peer Assessment** **To identify the make up of given composite shapes** In pairs learners will look at images of some composite shapes or objects and be asked to identify the shapes used to create them ..	 Retrieved from ttps://bingobaker.com/image/1928065/800/1/3d-shapes.png **Independent Learning** Learners will be given a worksheet and asked to match shapes to the composite they could be used to create

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 **Retrieved from** https://i.ytimg.com/vi/G_X5FrYOe-Y/maxresdefault.jpg **<u>Checklist</u>** **Learners will be asked to circle the appropriate answer.**  **<u>Think, Pair, Share</u>** **Composite Polygon Construction** In pairs learners will be asked to draw and shade varying sizes of composite polygon shapes. Learners will be asked to identify their created composite shape, note the different types of shapes as well as the number of each shape used to create them. Eg.	 Retrieved from https://www.liveworksheets.com/sites/default/files/styles/worksheet/public/def_files/2022/4/26/20426111315526786/204261113155267860001.jpg?itok=deuaJ4Ue ***<u>Learning through play and using technology</u> - Online game activity*** Learners will drag, add and rotate various polygons to create composite shapes

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 a hexagon created from 6 triangles  a triangle made up of 3 triangles and a hexagon **Retrieved from** **https://shop.luckylittlelearners.com/wp-content/uploads/2022/04/Small-Group-and-Intervention-Math-Kit-Instructional-Resources-Geometry-Composing-Shapes-Cover.jpg** **Checklist** Learners were able to use given pieces to accurately create composite shapes that are polygons yes somewhat no **Group Work /peer assessment** **Creating Composite Shapes**	Retrieved from https://apps.mathlearningcenter.org/pattern-shapes/ **Independent Learning** Learners will be given a worksheet where they are to draw the shapes they would use to compose given 3d shapes then fill out information based on their attributes.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Learners will be given cut outs to represent faces of circles, triangles, rectangles squares etc and glue/ tape, paper containing descriptions of various shapes In their groups learners are to read the description given and use the cut outs to create the 3 D shape being described then name them Eg. I am a shape with 5 faces , 8 edges and 5 vertices , I am made up of four triangles and one rectangle  rectangular based pyramid . Retrieved from https://study.com/cimages/multimages/16/square_pyramid1989337697368088437.png Groups will share their shapes and discuss their answers with the class. **Checklist** Learners were able to accurately construct polygons using shapes based given descriptions yes somewhat no	  Shapes of the faces | Shapes of the faces Name of the 3D shape | Name of 3D shape Number of faces | Number of faces Number of vertices | Number of vertices Number of edges | Number of edges

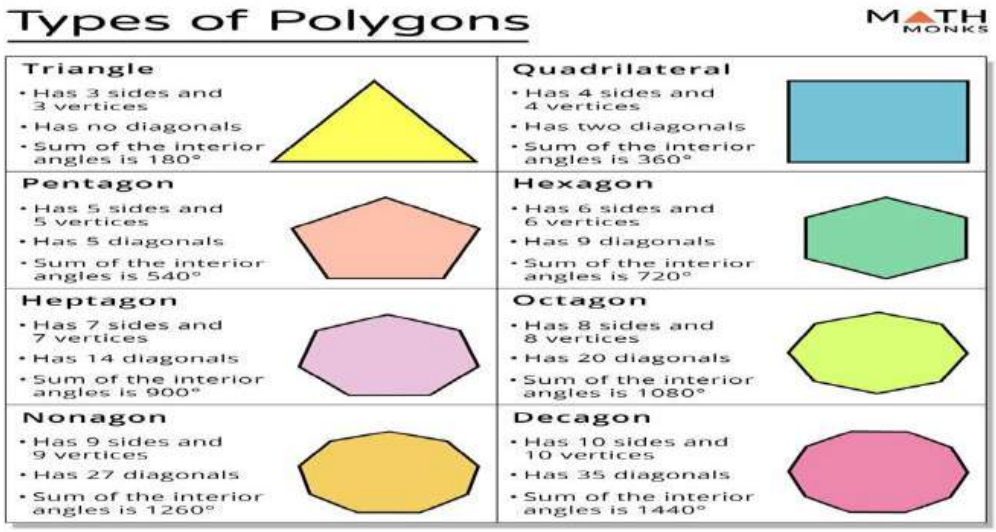
Additional Resources and Materials

https://www.khanacademy.org/math/cc-fifth-grade-math/properties-of-shapes/properties-shapes/a/polygons-review
https://teach.files.bbci.co.uk/skillswise/ma343dsh-e1-w-shape-bingo.pdf
https://www.matific.com/co/en-us/home/maths/episode/tile-a-shape-create-composite-shapes-simple/

Additional Content Knowledge for the Teacher

A composite shape can be defined as a shape created with two or more basic shapes. We often refer to composite shapes as compound and complex shapes as well.

A Polygon is a closed figure made up of line segments (not curves) in a two-dimensional plane. Polygon is the combination of two words, i.e. poly (means many) and gon (means sides). A minimum of three-line segments is required to connect end to end, to make a closed figure.



Real Life Examples Composite Figures
https://i.pinimg.com/736x/4d/6d/3e/4d6d3ef1fa9554347513b5ddd7bf8e34.jpg

Opportunities for Subject Integration:

Geometry & Algebra: Examine how combining shapes influences algebraic expressions for areas and perimeters.

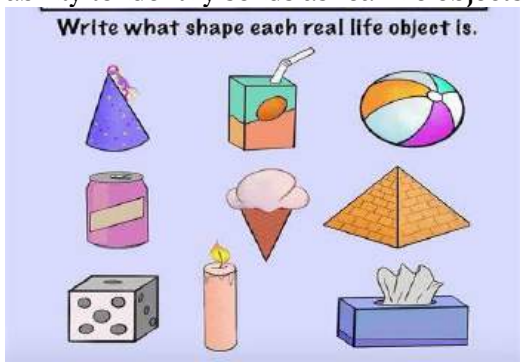
Geometry & Measurement: Decompose complex shapes to calculate surface areas and volumes.

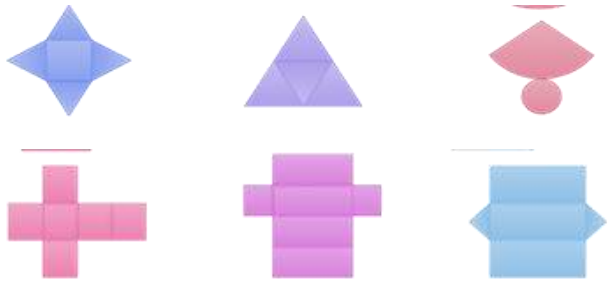
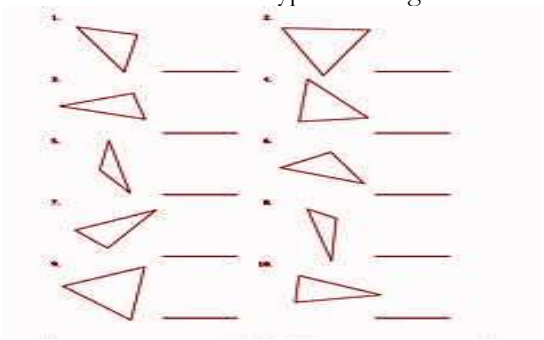
Geometry & Spatial Reasoning: Use transformations to understand shape composition and decomposition.

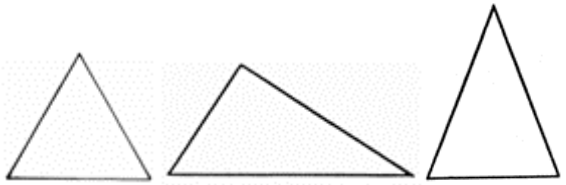
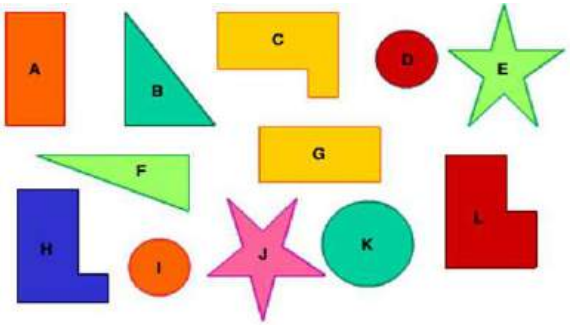
Geometry & Problem-Solving: Apply shape composition and decomposition to real-world design and optimization problems.

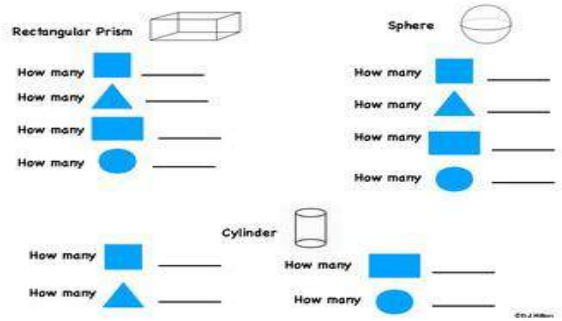
Geometry & Technology: Use digital tools to manipulate shapes and explore their properties.

Essential Learning Outcome: G3.2 - Composing, Decomposing and Transforming Shapes - Deconstructing Shapes
Grade Level Expectations: Deconstruct objects into nets of specific prisms, pyramids, cylinders and cones and by slicing. Deconstruct shapes using symmetry and folding to determine if a triangle is equilateral, isosceles or scalene. Use symmetry and folding to subdivide polygons into congruent parts.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Identify prisms, pyramids, cylinders and cones as everyday objects. 2. Differentiate between the nets of solid shapes 3. Differentiate among isosceles, equilateral and scalene triangles. **Skills** 4. a. Fold shapes accurately and with precision. b. Use the ruler properly to draw lines of symmetry. c. Sort triangles into isosceles, equilateral and scalene	**Entrance Slip/self assessment - to test learners' ability to identify solids as real life objects**  Retrieved from https://th.bing.com/th/id/OIP.Baau7wPuKssL7GE8PsatDQAAAA?rs=1&pid=ImgDetMain **Checklist** I can name each shape correctly yes/no **Discussion - to determine learners' ability to match a net to its shape** State the shape for each net.	**Through manipulation, learners will deconstruct real life objects, divide faces of polygons to show congruency and use symmetry to determine types of triangles.** ***Learning through manipulation*** Have learners bring as many objects from home as possible that are easy to deconstruct such as toilet paper roll, party hat and matchbox. A bank of objects can be created for future activities. In pairs invite learners to deconstruct their shape and record the faces of the shapes seen. ***Discovery Learning*** Have learners use solid shapes from the bank as well as those supplied that can be deconstructed. Have them deconstruct the shapes where they were stuck together and trace out the outline.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values 5. Recognise the accuracy derived when using a ruler to show lines of symmetry in a shape 6. Use the concept of folding to show congruence. 7. Deconstruct 3D shapes.	 **<u>Observation/self assessment</u> - to test learners' ability to differentiate between types of triangles** State the name of each type of triangle  Retrieved from https://i.pinimg.com/236x/fb/f0/71/fbf0719ea1e11792d9b5582bba808c9f.jpg **Checklist** I can name at least 6/10 triangles yes/no **<u>Product</u> - to determine learners' ability to show lines of symmetry**	Learners experiment by deconstructing a number of similar shapes to see if there can be more than one net of the shapes. ***Video-assisted Learning*** Expose learners to the three types of triangles through the faces of cut outs. Invite learners to measure the sides and make generalizations about the characteristics. Present the video to learners https://youtu.be/qdgcbhC0F-c The triangles are then categorized. ***Conceptual understanding*** Place learners in groups with varied triangle cutouts. Provide learners with examples of the three types of triangles. Have learners fold cutouts to derive equal parts. Generate a discussion on what is meant by symmetry. Invite learners to sort triangles by type and then fold the shapes in an attempt to create lines of symmetry. Learners will record how many different ways they can be folded to form equal parts. They record their observations to present to class.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Draw the line(s) of symmetry on each triangle and state the number of lines of symmetry in each.  **<u>Checklist</u>** Learner can accurately draw all lines of symmetry yes/somewhat/no **<u>Peer Assessment</u> - to determine learners ability to identify congruence.** Each learner will dip a shape by letter. They will say if the shape can be folded to form congruent parts. Class will determine accuracy and justify each response as correct or incorrect. 	***Discovery Learning*** Have learners fold shapes to get congruent parts. Discuss the results and the lines of symmetry created. ***Video-assisted learning*** Present this video to learners for discussion. Pause using discretion to ask how many particular 2D shapes were derived. For example in the square based pyramid, ask them to name the number triangles (4) and squares (1). Retrieved from https://youtu.be/GqXT808Sa3k

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Retrieved from https://www.open.edu/openlearncreate/pluginfile.php/472017/mod_oucontent/oucontent/58762/1dacbd98/82843013/tessa_enrw_numeracy_m2s5_f32.jpg **Checklist** Learner was able to recognise congruence yes/no **Product/Observation - to test learners ability to recognise 2 shapes formed from deconstructing solids.** Learners will choose any two of these solids to deconstruct, then fill in the spaces below. Teacher will provide the solids which can be deconstructed.  Retrieved from https://ecdn.teacherspayteachers.com/thumbitem/3D-Shape-Deconstruction-Worksheet-5967869-1598640655/original-5967869-2.jpg **Checklist** Learner is able to deconstruct shape yes/no	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Leaner is able to identify the number 2d shapes from deconstruction yes /no	

Additional Resources and Materials

- 2D shapes and 3D Shapes geometrical shapes
- Flash cards related to geometrical shapes and properties
- 2D and 3D shapes bingo cards
- 2D and 3D shapes Charts
- Grid paper
- Geoboard
- Protractor

Additional Content Knowledge for the Teacher:

Lines of symmetry are straight lines that divide a shape into two equal parts, where one part is an exact reflection or mirror image of the other.

Congruent: identical in form when superimposed.

https://elementarynest.com/how-to-teach-2d-and-3d-shapes/

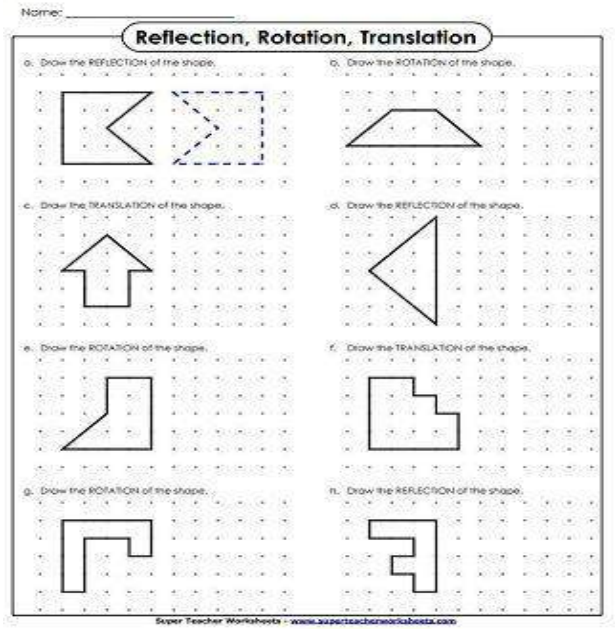
https://teachingperks.com/teaching-shapes-2d-and-3d/

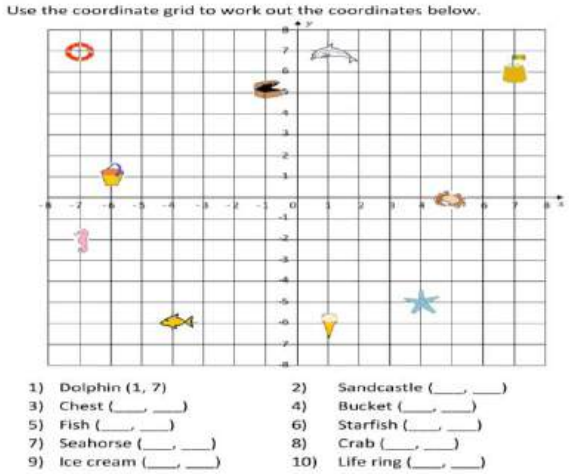
Opportunities for Subject Integration:

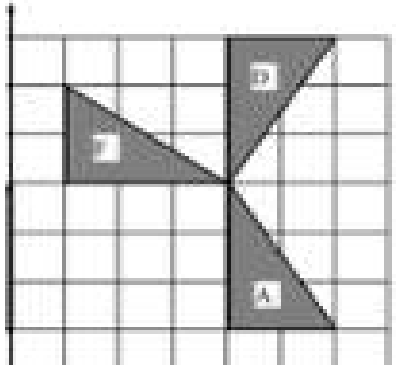
- Geometry - Tessellation patterns of 2D shapes
- Measurement - Perimeter, Area and Volume

Essential Learning Outcome G3.3: Composing, Decomposing and Transforming Shapes - Transforming Shapes
Grade Level Expectations: Recognise, name, perform, and draw transformations (reflections, rotations, translations). Predict, describe and justify the image of a shape under a given transformation. Use a pair of perpendicular number lines, called axes (x-axis and, y-axis), to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair (x-coordinate and y-coordinate) Plot points on the first quadrant of the Cartesian plane. Use a coordinate system to represent transformation in a coordinate plane. Transform 3D objects and 2D shapes using concrete and pictorial materials (geoboards, tangrams, square dot paper, etc.) to represent various polygons including triangles.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Differentiate among the terms reflections, rotation and translation in relation to shapes 2. Describe pairs of shapes that show transformations: a. reflections b. rotations c. translations. 3. Determine the composition of a single transformation. **Skills** 4. Given a shape, make predictions then create the reflection, translation and rotation of the said shape.	**<u>Discussion /self assessment</u> - to orient learners on the nature of and types of transformations** <u>3 Types of Transformations *Translations Reflections & Rotations *Math For Kids*</u> (video can be paused periodically based on discretion during discussion) 1. After watching the video learners will have a discussion on the different types of transformation. Ask learners to identify similarities and differences. Eg. The size of the object and its angles remains constant, however, the orientation changes. 2. After watching the video learners will complete the worksheet below.	Learners will use technology to explore the transformation of shapes ***Video Assisted learning*** <u>3 Types of Transformations *Translations Reflections & Rotations *Math For Kids*</u> (video can be paused periodically based on discretion during discussion) Have learners look at the video and discuss the three transformations. Let learners demonstrate an example of a real life scenario which depicts each one. Eg. The image formed when looking into a mirror is an example of a reflection. Eg. Sliding some spaces on the classroom floor. ***Conceptual Understanding*** Provide worksheets with a shape and three possible outcomes based on transformation. using the type as a cue, learners predict which shape

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
5. Draw shapes to show reflection, translation and rotation and justify. 6. Locate x and y axis on a graph 7. a. Plot coordinates on the graph b. write ordered pairs from coordinate graph 8. Use a coordinate system to represent transformation in a coordinate plane. 9. Use geoboards and tangrams to represent various polygons to reflect translations, rotations and reflections. **Values** 10. Showcase skills by creating class posters with transformations.	 Name: _____ **Reflection, Rotation, Translation** a. Draw the REFLECTION of the shape. b. Draw the ROTATION of the shape. c. Draw the TRANSLATION of the shape. d. Draw the REFLECTION of the shape. e. Draw the ROTATION of the shape. f. Draw the TRANSLATION of the shape. g. Draw the ROTATION of the shape. h. Draw the REFLECTION of the shape. Super Teacher Worksheets - www.superteacherworksheets.com Retrieved from worksheets on reflection, rotation and translation identification for kids - Search Images (bing.com) **Checklist** I can transform at least ⅝ objects accurately yes/somewhat / no **Observation- to observe learners' ability to determine how an image was formed** Have learners work in pairs to formulate transformations of rotation, reflection and translation using 2 D shapes. Learners should be able to state what is to be done to form the various transformations before performing the task. They can also perform this activity using tangrams and geoboards.	from the alternative will be the match for the original shape. ***Conceptual Understanding*** Present learners with work cards with different types of transformation. Learners will look at the characteristics displayed by the set and sort the cards into the three types giving reasons for their placements. ***Video - Assisted Learning*** Coordinates In Maths (video will be stopped at 1:38 to exclude irrelevant content) Present the video. Learners will then walk along a grid drawn on the floor to locate the coordinates of a point. 1. After modeling, learners take turns in plotting points on a graph GeoGebra software, verbalizing the reason why decisions are taken. 2. Using graph paper and provided coordinates, have learners name points using letters on the graph to match the coordinates.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	<u>Checklist</u> Learner can state 1 or more observation yes/no **<u>Product /Peer Assessment</u> - to test accuracy in plotting point on the cartesian plane** Write the coordinates of each picture on the line below. Peers will exchange worksheet for assessment  Retrieved from https://i.pinimg.com/originals/06/5a/0e/065a0e2bc5f2895830a179a06942f0a1.jpg **Checklist** Learner can state at least 6/10 ordered pairs or more observation yes/no	***Video assisted learning*** Present the video https://youtu.be/vQ2-o2Oj3WQ (teacher will use discretion in pausing video to exclude irrelevant content) Pause to discuss how each shape is transformed. ***Using Manipulatives*** Present learners in groups with geoboards and tangrams along with a picture with shapes and rubber band. Invite learners to discover transformation by creating shapes of their choice and representing them using any of the three types of transformation. Learners present their work to class at the end of the exercise.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product/- to test learners' ability to accurately plot coordinates Have learners plot the points A, B C of a triangle on graph paper (object). Learners will plot the points of the image of the triangle when reflected, translated and rotated (shaded differently). Learners will then determine by labeling which image represents each transformation. Eg. Learners will plot **D** (object). Image **F** and **A** (also plotted) represents a rotation and reflection respectively.  Retrieved from Google Images **Checklist** Learner can accurately plot points yes/somewhat /no Learner can identify the images under the respective transformation yes/no	

Additional Resources and Materials

GeoGebra Software
Wolfram software
Graph paper, squared paper

Additional Content Knowledge for the Teacher:

An ordered pair consists of two values that are written in a fixed order (x, y).There are three main types of transformations:

- translations (moving by sliding across the shape),
- rotations (turning the shape),
- reflections (flipping the shape like a mirror image).
- Rigid transformations keep the same size and angles of the shape.

The shape in the original position (before transformation) is called the object and the object in the new position (after transformation) is called the image.

Opportunities for Subject Integration:

Geometry & Algebra: Recognise, name, and perform transformations (reflections, rotations, translations) and use algebraic methods to describe their effects on shapes.

Geometry & Coordinate Systems: Use coordinate systems with axes to define points, plot them on the Cartesian plane, and explore transformations within this system.

Measurement

Introduction to Strand

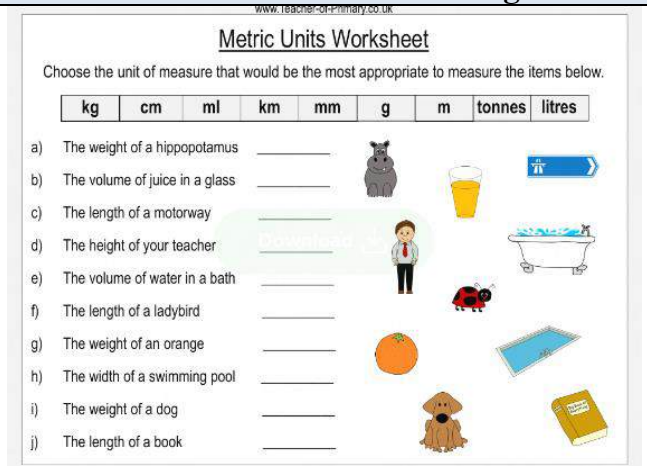
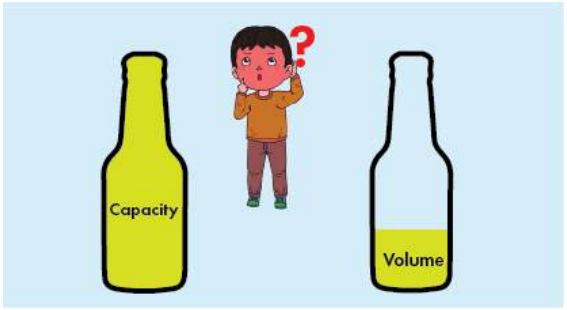
Measurement is a crucial part of the curriculum across different educational levels. It is introduced to learners to develop their understanding of quantifying various physical attributes accurately. The curriculum typically measures length, mass, capacity, and volume. Competence in measurement concepts help learners in various subjects like mathematics, science, and even in everyday life. It lays the foundation for more advanced topics in geometry, physics, and chemistry. By mastering measurement concepts, learners develop critical thinking skills, problem-solving abilities, and a practical understanding of the physical world around them.

Essential Learning Outcome M 1.1: Understanding What and How We Measure - Developing an understanding of measurable attributes.

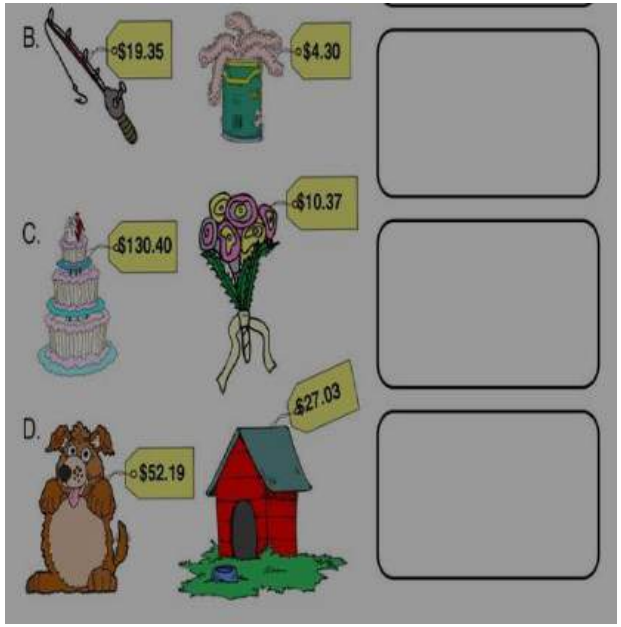
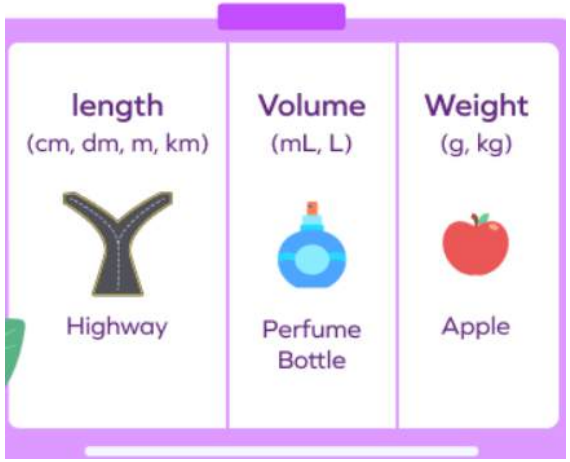
Grade Level Expectation:

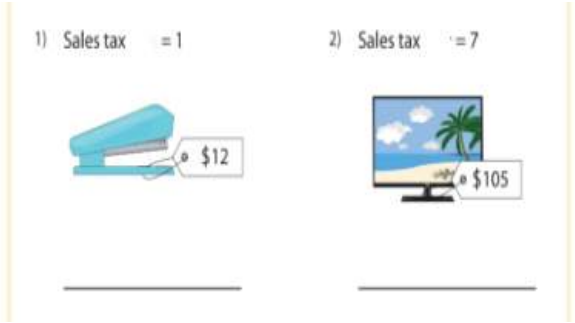
Develop and apply language relating to measurement terms (surface area, money, time and angles);
Recognise angles as geometric shapes formed wherever two rays share a common endpoint and understand concepts of angle measurement.
Understand measurement as the number that indicates a comparison between the object's attribute and the same attribute of a given unit of measure.
Understand that 'to measure' means to fill, cover, or match the attribute being measured with a unit of measure for that attribute.
Measure length, area, mass, and capacity using the appropriate metric units,
Solve problems that require converting smaller units to larger ones and vice versa

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1 a. Identify volume and capacity. 1 b. Use measurement terms accurately in relation to volume and capacity 2 a. identify the appropriate metric units for measuring length, area and mass	**<u>Product Entrance Slip /self assessment</u> - to test learners ability to identify appropriate units of measurement** *those related to capacity selecting best units for measuring*	Learners will be led to determine appropriate units in measurement and their application to real-life situations. ***Conceptual Understanding : To determine whether learners can differentiate between terms related to volume and capacity.*** 1. In small groups, provide 3-4 containers of varied sizes to learners. Have them fill some containers with water and pour only

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
2 b. Estimate length, area, mass, and capacity using metric units 2 c. measure length, area, mass, and capacity using metric units 3. Identify the appropriate metric units for measuring mass and capacity. 4 Use metric prefixes to describe the relative size of different metric units. **Skills:** 5. select appropriate units and tools for measuring length, mass, and capacity. 6. Estimate costs involving multiple items with sales tax 7. calculate costs involving multiple items with sales tax priced in dollars and cents **Values** 8. Pay attention to detail in creating a booklet on measurement to include length, mass capacity, volume and money	 Retrieved from metric units worksheet volume and capacity with a dog and a book - Search Images (bing.com) **Checklist** I circed all units accurately Yes /no I was able to select at least 6/10 appropriate units yes/no **Observation/Discussion/Peer Assessment: - To test learners ability to use estimate using appropriate units of measurement** Learners will estimate and measure the area of different spaces. Peers will critique each estimate. Have learners measure the area of different spaces in the school (e.g., the library, the gym, their classroom, the basketball court, the school community garden).	some water in others. Use this activity to introduce the concepts of volume and capacity. 2. Give scenarios which invite learners to say whether volume or capacity is being referred to. Eg. A carton of milk has the **capacity** of 1 litre. The **volume** of milk left in the carton is 500 ml. Discuss terms related to volume and capacity (space, solid, hollow, units etc.  Retrieved from https://math-media.byjusfutureschool.com/bfs-math/2022/11/07112512/image-1-4.png Guide learners into developing a working definition for volume and capacity using the image above. Volume is called the amount of the total space that is taken up by an object, while capacity is known as the measure of an object's ability to hold any given substance.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Invite learners to estimate and measure the mass of everyday objects based on the mass of a benchmark object. For example, a bag of potatoes has a mass of 5 kg. Does the chair have more or less mass than the bag of potatoes? Have learners estimate and measure the capacity of everyday objects based on the capacity of a benchmark container. For example, a container holds 1 liter. Can you think of a container that holds less than 1 L? How much less? **Checklist** Learner can provide a reasonable estimate for area , mass, capacity (1 each) yes/no	***Guided learning (length)*** Guide learners into identifying the units for measuring length. Discuss with learners, and ask," If I want to measure my desk or the board, what would I use? What unit of measurement would we find on these measuring tools? Millimeter (mili), Decimeter (deci), Centimeter(centi), Meter (m), and Kilometer (kilo). They are used to measure how long or wide or tall an object is. ***Interactive Learning*** Invite learners to choose an object in the classroom that is "very small" and one object that is "very large" Eg. a stone holding the door or an empty cardboard box. In pairs, they could determine which units should be used to measure these attributes and determine which measurable characteristics these objects have, such as length, mass, capacity, or area. 1. Help learners to realise that there are other considerations besides object size that go into choosing the appropriate unit of measurement. After selecting a suitable unit, instruct learners to estimate these attributes using benchmarks. 2. Next, measure the object's various attributes as precisely as needed for a

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	<u>Product</u> - to test learners' competence in estimating, calculating sales tax and total cost of an item after sales tax 1. Calculate total cost  Retrieved from https://images.google.com/	given purpose, keeping in mind that some attributes might be too difficult to measure (though some might find inventive ways to approximate).  Retrieved from https://www.splashlearn.com/math-vocabulary/geometry/metric-system ***Hands- on Learning-*** Present currency used in country, and have learners identify and compare the notes and coins 1. Have learners set up classroom shops with labeled empty containers from home (cereal boxes, milk tins etc). Add tax tags depicting additional tax on the price of goods. Guide learners into shopping for individual or multiple items . Invite learners to determine the cost of the

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	2. Calculate the cost of each item including the sales tax in dollars  Retrieved from https://www.mathworksheets4kids.com/sales-tax/tax-1.pdf	items before and after tax. In peers, learners operate a shop, buying and selling to each other.

Additional Resources and Materials

4 Best Ways for Teaching Volume and Capacity - That One Cheerful Classroom

Metrics System of Measurement -Metric System of Measurement (mathsisfun.com)

Shop make believe items (cereal boxes, milk cartons, biscuit wrappers, box juice, butter bowls, deodorants, soap boxes, liquid detergent cans) etc.)

Additional Content Knowledge for the Teacher:

Parameter	Volume	Capacity
Definition	The total amont of Space a substance occupies.	The maximum amount of substance a container can hold.
Measuring Units	Usually Metric Units	Both metric and customary units
Type of solid	Solid and Hollow	Only Hollow

Retrieved from https://math-media.byjusfutureschool.com/bfs-math/2022/11/07113146/image-4-2.png

Metric Units of Lengths and Equivalents

Unit	Prefix	Metric equivalent	Real-life equivalent
Kilometer (km)	*Kilo-*	1,000 m	About two-thirds of a mile
Meter (m)		1 m (SI base unit)	A little more than a yard
Centimeter (cm)	*Centi-*	0.01 m	About half the diameter of a Lincoln penny
Millimeter (mm)	*Milli-*	0.001 m	About the width of a pencil tip

Retrieved from metric prefix table length - Search Images (bing.com)

Opportunities for Subject Integration

Mathematics & Language Arts: Develop and apply measurement terminology (e.g., surface area, angles, time) in both written and verbal descriptions to enhance communication skills.

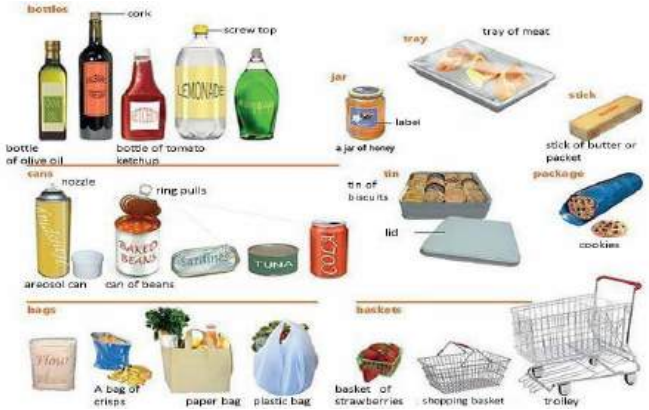
Mathematics & Geometry: Recognise and understand angles as geometric shapes and apply angle measurement concepts in geometric problems.

Mathematics & Science: Understand measurement as a comparison between attributes and units, and explore how this concept applies in scientific contexts.

Mathematics & Practical Application: Measure length, area, mass, and capacity using metric units, applying these skills to real-world scenarios.

Mathematics & Problem-Solving: Solve problems involving the conversion of units (smaller to larger and vice versa), reinforcing the practical use of measurement in various contexts.

Essential Learning Outcomes: M 1.2 Understanding What and How We Measure – Comparing and ordering based on measurable attributes
Grade Level Expectations: Compare and order a variety of solids and containers (long, thin, short, wide) based on the space they occupy, the amount of space that can be filled, their estimated volume, and capacity.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** **1.** Identify and explain basic geometric principles related to the properties of shapes and their dimensions, including recognizing different types of shapes. 2. Identify the attributes of different shapes and explain how dimensions affect their properties. **Skills** **3.** Use of spatial reasoning to analyze how objects occupy space. 4. Order solids and containers based on their dimensions and capacity. 5. Visualize how different shapes fit within containers and utilize space efficiently.	**<u>Product/Discussion/Self assessment</u>: -To determine whether learners can apply the concept of visualizing how objects occupy space** Ask learners to create diagrams, draw, describe or show how different shapes fit into containers.  Retrieved from https://www.easypacelearning.com/design/images/foodcontainers.jpg	Invite students to make conjectures about the properties of the shapes (e.g., "All shapes with 4 sides are squares or rectangles," "All 3D shapes have vertices"). After making conjectures, have students to work in groups to test their ideas by examining the shapes and discussing as a group whether their conjectures hold true. Have students presents their findings. Invite learners to use UDL, Hands-on activities, Video assisted and differentiated learning to aid in comparing and ordering of containers based on volume and capacity.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
6. Select appropriate containers for various solids to optimize storage space. **Values** 7. Demonstrate the need for the appropriate placements in creating a Math Corner.	**Checklist** I can sketch, describe or show at least 2 objects fitting into a suitable container yes/no **Observation - to determine learners ability to sort containers based on size and capacity** Assign group projects where learners work together to compare and order solids and containers from the class shop based on dimensions and capacity. For example, one group will work in the body care products, while another in the canned goods. **Checklist** Learners can sort at least ⅗ items correctly yes/no **Observation To evaluate learners' application of capacity principles** Provide learners with real-life scenarios where they need to select appropriate containers for given solids to optimize storage space.	***Universal Design for Learning*** ***(UDL)*** Teacher guides learners into using and demonstrating understanding through visual aids, physical models, and digital tools to represent geometric concepts. ***Hands-on Activity*** Offer hands-on activities where learners physically manipulate solids and containers to understand how shapes occupy space. Have learners engage with concepts using containers and solid shapes. Make reference to class shops from previous lessons and invite learners to package items such as rice, flour, fruits and water using appropriate containers. ***Video assisted learning:*** https://youtu.be/dtCM56EBeBo?si=JJpkSxtgT_ZSGgZu - *Volume and capacity explained* Discuss how different solids in the classroom fit into containers to illustrate space optimization. Eg the class cupboards, draws, stationery spaces etc. ***Differentiated learning/Discussion*** Encourage learners to explore different combinations of solids and containers to foster

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from https://www.eslprintables.com/previews/589482_1-CONTAINERS.jpg **Checklist** Learners can match at least 10/15 objects to containers. yes/no **Product/Authentic Assessment - show learners' application of geometric principles and spatial reasoning**	creativity. Have them compare. Eg. How eggs are stored in multiple appropriate ways and why other containers which would be unsuitable for storing eggs.  Retrieved from https://i5.walmartimages.com/asr/bc2a3ffa-8561-43a2-ab78-ef24bc0c4a11.89e9de07acd6646e06268c99299bb7fd.jpeg

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Assessments: Learners will create that can store multiple objects for home, school or otherwise ***(be mindful of age appropriateness)***. Learners will each work with a partner to merge ideas and design the container before sharing with the class for critique.	 Retrieved from https://ae01.alicdn.com/kf/HTB1D3kKs7OWBuNjSsppq6xPgpXaq/Portable-Egg-Container-Fresh-Holder-Storage-Box-Hiking-Outdoor-Camping-Carrier-For-Egg-Case-Kitchen-Convenient.jpg

Additional Resources and Materials

Comparing Volume and Capacity: Comparing Volume Worksheet / Worksheet Pack (teacher made) (twinkl.co.za)

Volume and Capacity Explained: https://youtu.be/dtCM56EBeBo?si=yA9UW_oRYnQOCG8c

Manilla, cardboard

Additional Content Knowledge for the Teacher

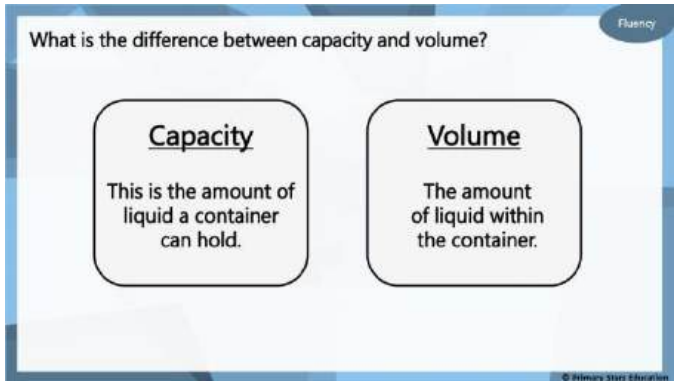
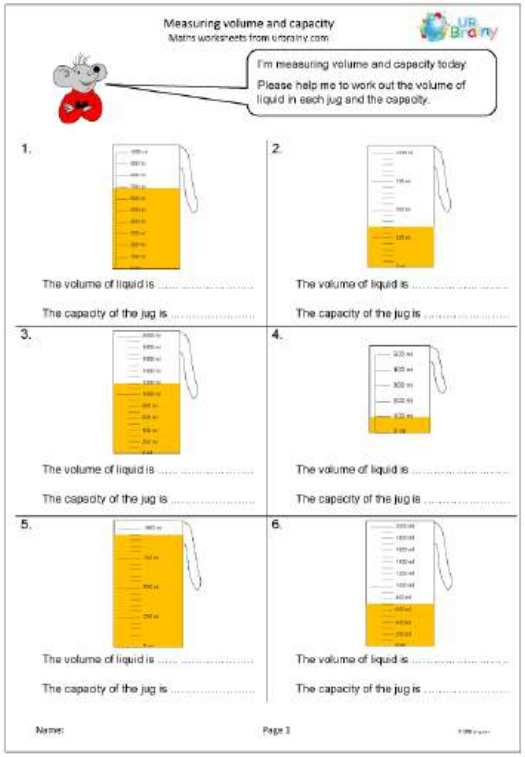
Multiple Means of Engagement: Incorporate interactive activities like building shapes with manipulatives or using geometry software

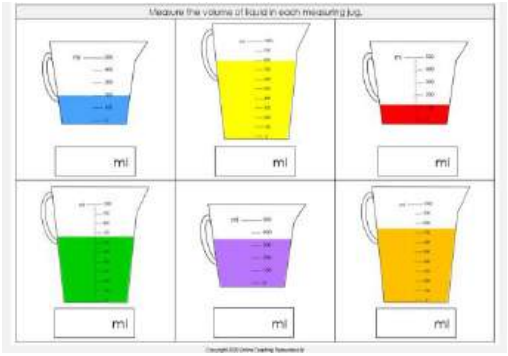
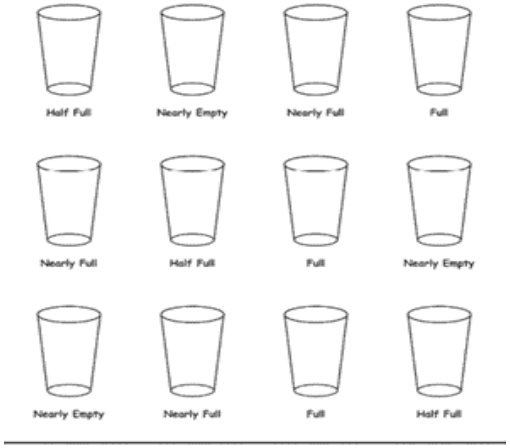
Opportunities for Subject Integration:

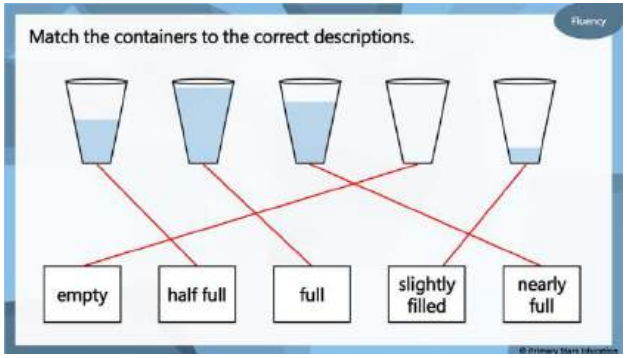
Solving Word Problems
Patterns and relations in ordering items

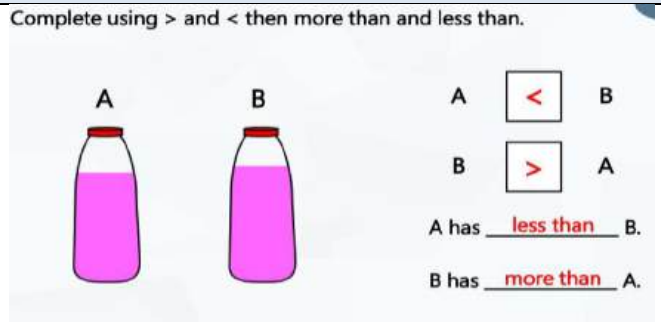
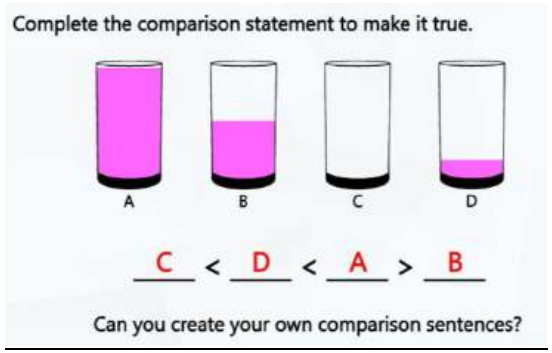
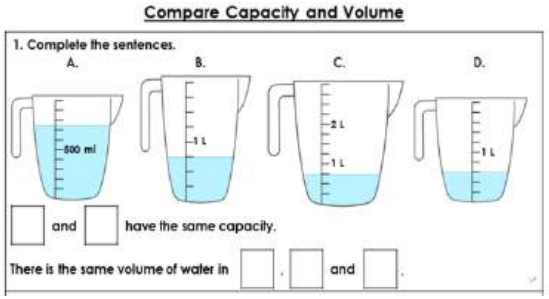
Essential Learning Outcome M1.3 Understanding What and How We Measure - Developing and applying non-standard units of measure
Grade Level Expectations: Measure volume and capacity by counting cubic units from improvised units, concrete materials and personal measurement tools (E.g., multi-link cubes, cubic cm cubes, liquids, containers). Compare angles and determine their relative size by matching them and by measuring them using appropriate non-standard units

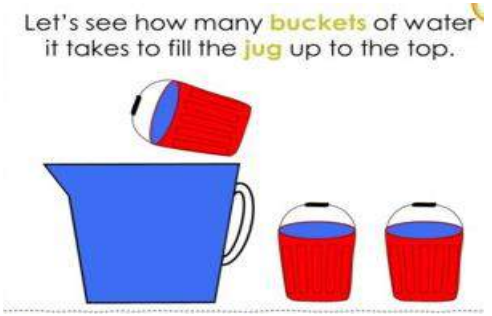
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Differentiate between volume and capacity 2. Differentiate between the terms volume and capacity by counting cubic units 3. Compare volume and capacity 4. Define and identify various angles. 5. State the characteristics of the different types of angles **Skills** 6. Measure volume and capacity by counting cubic units from improvised units	**Entrance Slip/self assessment: To evaluate learners' understanding of volume and capacity.** Look at the videos and discuss with the teacher and peers to share two notes about the terms volume and capacity. Volume For Kids | Introduction to Volume | Measuring Volume using Unit Cubes | Applications of Volume Intro to Volume Counting (Unit Cubes) Capacity for kids! Education Cartoon for Kids. Maths for Children I can state one note linked to volume and one different note linked to capacity • Yes • No • Somewhat	Learners will use Video Assisted Learning (VAL), guided discovery, and discussions to define, differentiate, and compare volume and capacity. ***Using guided discovery*** Have learners demonstrate the ability to differentiate between volume and capacity by completing the provided worksheet.

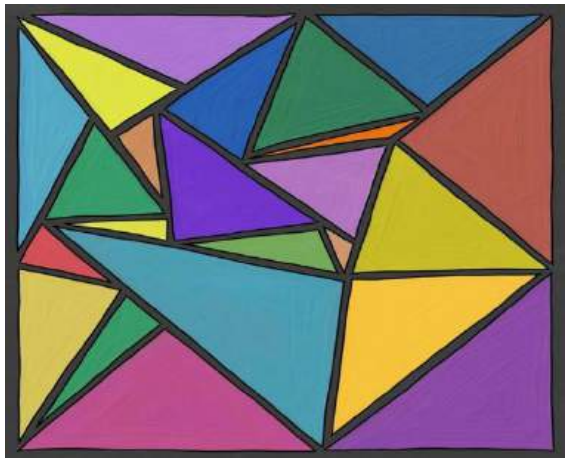
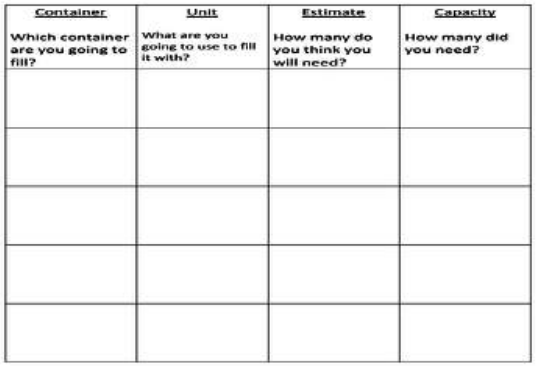
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
7. Calculate the volume of a rectangular prism by using unit cubes. 8. Identify and describe examples of angles found in everyday surroundings **Values** 9. Show a deep appreciation for space and its capability to store by exploring its importance within the environment	**<u>Discussion and observation (outcome 2-3)</u>: To assess learners' ability to differentiate between volume and capacity.**  1. The teacher places six (6) measuring cups of different sizes or similar sizes on a desk in front of the class. Each measuring cup has different amounts of water. (Teacher can use food coloring to differentiate). Learners will discuss the amount each measuring cup can hold using the unit vs the actual amount in each measuring cup.	 Retrieved from https://urbrainy.com/get/6460/measuring-volume-and-capacity

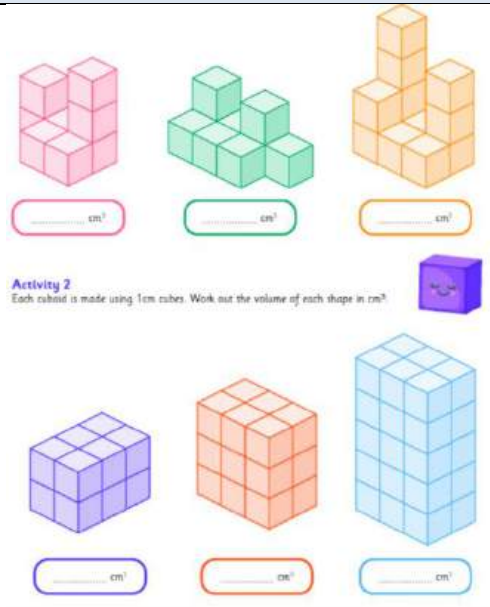
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from https://images.google.com/ **<u>Match/Peer Assessment -</u> to compare volume and capacity** Probe learners to discuss the following: 1. When the volume and the capacity are the same 2. When the volume is half the capacity 3. When there is no capacity Peers will assess each others findings	***Use guided discovery through hands-on theory*** Draw a line on the glass to represent the capacity of the glass and shade the volume.  Retrieved from https://images.google.com/

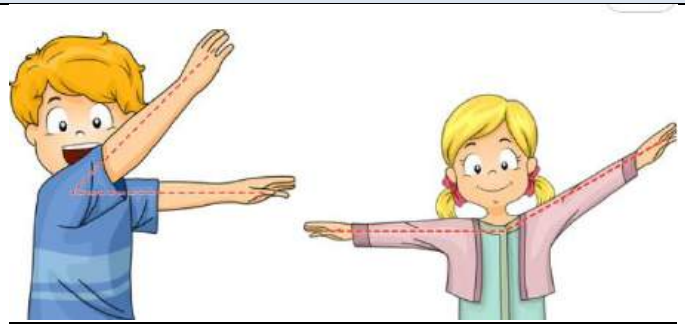
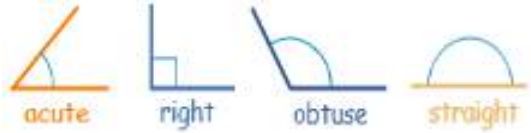
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 <u>Checklist</u> Learners can differentiate between volume and capacity • Yes • No • Somewhat **<u>Group work</u>** Using a variety of items such as those seen below, invites learners to compare capacity and volume using the >,<, = signs Also, learners can arrange the items in ascending or descending order using capacity or volume.	***Guided discovery using real-life application*** Use a large jug of water in the center of your tables to measure various volumes. Record your result in the table Task / Capacity of container (ml) / Volume to measure (ml) / Volume measured (✓) / Describe how full the container is A / 50ml / Full / nearly full / half full / slightly filled B / 10ml / Full / nearly full / half full / slightly filled C / 100ml / Full / nearly full / half full / slightly filled D / 500ml / Full / nearly full / half full / slightly filled E / 70ml / Full / nearly full / half full / slightly filled F / 150ml / Full / nearly full / half full / slightly filled G / 850ml / Full / nearly full / half full / slightly filled Compare your results in your table using the following sentences: _____ is more than _____. _____ is less than _____. _____ > _____. _____ < _____.

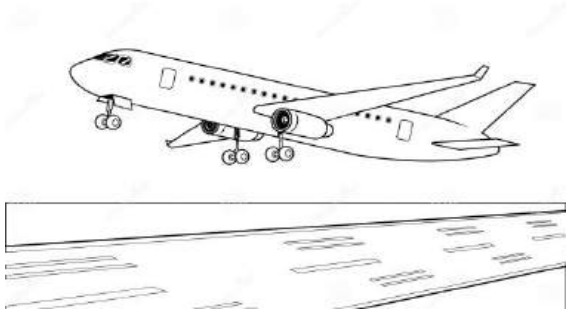
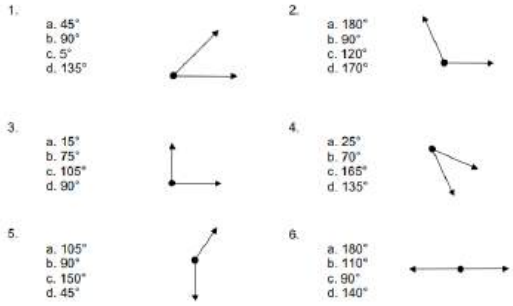
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	  **Checklist** Learners can compare volume and capacity • Yes • No • Somewhat **Group Work - to develop learners' skills in measuring capacity** Play a game of '***Fill the Container***'. Break the class into groups and provide each group with a container (be sure to vary the sizes). Instruct the learners	 Retrieved from https://classroomsecrets.co.uk/compare-capacity-and-volume-extension/

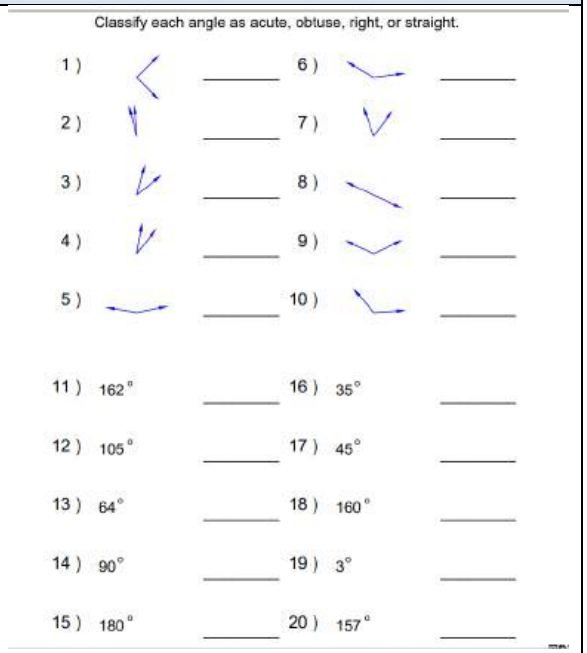
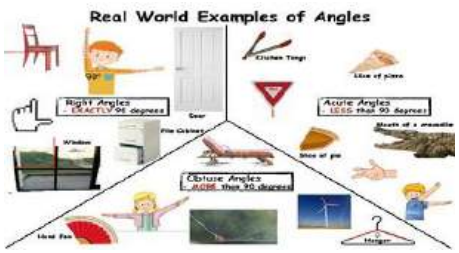
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	to fill their container with an informal unit chosen by the teacher e.g. small cubes, marbles, or counters. This could be turned into a race to see which group can fill their container the fastest. Afterward, invite the groups to share how many of the chosen informal units they could fit into their containers. Initiate a discussion on the game. Lead the learners to the idea that the different containers could hold different amounts of the chosen units, depending on their size.     **Checklist** Learners can measure volume and capacity by counting cubic units from improvised units	***Discovery through technology and play*** Play the game provided on the link below as groups. First group to complete correctly wins. Retrieved from https://htmlgames.mathsbuilder.com.au/?id=179 ***Guided discovery using real-life application***  Retrieved from https://images.google.com/ Complete the table below

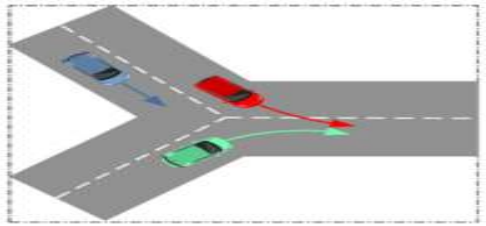
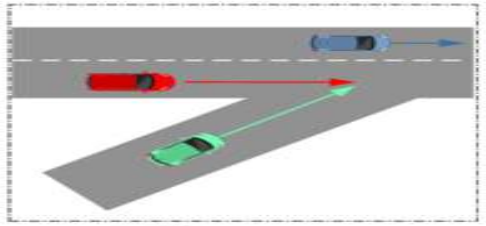
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• Yes • No • Somewhat **<u>Product/</u>- to assess learners' ability to identify various angles** 1. Identify five types of angles in the painting.  ***Guided Discovery through Exploration*** 2. Identify at least two of each angle in the diagram below. Draw an arrow to label the angle.	 Container: Which container are you going to fill? Unit: What are you going to use to fill it with? Estimate: How many do you think you will need? Capacity: How many did you need? Retrieved from https://images.google.com/ ***Using guided discovery*** Find the volume by counting the cubes

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 . Retrieved from https://images.google.com/ 3. You are given this pizza to share in different parts. Your baby brother gets an acute slice, your aunt gets a right angle, and mum gets an obtuse slice. What will your share be? Draw lines on the diagram to depict the problem.  Retrieved from https://images.google.com/	 Retrieved from https://www.cgpplus.co.uk/primary/ks2/maths/m2wft15022-find-the-volume-by-counting-cubes ***Discovery through Game-Based Learning*** Play the game in pairs provided on the link below to find the volume using cubes. Retrieved from https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Cubes/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 **<u>Mental Game</u> /Observation - <u>t</u>o express the characteristics of different types of angles** The class will be divided into two groups, teams A and B. Team A will give the angle size to a chosen person from Team B and he or she will state the type of angle. The same will continue in reverse. Learners will be given 10 seconds to respond. Example: 1. John, team A, says 62 degrees to one learner from team B who will state if it's acute, obtuse, reflex, right, or a complete turn. 2. Mary, Team B, says obtuse angle, and the learner from Team A will state an angle degree that corresponds. 3. Alternate roles so that each team gets to do both activities.	***Guided Discovery through abstract conceptualisation*** Learners will use hands to demonstrate different angles. Invite the incorporation of both left and right arms to show that the angles can be formed from the left or right vertex. The hands on a clock will be used to teach as a guide.  Retrieved from https://images.google.com/ 1. Invite learners to look around their environment and identify as many angles as possible, then draw them on their books.  **<u>Checklist</u>** Learners can draw or describe at least 3 different angles represented Yes No

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	The teacher will record the scores and treat the winning team with whatever extrinsic motivational tools are available at the school. **<u>Checklist</u>** Learners can state the characteristics of at least 3 different types of angles • Yes • No • Somewhat **<u>Product</u> - to test learners' ability to show the application of angles around us** Eg. Draw or sketch two pictures to mark-off angles. Pictures can include how airplanes land or take-off, a parked vehicle, how wide a laptop is opened, or how wide a shark mouth is opened.  Retrieved from airplane drawing taking off at angle - Search Images (bing.com)	***Guided Discovery using reflective observation and estimation*** Complete the worksheet by circling the correct answer.  Retrieved from https://www.k5learning.com/worksheets/math/grade-5-geometry-estimate-angles-a.pdf ***Use reflective observation and guided discovery*** Learners will complete the worksheet

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist Learner can outline angle in drawing • Yes • No • Somewhat	 Classify each angle as acute, obtuse, right, or straight. 1) ____ 6) ____ 2) ____ 7) ____ 3) ____ 8) ____ 4) ____ 9) ____ 5) ____ 10) ____ 11) 162° ____ 16) 35° ____ 12) 105° ____ 17) 45° ____ 13) 64° ____ 18) 160° ____ 14) 90° ____ 19) 3° ____ 15) 180° ____ 20) 157° ____ Retrieved from https://www.math-aids.com/cgi/pdf_viewer_4.cgi?script_name=angles_classifying.pl&language=0&memo=&answer=1&x=158&y=21 ***Use reflective observation and guided discovery*** 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		2. Compare the angles found in the Y- Y-intersection with the Ramp merge.  (c) Y-intersection  (g) Ramp merge Retrieved from https://www.researchgate.net/figure/Different-types-of-intersections_fig1_352523373

Additional Resources and Materials

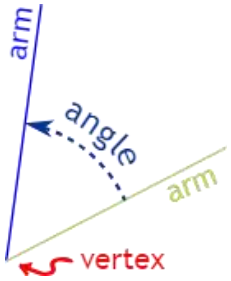
https://year4withmissa.weebly.com/volume-and-capacity.html
https://pbskids.org/cyberchase/games/can-you-fill-it
https://youtu.be/r9emftGfpjQ?si=RCVg-Tc2oaXVOLq9

Text: Caribbean Primary Mathematics 6th Edition- Morrison Paizee or any other text recommended by your Ministry.

Additional Content Knowledge for the Teacher

Difference Between Volume and Capacity:

Volume is the total amount of space that is covered by an object. Capacity is the ability of an object to contain a substance that is either solid, liquid, or gas.



The corner point of an angle is called the vertex. The two straight sides are called arms. The angle is the *amount of turn* between each arm.

Opportunities for Subject Integration

Mathematics & Science: Measure volume and capacity using cubic units and improvised materials (e.g., multi-link cubes, liquids) to understand concepts of space and volume in scientific experiments.

Mathematics & Art: Use personal measurement tools to measure and compare volumes of materials for art projects, integrating practical measurement skills with creative design.

Mathematics & Engineering: Compare angles by measuring with non-standard units in engineering or construction projects, applying geometric concepts to practical problem-solving.

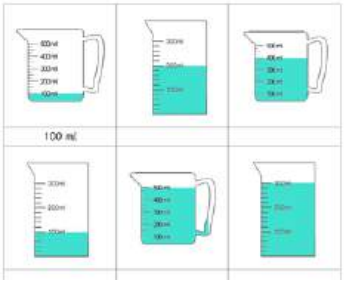
Mathematics & Environmental Studies: Measure and compare volumes of natural resources or materials in environmental projects, linking measurement skills to real-world applications.

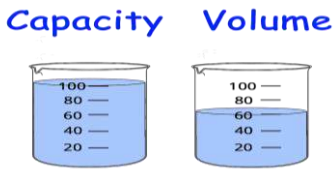
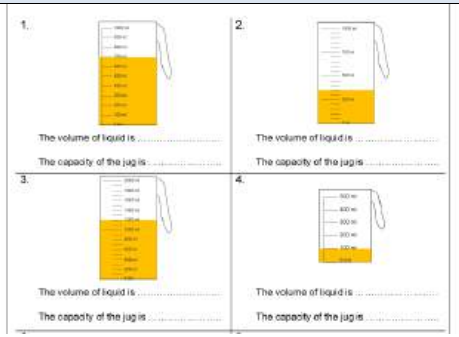
Essential Learning Outcome: M1. 4 Understanding What and How We Measure - Developing and applying standard units of measure

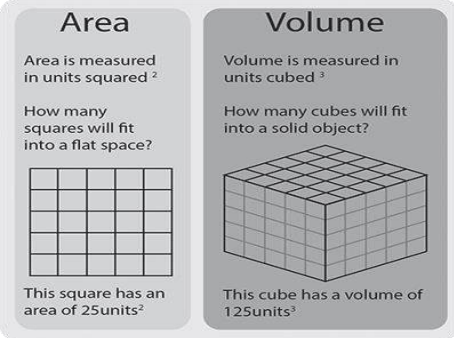
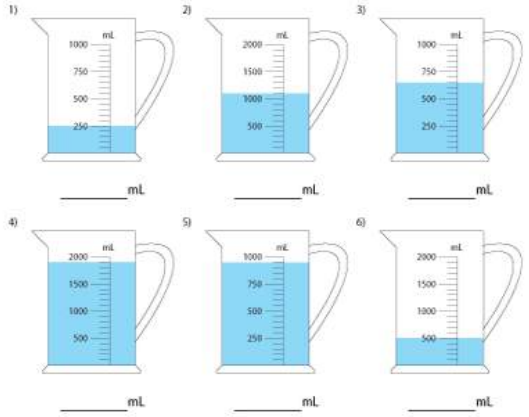
Grade Level Expectations:

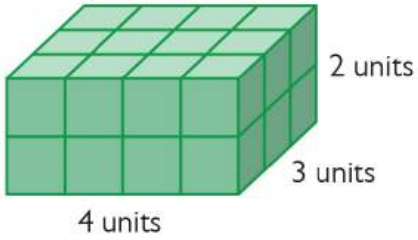
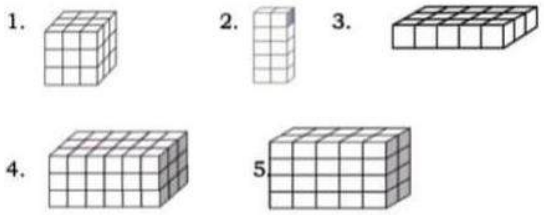
Measure volume using standard units (cubic cm, cubic dm, and cubic m) and capacity using standard units of mL and L.
Solve problems involving converting larger metric units into smaller ones and describe the base ten relationships among metric units.
Explain how the protractor works, use it to measure and construct angles up to 180°, and benchmark angles to estimate the size of other angles.
Show that two-dimensional shapes with the same area can have different perimeters and solve related problems.

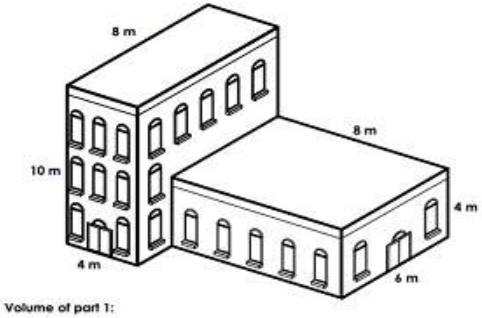
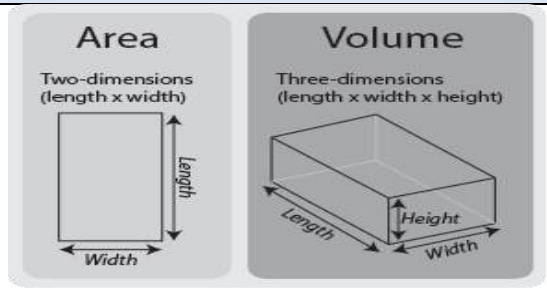
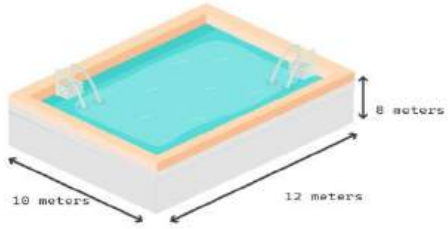
- Calculate unit rates for various goods and services and identify which rates offer the best value.

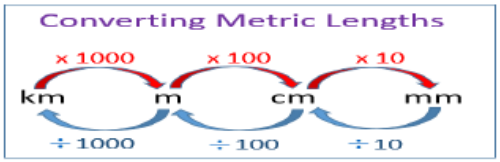
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge:** 1. Identify the capacity within a hollow space using standard units (milliliter and liter) 2. Describe base-ten relationships among metric units 3. Define the terms (i)complementary angle and (ii) supplementary angles 4. Calculate the missing angles in a right angle (complementary angles) 5. Calculate the missing angle on a straight line (supplementary angles) 6. Differentiate between area and perimeter	**<u>Entrance Slip</u> /self assessment : To evaluate learners' understanding of volume and capacity using standard units** Measuring cups are placed on a desk for learners to observe. The teacher pours unequal amounts into each cup. Learners are to then make two observations from discussion. 1. The amount of liquid the cup can hold ___ 2. The actual amount of water in each cup ____ 	Learners will use Video Assisted Learning (VAL), guided discovery, and discussions to compare volume and capacity and calculate volume using standard units. ***Discovery using Guided/Independent Learning*** Record the capacity and volume of each

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
7. Recognise how rectangles can have the same area but different perimeters **Skills:** 8. Calculate the difference between the volume and capacity. 9. Measure volume using standard units (cubic cm, cubic dm, and cubic m) 10. a. Recognise volume as an attribute of solid figures and understand concepts of volume measurement b. Calculate the volume of solids 11. Convert larger metric units into smaller ones. 12. Measure angles up to 180 degrees accurately. 13. Use a protractor and ruler to accurately draw angles up to 180 degrees. 14. Calculate unit rates for various goods and services.	Retrieved from https://urbrainy.com/get/6460/measuring-volume-and-capacity I can identify the capacity of 4/6 within a hollow space using standard units (milliliter and liter) • Yes • No **Peer Assessment** Look at the capacity of the measuring cup below in the first cup and the volume in the second cup. Invite each learner on paper to find the difference between the volume and the capacity. Have them exchange solutions with a partner for critique..  Retrieved from https://urbrainy.com/get/6460/measuring-volume-and-capacity Learners can calculate the difference between the volume and capacity. • Yes • No • Somewhat	 Retrieved from https://urbrainy.com/get/6460/measuring-volume-and-capacity ***Using guided discovery*** Calculate how much more liquid the cup needs to reach its capacity.

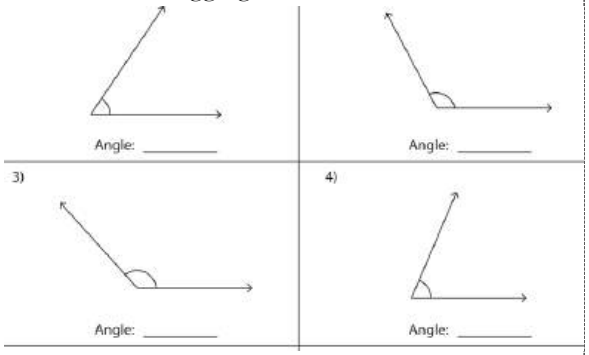
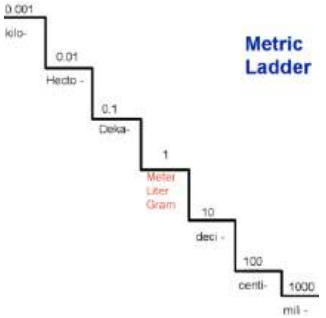
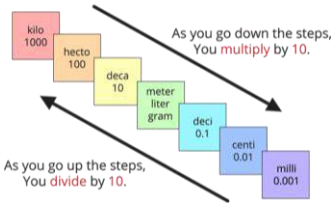
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
15. Determine best buy practices by comparing the unit rates to the value of several goods and services. **Values** 16. Make smart/relevant decisions using unit rates when making purchases	**Listening and Discussion** Listen to the video and discuss two notes/steps involved in how to measure volume using standard units. Volume Song | Measuring Volume For Kids | 4th Grade - 5th Grade Measuring Volume in Cubic Units  Retrieved from https://www.skillsyouneed.com/num/volume.html *(Note volume is **not** area)* **Checklist** Learner can outline at least one note /step. yes/no **Observation** Present the diagram below to learners, physically or as an image. Using connecting cubes, invite the learners to build a replica of the diagram presented. Learners will	 Retrieved from **https://urbrainy.com/get/6460/measuring-volume-and-capacity** ***Guided Discovery using critical thinking*** Using the connecting cubes given, construct a replica of each diagram below. Use the replica to find the volume of each diagram where each cube represents 1 cubic cm.

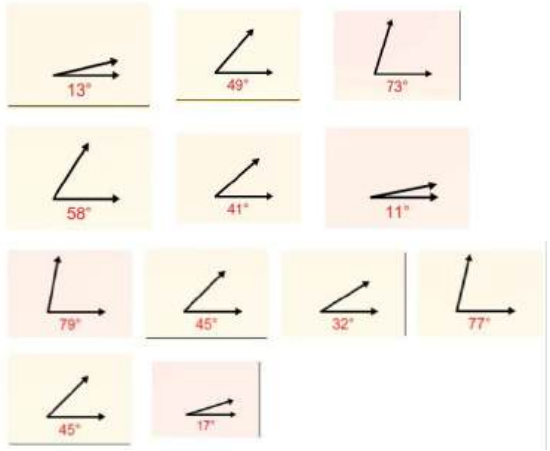
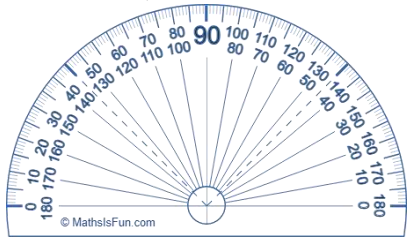
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	discuss the shape dimensions and count the number of cubes used to make the replica.  Learners can measure volume using standard units (cubic cm, cubic dm, and cubic m) • Yes • No • Somewhat **<u>Product</u> - to calculator volume of a real life object** 1. Calculate the volume for each real-life object below	 Retrieved from https://brainly.ph/question/16113377 ***Guided discovery using critical thinking*** **<u>Group Discussion</u>** 1. Look at the video to discuss. Discussion should entail terms such as base, height, length, and width. Volume of Rectangular Prisms | Math with Mr. J

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• You have a book and want to find out it's volume.  • Volume = L x W x H L= 10cm W = 5cm H = 2cm • What is the volume of the book? 2. Calculate the volume of the shape below  Volume of part 1: _____ x _____ x _____ = _____ m³ Volume of part 2: _____ x _____ x _____ = _____ m³ Volume of the building: _____ + _____ = _____ m³ Retrieved from https://images.google.com/	 Retrieved from https://www.skillsyouneed.com/num/volume.html *(Note volume is **not** area)* 1. Calculate the volume of the pool  Retrieved from https://images.google.com/

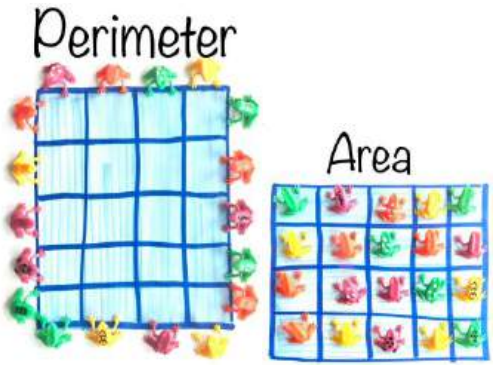
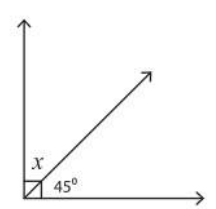
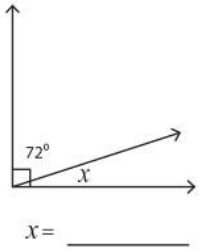
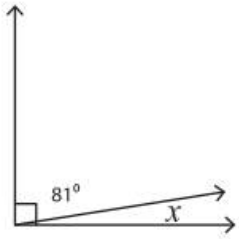
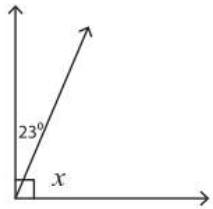
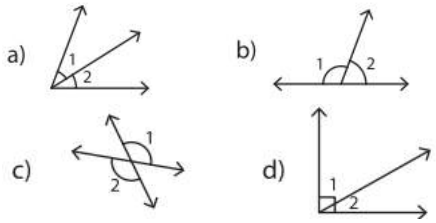
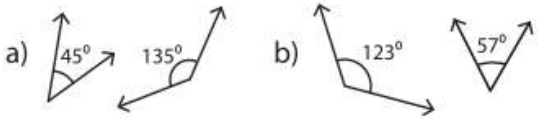
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Group Discussion 1. Present a measuring cup and a glass to the class. Fill the measuring cup with water. Discuss with learners your intention to pour all the water in the glass. Invite learners to provide solutions for your problem.  Learners should make the connection of dividing the content into multiple glasses. 2. Learners listen to the video and discuss their understanding on conversion of units. A beginners guide to the Metric System Conversion of Metric Measurements | Mathematics Grade 5 | Periwinkle  Learners can convert larger metric units into smaller ones ● Yes	***Use reflective observation and guided discovery***

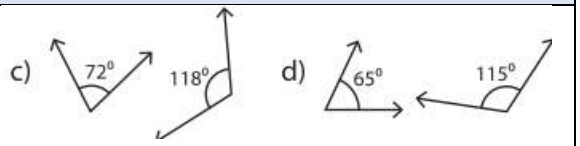
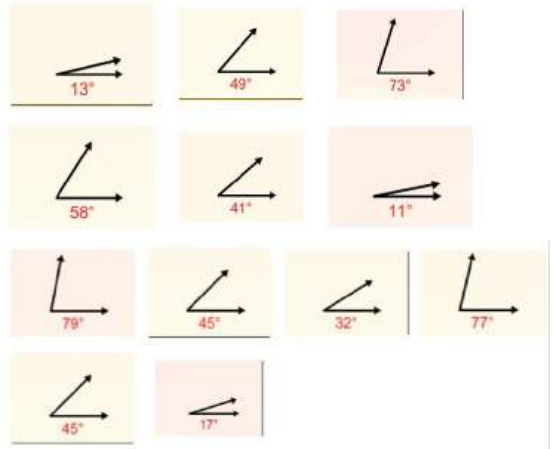
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• No • Somewhat **<u>Product</u> /Peer assessment- to draw angles** 1. Place learners in pairs. Learners will work together to draw any five angles of their choice accurately. Invite teams to switch drawings and measure for accuracy. Learners will critique other learners' work at the end of the class by discussing whether the angles are accurate, encouraging healthy discussion. Learners can use a protractor and a ruler to construct angles up to 180 degrees accurately • Yes • No • Somewhat 2. Provide learners with a worksheet on measuring angles and observe them. Guide learners accordingly in the proper use of the protractor. Invite learners who are more versed to assist	Estimate the number of bottles of mineral water will fill your water bottle?  Retrieved from https://www.google.com/search?q=200+ml+water+in+bottle&udm=2&hl=en&sa=X&ved=2ahUKEwjCtYS4w4iHAxW0AHkGHb-KAAkQrNwCegUIgAEQAA&biw=1920&bih=945&dpr=1&safe=active&ssui=on#vhid=tIUMyelFHh5OFM&vssid=mosaic

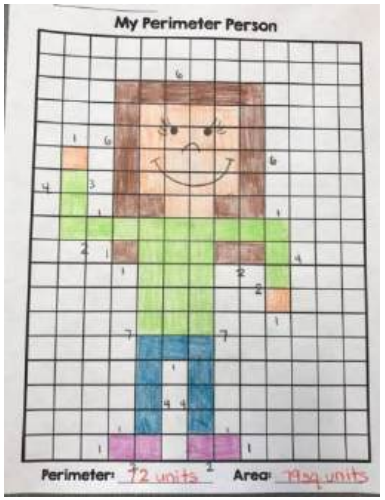
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	those who are lagging.  Retrieved from https://www.mathworksheets4kids.com/angles/measure/inner-scale-1.pdf Learners can measure angles up to 180 degrees accurately. ● Yes ● No ● Somewhat **Game / Self Assessment** 1. Complementary Angles Memory Game Place learners in groups of four Create 12 cards with angles when combined in pairs will form complementary angles.	***Game Metric Ladder*** Using a flight of stairs to convert units. Using meter, liter and gram as the base unit. Learners will either climb up the stairs where the units get smaller or walk down the stairs where the units gets bigger. Teacher will demonstrate with one then give each learners a number from 2-9 for conversion. Teacher will demonstrate with one then give each learners a number from 2-9 for conversion.   *Ensure learners understand once they are walking down the stairs, they will be multiplying by 10 on each stair.*

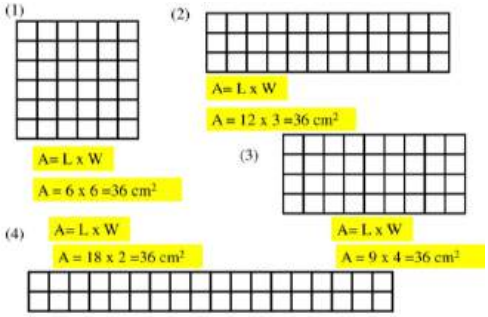
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Place cards face down and learners are to pick two cards, if they do not add up to 90 degrees they are to place them face down. Other persons in the group can only see the cards each person has chosen if they add up to 90 degrees. Sample Cards  Retrieved from https://matchthememory.com/gl1station2	***Use reflective observation and guided discovery*** 1. Provide learners with protractors or invite them to purchase one before the lesson. Have them observe the markings and manipulate them. 2. Have learners look at the video on how to use a protractor accurately. During the video, pause to invite learners time to understand the process involving using a protractor. ***(Highlight that angles can be drawn from both vertices of the straight line)***  https://www.mathsisfun.com/geometry/protractor-using.html How to Use a Protractor Learners are given printing sheets to construct angles up to 180 degrees.

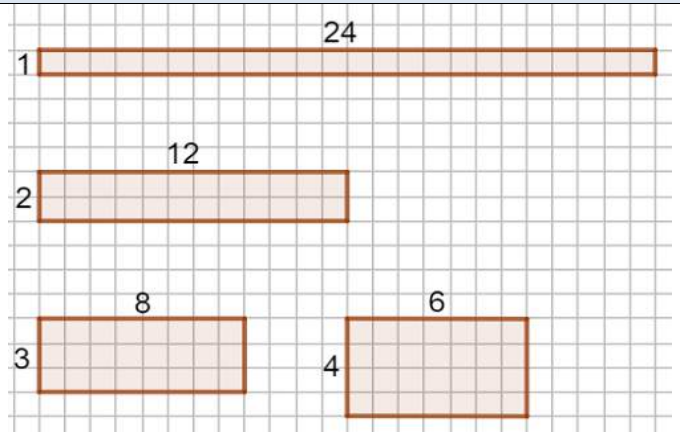
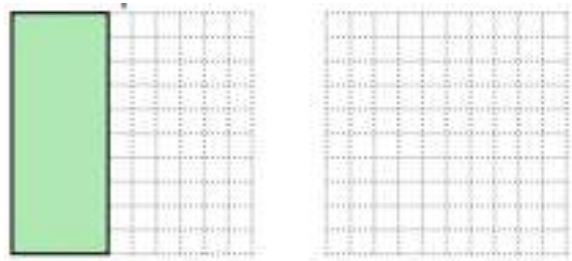
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist I can calculate the missing angles in a right angle (complementary angles) • Yes • No • Somewhat **Product - to calculate supplementary angles** Use the link below, and complete the quiz by clicking on the correct answer. Make reference to the sum of the angles in a triangle. Retrieved from https://quizizz.com/admin/quiz/5f50ed0fb82e88001ea5e5a0/supplementary-angles?fromSearch=true&source= **Checklist** Leaner scored at least 6/10 yes/no **Observation - to differentiate between area and perimeter**	***Games - Drawing Angles: Hot and Cold Activity*** Develop learners' ability to independently construct angles using hot and cold hints in this activity. Draw angles accurately to improve their angle sense in this interactive game. Retrieved from https://www.geogebra.org/m/scavsujt ***Use reflective observation and guided discovery*** Invite learners to add angles adding to 90 degrees and 180 degrees. Let them discuss their findings. Using their findings, introduce the learners to complementary and supplementary angles. ***Video-Assisted Learning*** Complementary Angles Video - Learn How to Calculate Missing Complementary Angles Find the missing angle

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	1. Have learners stand on the perimeter of the class, then invite them to move in the area of the class. Learners discuss the difference between the perimeter and the area.   Retrieved from https://beyondtraditionalmath.com/2023/01/28/3-tips-to-help-learners-tell-the-difference-between-area-and-perimeter/ 2. Learners are given a scenario where they are to consider their desks as being their home. Learners would	    Which of the following is a pair of complementary angles  Which pair of angles is not supplementary? 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	like to fence their homes because home invasion is on the rise. Learners are asked to draw an outline that will be considered the fence for their homes. Colored chalk will be used to draw the border. Using a ruler learners will measure the length of each side and then calculate its perimeter. Learners then calculate their area. Learners compare their perimeter and area.  Retrieved from https://www.bing.com/ck/a?!&&p=8e8de2d29d5bf219JmltdHM9MTcyMjM4NDAwMCZpZ3VpZD0xNjQwZTIwYi01OWNhLTZkZDktMmY3NS1mNjg5NThlNDZjMzkmaW5zaWQ9NTE5Mg&ptn=3&ver=2&hsh=3&fclid=1640e20b-59ca-6dd9-2f75-f68958e46c39&psq=google+images&u=a1aHR0cHM6Ly9pbWFnZXMuZ29vZ2xlLmNvbS8&ntb=1 **S.T.E.M Challenge** 3. The learners are given a piece of grid paper as their base. Then they will decide on the area of their garden.	 ***Discovery through technology*** Learners are to pick two cards, if they do not add up to 90 degrees they are to place them face down. Other persons in the group can only see the cards each person has chosen if they add up to 90 degrees. **Use the link to play or where technology is absent cards can be made** 

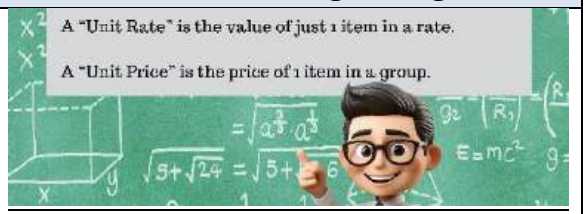
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Next, they are given index cards, Popsicle sticks, and some tape to create their fence/ Perimeter around their garden. This challenge can be done individually where each learner makes a fence or it can be done in groups. It's totally up to the teacher.  Retrieved from https://www.bing.com/ck/a?!&&p=8e8de2d29d5bf219JmltdHM9MTcyMjM4NDAwMCZpZ3VpZD0xNjQwZTIwYi01OWNhLTZkZDktMmY3NS1mNjg5NThlNDZjMzkmaW5zaWQ9NTE5Mg&ptn=3&ver=2&hsh=3&fclid=1640e20b-59ca-6dd9-2f75-f68958e46c39&psq=google+images&u=a1aHR0cHM6Ly9pbWFnZXMuZ29vZ2xlLmNvbS8&ntb=1 Learners can differentiate between area and perimeter in ⅔ observations ● Yes ● No ● Somewhat **<u>Think Pair and Share</u>**	Retrieved from https://matchthememory.com/gl1station2 ***Independent Learning*** 1. Invite half the class to walk around the classroom. Then, have the other half walk through the entire space of the classroom. Learners will count their steps in each instance. Groups will then compare the results. 2.Draw a perimeter person and label it as **"My Perimeter Person"**  Retrieved from 28 Creative Area and Perimeter Activities for the Classroom

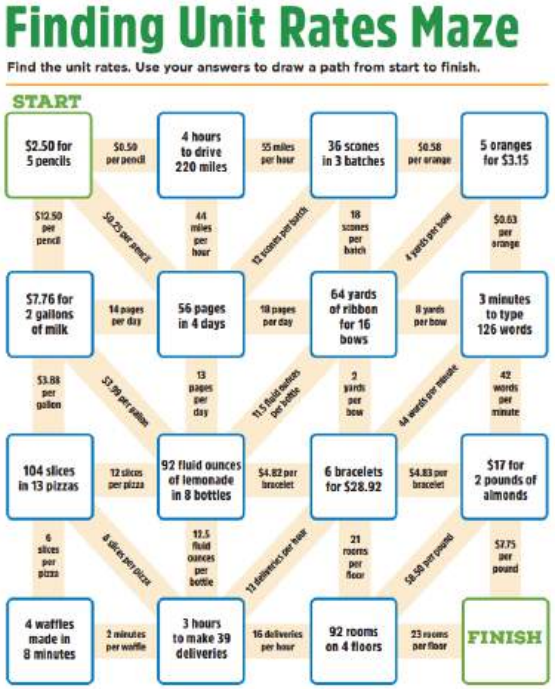
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Give learners a plain grid sheet. Given the area, learners will shade the amount. Learners will use the shaded region to find the perimeter of the shape. Invite learners to present and share their findings.  Retrieved from https://images.google.com/ **Product/Problem Solving** - Give learners problems involving areas and invite them to find the perimeter. Learners should be able to give reasons for their answers. Example The area of Mr. John's pigsty is 24 meters square. He wants to fence the pigsty to prevent the neighbor's dog from entering and killing his pigs. How many different ways can the pigsty be fenced and what's the perimeter of Mr.John's pigsty?	***Discovery using creative arts*** Learners draw their names on grid paper. They get to decide how large or small they go. Then, they calculate the area and perimeter. Is the name too long? Use initials instead.)  Retrieved from 28 Creative Area and Perimeter Activities for the Classroom ***Project Based Learning***

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from https://images.google.com/ Learners can give 1 reason or show working which explains how rectangles can have the same area but different perimeters. • Yes • No • Somewhat	Give learners the area of a polygon. Using the given area, have learners create various polygons with different perimeters to create designs.  Retrieved from 28 Creative Area and Perimeter Activities for the Classroom ***Guided Discovery using critical thinking*** The rectangle below has dimensions 4×10. Create rectangles with the same area, but a different perimeter.  Retrieved from https://images.google.com/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Observation/ Discussion Unit price Item / Price Kitchen items Dozen (12) of spoons — $ 24 Dozen (12) of plates — $ 36 Dozen (12) of tea cups — $ 48 A pot — $ 23 A bowl — $ 13 A pistle — $ 5 1) What is the price of one spoon ? 2) What is the price of one plate ? 3) How much do a dozen of pots cost ? 4) How much do a dozen of bowls cost ? 5) How much do 3 spoons and 4 plates cost ? **Checklist** Learner can answer accurately at aleast ⅗ questions.	Create rectangles with an area of 36 meters squared, but a different perimeter. How many rectangles could you make? ***Use reflective observation*** How many of these do I need to obtain $1, $10 and $100 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	<u>Product</u> - to solve simple problems involving unit rate **1.** Find a Unit Rate Darius drove 186 miles in 3 hours. What was Darius' average rate of speed in miles per hour? Write the rate that expresses the comparison of miles of hours. Then find the average speed by finding the unit rate. $\frac{186 \text{ miles}}{3 \text{ hours}} = \frac{62 \text{ miles}}{1 \text{ hour}}$ Divide the numerator and denominator by 3 to get a denominator of 1. **Darius drove an average speed of 62 miles per hour.** **2.** Calculate the cost of one bottle of soda.  **<u>Think and Share</u>** Invite learners to think and share their thoughts on which item is a better buy. Use many daily items used by learners or at home to create smart shopping awareness.	 How many ten cents will give you $1? How many $1 will give you $10? How many 10c will give you $10? Let's assume the 10 cent is a millimeters, $1 is a centimeter, $100 is a meter ***Guided discovery, real-life applications.*** ***Learners will use field trips, and discussions to make deductions by applying unit rates.***

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	  Learners can justify purchase of each good. . • Yes • No • Somewhat **Product - (outcomes 14,15,16)** A school carnival ticket booth posts the following sign:	 Give learners an everyday scenario and observe their reasoning skills toward the problem ***(make use of class shop)*** Example: There are 35 books in 5 boxes. How many books are in 1 box? Ask the learners to explain how they derived the answer. Example 2. You spend $15 on bus fare for school for the week. How much did you pay the bus driver per day? Use examples the learners can relate to, such as purchasing snacks, buying bread, speed and time ***Listening/ Discussion*** Have the learners listen and follow with the video. Pause and invite learners to attempt solving the problem before. Continue the video, and discuss their answers with the learners after it has been revealed. Unit Rates | Solving Unit Rate Problems

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from https://images.google.com/ a. Which number of tickets offers the best deal? Explain. b. How would you suggest the learners running the ticket booth modify the list of prices? Explain **Checklist** Learner identifies a deal yes/no Learner can justify best deal yes/no	 Retrieved from https://www.education.com/download/worksheet/175678/finding-unit-rates-maze.pdf

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Guided Discovery using critical thinking  Retrieved from Better Buy 2 | CK-12 Foundation 1. Which store sells 1 sack of oranges for less? 2. How did you decide? 3. How much would it cost to buy 4 sacks of oranges at Mac's? 4. How much would it cost to buy 4 sacks of oranges at Zac's? ***Field Trip*** Take the learners to a supermarket nearby. In the supermarket, they are to look at at least 5 items. For each item, learners should record the name of the item and the cost of two different quantities of each item. Upon return to the class, learners will discuss the item chosen and the better buy.

Additional Resources and Materials

https://www.geogebra.org/m/crgtvj5s
Measuring Angles Using a Protractor – GeoGebra
www.quizziz.com
www.splashlearn.com
cubes/ blocks
money
Related Mathematics text

Additional Content Knowledge for the Teacher

Complementary angles add up to 90 degrees.
Supplementary angles add up to 180 degrees.

https://youtu.be/6-48sZLy4E8

The volume of a unit cube whose length, width, and height are 1 unit each is 1 cubic unit.

Cubic units symbol can be given as unit3. For example, 'cubic centimeter' can be represented as cm3.

When converting a larger unit to a smaller one, you multiply; when you convert a smaller unit to a larger one, you divide.

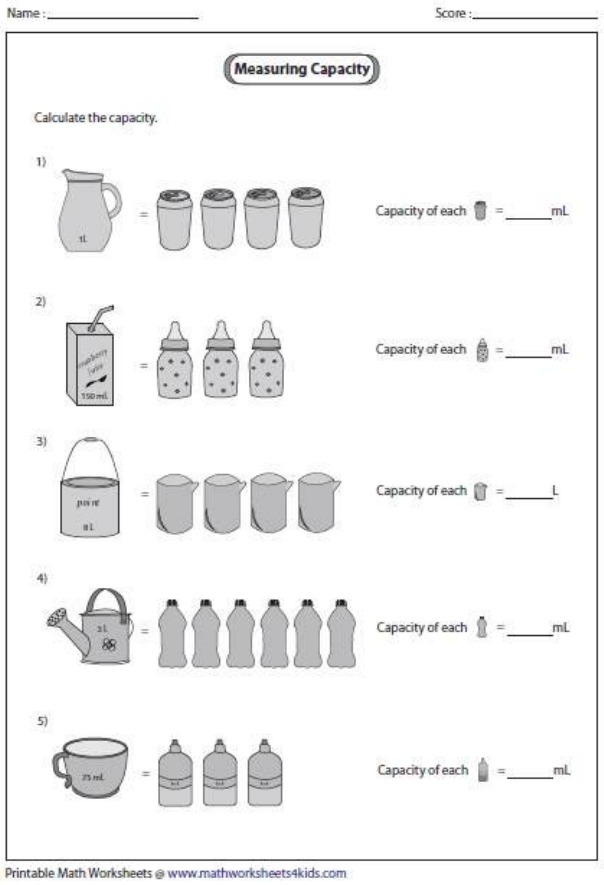
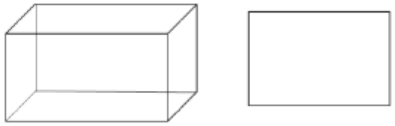
Opportunities for Subject Integration

Money- Unit rate requires the knowledge and concept of money
Number Operations- all operations are used by all the ELOs
Geometry- Utilizing the use of shapes to find area and perimeter and the understanding of dimensions for volume and capacity.

Essential Learning Outcome M 2.1: Applying Techniques, Tools and Formulae for Measuring - Developing personal referents for measuring attributes
Grade Level Expectations: Recognise volume as an attribute of solid figures and understand concepts of volume measurement a: A cube with side length 1 unit, called a 'unit cube" is said to have "one cubic unit" of volume, and can be used to measure volume, b: A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units; Recognise capacity as an attribute of solids that can be filled with liquid and understand concepts of capacity measurement.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Recognise volume as an attribute of solid figures and describe concepts of volume measurement 2. Identify the cube as the most efficient unit for measuring volume and explain why. 3. Identify the referent for a cubic centimeter and explain the choice. 4. Identify a referent for a cubic metre and explain the choice 5. Determine which standard cubic unit is represented by a given referent.	***Observation*** The teacher will observe learners as they look at containers with solids and liquids. The teacher will look to see what the learners are doing to determine the volume. Are they looking at it from the stand point of cubic measures. ***Observation Checklist*** Observe learners to determine whether they can do the following: i) measure the volume of the box correctly (e.g., completely fill the box with a unit and count the number of units used) ii) record both the number and the unit of measure	Provide opportunities for learners to gather evidence to develop the concept volume. For example, show learners two empty boxes of different shapes (e.g., a rectangular box and a triangular prism). Then ask the learners, "Imagine you have a bunch of small identical cubes. Which box would take more cubes to fill it completely? How can we be certain about our answer?" Provide opportunities for learners to be engaged in investigation and collaborative work to understand the concept volume: for example, divide learners into groups and provide each group with a box and three different objects: cubes, another 3D shape (like triangular prisms), and something round (like marbles).

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
6. Explain the term Capacity 7. Estimate the capacity of solids 8. Distinguish between volume and capacity **Skills** 9. Estimate the volume of 3 D shape using personal referent 10. Create a model building (rectangular prism) using cubes or Legos **Values** 11. Discuss the importance of volume and capacity in daily life (e.g., cooking, packaging).	iii)recognise that the cube is the most efficient unit for measuring volume and explain why *Conversion* Learners are correctly expressing their understanding of why volume is considered with three measurements and not two. Check for them pointing out the three different measurements as they may speak to each other or the teacher. *Product* Learners record the length, width, height, and volume of self-built rectangular prisms on a record sheet. Record Sheet Shape | Length | Width | Height | Volume 1 2 3	***Investigating Volume:*** Explain that the groups will be detectives figuring out the best way to measure the "spaciousness" inside their box, which is called volume. The Three Trials: Each group will measure the volume of their box three times, using each of the provided objects once. Instruct them to carefully fill the box with one type of object at a time, making a single layer at the bottom first. Ask them to count the number of objects used for each layer and record the total used for the entire box. Encourage them to note any difficulties they encounter while filling the box with each object. Sharing Findings: After each group has completed the challenge, have them share their observations about using different objects to measure volume. Facilitate a discussion to help them understand why the cubes were the most efficient unit. You can ask questions like: • Did any of the objects create empty spaces inside the box? Why? • Which object was easiest to use for filling the box completely?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Learners complete given worksheet on capacity  *unitary-metric-large.png (442×633) (mathworksheets4kids.com)*	• Why do you think cubes might be the best unit for measuring volume in general? Also, To further illustrate the inefficiency of using round objects like marbles, demonstrate "filling" a box with marbles and then carefully pouring sand on top. This will visually show the leftover space between the marbles compared to a cube-filled box. *Display two images (a rectangle and a cube).*  Learners view the images of a rectangle and a rectangular prism (cube) and are asked what the dimensions of each shape are. (Concrete manipulatives) Building rectangular prisms using cubes Present learners with a set of small unfixed cubes in groups to build a rectangular prism. Learners

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		will write down the dimensions of their built rectangular prism. Provide rectangular prisms (e.g., boxes). Have learners measure dimensions (length, width, height) and calculate the volume using the formula (Volume = length × width × height). Create a "volume station" where learners rotate through different stations measuring various objects and recording their volumes. The concept of Capacity  Engage learners in a whole class discussion about the concept of capacity leading to the generalization that capaacity is the amount of liquid or solid a container can hold. Further, discuss the importance of measuring capacity in everyday life (e.g., cooking, mixing paints).

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Provide learners with the opportunity to estimate the among of water in a container and are questioned as the amount of water inside the jug. They are most likely to give the amount of liquid in terms of the number of cups it can hold instead of litres. If not given, ask learners what unit is used for measuring liquid inside of a container or jug. Have learners conduct experiment where learners predict and then measure the capacity of different containers (e.g., how many milliliters fit into a liter bottle). Comparing capacity (Capacity sort) Provide learners with a variety of containers, with a marked target. Invite learners to sort the collection into those that hold more than, less than, or about the same amount as the target container. Exploring litres and millilitres Provide learners with a 1 litre container and a combination of smaller containers measured in millilitres. They will fill a 1 litre container using a combination of smaller containers (measured in millilitres) Invite learners to engage in a game activity. Learners estimate and then measure the amount

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		(capacity) of rice/beans different containers can hold. They compare their estimates to the actual amount, discuss how container shape affects capacity, and explore the importance of using standard units (like cups) for clear communication.

Useful Content Knowledge for the Teacher

Volume is the amount of space an object occupies or, if the object is hollow, the amount of space inside the object. Volume is measured in cubic centimetres (cm3) or cubic metres (m3).

Capacity is the maximum amount of liquid a container can hold. Capacity is measured in litres (L) and millilitres (mL).

Standard units of capacity include gallons. Quarts, litres and millimetres.

Standard units of volume of solid figures are expressed in terms of cubic units such as cubic metres, cubic centimetres or cubic inches.

Additional Resources and Materials

Measuring tools (rulers, measuring cups, graduated cylinders).

Various containers and objects for measurement.

Worksheets and practice problems.

Online simulations and interactive math websites.

Opportunities for Subject Integration

Science:

Measure the capacity of containers using measuring cylinders or cups. Measuring capacity can help you explore recipes and provide opportunities for learners to use different units of capacity

Language Arts –

Listen to or read the story of ' Area, Perimeter and Volume' by David A Alder

H.F.L.E –

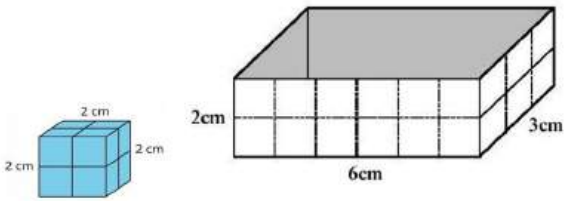
Measure the capacity of the amount of water needed per day to keep the body hydrated.

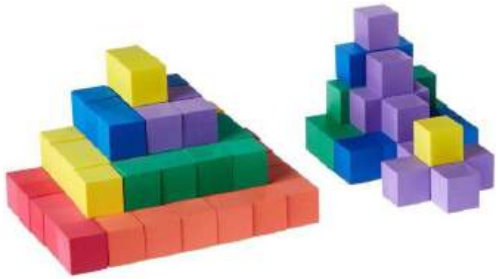
Compare volume of alcoholic drinks and discuss possible effects on body based on volume

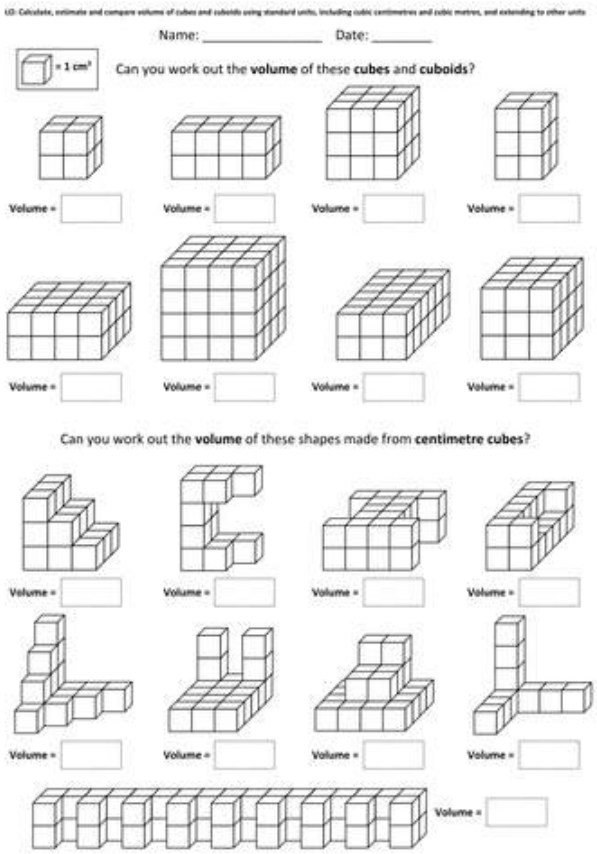
Art –

Drawings involving rectangular prisms and cubes

Essential Learning Outcome M 2.2: Applying Techniques, Tools and Formulae for Measuring - Use tools to measure attributes
Grade Level Expectation:
Measure volumes by counting unit cubes, using cubic cm, cubic m, and improvised units.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Determine the volume of 3D objects by visualizing and counting the number of cubic units they contain. 2. Find the volume of a rectangular prism by counting the number of unit cubes. **Skills** 3. Create a model building (rectangular prism) using cubes or Legos **Values** 4. Recognise the relationship between dimensions and volume by designing and solving practical problems involving volume measurements."	*Observation* Learners are observed as they work in pairs to construct/build different types of regular and irregular rectangular prisms (as many as possible). *Conversion* Group work  Learners are presented with a scenario where they are given a large box of a certain dimension and a cube also of a certain dimension. They will discuss with their group members as to how many of the small cube boxes can fit into the larger box. (each group is given a	*Concrete manipulatives (constructivism)* Provide learners with a specific number of cubes in pairs. Learners use cubes of eight to form as many different shapes of rectangular prisms as possible (regular or irregular).  Concrete manipulatives

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	different dimension). They will then report their findings. Scenario Learners are presented with a rectangular prism and are asked to say how many layers of cubes are on the prism and also the total number of cubes in each layer *Product* Worksheet Learners complete a worksheet on finding the volume of regular and irregular rectangular prisms.	Provide learners with built legos structures of rectangular prisms in pairs and learners are asked to give the volume of each without separating/dismantling the structures. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 https://www.tes.com/teaching-resource/year-6-volume-of-cubes-and-cuboids-3-day-unit-of-work-11540135	

Additional Content Knowledge for the Teacher

The amount of space the contents occupy is called **volume.** A unit cube is a cube with sides of length 1 unit
The metric system relies on understanding the relative size of units and the multiplicative relationships in the place-value system. Both are based on a system of tens, so metric conversions can be visualized as shifting digits left or right of the decimal point, depending on the unit sizes. For example, converting 28.5 km to meters involves shifting the digits three places left, resulting in 28,500 m. There's also an inverse relationship between unit size and count: smaller units result in higher counts, which is crucial for estimating conversions.

Opportunities for Subject Integration

Science: Exploring Volume in the Natural World
Hands-On Experiment:
Activity: Learners measure the volume of objects like rocks or small containers by submerging them in water and calculating the water displacement, then comparing it to volume measured with unit cubes.
Density Exploration:
Activity: Compare the volume and weight of different objects (e.g., a wooden block and a metal cube). Learners calculate volume using unit cubes and discuss why some objects float while others sink.

Social Studies: Building and Space in History
Activity: Study the volume of simple ancient structures (e.g., an Egyptian pyramid or a log cabin). Learners can build small-scale models using unit cubes and calculate their volume.
Community Planning*:*
Activity: Design a simple model of a community with buildings and parks using unit cubes. Learners calculate the volume of each building and compare them.

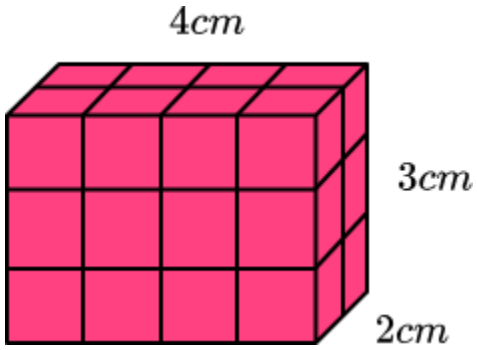
Art: Creating and Measuring 3D Shapes
Sculpture Making:
Activity: Create sculptures using clay or building blocks and measure their volume using unit cubes.
Perspective Drawing:
Activity: Draw 3D objects and estimate their volume, then calculate the volume of a real-life object, like a box, and draw it to scale.

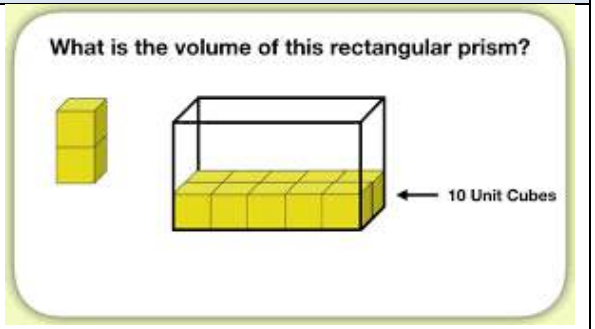
Physical Education: Understanding Volume in Sports Equipment
Gym Equipment:
Activity: Using unit cubes, measure and calculate the volume of various sports equipment (e.g., a stack of gym mats or a storage box).
Field Space:
Activity: Measure and calculate the volume of different sections of a sports field or the court area marked by cones, using simple geometric shapes and unit cubes.

Technology: Designing in 3D
3D Modeling with Simple Tools:
Activity: Use simple modeling software or online tools that invite learners to design objects and calculate their volume virtually.
Virtual Blocks:
Activity: Use a program like Minecraft or another block-building game to create structures and calculate their volume by counting the blocks used.
Language Arts: Writing and Discussing Volume
Descriptive Writing:
Activity: Write a descriptive paragraph about a classroom object, including its volume. For example, "The storage box is large enough to hold 500 cubic centimeters of markers."
Math Journals:
Activity: Keep a journal where learners record experiences with measuring volume, reflecting on how this skill applies across different subjects.

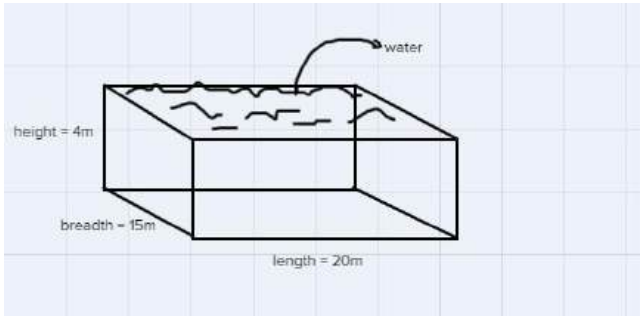
Essential Learning Outcome: M2.3 : Applying Techniques, Tools and Formulae for Measuring - Developing and applying formulae for measuring
Grade Level Expectations: Relate volume and capacity to the operations of multiplication and addition and solve real world and mathematical problems involving volume (cubic cm, cubic dm, cubic m) and capacity (mL, L). Use the area relationships among rectangles, parallelograms, and triangles to develop the formulas for the area of a parallelogram and the area of a triangle and solve related problems.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Recognise the concepts of volume and capacity and their relationship to multiplication and addition. 2. Convert between units of volume (cubic cm, cubic dm, cubic m) and capacity (mL, L). **Skills** 3. Calculate the volume of rectangular prisms using multiplication. 4. Solve real-world problems involving volume and capacity.	*Observation* Observe learners as they manipulate objects to determine volume and capacity. Watch learners as they measure objects to calculate area and volume. Note learners' ability to identify and explain the relationships between shapes and their areas. Observe learners' use of mathematical language and vocabulary when discussing concepts. Assess learners' ability to work collaboratively in group activities. **Checklist for Observing and Assessing Learners** **1. Observation of Manipulating Objects to Determine Volume and Capacity** • Does the learner handle the objects properly and with care Does the learner accurately determine the volume and capacity of the objects?	Review what "volume and capacity" means Provide learners with the opportunity to find volume and capacity, for example: Show learners a small box and invite them to develop a description for the makeup of the box. Fill different containers with water or cubes. Discuss the amount of space occupied by the water or cubes. Introduce the concept of volume as the amount of space an object occupies. Relate it to capacity, which is the amount a container can hold. Have learners build rectangular prisms using unit cubes. Count the number of cubes to determine the volume. Introduce the formula for volume (length x width x height)

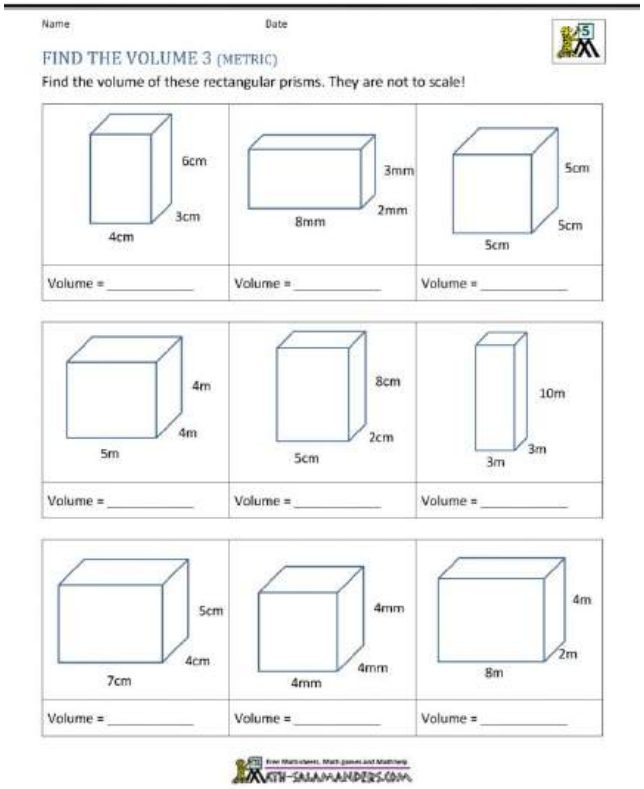
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
5. Derive the formulas for the area of a parallelogram and a triangle based on the area of a rectangle. 6. Calculate the area of parallelograms and triangles using the appropriate formulas. 7. Solve real-world problems involving the area of parallelograms and triangles. **Values** 8. Visualize how the area of a parallelogram and a triangle relate to the area of a rectangle.	• Can the learner explain the process of determining volume and capacity? • Does the learner show problem-solving skills when faced with challenges in manipulation? • Does the learner apply prior knowledge to determine volume and capacity? **2. Measuring Objects to Calculate Area and Volume** • : Does the learner measure objects accurately (length, width, height)? • : Can the learner correctly calculate the area and volume from the measurements? • Does the learner correctly use appropriate tools (ruler, measuring tape, etc.)? • Is the learner able to use and convert units of measurement correctly? • Can the learner explain how they arrived at their calculations? **3. Identification and Explanation of Relationships Between Shapes and Their Areas** • Can the learner correctly identify different geometric shapes? • Can the learner explain the relationships between the shapes and their areas? • Does the learner use the correct formulas to calculate the areas of different shapes? • Does the learner show a deep understanding of the concepts behind the formulas?	Explain to learners the process of using the lengths for the dimensions to calculate the volume of the box .  *Volume= (2 x 4) x 3* *= 8 x 3* *= 24 cubic cm* Hence formula for a volume of a rectangular prism is L x W x H Weaker learners can use the technique of counting, to determine the number of squares at the base (floor/bottom) of the box. Then encourage learners to recognise that the number of squares at the base is repeated several times depending on the height of the box

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• Can the learner apply their understanding to solve complex problems involving area? **4. Use of Mathematical Language and Vocabulary** • : Does the learner use correct mathematical terminology (e.g., "area," "volume," "capacity," etc.)? • Is the learner clear and precise in their use of mathematical language? • : Can the learner effectively explain mathematical concepts using appropriate vocabulary? • Does the learner use mathematical language when communicating with peers? • Is the learner consistent in using mathematical terms correctly across different contexts? **5. Collaborative Work in Group Activities** • : Does the learner actively participate in group activities? • Does the learner contribute meaningful ideas and solutions during group discussions? • Is the learner attentive and respectful when others in the group are speaking? • Does the learner cooperate with others and work well as part of a team? • Can the learner resolve conflicts within the group effectively and constructively?	 10 unit squares at the base Assume the height is 3 units Total cubes is 10 +10 +10= 30 cubic units Have learners measure the dimensions of real-world objects and calculate their volume. Discuss the capacity of containers and how it relates to volume. ***Conversion activities*** Fill containers with water or rice/sand and discuss the capacity in liters (L) or milliliters (mL). Introduce the relationship between liters and milliliters (1 L = 1000 mL). Have learners estimate and then measure the capacity of different containers. Discuss the concept of volume as the amount of space an object occupies and its connection to capacity. Introduce the cubic units of measurement (cubic centimeters,

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Conversion Conduct class discussions about real-world applications of volume and area. Ask learners to explain their reasoning when solving problems. Encourage learners to share different strategies for solving problems. Facilitate debates about the most efficient methods for calculating volume and area. Conduct interviews with individual learners to assess their understanding of concepts. *Product* Have learners create models or diagrams to represent volume and area concepts. Collect learner work samples (e.g., worksheets, projects, assessments) to evaluate their understanding. Use rubrics to assess the quality of learners' work. Create portfolios to document learner growth over time. Develop projects that require learners to apply their knowledge to real-world problems. Group work Learners work in groups and are given various size containers that are in the shape of a regular rectangular prism. Learners need to measure the dimensions of the containers then determine its volume using the formula (L x W x H) and the use of a measuring cup.	cubic decimeters, cubic meters). Explain the relationship between linear units and cubic units (e.g., 1 dm = 10 cm, so 1 cubic dm = 1000 cubic cm). Provide learners with conversion charts and practice problems to convert between cubic units. Discuss real-world examples of volume measurements (e.g., aquarium, shipping boxes). ***Group activity*** Divide learners into small groups and provide each group with different containers and measuring tools (eg. measuring cups). Have learners measure the dimensions of the containers and calculate the volume using a multiplication approach. Then, they will fill the containers with water using the measuring cups Have learners compare the results for both methods used above. **Independent Practice** Invite learners to draw a rectangle on grid paper. Cut the rectangle along a diagonal to form two triangles. Rearrange the triangles to form a

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Scenario *Present learners with a picture of a fish tank or a bathtub in the shape of a regular rectangular prism. eg.*  *https://www.google.com/url?sa=i&url=https%3A%2F%2Fbrainly.com%2Fquestion%2F29133942&psig=AOvVaw1IbIuGTs6Ws2Yq3yQ8lybJ&ust=1717923683639000&source=images&cd=vfe&opi=89978449&ved=0CBcQjhxqFwoTCKDpycjSy4YDFQAAAAAdAAAAABAZ* *Learners are asked to calculate the volume of water in the fish tank when it is at full capacity and half tank. Then ask learners to determine what possible adjustments must be made to the length of one dimension for the tank to be at half of its capacity.*	parallelogram. Discuss the relationship between the area of the rectangle, parallelogram, and triangles. Have learners create different parallelograms and triangles on the geoboard. Count the unit squares to find the area. Introduce the formulas for the area of a parallelogram (base x height) and a triangle (base x height ÷ 2). Have learners measure the dimensions of real-world shapes (doors, windows, floors) and calculate their area. Engage learners in discussions on how to solve real-world problems involving the area. Invite learners to practice estimating volume and capacity before measuring. Collect data on the dimensions of various objects and create graphs to represent the data. Invite learners to create word problems involving volume, capacity, and area of parallelograms and triangles. Have learners work in groups to solve problems and share their findings. Have them use online tools or software to visualize and calculate volume and area.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 *Encourage learners to visualise that the fish tank is too wide to fit in a specific space in the house. Hence the size of the dimensions needs to be adjusted. Asked learners to explore possible changes to the dimensions of the tank whilst maintaining the same capacity as the original tank.* *Worksheets* Learners complete a worksheet on finding the volume of regular rectangular prisms using the formula (L x W x H).	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 https://www.google.com/search?q=worksheets+on+finding+the+capacity+of+a+regular+rectangular+prism&rlz=1CAYJDV_enVC1076VC1076&oq=worksheets+on+finding+the+capacity+of+a+regular+rectangular+prism&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIICAEQABgWGB7SAQoyNTQ4OWowajE1qAIIsAIB&sourceid=chrome&ie=UTF-8#vhid=Ye1tNo_tJV2naM&vssid=l:~:text=volume%20word-,5th%20Grade%20Volume%20Worksheets,Math%20Salamanders.-Volume%20of%20Right	

Additional Content Knowledge for the Teacher about the Outcome

Heights of two dimensional figures are not always measured along an edge.
Any side of a figure/shape can be called a base and for each base a figure has there is a corresponding height.
The base times the height area formulas can be generalised to all parallelograms (not just rectangles) and can be used to develop the area of triangles formula.

Inclusive Resources and Materials

Various containers (boxes, jugs, measuring cups), water, rice or sand.
Metric conversion charts, worksheets with conversion problems. Dice, conversion charts, game board. various objects with different volumes (e.g., boxes, balls, books), measuring tools (rulers, measuring cups). Geoboards, rubber bands. Measurement tools (rulers, tape measures) Grid paper, scissors, rulers

Opportunities for Subject Integration

Language Arts
Writing: Write persuasive essays about the importance of accurate measurements.
Reading: Analyze texts for information about volume and capacity.
Vocabulary: Expand vocabulary related to measurement and geometry.

Arts
Visual Arts: Create sculptures or models involving geometric shapes and volume.
Music: Explore the relationship between the volume of sound and its intensity.

Science
Explore the concept of density, which relates to mass, volume, and capacity.
Discuss the measurement of liquids in experiments and the importance of accuracy.
Investigate the volume of different biological specimens or the capacity of organs.

Data Handling

Introduction to the Strand:
Data is everywhere around us— in the numbers we encounter in sports scores, the information we see in weather forecasts, and the stats we read in news articles. Understanding how to handle and interpret this data is a crucial skill in our modern, information-driven world. Incorporating data handling into the curriculum equips learners with essential life skills, prepares them for future academic and career success, and fosters informed and engaged citizenship. Throughout this strand, we will use real-world examples and hands-on activities to make data handling come alive to learners.

Essential Learning Outcome D 1.1 : Collecting, Organising and Displaying Data - Formulating questions that can be answered with data

Grade Level Expectations:

Formulate a question that can best be answered using first-hand data and explain why.
Formulate a question that can best be answered using second-hand data and explain why
Take steps to reduce bias in questioning.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. List and explain different ways of collecting data. **Skills** 2. Ask suitable questions for collecting relevant data.	***Conversation*** *Create a scenario where learners need information to plan a school event and have them develop questions accordingly.* *Think Pair Share:* Learners work in pairs and find a graph, chart, or infographic online, then write 3 new questions they could answer using the data presented. ***Observation***	***Introduction***: Give learners opportunities to learn how to formulate questions based on a topic through games.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
3. Accurately record and document information received. **Values** 4. Engage in an iterative process of refining questions based on feedback, data exploration, and preliminary analysis to ensure alignment with research objectives and data availability.	The Teacher presents graphs to learners and asks them to formulate questions so that they can derive answers from the graphs. ***Product*** Learners design a simple survey to ask their classmates about their interests, then write 4 questions they could answer with the survey results. *For example:*  All about _____ I am _____ years old. I have _____ hair and _____ eyes. My birthday is on _____. I have _____ brothers and _____ sisters. My favorite subject in school is _____. These are a few of my favorite things Color:_____ Food:_____ Animal:_____ Sport:_____ Song:_____ Movie:_____ Book:_____ Game:_____ ***Source:https://i.pinimg.com/236x/79/58/9b/79589be8c3bb7af633ff4dd0e67717da.jpg*** Question 1: How many male learners completed the survey?	 source:https://alexwallselt.com/wp-content/uploads/2018/04/Guess-the-question-1024x1024.jpg **Quiz question challenge** A quiz game based on recent topics covered in class. • The Teacher reads aloud the answers from your quiz cards. • In teams, learners must guess what the question is. Teacher invites conferring between team members to guess the question.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Question 2: Which food is the favourite in Grade 5?	• Teacher awards two points for getting the question exactly right and one point for providing a question which makes sense and gets the answer, e.g. if the answer is '21', the questions could be 'How many learners are there in this class? (two points) and 'How old is the assistant?' (one point). Learners look at a video reminding them about Data Collection. **Link:** Describe ways on how to collect and organize data  **Source:https://blog.brookespublishing.com/wp-content/uploads/2020/06/data-detective-header-scaled.jpg** *Data Detectives*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Learners will find a news article that uses data, then write 2-3 questions that they could answer using that data. Learners will make a prediction about something in their life, then collect data to see if their prediction was correct and write 2 new questions about their findings. Learners will think of something they are curious about, then research to find data that could help answer their questions. Learners will then write 3 questions they discovered along the way.

Content Knowledge for the Teacher

When formulating questions to collect data, learners should be aware of several key considerations to ensure the effectiveness and relevance of their inquiries.

1. The purpose for collecting the data - the purpose will guide the formulation of appropriate questions.
2. Know the audience – questions should be tailored to the participants' level of expertise, interests, and information needs to ensure relevance and usefulness.
3. Data Collection Method – select appropriate methods based on the nature of the research question, the target population, and resource limitations.
4. Avoid leading questions – Ensure that questions are neutral and unbiased to elicit honest responses from participants.
5. Ethical considerations – Ensure that questions respect respondents' rights and minimise potential harm or discomfort.

By considering these factors, learners can formulate questions that effectively collect data to address research objectives while ensuring clarity, relevance, and ethical conduct throughout the data collection process.

First-Hand Data:

First-hand data is data that is collected directly from the original source. This type of data is firsthand information obtained through experiments, surveys, observations, or interviews. It is considered more reliable and accurate as it comes directly from the primary source.

Second-Hand Data:
Second-hand data, on the other hand, is data that has been collected by someone else and is being used by the researcher. This data is obtained from sources like books, articles, websites, or other publications. Second-hand data may not always be as reliable as first-hand data, as it has already been interpreted or analysed by others before reaching the researcher.

Additional Resources and Materials

Learn about first-hand and second-hand data First-Hand Data and Second-Hand Data

Opportunities for Subject Integration

Language:
Learners answer questions correctly for question and answer relationships.

Mathematics:
Learners ask questions on the topic of money.

Science:
Learners create hypotheses for science projects.

Social Studies:
Learners form questions to conduct research on topics they present in Social Studies. For example: What are the cultural activities done in my country? When do these activities occur?

Health:
Learners form questions that health workers would ask. For example: How old are you? What is your sex? Where do you live?

Essential Learning Outcome D 1.2: Collecting, Organising and Displaying Data - Collecting, organising, displaying and communicating data.

Grade Level Expectations:

Collect data, using appropriate sampling techniques as needed, to answer questions of interest about a population, and organize the data in relative-frequency tables

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Identify appropriate research questions to guide data collection. 2. Select and apply suitable sampling techniques to gather data from a target population. **Skills** 3. Organize collected data into relative frequency tables. 4. Analyze the collected data to draw preliminary conclusions. 5. Communicate findings derived from relative-frequency tables effectively, using visual aids such as charts, graphs, or diagrams. **Values**	***Conversation*** Learners give a 2-minute presentation to the class sharing what they have learned from the teacher about data collection and analysis. ***Observation*** Learners are graded by their teacher demonstrating their ability to conduct data collection and represent the information collected. Teachers would use a rubric to guide their scoring.	Learners look at a video talking about data collection. Learners and teacher have a discussion about data collection. Link: Data Collection Methods | Mathematics Grade 1 | Periwinkle Learners create a survey to collect data from their classmates (e.g., favorite subject, preferred lunch, number of siblings). Example of survey on their favourite snacks. *For example:*  Source: https://cdn.shortpixel.ai/spai3/q_lossy+ret_img+to_webp/https://media.madebyteachers.com/wp-content/uploads/2023/01/20192546/snack-food-month1.jpg

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
6. Determine the most suitable sampling method based on the research questions, available resources, and constraints.	*Example of a rubric:* |	1	2	3 | |---|---|---|---| | **Interactivity** | static | explorable | customizable | | **Data Freshness** | static | periodic updates | (near) real time | | **Data Quality** | raw data | cleansed & transformed | validated (with automated testing) | | **Clarity/Aesthetics** | functional (tables, crosstabs & basic graphs) | illustrated (visuals laid out to tell a story; unique layout that captures brand) | illuminated (every aspect of design enhances message & guides the user's attention) | | **Usability** | technical (needs training to navigate and interpret, cluttered complicated) | intuitive (interface is easy to navigate) | guided (minimal effort required from users) | | **Depth of Analysis** | none | basic statistics | machine learning/advanced stats | | **Availability** | uptime < 90% (site is down 2 hours daily) | uptime ≈ 99% (site is down 15 minutes daily) | uptime ≈ 99.999% (site is down 1 second daily) | | **Performance** | loads in minutes | loads in tens of seconds | loads in under 5 seconds | Source:https://miro.medium.com/v2/resize:fit:960/1*i3Y31iXJj5jhPUxvyMy_6g.png ***Product*** Learners make a chart that compares the snack preferences of boys and girls in their class. Learners create a short story that incorporates the data they collected on favourite snacks.	Learners administer the survey to the entire class, collect and tally the data, and create a relative frequency table to display the results. Analyze the data to identify trends or patterns. ***School-Wide Survey*** Learners develop a survey question relevant to the entire school (e.g., favorite school activity, preferred mode of transportation). Determine an appropriate sample size and sampling method (random, stratified, etc.). Collect data from the selected sample. Organize the data into a relative frequency table. Analyze the data and draw conclusions about the entire school population. ***Real-World Data Analysis*** Provide learners with real-world data sets (e.g., weather data, sports statistics, economic indicators). Learners identify the population and sample used in the data collection. Analyze the data presented in relative frequency tables. Draw conclusions and make predictions based on the data. ***Data Presentation*** Learners choose a data set they have collected or analyzed. Based on the relative frequency table, create a visual representation of the data (e.g., bar graph, pie chart). Present findings to the class,

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		explaining the data collection process, analysis, and conclusions. Incorporate technology tools (e.g., spreadsheets, online survey tools) to enhance data collection and analysis. Emphasize the importance of accurate data collection and ethical considerations. Encourage critical thinking and problem-solving skills throughout the activities. Provide opportunities for learners to collaborate and share their findings.

Useful Content Knowledge for the Teacher

Data collection involves gathering information to analyze and make decisions. It's fundamental for scientific research and everyday problem-solving.

Methods:

- Surveys and Questionnaires: Structured sets of questions to gather specific information.
- Observations: Recording information based on what is seen or experienced.
- Experiments: Controlled procedures to test hypotheses.
- Interviews: Directly asking people questions to gather qualitative data.

Best Practices:

- Ensure questions are clear and unbiased.
- Use a representative sample to generalise findings.
- Record data accurately and consistently.

Organising data helps in making sense of raw data, enabling easy analysis and interpretation.
Categorization: Grouping data into categories (e.g., age groups, income levels).

Sorting: Arranging data in a specific order (e.g., ascending, descending).
Tabulation: Creating tables to systematically display data.

Displaying Data
Visual representation of data makes it easier to understand patterns, trends, and outliers.
Types of Graphs and Charts:

- Bar Graphs: Compare quantities across categories.
- Line Graphs: Show trends over time.
- Pie Charts: Display parts of a whole.
- Histograms: Show frequency distributions.

Components of a Good Graph:

- Clear title.
- Labelled axes with units.
- Legend if necessary.
- Appropriate scale to accurately represent data.

Inclusive Resources and Materials

Graph Paper and Templates: Provide graph paper for creating frequency and relative-frequency tables.
Survey Templates: Provide templates for learners to design their surveys.
Online Tools: Use tools like Google Forms for survey creation and Excel or Google Sheets for organizing data and calculating relative frequencies.
Visual Aids: Create posters or handouts summarizing the steps for creating relative-frequency tables and explaining the different sampling techniques.

Additional Resources and Materials

Lesson on data collection and organising data: COLLECTING AND ORGANIZING DATA

Opportunities for Subject Integration

Language:
Learners can present words that begin with different diagraphs they collected.

Mathematics:
Learners can collect data on shapes and group them based on their characteristics.

Science:
Learners present information based on their research topic. For example, They Might Give a report on the weather based on the information they collected during the week.

Social Studies:
Based on their research, learners can present a graph showing the different ethnic groups in St. Vincent and the Grenadines.

Health:
Learners can create a graph to show the healthy living practices done by their peers.

Elements from Local Culture

Learners can look at data collected on the population of the country done by census. This will teach them the importance of data collection.
Learners can look for articles in newspapers that show data collection.

Resources for a learner who is struggling

Online games: https://toytheater.com-fall/
Online games: Fishing Pictograph Game | Toy Theater

Resources for a learner who needs challenge

Online games: https://mathsframe.co.uk/en/resources/resource/51/bar_charts
Online games: https://www.topmarks.co.uk/carroll-diagrams/2d-shapes

Essential Learning Outcome D2.1: Using Statistical Methods to Analyse Data - Describing data sets
Grade Level Expectations: Explain the difference between first-hand and second-hand data. Select from among a variety of graphs, including stacked-bar graphs, the type of graph best suited to represent various sets of data; display the data in the graphs with proper sources, titles, and labels, and appropriate scales; and justify their choice of graphs.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Distinguish between first-hand and second-hand data, providing examples of each. 2. Select the appropriate graph type (including stacked-bar graphs) to represent a given data set visually. **Skills** 3. Construct clear and accurate graphs, including appropriate titles, labels, scales, and data points. 4. Justify the choice of graph type based on the nature of the data and the information to be conveyed.	**Conversation** *Learners are given a set of data sources to group as Primary /first hand and secondary/ second hand in their small group. Each group will share their answers and explain their choice.* Focus groups, magazines,, Personal investigation , Telephone calls,diary, photograph, Questionnaires Research journals and newspapers **Observation** Learners are given data to construct graphs using a scale of their choice. Teacher observes learners at work to check for correctness. Teacher will also question learners to make clarification. **Product:**	Let learners watch a video (link below) about the types of data. https://youtu.be/t1JTa97SFwk Have learners explain in their own words and give examples for the types of data. Provide the opportunity for learners to look at the graph (link below). Give the parts on the graph by name or description. Talk about the graph in the link and reasons why it was used https://g.co/about/rmu3w2 Teacher displays other graphs for learners to identify by names and states when it's best to use each. ***Divide learners into groups.*** Assign one group to collect first-hand data (e.g., the number of learners wearing blue shirts). Assign another group to find second-hand data (e.g., average rainfall in their city). Have learners

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values 5. Acquire a strong sense of academic honesty and integrity by consistently citing data sources to support the credibility and transparency of their work.	Select one set of data from the given sets. Say whether it's first hand or second hand. Use the data to construct the most appropriate graph for the data.	discuss the differences between the two types of data. Have learners create a chart or table to compare and contrast first-hand and second-hand data. ***Graph Selection and Creation*** Provide learners with different sets of data (e.g., the number of learners who like different ice cream flavors and the number of hours spent on different activities). Have learners decide which type of graph would best represent the data (bar graph, pictograph, stacked bar graph). Guide learners in creating the chosen graph, emphasizing the importance of titles, labels, and scales. Have learners discuss the effectiveness of different graph types for displaying the data. ***Data Analysis and Justification*** Present learners with various graphs (including stacked bar graphs) from newspapers, magazines, or online sources. Ask learners to identify the type of graph used and explain why they think that graph was chosen. Have learners create their own data set and choose the most appropriate graph to represent it.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Encourage learners to justify their choice of graph based on the type of data and the information they want to convey. Discuss with learners the importance of citing data sources. Provide learners with examples of credible and non-credible sources. Have learners find data on a specific topic (e.g., population growth) from different sources. Ask learners to evaluate the credibility of each source and explain their reasoning. Teach learners how to properly cite sources (e.g., author, title, publication date). Use real-world data whenever possible to make the learning more engaging. Encourage learners to work collaboratively on projects. Provide opportunities for learners to present their work to the class. Use technology to create graphs and analyze data.

Useful Content Knowledge for the Teacher

First hand data is information collected directly from the source. For example carrying out a survey to find out how many males are in your school, white second hand data is data collected by someone else other than the user. This data can be sourced from newspapers and other sources. For example, the National Census.

Types of Graphs

Bar Graphs

Use: Comparing different categories of data.

Structure: Rectangular bars represent different categories, with the length of each bar proportional to the value it represents.

Example: Comparing the number of learners who like different ice cream flavors.

Pictographs
Use: Similar to bar graphs but uses pictures or symbols to represent data.
Structure: Each picture or symbol represents a specific quantity.
Example: Using pictures of cars to represent the number of cars sold by different dealerships.

Stacked Bar Graphs
Use: Comparing different parts of a whole within different categories.
Structure: Each bar represents a whole, divided into segments representing different parts.
Example: Showing the number of boys and girls in different grades.

Key differences:

Bar graphs and pictographs are used to compare different categories of data, while stacked bar graphs are used to compare parts of a whole within different categories.
Pictographs use pictures instead of bars to represent data.
Stacked bar graphs combine information about multiple categories within a single bar.

Inclusive Resources and Materials

- Graph paper: For learners to practice creating graphs.
- Markers or colored pencils: For creating visual representations.
- Rulers: For drawing straight lines and measuring accurately.
- Whiteboard or chart paper: For whole-class demonstrations and discussions.
- Real-world data sets: Examples from newspapers, magazines, or online sources.
- Graphing templates: Pre-made templates to save time.
- Manipulatives: Blocks, counters, or other objects to represent data.
- Technology: Computers with graphing software or online tools.

Visual Aids:

- Posters or charts: Examples of different graph types.
- Flashcards: With key terms and definitions.

Additional Resources and Materials

https://youtu.be/t1JTa97SFwk
https://youtu.be/opWkRvGtwf8

Opportunities for Subject Integration

Language Arts:
write a descriptive paragraph on a data set provided

Social Studies:
Collect firsthand data about different situations in the school. For example, the number of learners absent on Fridays from the different grades.

Science:
Use secondhand data to construct appropriate graphs. For example, days for germination of different seedlings

Elements from Local Culture

Use of secondhand data of carnival shows results for the past 5 years.
Second hand data from the yearly labour day fisherman competition. Make an appropriate graph and determin the total catch each year.

Resources for a learner who is struggling

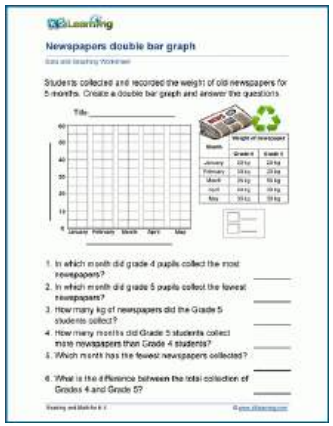
Source: https://images.app.goo.gl/WvYYQ9wiCyMQX1Jn8

Resources for a learner who needs challenge

Source: https://www.twinkl.com.mt/sign-up

Essential Learning Outcome: D2.2: Using Statistical Methods to Analyse Data - Developing and applying methods to analyse data sets
Grade Level Expectations: Find examples of second-hand data in print and electronic media, such as newspapers, magazines, and the Internet for analysis. Analyse different sets of data presented in various ways, including in stacked-bar graphs and in misleading graphs, by asking and answering questions about the data, challenging preconceived notions, and drawing conclusions, then make convincing arguments and informed decisions.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge:** 1. Identify examples of second-hand data from print and electronic media **Skills:** 2. Analyze data in different ways 3. Ask questions about data 4. Answer questions about data 5. Draw conclusions to make informed decisions **Values** 6. Willingly participate in answering questions about data	**Observation:** Present learners with the different data materials. Ask learners to divide them into two groups. Teachers observe different learners to see their approach to the information. Listen to them talking as they try to decide how to group them and why. **Think, pair, share**. Learners work in pairs to identify secondhand data in different materials. Each pair can report to the whole class because they make their choices. Learners are given the opportunity to write two examples of secondhand data on their own. **Conversation:** Learners in groups are given materials to group data as first and second hand Teacher converses with each group to discuss their grouping and why the items are placed in each group.	Present learners with different articles with information. Learners examine one at a time and identify the secondhand data. Learners identified areas in which they will like to collect first hand data. Collect the data then construct graphs Learners are given graphs to analyze and answer questions about the graph.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product: Learners are given data to represent in a graph Source: https://images.app.goo.gl/7pgKxTcKrbwiPYH48  	

Useful Content Knowledge for the Teacher

Interpreting results requires reasoning and analysis, which teachers should nurture through varied activities and open-ended questions encouraging learners to engage deeply with data. Gal (2002) suggests interpreting data from both the investigator's and reader's perspectives. As investigators, learners analyze their own collected data, while as readers, they examine externally sourced data from subjects like science or social studies. Teachers should invite time for learners to reflect on data, discuss it in groups, and answer open-ended questions to express their observations and draw conclusions.

Comprehending data involves three levels:
Reading the Data: Identifying essential elements like titles, axes, and specific data points.

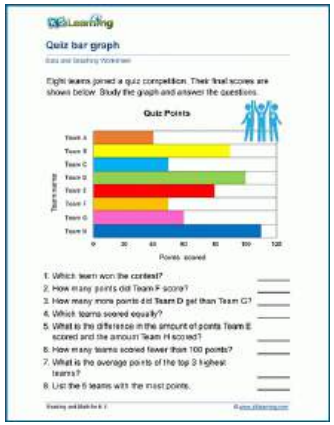
Example Questions: "What is this graph about?" "How many categories are there?"
I am reading Between the Data: Comparing and analyzing relationships between data sets.
Example Questions: "What is the most popular category?" "How many more of X than Y?"
Reading Beyond the Data: Making inferences, predictions, and concluding.
Example Questions: "What other questions can this data answer?" "How could the data be organized differently?"

Teachers should guide learners through all three levels to develop their ability to conclude, formulate arguments, and make informed decisions based on data. This process is critical in inquiry, helping learners connect data relationships, derive meaning, and make decisions informed by their conclusions.

Inclusive Resources and Materials

Graph Paper and Templates: Provide learners with graph paper or templates for creating graphs.
Interactive Tools: Use online graphing tools like Create A Graph from the National Center for Education Statistics, which is simple enough for Grade 5 learners.
Books and Articles: Include age-appropriate books that present data in fun ways, like "The Great Graph Contest" by Loreen Leedy or "Lemonade for Sale" by Stuart J. Murphy.
Visual Aids: Posters that show different types of graphs and key terms like “x-axis,” “y-axis,” “scale,” etc., can be helpful for reference.

Additional Resources and Materials



Source: https://images.app.goo.gl/7pLyzVWoLuAjaeo39

Opportunities for Subject Integration:

Language Arts:
Write a paragraph to explain to your friends what is second hand data and where we can get them.

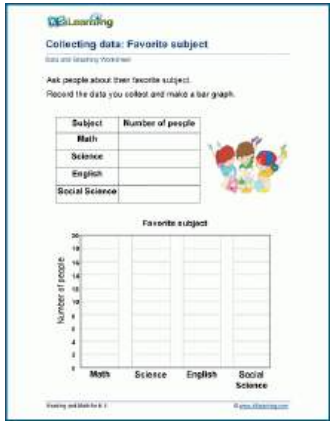
Social Studies:
Collect second hand data about a current issue and construct a graph to show that information.

Science:
Use the graph from the second hand data constructed to make generalisation about the weather in the Caribbean

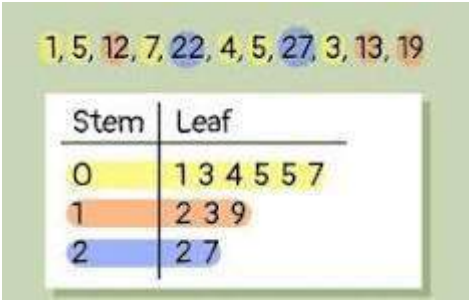
HFLE:
collect second hand data about the different unhealthy habits and determine which is most popular among our people.

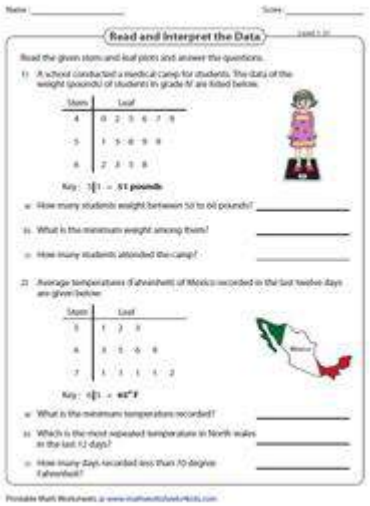
Resources for a learner who is struggling:

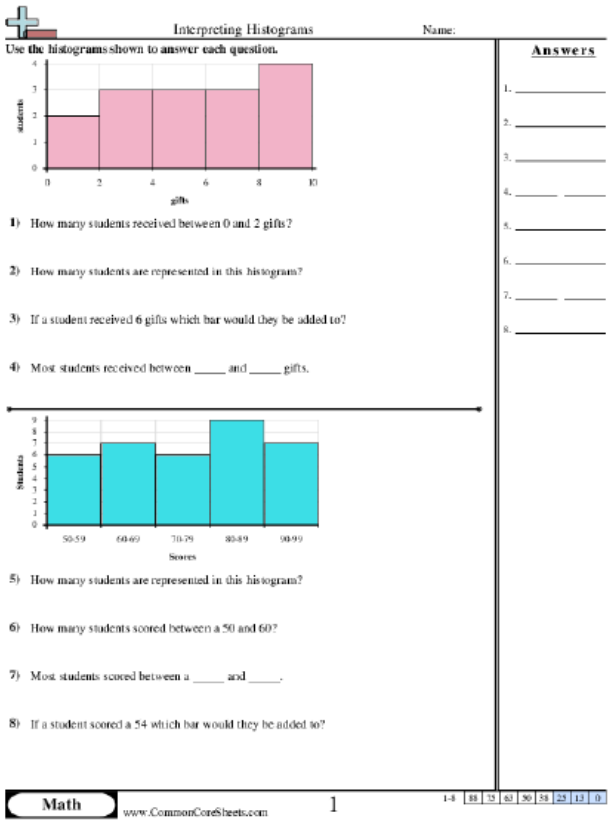
Source:https://images.app.goo.gl/69WvrErC85cUjw9T7



Essential Learning Outcome D3.1: Evaluating Inferences and Making Predictions Based on Data - Making inferences with data sets
Grade Level Expectation: Read, explain patterns, and make predictions from data represented in stem-and-leaf plots and histograms.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Read and interpret data presented in stem-and-leaf plots and histograms. **Skills** 2. Identify and explain patterns within data sets represented in stem-and-leaf plots and histograms. 3. Make predictions about data trends based on the information presented in stem-and-leaf plots and histograms. **Values** 4. Use predictions from data represented in stem-and-leaf plots and histograms to make informed decisions	**Conversation:** Review previous knowledge by oral questioning. Video presentation: How to Make a Stem-and-Leaf Plot (2-Digits) | Math with Mr. J Histograms Explained! | How to Make a Histogram | Math Defined with Mrs. C Learners view videos as they are questioned intermittently to ensure understanding of concept presented **Observation:** Learners are observed as they work on given tasks.	Briefly review the concepts of stem-and-leaf plots and histograms. Discuss the purpose of these graphs: to organize and visualize data. Introduce the idea of patterns in data.  https://www.wikihow.com/Read-a-Stem-and-Leaf-Plot Learners view videos. They are paired and encouraged to share their understanding of stem and leaf plots/ histograms. How to interpret a histogram | Data and statistics | 6th grade | Khan Academy

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist is used to assess learners, behaviour, ability, skills and understanding as they perform the tasks given. Tasks: Learners are given stem-and-leaf plots, and histogram worksheet complete. **Product:** **Worksheet** https://www.mathworksheets4kids.com/stem-leaf/read-level1-1.pdf  	How to Read a Stem-and-Leaf Plot (2-Digits) | Math with Mr. J Present learners with a stem-and-leaf plot. Ask learners to observe the data and identify any patterns they notice. - Are there clusters of data? - Are there any gaps in the data? - Is the data spread out evenly or clumped together? - Are there any outliers? Repeat the process with a histogram. Discuss the similarities and differences in the patterns observed in both graphs. **Pattern Descriptions:** Introduce vocabulary related to data patterns: symmetric, skewed, bimodal, uniform, clustered, and outliers. Provide learners with a variety of stem-and-leaf plots and histograms. In pairs or small groups, learners analyze the graphs and describe the patterns using the vocabulary. Share findings as a class and discuss the reasoning behind their observations. **Real-World Application:** Present real-world data sets (e.g., class test scores, heights of learners, weather data).

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	https://www.commoncoresheets.com/worksheets/157/english/thumb.png  Interpreting Histograms Name: Use the histograms shown to answer each question. 1) How many students received between 0 and 2 gifts? 2) How many students are represented in this histogram? 3) If a student received 6 gifts which bar would they be added to? 4) Most students received between ____ and ____ gifts. 5) How many students are represented in this histogram? 6) How many students scored between a 50 and 60? 7) Most students scored between a ____ and ____. 8) If a student scored a 54 which bar would they be added to? Answers Math www.CommonCoreSheets.com 1	Learners observe stem-and-leaf plots and histograms for the data. Analyze the patterns in the data and discuss what the patterns might indicate. For example, if a histogram of test scores is skewed to the left, what does this suggest about the class's performance? Have learners create their own data sets based on a given pattern (e.g., create a data set that would result in a symmetric histogram). Challenge learners to find examples of stem-and-leaf plots or histograms in newspapers, magazines, or online sources and describe the patterns they observe.

Useful Content Knowledge for the Teacher

Interpreting a Stem-and-Leaf Plot

Step 1: Read any text present with the plot to help determine the overall context.
Step 2: Determine the minimum, median, maximum values, as well as the range of the data represented in the stem-and-leaf plot.
Step 3: State whether the distribution is skewed toward lower values, symmetric, or skewed toward larger values.
Step 4: Interpret the stem-and-leaf plot by summarising what you have found in the previous steps.

Vocabulary and Formula

Stem-and-leaf plot: A stem-and-leaf plot is a graphical display of quantitative data that separates all but the last digit to form the stem and uses the last digit to be a leaf.
Minimum: The minimum value of a data set is the smallest value.
Maximum: The maximum value of a data set is the largest value.
Range: Range = Maximum - Minimum The range measures how spread out the data values are.
Median: The median of the data set is the centre value.

How to Interpret a Histogram.

Step 1 : Identify the independent and dependent variable.
Step 2: List the frequency in each bin.
Step 3 : Interpret the data and describe the histogram's shape. Use the interpretation to answer any questions posed about the data.

Histogram Distributions

Analysing the pattern of variation.
The 4 most common Distributions are:

- Normal Distribution - data is evenly distributed and centred around your Mean value.
- Double-Peaked (Bi-Modal) Distribution - there are 2 independent sources of Variation that result in Peaks within the data.
- Plateaued (Multimodal) Distribution - there are multiple sources of variation that are affecting the outcome.
- Skewed Distribution - can be skewed in either the Left or Right direction.

Describing Histograms

Additional Resources and Materials

Reading stem-and-leaf plot
Representing Data - Stem-and-leaf plot
Effective use of Histograms

Opportunities for Subject Integration

- **Social studies** - when studying the population, money budget
- **Science** - measure plant growth, studying weather pattern, weather prediction
- **Language Arts** - reading comprehension, vocabulary and spelling of terms/concepts

Resources for a learner who is struggling

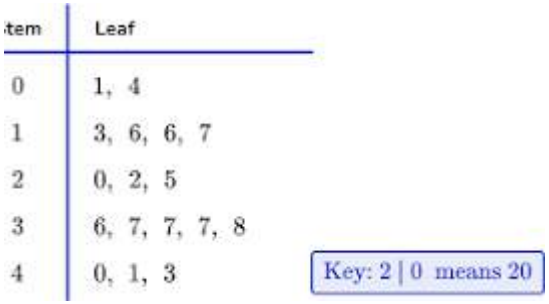
Online interactive quiz which invites them to read the stem-and-leaf plot for scenarios and interpret the two-digit data to answer questions. Explanations to incorrect responses and steps are given to solve the problems.
Interpret stem-and-leaf plots | 8th grade math
Interpreting Histogram online game

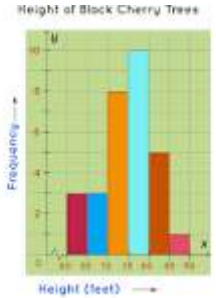
Resources for a learner who needs challenge:

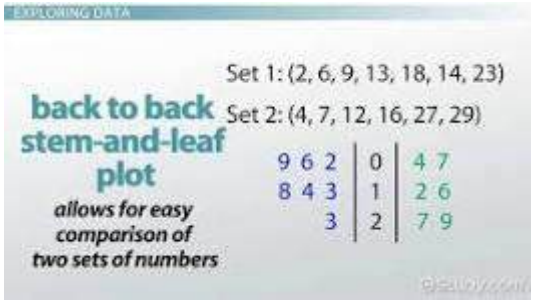
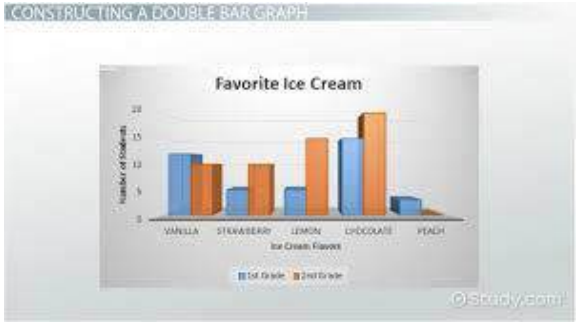
Online interactive quiz which invites them to read the stem-and-leaf plot for scenarios and interpret the three-digit data to answer questions on mode, range, maximum and minimum values. Explanations to incorrect responses and steps are given to solve the problems.
Reading stem-and-leaf plot
Analyse stem-and -leaf plot
STEM AND LEAF DIAGRAMS – PRACTICE QUESTIONS
Reading and Interpreting Histogram

Essential Learning Outcome D3.2: Evaluating Inferences and Making Predictions Based on Data - Making and testing conjectures based on data sets
Grade Level Expectation: Analyze stem-and-leaf plots and histograms to answer specific questions.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Learners are expected to:
 	
Knowledge
 	
1. Answer specific questions about the data based on the information presented in the plots.
2. Compare and contrast information from stem-and-leaf plots and histograms.
 	
Skills
 	
3. Create stem and leave and histogram charts
 	
Values
 	
4. Recognised the advantages of both a stem-and-leaf plot and a histogram.
	Formal Assessments
	
	• **Quizzes and Tests:** Include questions that require learners to:
	  ○ Read and interpret data from given plots.
	  ○ Create stem-and-leaf plots and histograms based on data sets.
	  ○ Compare and contrast different data displays.
	  ○ Solve problems using information from the plots.
	• **Projects:** Assign projects where learners collect data, create both types of plots, and analyze the results. They can present their findings to the class.
	
	Informal Assessments
	
	• **Observations:** Observe learners as they work in groups or individually. Look for their ability to:
	  ○ Understand the concepts of stem-and-leaf plots and histograms.
	  ○ Use the plots to answer questions.
	  ○ Explain their reasoning.
		Create Stem-and-Leaf Plots and Histograms
		
		• Have learners collect data on a topic of their choice, such as their heights, shoe sizes, or favourite pencil numbers. Then, have them create a stem-and-leaf plot and a histogram to represent the data. This will help them understand how these displays are constructed.
		
		 
		
		https://thirdspacelearning.com/us/math-resources/topic-guides/statistics-and-probability/stem-and-leaf-plot/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• **Exit Tickets:** To assess learners' understanding, ask them a brief question or problem related to the day's lesson. • **Class Discussions:** Facilitate discussions about the data displays, encouraging learners to share their thoughts and interpretations. • **Portfolios:** Collect learner work samples over time to track their progress and growth. Performance-Based Assessments • **Data Analysis Tasks:** Provide learners with real-world data sets and ask them to choose the appropriate display (stem-and-leaf plot or histogram), create it, and analyze the results. • **Group Presentations:** Have learners work in groups to analyze a data set, create both plots, and present their findings to the class.	understanding the Data Displays **Have** Learners collect data (e.g., heights, test scores, number of siblings) and create both a stem-and-leaf plot and a histogram to represent the data. Provide learners with pre-made stem-and-leaf plots and histograms. Ask them to describe the shape of the data (symmetrical, skewed, uniform), identify outliers, and find the range, median, and mode.  https://www.cuemath.com/data/histograms/ Use real-world data sets (e.g., weather data, sports statistics) and have learners create both a stem-and-leaf plot and a histogram. Discuss the advantages of each display for different types of data. Provide learners with two different data sets (e.g., boys' heights vs. girls' heights, test scores for two classes). Have them create a stem-and-leaf plot

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		and a histogram for each set. Compare and contrast the data using the displays.  https://study.com/learn/lesson/stem-and-leaf-plot.html  **https://study.com/academy/lesson/video/double-bar-graph-definition-examples.html** **Have learner**s debate which display (stem-and-leaf plot or histogram) is better suited for a particular data set, justifying their choices with reasons.

		Answering Questions • **Data Dilemma:** Provide learners with a stem-and-leaf plot or histogram and a series of questions about the data. Questions should range from simple (e.g., what is the most frequent value?) to more complex (e.g., what percentage of the data falls within a certain range?). • **Real-World Problem Solving:** Present real-world scenarios involving data (e.g., analyzing sales figures, studying plant growth). Learners use stem-and-leaf plots or histograms to answer questions related to the scenario. **Technology Integration** • **Online Tools:** Use online tools or software to create interactive stem-and-leaf plots and histograms. Learners can manipulate the data and observe the changes in the displays. • **Data Analysis Software:** Introduce learners to statistical software (e.g., Excel, Google Sheets) to create and analyze larger data sets.

Useful Content Knowledge for the Teacher

Stem-and-leaf plots are a simple way to organize and visualize data. Here's how to create one:

1. **Order your data:** Arrange your numbers in ascending order.
2. **Identify the stem:** This is the leading digit(s) of each number.
3. **Identify the leaves:** The remaining digit(s) are the leaves.
4. **Create the plot:** Draw a vertical line. To the left, list the stems. To the right of the line, list the leaves for each stem in ascending order.

Example: Data: 23, 45, 32, 48, 37, 29, 41

- Stems: 2, 3, 4
- Leaves: 3, 2, 7, 9, 5, 8, 1

Stem-and-Leaf Plot:

2 | 3 9
3 | 2 7
4 | 1 5 8

Creating a Histogram

A **histogram** is a bar graph that shows the frequency of data within specific intervals.

1. **Determine the range:** Find the difference between the highest and lowest values in your data.
2. **Choose intervals:** Divide the range into equal-sized intervals (called bins or classes).
3. **Count the frequency:** Determine how many data points fall into each interval.
4. **Create the histogram:** Draw a horizontal axis to represent the intervals and a vertical axis to represent the frequency. Draw bars for each interval, with the height of each bar corresponding to the frequency.

Example: Data: 23, 45, 32, 48, 37, 29, 41

- Intervals: 20-29, 30-39, 40-49
- Frequencies: 2, 2, 3

Inclusive Resources and Materials

Analysing stem and leaf plots

- **Whiteboard or chalkboard:** For demonstrations and learner participation.
- **Markers or chalk:** For writing and drawing on the board.
- **Graph paper:** For learners to practice creating histograms.

- **Rulers:** For drawing axes and bars on graph paper.
- **Data sets:** A variety of data sets, both real-world and fictional, for practice.

Additional Resources and Materials

- **Manipulatives:** Blocks, counters, or cards to represent data points can be helpful for visual learners.
- **Technology:** Computers with statistical software or online tools for creating and analyzing data.
- **Worksheets:** Pre-prepared worksheets with practice problems and data sets.
- **Real-world examples:** Newspapers, magazines, or online resources with data to analyze.
- **Posters or charts:** Visual representations of stem-and-leaf plots and histograms.
- **Examples:** Real-world examples of these plots and histograms to show their applications.

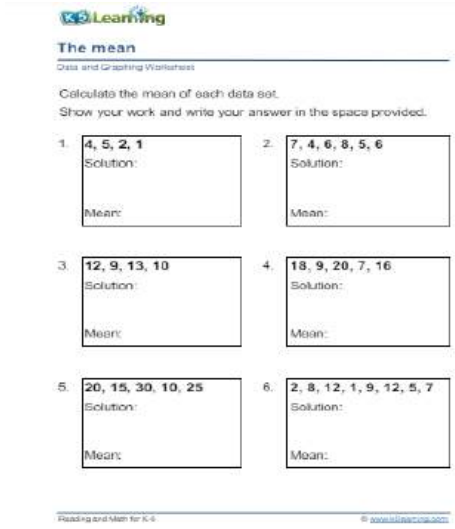
Opportunities for Subject Integration

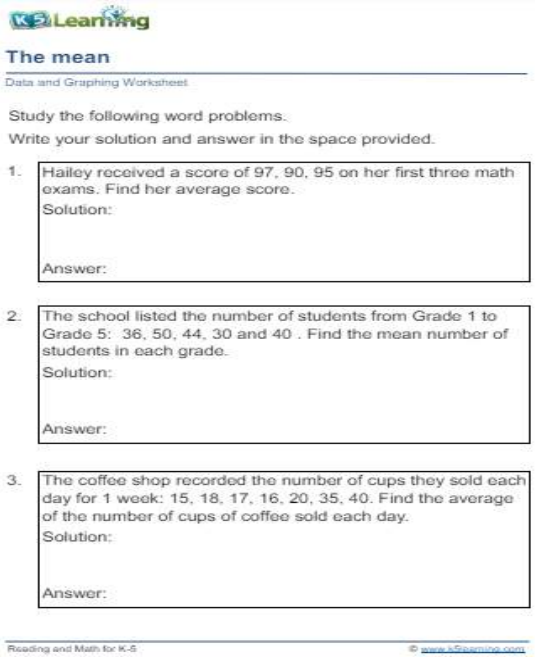
Science:
Learners can collect data on plant growth over time, create a stem-and-leaf plot to show height variations, and then use a histogram to visualize the distribution of heights.

Social Studies:
Learners can analyze census data to create a histogram showing population distribution by age group.

Language Arts:
Learners can count the number of words in each sentence of a text, create a stem-and-leaf plot, and then analyze the data to determine sentence length patterns.

Essential Learning Outcome D 3.3: Evaluating Inferences and Making Predictions Based on Data - Evaluating data descriptions and reports
Grade Level Expectations: Find examples of second-hand data in print and electronic media, such as newspapers, magazines, and the Internet. Determine the mean and the median and identify the mode(s), if any, for various data sets involving whole numbers and decimal numbers, and explain what each of these measures indicates about the data.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Explain what is meant by second-hand data 2. Identify examples of secondary data 3. Differentiate between the terms 'mean' and 'median' **Skills** 4. Use data sets to calculate the mean and median **Values** 5. Recognise the importance of knowing how to calculate the mean and median of data sets	***Product*** *Learners complete the worksheet on calculating the mean for given data sets.*  K5 Learning The mean Data and Graphing Worksheet Calculate the mean of each data set. Show your work and write your answer in the space provided. 1. 4, 5, 2, 1 Solution: Mean: 2. 7, 4, 6, 8, 5, 6 Solution: Mean: 3. 12, 9, 13, 10 Solution: Mean: 4. 18, 9, 20, 7, 16 Solution: Mean: 5. 20, 15, 30, 10, 25 Solution: Mean: 6. 2, 8, 12, 1, 9, 12, 5, 7 Solution: Mean: Reading and Math for K-5 © www.k5learning.com *Source: https://www.k5learning.com/worksheets/math/data-graphing/grade-5-mean-a.pdf*	Provide learners with explanation of second-hand data. Present examples of data from school records, books, magazines, books, internet etc. Elicit other sources of first data from learners. Invite learners to discover the diffrence between primary and secondary data through a video presentation on youtube to explain the difference between primary data and secondary data (second-hand data. Using Primary & Secondary Sources Provide learners with explanations of the difference between the terms 'mean' and 'median'. Invite learners to use real life data sets to demonstrate how to calculate the mean and median of a data set. For example, learners will be presented with a data set showing the scores of 5

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 K5 Learning **The mean** Data and Graphing Worksheet Study the following word problems. Write your solution and answer in the space provided. 1. Hailey received a score of 97, 90, 95 on her first three math exams. Find her average score. Solution: Answer: 2. The school listed the number of students from Grade 1 to Grade 5: 36, 50, 44, 30 and 40 . Find the mean number of students in each grade. Solution: Answer: 3. The coffee shop recorded the number of cups they sold each day for 1 week: 15, 18, 17, 16, 20, 35, 40. Find the average of the number of cups of coffee sold each day. Solution: Answer: Reading and Math for K-5 © www.k5learning.com *Source: https://www.k5learning.com/worksheets/math/data-graphing/grade-5-mean-c.pdf* ***Peer Assessment*** Have learners work in pairs to calculate the mean and median of given data sets. Have learners take turns to explain to each other the steps the followed in calculating the mean/median.	randomly selected learners in a particular subject. Invite learners to use the data to demonstrate how to calculate the mean (average). Invite learner the opportunity to engage in discussions about means. Invite learners to use the same or a similar data sat to demonstrate how to calculate the median. Have learners practise rearranging the terms in ascending order to determine/calculate the median. Have learners look at the video clip to learners to help reinforce the concepts. Mean, Median and Mode Song

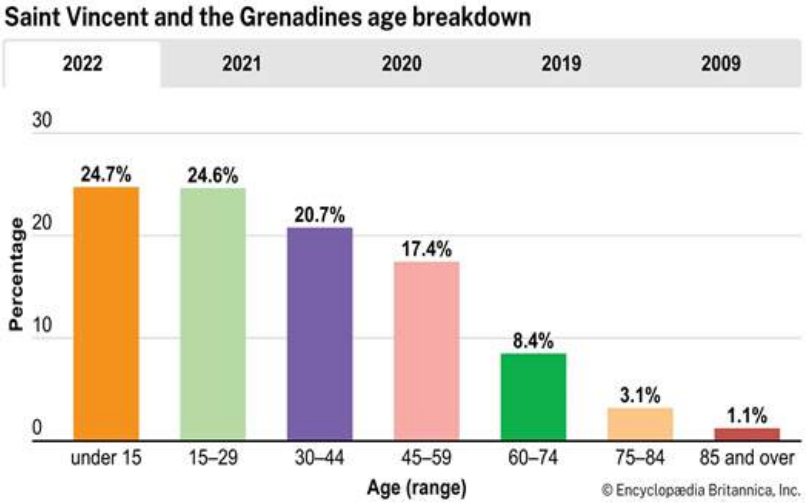
Useful Content Knowledge for the Teacher

Primary data refers to that which is collected first hand. Such data can be collected via interviews, observation, questionnaire and surveys.
Second-hand data is such that has been collected and organised to be used for a particular purpose. Such data can be obtained in books, magazines, newspapers, health records, school records, internet etc.
Video link: https://www.youtube.com/watch?v=dU8Tr6JChqY

Examples of second-hand data
A table showing the number of males and females in various grades in a school.

Grade	No. of males	No. of females
Kindergarten	15	13
Grade 1	15	7
Grade 2	8	6
Grade 3	15	12
Grade 4	13	14
Grade 5	14	15
Grade 6	14	13
	94	80

A bar graph showing the breakdown of ages among members of the population.



Source: https://www.britannica.com/place/Saint-Vincent-and-the-Grenadines/Economy

The mean of a data set is also called the average. It can be found by grinding the sum of all the numbers in a data set then dividing by the number of terms in the set.

Eg. The scores of 5 learners on a Math test: 75 , 80 , 50 , 95 , 80

To calculate the mean : $\frac{75 + 80 + 50 + 95 + 80}{5} = \frac{380}{5} = 76$

This shows that the average score of the 5 learners is 76. Most of the scores lie around this number.

Eg. #2: The shoe sizes of 5 learners in Grade 5: 7 , 6.5 , 8 , 7.5 , 5

To calculate the mean : $\frac{7 + 6.5 + 8 + 7.5 + 5}{5} = \frac{34}{5} = 6.8$

This shows that the average shoe size of the 5 learners is 6.8.

The median refers to that number that lies in the middle of a data set when the terms are organised in sequence (smallest to largest).

Eg. Data set : 75 , 80 , 50 , 95 , 80

Data set arranged in ascending order: 50 , 75, **80** , 80 , 95

The middle number is now 80.

In cases where there is an even number of terms , eg. 35, 60, 20 , 80

Data set arranged in ascending order: 20 , **30 , 60** , 80

Two (2) numbers lie in the middle of the arranged data set. Hence, we calculate the average of the two (2) numbers : $\frac{30+60}{2} = \frac{90}{2} = 45$

Additional Resources and Materials

How to calculate the mean and median: Math Antics - Mean, Median and Mode

Opportunities for Subject Integration

Language .Arts -
Writing a poem using the words 'mean' and 'median.'

Science –
Calculating the average height of selected learners in the class

Social .Studies –
Determining the mean and median of data sets about the population of various communities/countries

Resources for a learner who is struggling

Video Clip: https://www.youtube.com/watch?v=Jqbd8enkkC0

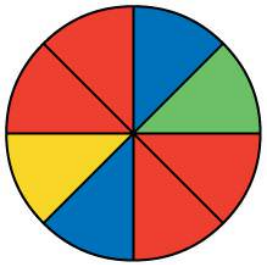
Resources for a learner who needs challenge

Worksheet: https://www.mathworksheets4kids.com/mean/decimal-type1-1.pdf

Essential Learning Outcome D4.1 : Understanding and Applying Concepts of Probability - Predicting and describing the likelihood of events
Grade Level Expectations: Explore simple, one-step events; Make and test predictions; Classify the likelihood of a single outcome occurring in a probability experiment as impossible, possible, or certain.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Explain what is meant by one-step events 2. Identify real life examples of one-step events 3. Classify events in terms of 'impossible, possible, certain' **Skills** 4. Classify the likelihood of a single outcome in a probability event as being impossible, possible, or certain. **Values** 5. Willingly assist their peers who experience difficulty understanding the concepts taught	**Observation:** Observe learners as they work in groups to discuss and make a list of one-step events.  Source: https://www.teacherkit.net/10-great-ideas-for-group-work/ **Conversation** Divide learners into groups of three. Present each group with a list of events. Have learners discuss each event to determine whether or not it can be classified as a single event. Learners take turns sharing their answers with the rest of the class.	*Provide the opportunity for learners to discover* the meaning of the term 'one-step events' to learners. Invite learners to engage with examples of events to help learners the meaning of the concept. Examples of activities include rolling a 5 on a die , getting a tail with a single toss of a coin , selecting numeral 5 out of a bag with numbers between 0 and 10 etc. **Gallery walk** Have learners work in groups to make a list of real life events that can be categorized as 'one-step events' or 'single events' Learners will then be instructed to post their lists on the walls of the classroom. Groups of learners walk around the room to observe and discuss each other's lists.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
6. Participate in class/group activities involving classifying given events as impossible, possible, and certain	 Source: https://www.freepik.com/premium-vector/group-learners-talking-cartoon-illustration_37084949.htm **Product** Learners complete a worksheet which requires the classification of given events as possible, impossible and certain. *Sample of worksheet* Correctly identify each of the following as certain, possible or impossible 1. It will get dark tonight ._____ 2. It will rain tomorrow. _____ 3. I will laugh today. _____ 4. A pig will fly past my window ._____ 5. I will get something wrong today. _____ 6. If I jump up, I will come back down again ._____ 7. If a throw a regular dice, I will get a 7 ._____	 Source: https://ctlonline.org/gallery-walk/ **Video** **Invite learners to observe a video clipping to**. discuss the meanings of the terms 'possible', 'impossible' and 'certain'. Elicit from learners a list of events that can be classified as possible, impossible, and certain. Video clip: Probability - Impossible Events and Certain Events | Don't Memorise **Cooperative Learning** Present models of the Chance Colour Wheels to groups of learners. Instruct the learners in each group to take turns predicting the probability of getting selected colors by spinning the wheel. Have learners use the terms (possible, impossible, certain) to describe the outcomes. Group leaders share their answers with the class.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Adopted from http://www.firstschoolyears.com/numeracy/data/worksheets/probability	The Chance Colour Wheel  Source:https://ecampusontario.pressbooks.pub/sccstatistics/chapter/terminology/

Useful Content Knowledge for the Teacher

An event in probability refers to a set of outcomes that result from a particular situation or experiment. Such outcomes can be classified as being possible, impossible, and/or certain.

Possible Outcomes - All the possible results of an experiment. (*The probability is usually ½ or 0.5)*

Example #1 - When a die is rolled, all the possible outcomes are 1, 2, 3, 4, 5, 6. *(There are 6 possible outcomes.)*

Example #2 - When a coin is tossed, the possible outcomes are head and tail. *(There are 2 possible outcomes.)*

Impossible Outcome - If the possibility of an event occurring is zero.

Example #1 - When I go outside, candy will rain from the sky.

Example #2 - Selecting a yellow ball from a box containing white balls

Certain Outcome - When the outcome or result of an event is sure; it will always happen in an event. *(The probability is usually 1)*

Example #1 - Selecting a blue marble from a jar of containing blue marbles

Example #2 - Selecting a blank sheet of paper from a ream of blank print paper

Additional Resources and Materials

Books and Literature:

"Probably Pistachio" by Stuart J. Murphy: A story that introduces basic probability concepts through a relatable narrative.

"If You Hopped Like a Frog" by David M. Schwartz: A fun book that uses real-life analogies to explain the likelihood and probability of different events.

Online Resources and Videos:

Khan Academy: Probability and Statistics: Videos and interactive exercises on basic probability concepts.

YouTube Channels: Channels like "Math Antics" offer clear and engaging explanations of basic probability.

Opportunities for Subject Integration

Language Arts –

Writing short story or summary of events that are certain, possible or impossible. Write to justify why an event can be possible, impossible or certain.

Science –

Making predictions about the possibility of events occurring eg. Rain falling on the first day of the new week; a seed sprouting 5 hours after being planted

Social Studies –

Learners can create posters of events with the headings certain, possible and impossible. They can name activities that will fall under these headings or use pictures.

Essential Learning Outcome D4.2: Understanding and Applying Concepts of Probability - Calculating Probabilities
Grade Level Expectation: Identify all possible outcomes of a probability experiment; Calculate probabilities for one-step events.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Identify possible outcomes of a probability experiment **Skills** 2. Determine the probability of single events. **Values** 3. Apply probability concepts to real-world situations by identifying potential outcomes and calculating their chances of occurring in single-step events.	*Conversation* ***Dice vs crayons (Making connections)***   *Learners will respond to questions such as 'What is the number of event taking place?' 'What are the total number of answers/* ***outcomes*** *you can get if you are to roll the dice once?' 'What do you look for with the colours to be able to calculate the probability?' 'What is the difference in the way you have to do the calculation for the dice as opposed to the crayons?' The teacher pays attention to learners' reasoning and questions or guides learners' thinking.* *Observation* *Learners are given a box of crayon with a variety of colours but there can be multiple crayons of the same colour. Learners can*	Constructivist/Discovery Learning Provide each learner will the given a dice to roll once. They will be asked to consider the probability/chance of a six occurring on that one roll. Learners will roll the dice and they will note all the outcomes or possible outcomes. The idea of one roll taking place is reinforced as **one event** and the different possible answers that can be derived as the **outcomes.** So for this probability, learners will observe that they are taking only one roll but they can have six possible outcomes (1,2,3,4,5,6). It therefore means that the probability of this event occurring is ⅙. Learners will try for the probability of other numbers occurring in one event wih the dice. **Experiments** **Invite learners to experiment with dice> For example, have learner**s throw a dice ten times

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	calculate the probability of pulling a blue out of the box. The teacher will observe learners as they work through this activity in pairs. Listen to learners reasoning on how they calculate their answers and where learning is transferred from one concept to another. Anecdotal notes are taken by the teacher.  *https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQjxmqEwPDYc4jUb5qJObx23J01FktjozR-magOxZD4gHVjunSJcH0FlmsnfAc&s* *What is the probability of getting a blue?* _____ *What is the probability of getting an orange?* _____ *What is the probability of getting a green?* _____ ***Product*** *Learners in pairs can use any of the suite of a pack of cards as in the picture below and create questions on their own for single event probabilities. They must also supply the answers.*	and record the results. Each throw is seen as a single event. **'Bottle cap prob'** **Have learner engage in a probability game. For example,** learners will be given the bottle caps below in a bag to make one draw to find single event probability such as Getting a black bottle cap Getting a red bottle cap  https://m.media-amazon.com/images/I/61K6MReOmJL._AC_UF1000,1000_QL80_.jpg Provide opportunities for learners to engage in coin-flipping activities. For example: Flip a coin 20 times and record the results, then calculate the

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 *Source:https://qph.cf2.quoracdn.net/main-qimg-ce003f7c775c95592689063dd5e624e7-lq*	chance of getting heads or tails based on your results. This is experimental probability, which may differ from the theoretical 50/50 chance for a fair coin. Have learners create probability trees for simple experiments (e.g., flipping two coins). Then, have learners calculate probabilities based on the tree diagram. Create a number line from 0 to 1. Let learners Label key points (impossible, unlikely, equally likely, likely, certain) and place events on the number line based on their probability. Have learners engage in a class project. For example, collect weather data for a week and identify the possible weather outcomes (sunny, cloudy, rainy, etc.). Have the learners calculate the probability of each weather outcome and discuss how weather predictions are made based on probability.

Useful Content Knowledge for the Teacher

Probability = Number of favorable outcomes / Total number of outcome
P(A) = f / N =

- **P(A)** = Probability of an event (event A) occurring
- **f** = Number of ways an event can occur (frequency)
- **N** = Total number of outcomes possible

Inclusive Resources and Materials

Coins, Spinners with different sections (e.g., colors, numbers), Weather data, newspapers, or online resources, dice, cards, or other game materials, whiteboard or paper and number line, markers.

Additional Resources and Materials

Coin Toss & Dice Roll Chart: Have learners create a chart for flipping two coins or rolling two dice. They can list all possible outcomes (e.g., HH, HT, TH, TT for two coins).
Card Draw Simulation: Learners use a deck of cards to explore outcomes. When drawing one card, they can identify all possible outcomes (e.g., suits and ranks).

Opportunities for Subject Integration

Math: Link to fractions, decimals, and percentages. Learners' probabilities can be expressed as percentages or decimals.
Science: From a given number of items in a box containing solids, liquids, and gases, the probability of selecting a type of matter can be calculated. For example,

1. what is the probability of selecting a picture representing liquid?
2. What is the probability of selecting a gas?

Source: https://i.ytimg.com/vi/E3jrKH2pXUg/maxresdefault.jpg

Elements from Local Culture

The Mardi Gras/junior calypso/steal band competition has 10 competitors. Learners can calculate the probability of a competitor winning or placing in the top three.

Resources for a learner who is struggling

Make sure to use concrete materials that are familiar to learners.
Have them make observations and identify possible outcomes based on the materials to which they are exposed (dice, coins, cards, spinners). Materials based on real activities such as sports, games, weather or current events are great to help learners understand the need for probability.
Example of a spinner below. Learners can observe then make predictions given a single chance to spin what the answer could be.
Example of the dice: This can be used to start the process so that the learner can identify all the possible answers at first then they are able to carry out the experiment and note the result.

https://spinthewheel.app/assets/images/preview/fractions.png

https://thumbs.dreamstime.com/b/dice-18514485.jpg

Resources for a learner who needs challenge

Exemplary learners can roll two dies to calculate the probability of a single event.