June 2024

Organisation of
Eastern Caribbean States

OHPC Grade 4 Mathematics Curriculum

INTRODUCTION TO THE OECS HARMONISED PRIMARY MATHEMATICS CURRICULUM

Grade 4 standards are developed with prior grades in mind, ensuring that students are proficient in prerequisite skills before learning new concepts. The expected outcomes for Grade 4, covering knowledge, skills, values, and mathematical processes, are categorized into six content strands: Number Sense (N), Operations with Numbers (O), Patterns and Relationships (P), Geometric Thinking (G), Measurement (M), and Data Handling (D). This section offers instructional suggestions, assessment strategies, and learning resources to engage Grade 4 mathematics learners meaningfully. The document serves as a guide for educators and other stakeholders to help students achieve mastery in these content areas.

- In Pattern Relationships, students learn to identify patterns, both visual and numerical, and describe the rules behind them. They can find missing elements and tell the difference between growing and shrinking patterns. This detective work hones their critical thinking and problem-solving skills, preparing them for future math adventures.
- In Number Sense and Operations - the building blocks of math come together! Students develop a strong understanding of numbers themselves, from recognizing patterns and sizes to using them flexibly. They then tackle addition and subtraction, the tools we use to put numbers together or take them apart. By using hands-on objects, solving practical problems, and explaining their ideas, students gain a solid foundation in math that will prepare them for more complex concepts.
- In Measurement and Data Handling - Students graduate to standard units like inches, centimetres, and cups to measure length, weight, and volume. They become familiar with rulers, measuring cups, and scales. An important skill they develop is converting between these units, like going from inches to feet. Another key concept is learning to represent data visually. This means taking the information they collect and showing it on graphs and charts, making it easier to understand and analyze.
- In Geometry, students sort through polygons with much emphasis on quadrilaterals, learning their properties like the number of sides and angles. Angles themselves become a game, with right angles, acute angles, and even obtuse angles joining the fun. Symmetry and congruence make an appearance, showing students shapes that can be perfectly folded in half and those that are equal. Finally, area and perimeter take centre stage, teaching students how to measure the space inside a shape and the total distance around it. By working with objects, drawings, and problems, fourth graders build a strong visual understanding of shapes and lay the groundwork for future math adventures.

In summary, these mathematical concepts and their applications form the foundation for understanding and interpreting the world around us, facilitating problem-solving and effective communication of information.

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.

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

Grade Four Level Expectations: N1.1. Demonstrate an understanding of the meaning of all whole numbers to five digits (to 10 000); count by 2s, 5s, 10s, 100s, and 1000s from any number (to 10 000)

Specific Curriculum Outcomes

Learners will be expected to:

Knowledge

1. skip count by 2s, 5s, 10s, 50s, 100s, and 1000s from any number to 10 000
2. say number sequence by 2s, 5s,10s, 100s and 1000s forward and backward, starting from any point, to 10 000

Skills

3. model skip- counting by 2s, 3s, 5s, 10s, 100s, and 1000 using number lines, currency and concrete materials.
4. Identify and extend increasing and decreasing number sequences starting from any given number.

Values:

Inclusive Assessment Strategies

Observation

- Listen to learners as they skip count numbers from different starting points. Check to see if they are making use of multiples of whole numbers, and if they are counting on or counting back. E.g. I am at 280 and I make 10 jumps of 5, at what number will I be?
Check to see what resources they might be using e.g. number lines, centuries chart, etc.

Checklist

Cognitive Skills	2	5	10	50	100	1000
Skip counting from Zero						
Skip counting from any point						

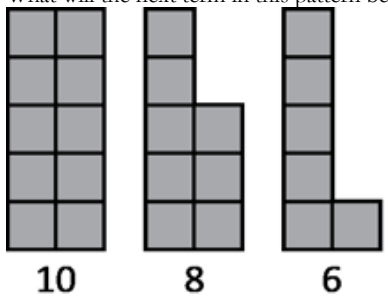
Resources used	√
Number line	
Centuries Charts	
Place value blocks	
Any other	

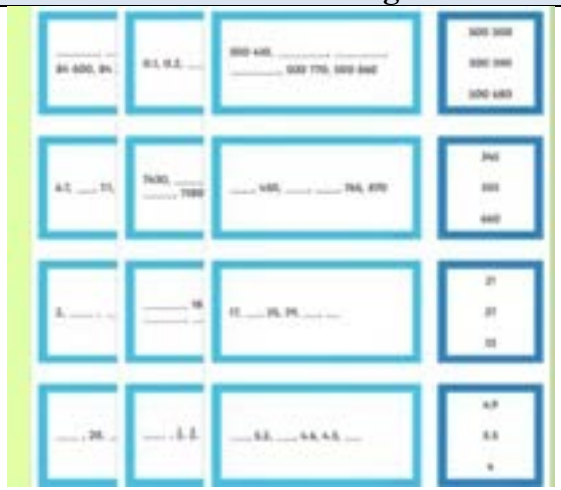
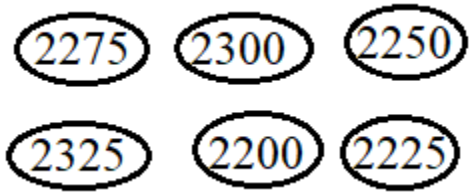
Inclusive Learning Strategies

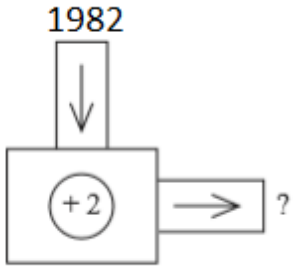
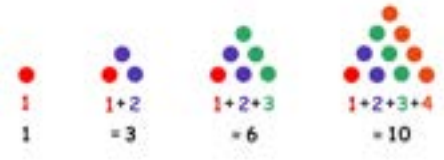
- Have learners use currency, number lines and other concrete materials to skip count in 50s, 100s, 200s, 500s etc. forward and backwards e.g.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
5. Strengthen problem-solving skills by recognizing patterns that lead to faster and more reliable solutions.	**Observation** Observe learners as they model skip counting using place value blocks, money, beads, stones etc. **Conversations** Listen to learners as they talk about whether their sequence is showing an increase or decrease. Ask them questions such as: What will be the 6th number? What will the next term in this pattern be? **Product - Exit tickets** Distribute number sequence cards and observe learners as they complete by circling and correcting the error in each. Have them post cards on wall before leaving. For example:	 - Have learners complete number sequences with increasing and decreasing patterns at different starting point e.g. 1175, 1150, 1125, ___, ____ 7890, 7892, 7894, 7896, ___, ___ - Provide opportunities for learners to identify and correct errors in number sequences. E.g.,  - Allow learners to generate stories/ problems and role play using skip counting in 2s, 3s, 5s, 10s, 50s etc., e.g. Mary is a vendor who sells mangoes outside the school. She visits the school on Mondays, Tuesdays, and Wednesday every week. On April 1st, she visited the school, how many times will she visit the schoolin the month of April? Would Mary visit more times in April than? - Allow learners to identify the number pattern and explain the pattern rule used in the sequence. E.g. For the sequence 3, 7, 11, 15, ___, __, __ The pattern rule is: start at 3 and add 4 each time

Resources for modelling	√
Money	
beads	
Place value blocks	
Any other (please list(	



Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 *Retrieved from: https://www.twinkl.co.in/resource/tp2-m-168-sequence-and-term-matching-cards* **Think Pair Share** Have learners read stories/problems about skip-counting situations generated by peers. Allow them to work in small groups and discuss solutions. Allow them to make presentations by role-playingg or demonstrating using concrete materials. Observe learners as they complete number sequences and listen to them as they explain the pattern rule. Allow them to say how they were able to determine the pattern and generate the rule. - **Talking circles** Listen to learners as they select completed number sequences from previous lessons and explain the number pattern used. Teacher can use a ball to pass around in the circle to facilitate taking turns to speak in the circle.	Find (a) the next three terms (b) the 10th term (c) describe the pattern rule used - Provide opportunities for learners to generate games at home and participate in games that emphasize strategies for counting on and back. - Provide opportunities for learners to generate number sequences showing increasing or decreasing number patterns. E.g. learners can be given jumbled numbers and ask to arrange them to form a number sequence.  - Use centuries chart and mat and have learners model skip counting by stepping or pointing to the next number. E.g. start at 675 and count 5 places backwards in 5's. Where will you stop?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product- Playing games - Have learners play fishing games in small groups to collect numbers to complete and or make number sequences. Listen to learners as they: - read numbers out aloud, - talk about the value of the numbers - compare the sizes of the numbers - discuss the pattern rule and whether the - sequence is reflecting an increasing or decreasing pattern **- Think, Pair, Share** Have learners assemble a set of number cards together to form a number sequence and describe the pattern and the rule. Listen to them ask they debate whether a specific number card belongs to the sequence. **- Observation** Have learners work in small groups to complete number sequence cards. Observe and listen to them as they use skip counting, discuss whether they should use counting on or counting back and how they were able to determine the next number.  **Product--Group work** Have learners work in small groups using concrete material to generate or make models of different number	 - Have learners use dots, matchsticks, marbles, and beads etc. to represent number patterns. Allow them to them extend patterns e.g.  Pattern rule: start with 1 Add 2, then keep increasing the value by adding the next number

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	patterns. Observe and listen to learners as they discuss their pattern. Observe them as they interact with peers, and take turns sharing ideas and working collaboratively to complete task.	

Useful Content Knowledge:

Skip counting is important in the development of fluency in calculation, number sense and as the basis of multiplication and division. Skip counting is a skill that develops over time growing as students continue to expand the range of numbers with which they can skip count. They will also become able to skip count from any number, not just starting at zero, which results in the most familiar sequences (e.g. 0, 2, 4, 6 ... instead of 1, 3, 5, 7 ...).

How to skip count

To skip count you add the same number over and over.

You can start at any number. When you count by 1s (like 1, 2, 3, 4, 5, 6) you add 1 to get the next number. To count by 2s, you add 2 to get the next number. You can also think about counting by 2s as the next even number (if you start with an even number) or the next odd number (if you start with an odd number).

Counting by twos

The example below shows how to count forward by twos starting from 134.

134, 136, 138, 140, 142, 144

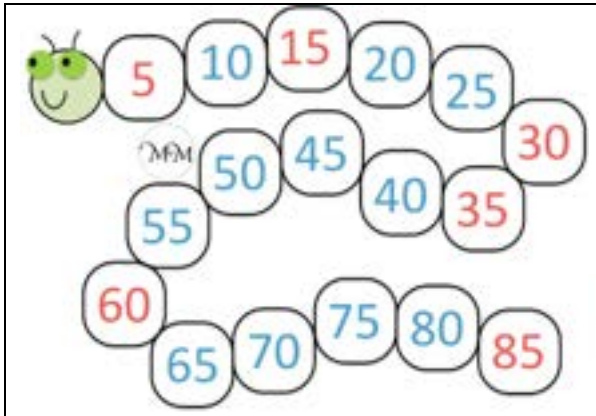
Pattern rule: start at 134 and add 2 to the next number.

Notice the change in the ones digit, e.g. 136 + 2 gives you 138,

There can also be change in the tens and hundreds digit e.g. 1**3**8 + 2 = 1**4**0 (8 ones + 2 ones = 10; 3 tens + 1 tens = 4 tens)

Counting by fives

We count by fives quite often; counting money and telling the time are two examples. The picture below shows how to count forward by fives starting from 30.



Retrieved from: https://www.mathswithmum.com/skip-counting-by-5/

Coins Retrieved from: https://www.ebay.co.uk/itm/144724663623

5

10

15

20

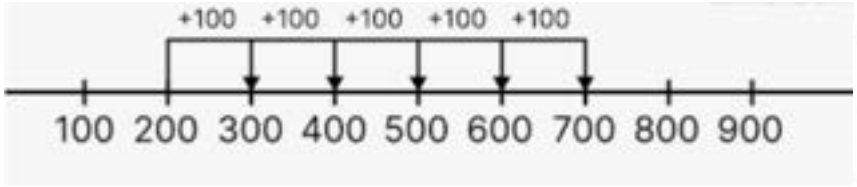
25

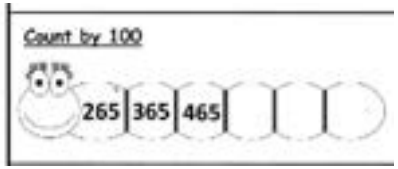
Counting by tens

The two examples below show counting by tens. Look at the numbers. There is always a pattern.

Retrieved from: https://shop.luckylittlelearners.com/product/skip-counting-number-line-worksheet-1-skip-counting-by-10/

Counting by hundreds- The examples below show counting by hundreds. The patterns in all two are the same; the number in **the hundreds place goes up by one each time**.





Retrieved from: https://www.vedantu.com/maths/skip-counting-by-100

Inclusive Resources and Materials.

- Number line
- Number cards
- coins and notes
- counters
- beads, matchsticks
- centuries charts/mats

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

Grade Level Expectations and/or Focus Questions:
Read, represent, and partition any given number to 10 000 concretely, pictorially, and symbolically; Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form to 10 000.

Specific Curriculum Outcomes

Learners will be expected to:

Knowledge:

1. Match number words/names and numerals up to 10,000 with the quantities they represent.

2. Represent whole numbers up to 10,000 using various models (concretely, pictorially, and symbolically)

Skills

3. Read and write 4-digit whole numbers up to 10 000 in standard and expanded form

Values

4. Solve problems using real-life situations involving reading, writing, and representing whole numbers up to 10 000.

Inclusive Assessment Strategies

Observation:
Observe and listen to learners as they read numbers presented in various forms aloud. Observe as they write the numbers using proper spacing.
For example, 7 423 - seven thousand four hundred twenty - three

Concepts	Yes	No
Read numbers up 10 000		
Write numbers up to 10 000		

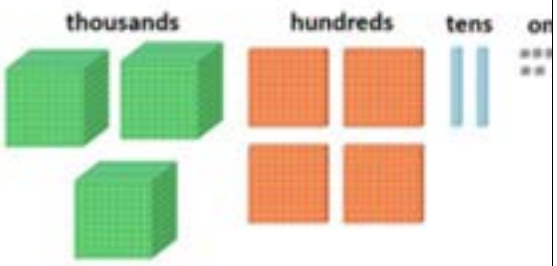
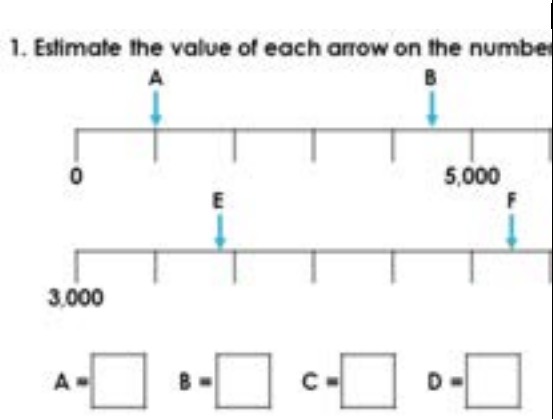
Product: Game
Allow Learners to work in groups to match numbers name/words to corresponding numerals. use a game with domino effect or cards.
Observe as the learners take turns to match the number names correctly to the numerals.

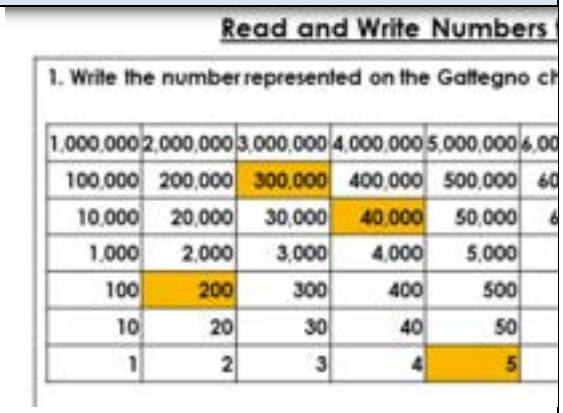
Inclusive Learning Strategies

Provide learners with opportunities to read numbers in everyday situations. For Example, learners can read numbers on receipts, codes and bills, passport numbers, street numbers and license plate numbers.

Provide opportunities for students to create sentences using four digi numbers. For example, writing two statements, one which includes a four digit number (written in words) and the other a four digit number written in symbols
Example.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product: Quiz Ask the learners to represent numbers in various ways where they respond or complete number cards for different numbers. (image) Think - Pair - Share Allow learners to work with a partner or small group. Give them cards with numbers and listen as they discuss the place value and total value of the digits, then provide the expanded form of the number. Product: Let learners describe numbers written on cards. They will describe each number by explaining its place values, total values of digits, and expanded form. They can share their descriptions with the class or display them for everyone to see. Learners can work in groups to solve riddles or situations using the expanded form of numbers given to provide the standard form and vvice-versa. For example: Let's say we have a riddle: "I am a three-digit number. My expanded form is 500 + 40 + 7. What number am I?" Think - Pair - Share: Allow learners to discuss real-life situations involving numbers, for example numbers on receipts, codes and bills	At the end of the day Jack realized that he had spent five thousand and two hundred ten dollars At the end of the day Jack realized that he had spent $5 210 Provide experience for learners to connect or match the number names/ words to the numerals. For example, using flash cards with the names and numerals. Retrieved: https://www.twinkl.com/resource  Let learners represent numbers up to 10 000 in various ways. For example, using place value charts, base ten blocks, number charts and number lines. For example, retrieved from *https://study.com/academy/lesson/what-are-base-10-blocks.html*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	and listen to them. Then allow them to solve the situations and present findings with others For example: Item — Price Apples — $2.50 Bananas — $1.20 Oranges — $3.75 Total — $7.45 Now, let's say the student needs to figure out the total cost using the expanded form of the prices. They can work in their groups or individually: Apples: $2.50 can be expanded as 2 dollars and 50 cents. Bananas: $1.20 can be expanded as 1 dollar and 20 cents. Oranges: $3.75 can be expanded as 3 dollars and 75 cents. To find the total, they'll add up the dollars and cents separately: Dollars: 2 + 1 + 3 = 6 dollars Cents: 50 + 20 + 75 = 145 cents But since there are 100 cents in a dollar, they need to carry over any extra cents to dollars: Cents: 145 cents = 1 dollar and 45 cents. So, the total cost is $6.00 (dollars) + $1.45 (cents) = $7.45. Product: Exit cards	  *Retrieved from: https://classroomsecrets.co.uk/estimate-on-a-number-line-to-10000/*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Give learners situations on cards. They will solve the situation on the cards and present it at the end of the lesson. The situations will allow students to read, write, and represent whole numbers. For example: School Library: The library has 1001 fiction books, 1100 non-fiction books, and 1010 picture books. Write each number in expanded form. State which category has the most books.	 Read and Write Numbers 1. Write the number represented on the Gattegno ch 1,000,000 2,000,000 3,000,000 4,000,000 5,000,000 6,00 100,000 200,000 300,000 400,000 500,000 60 10,000 20,000 30,000 40,000 50,000 1,000 2,000 3,000 4,000 5,000 100 200 300 400 500 10 20 30 40 50 1 2 3 4 5 *Retrieved From: https://classroomsecrets.co.uk/read-and-write-numbers-to-10000000-extension/* Provide learners with opportunities to expand 4 - digit numbers in different ways. For example using a place value chart. Learners can see the values for each digit and use this to determine the total value for the digits within the number. For example, 9 326 = 9000 + 300 + 20 + 6 9 × 1000 + 3 × 100 + 2 × 10 + 6 × 1 Place Value Chart Thousands | Hundreds | Tens | Ones 9 | 3 | 2 | 6 Allow learners to describe numbers using the place values, total values and expanded form. Let them determine the numbers being described by stating them in standard form and vice - versa. For example, 3 8 41 - An odd number with three thousand eight hundreds, four tens and one ones.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Provide learners with opportunities to create and solve situations involving reading , riting and representing whole numbers up to 10 000. For example using numbers from receipts, bills or other sources to form situations to generate numbers and to rearrange digits to form new numbers. Example: 3 5 8 0 2 9 Use only one of each digit to make four-digit umber. ____ ____ ____ ____ . Read your number, write the number name, and expand the number. Use the digits/clues to complete the four digit number. The digit in the Ones place is the smallest prime number, the digit in the Thousands place is four times the digit in the ones place, the digits in the hundreds and tens places are two consecutive odd numbers. ____ ____ ____ ____

Additional Resources and Materials

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

Additional Useful Content Knowledge for the Teacher:

- Whole numbers are read without using 'and'. 'And' is used only when reading and writing decimal numbers, for example, 71. 45 - seventy - one and forty - five hundredths.
- Whole numbers are read from left to right.
- A space is left between the families, for example, 9 431 and 3 202,

Opportunities for Subject Integration:

Mathematics: All topics that requires reading and writing numbers
Money: Reading and writing amounts, total cost
Data Handling: Representing data - Tally marks for the tally charts, graphs, numbers for labeling the axis

Language Arts:
Writing: Learners can write brief descriptions about numbers which may include the names and place values, total values and expanded forms.
Comprehension: Use clues and allow learners to read and make inference/ draw 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
Land Features: height of of mountains

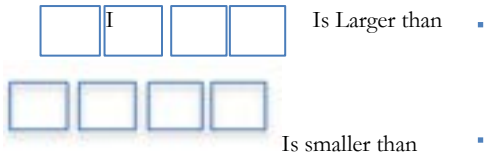
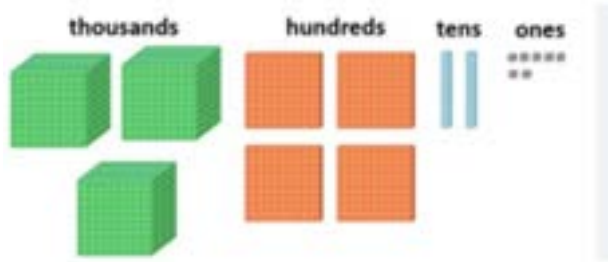
Science:
Weather: amount of rainfall, wind speed
Body Systems: Skeletal System: Number of bones in the body
Body Parts: Fingers/Toes - five on one hand/foot, ten in all, Some parts come in pairs - nostril, eyes, ears, hands, legs, breasts

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 and/or Focus Questions:
Compare two multi-digit numbers based on meanings of the digits in each place (to four place values); Use >, =, and < symbols to record the results of comparisons; Tell the number that is 100, 1000 or 10 000 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 will be expected to: **Knowledge:** 1. Compare the values of two 4-digit whole numbers using the <, > or = 2. Use different strategies to find numbers that are 100, 1000, or 10 000 more or less than a given number up to 4 digits 3. Compose and solve real-life situations/ problems involving the comparison of whole numbers up to 4 digits. **Skills:** 4. Identify the total value of each digit in a four-digit number using concrete materials 5. Arrange in ascending and descending order a set of whole numbers up to 5 numbers. 6. Create pictorial representations to illustrate the difference between the values of a pair of whole numbers.	Think - Pair - Share Distribute cards with numbers and let students work with a partner to compare their numbers. Have them discuss the place value of the digits and their total value. Learners can also use base ten blocks to represent the numbers and compare. Learners will record their findings and share justifications for it. Product: Game - Dice Roll Have learners work in small groups where each will take turns to roll 4 dice. Each learner will record his or her number and then compare with the other numbers generated by their peers. Learners can also roll the dice and generate numbers. Use the numbers to make several four digit numbers and then compare. For example; number generated for a dice roll:4, 7, 2, 5 Possible numbers - 5 742, 7 524, 4 725, 2 754 Ascending order: 7 524, 5 742, 4 724, 2 754 Observation: Observe learners as they use place value charts to represent numbers and compare the values of the various digits.	Let learners use materials and pictures to compare numbers. Provide opportunities to use words and symbols when comparing numbers. For example,  is less than  2 400 < 3 000 Provide opportunities for learners to represent numbers up to 10 000 using place value charts and to recognize the total value and to compare numbers. Example: Place Value Chart | Thousands	Hundreds	Tens	Ones
---	---	---	---
5	3	7	2
7	8	9	1	 The place value chart allows learners a full view of all the digits, their place values and their total values. In the number 5 372, there are 5 thousands = 5 000, 3 hundreds = 300, 7 tens =70 and 2 ones = 2 Compare the digits in the thousands place. 7 thousands is greater. Thus, 7 891 is greater than 5 372. For example: Have student roll four dice and compare numbers

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values: 7. Recognize the practical relevance of comparing numbers in everyday situations like budgeting expenses or comparing prices, fostering a sense of mastery and motivation in mathematical reasoning.	Question learners about their choices of answers and allow them to provide responses. For example, How did you get this value? What did you do to get this number? Product: Exit Cards Give learners work cards which they complete individually or in groups. Learners will select cards and complete them by inserting the correct symbol for the example (s) on the card. Allow learners to share how they were able to compare the pairs of numbers. Example: EXIT CARD Which sign (< > =) makes the following correct? . 8 709 _____ 4 258 . 1 905 _____ 3 986	 Allow learners to engage in activities that require them to use the symbols (< , >, =) to write their comparisons. Situations for comparisons should be varied - pictures or numbers. Example: 2 317 ___ 3 015. Put in the correct sign to complete the following. Provide experiences where learners can use place value charts, pictures or base ten blocks to compare numbers by placing them in ascending or descending order. Learners can also be given the opportunities to use a list of numbers to arrange in a place value chart and then determine the greatest, least etc.  *Retrieved from : https://study.com/academy/lesson/what-are-base-10-blocks.html*

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Comprehension: Use clues and allow learners to read and make inference/ draw 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
Land Features: height of of mountains

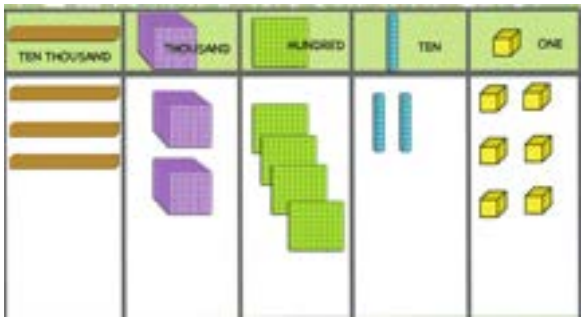
Science:
Weather: amount of rainfall, wind speed
Body Systems: Skeletal System: Number of bones in the body
Body Parts: Fingers/Toes - five on one hand/foot, ten in all, Some parts come in pairs - nostril, eyes, ears, hands, legs, breasts

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

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

Grade Level Expectations and/or Focus Questions: Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place value to the right, for example, recognizing that 70 x 10 = 700 by applying the concept of place value and division. Use place value understanding to round multi-digit whole numbers to hundreds and thousands, represent the place value of numbers in base-ten groupings concretely, pictorially, contextually, verbally, and symbolically and explain the pattern regularity of the place value system. Finally, identify the value of a digit as determined by its position.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. State the place value of any digit within a whole number up to 10,000. 2 Represent the place value of a numeral in context, up to 10 000 concretely, pictorially and symbolically. 3. Identify and apply the principle that in a whole number up to four digits, each digit's value is ten times greater than its value in the place immediately to its right. 4. Explain the pattern of regularity in the place value system . 5. Recognize and articulate **Skills**	Product: Playing a game. In groups, students will play a game of tossing the ball into the place value bin. Each child in the group will get the opportunity to toss the correct number of balls in each place value bin labelled ones to ten thousand. After he or she is done, the others will count the balls in each bin to formulate and state the place value of the number in his hand. Student will compare what is said to what is on his card for verification.	Lucky Dip Number Formation. In groups of fours, students will dip for a lucky number from 1 to 9. Students will be asked to reveal their lucky number.  *Retrieved from: https://www.istockphoto.com/illustrations/lucky-number* Guided questions should be used to help students determine that the numbers 0 to 9 are symbols or digits used to represent the value of a number. If a number is in the one's column, it has a different value to a digit in the tens, hundreds, thousands and ten thousands column. Examples of Questions: 1. What number do you have?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
6. Round off any whole number up to 10,000 to the nearest 100 and 1000 **Values** . 7. Compose and solve mathematical problems or puzzles, recognizing simple patterns and relationships among digits in a whole number.		2. What other words can be used to refer to each of the numbers from 0 to 9 3. What will happen if we place your number under different columns on a place value chart?  ***Retrieved from: https://www.spadaroromankitchen.com/?c=representing-numbers-using-base-10-blocks-up-to-digits-cc-M8Q7MGIp*** Have students place their number under the correct place value of ones. Allow them to represent the number using manipulatives in the form of play money, base-ten blocks or number disks and a place value mat. Instruct them to place the 2 in the tens column and represent it using manipulatives. Question them to find out what has changed. Continue this activity up to 5 digits. What am I Worth? Let students know that they are going to determine the value of numbers on a place value chart. Provide each group with a set of base-ten blocks, match sticks or popsicle sticks, place value disk and a place value mat. Allow students to write their own numbers up to

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

In groups, provide students with worksheets with three numbers up to four digits. Allow students to place numbers in the correct column and use pictorial representation to help them state the total value of numbers. Listen to discussions and observe students as they work.

Checklist

<table><tr><td>Students can represent the number in the:</td><td>Yes</td></tr><tr><td>Ten Thousand Place
● pictorially using place value disk showing groups of 10000
● symbolically indicating the number of groups of 10000
● symbolically indicating the total value
Thousands Place
● pictorially using place value disk</td><td></td></tr></table></td><td>five-digits. Have students place numbers on the place value house under the correct column.

Retrieved from: https://www.didax.com/eureka-math-place-value-disks-set-2.html

Allow students to use manipulatives to represent the number under each column on the mat and represent these numbers symbolically by stating how many groups of 1, 10, 100,1000, 10000. Then allow students to calculate or count to provide the total value for each number. Have students represent the total value of each number symbolically

Example:</td></tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

showing groups of 1000
- symbolically indicating the number of groups of 1000
- symbolically indicating the total value

Hundreds Place
- pictorially using place value disk showing groups of 100
- symbolically indicating the number of groups of 100
- symbolically indicating the total value

Tens
- pictorially using place value disk showing groups of 10
- symbolically indicating the number of groups of 10
- symbolically indicating the total value

Ones
- pictorially using place value disk showing groups of 1
- symbolically indicating the number of groups of 1
- symbolically indicating the total value

Creating bingo cards game

In groups of threes, each child will dip for a card with a number representing a certain value (3 hundreds). The child will use manipulatives to help identify the number of tens in this number and represent it symbolically (30 x 10). Members

2x10000 2x1000 1x100 2x10 4x1

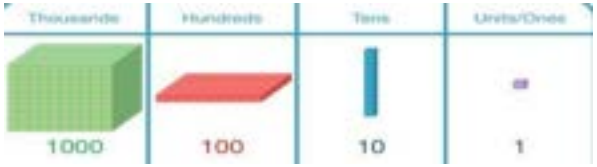
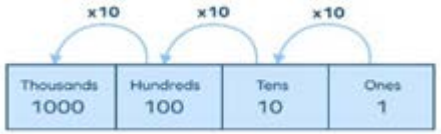
20000 2000 100 20 4

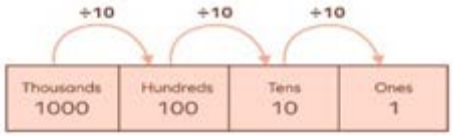
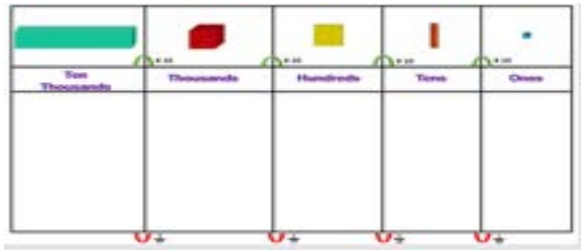
Retrieved from https: https://www.tes.com/teaching-resource/numbers-to-100-000-year-5-place-value-12891753

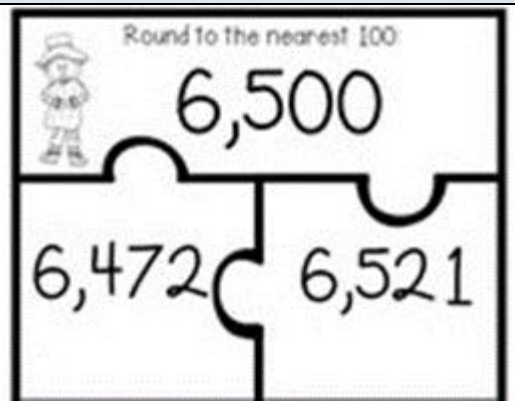
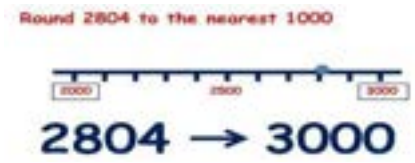
Private Investigating

Let learners know that they will be investigating patterns in place value. Two cards with place value charts will be given to each group. Each chart will show the same number represented in different place values. Teacher will pose the question "How does the value of a digit change as it moves up the place value chart?

Students will look at the charts to see whether there are patterns which exist within the numbers. Students will discuss and explain their findings.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	of the group will verify answers before the expanded number is written on a blank bingo card. Students will repeat activity until all twelve slots on the card are filled.  *Retrieved from:* *https://myfreebingocards.com/templates*	 *Retrieved From: https://www.mathswithmum.com/mab-dienes-place-value-base-10-blocks/* Use guided questions to probe discussion in different groups. 1. How can you represent the numbers in each place value? 2. Is there any other way in which it can be represented? Pay careful attention to the formation of the hundred blocks 2 in the tens place is 2 groups of ten, 2x10, 20 2 in the hundred column is 2 groups of 100, 2 x 100 or 20 groups of 10, 20x10 0. If we move from right to left, what pattern can you find?  *Retrieved from : https://www.splashlearn.com/math-vocabulary/decimals/decimal-place-value* 0. If we move from left to right, what other pattern can you find?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Creating puzzle games Provide students with blank cards which can be cut to create a puzzle. Cards can be drawn similar to the one below. Have students place the number they rounded in groups on the cards. Students will write another number which can be rounded to the same number as the one on their card to complete each puzzle. Allow students to cut out their three puzzles. Provide them with the opportunity to explain and display their work.	 *Retrieved from:https://www.splashlearn.com/math-vocabulary/decimals/decimal-place-value* 0. If we add another place value to the right, will the same pattern exist.  ***Retrieved From: http://mrsblackmore.weebly.com/place-value-games-and-activities.html*** **How much do I need?** Using the concept of money and place value, have learners place numbers on a number line to estimate how many hundred or thousand dollars is needed to buy a particular item. Provide each group of students with three price tags. Ask them about how many hundred dollars will they need to get each item. Begin with one item at a time. Ensure that you vary price tags to include a number that would fall exactly in the middle, in the lower end and one in the upper end.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 *Retrieved from: https://www.teacherspayteachers.com/Product/Rounding-Puzzles-Rounding-To-the-Nearest-10-and-100-2023604*	 *Retrieved from: https://www.quora.com/Why-do-retailers-add-end-of-their-pricing-1-99-399-00-etc* Students will place the number on a place value chart to identify the least number of hundred dollars needed. Use guided questioning to help them identify the most number of hundred dollars needed and place it on the number line. Allow them to use play money to represent these two figures. Provide instructions to learners to place these numbers on the markers on a number line. Use questions such as: 1. How do we figure out which hundred gets us closer to our targeted price mark? Allow students to label by placing a marker in the middle with the correct number. By reverting to the place value chart, students will figure out whether the number in the tens place will fall closer to the number on the lower end of the upper end. Have students place their number on the number. Example:  *Retrieved From: https://slideplayer.com/slide/13749236/*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Allow students to continue with the other examples. Ensure that examples used allow students to understand that numbers that are more than 2500 and less than 3500 can all be rounded off to 3000. Monitor and listen to discussions as they solve their problems.

Additional Resources and Materials

Material

Number ten blocks

popsicle sticks

match sticks

rubber bands

place value disk

puzzle cards

bingo card

play money

place value chart

Books

- ***Zero the Hero*, by Joan Holub and Tom Lichtenheld**
- ***Sir Cumference and All the King's Tens*, by Cindy Neuschwander**
- ***Place Value*, by David A. Adler**

Websites

- https://www.teachstarter.com/au/blog/15-new-place-value-activities

Additional Useful Content Knowledge for the Teacher:

When it comes to place value teaching and learning, hands on manipulatives are a must. These manipulatives allow students to understand the base ten number system as they engage in activities where they can physically see and manipulate numbers.

Although there are ten numbers in all; (0,1,2,3,4,5,6,7,8,9,) the use of manipulatives helps students to understand that to create larger and larger numbers, the base ten system allows us to use place value.

Place Value that the quantity that a digit in a number represents depends on the position of the digiti in the number.

The place value system works by creating larger numbers by repeatedly bundling groups of ten.

Therefore 10 ones are used to make a new unit of ten, 10 tens are grouped to make a new unit of one-hundred, and 10 hundreds are grouped to make a new unit of one-thousand and so on.

Opportunities for Subject Integration:

Art and Craft:
Creating bingo game
creating puzzles
creating board and floor games

Science and Technology

Recording and comparing quantitative data
linking population of countries to the concept of rounding off

Social Studies

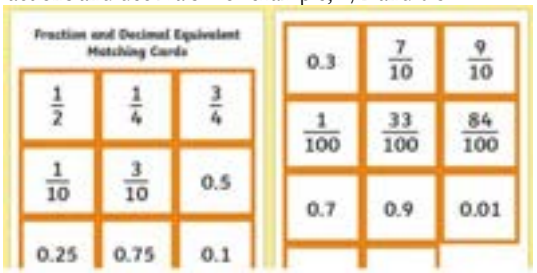
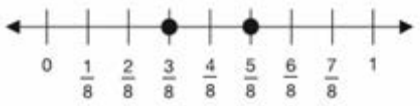
Work effectively in groups, accepting responsibility for their part of a task.

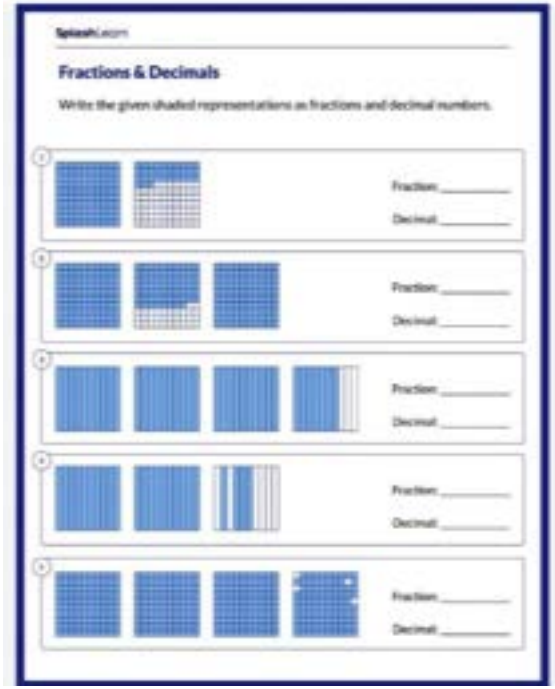
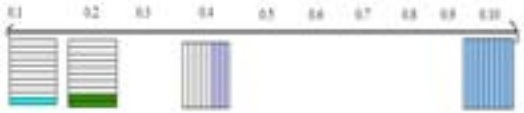
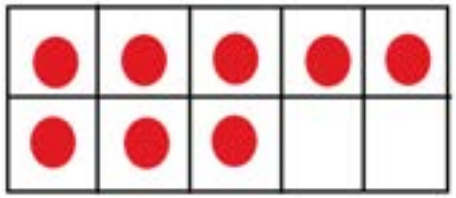
Language Arts

Creating rules for games and puzzles created.

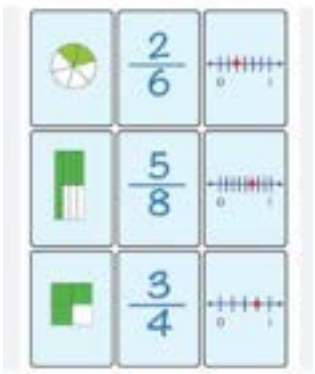
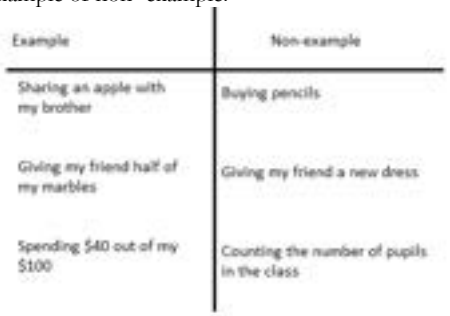
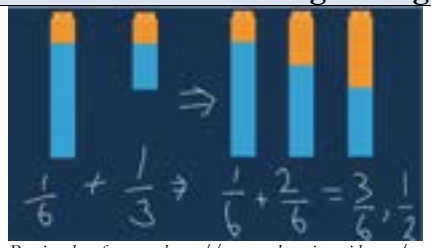
Essential Learning Outcome: N2:1 Learners will recognize, represent, and compare quantitative information and develop quantitative reasoning including additive and multiplicative thinking to make meaningful connections and solve problems.

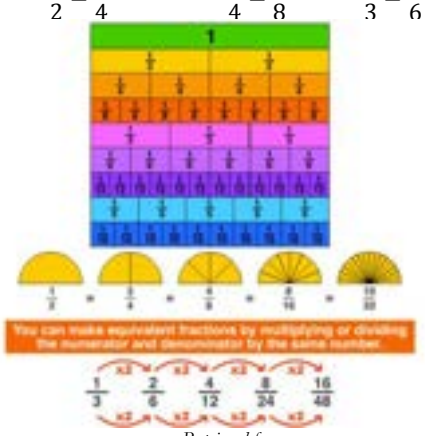
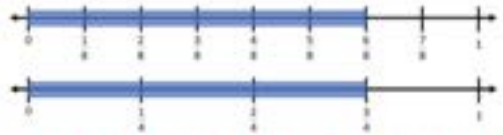
Grade Four Level Expectations: Numbers to 10 000.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size; 2. Describe two fractions as equivalent (equal) if they are the same size parts of the same one-whole, or the same point on a number line. 3. Explain why the fractions are equivalent, e.g., by using a visual fraction model. **Skills** 4. Represent proper fractions and decimal tenths concretely (fraction strips, Cuisenaire rods, etc.) 5. Represent proper fractions and decimal tenths pictorially (number lines, drawings, etc.), contextually and symbolically. 6. Represent proper fractions as equal parts of one-whole region, set or measure 7. Model, identify, and generate simple equivalent fractions, e.g., $\frac{1}{2}, \frac{2}{4}, \frac{4}{6}, = \frac{2}{3} 1/2 =$ 8. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Examples:	**Think pair share—Representing fractions and decimals** - Have learners work in pairs using the provided sheet. Give one student a fraction and the other the corresponding decimal. Once they finish, have them compare their work and discuss the relationship between fractions and decimals. For example, 1/2 and 0.5.  *Retrieved from : https://www.twinkl.co.uk/homework-help/how-to-teach-maths-guides-for-parents/decimals/how-to-teach-year-4-decimals* **Card sort** - Create fraction name cards and have learners match the fraction with the model or diagram it represents. E.g.	-Provide opportunities for learners to model/represent proper fractions and concretely using fraction tiles, pattern blocks, fraction strips/bars, number lines and Cuisenaire rods etc. e.g.1 place several fraction cards and have learners represent the fraction using materials provided.  - Have learners represent and write fractional parts and decimals using ten frames, number lines, base ten blocks and counters. Allow learners to see the relationship between fractions and decimals. E.g. Write the decimal and the fraction of the diagram that is shaded?  Write the fraction that represented by the letter on the number line. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Express 3 in the form of 3 = $\frac{3}{1}$; recognize that $\frac{6}{1}$ = 6; locate $\frac{4}{4}$ and 1 at the same point of a number line diagram. **Value:** 9. Use equivalence fraction in solving problems involving fractions	 *Retrieved from: https://www.splashlearn.com/s/math-worksheets/identify-place-value-grids-as-fractions-decimals* **Product --- Decimal art** Have learners complete a number line by drawing diagrams to show the missing decimals.  **Create the problem** - Distribute a picture or fraction to learners and have them generate a problem in groups of 3. Have each group share	e.g. 2, The ten frame below represents a whole. What fraction/ decimal of the whole filled? What fraction/decimal of the whole is empty? Use the ten frame and represent two –fifths.  *Retrieved from: https://helpingwithmath.com/ten-frames/* - Provide adequate problems relating to context as well as provide opportunities for them to generate problems and represent solutions symbolically, concretely and pictorially. E.g Jason has 12 balloons. He told his best friend Jace to take $\frac{1}{3}$ of the balloons. How many balloons should Jace take?  *Retrieved From: https://www.ebay.co.uk/itm/164740819035* - Have learners play games (board and online) to represent proper fractions as equal parts of one whole region, set or measure. E.g.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	their problem with peers and observe them as they depict their answers concretely, symbolically or pictorially. E.g. Mr. John sells umbrellas. During the rainy season, lots of people buy umbrellas. One morning it rained so heavily that Mother had to stop at his shop to buy some umbrellas for my sisters and me. Mr. John had six umbrellas, two pink, two green, one blue and one multi colour. Mother bought the two pink ones. What fraction of Mr. John's umbrellas is remaining? What fraction of pink umbrellas did Mother buy?  *Retrieved from: https://www.dreamstime.com/illustration/identical-umbrellas.html* **Matching** - Create games for learners to play in base groups. Example Fraction Station, have learners choose cards and represent the fraction on the number line. The objective of the game is to reach at the right side of the game (whole number) using fewer cards. Listen to learners as they talk about equivalent and comparing fractions indirectly and unconsciously.	 Retrieved from: https://easypeasylearners.com/i-have-who-has-fractions-game/ - Provide opportunities for learners to demonstrate the use of proper fractions in context. E.g. identify things (whole) that can be share fruits, toys, crayons etc.) - Have learners sing songs and listen to stories involving fractions. For example, ' The Hershey's Chocolate Bar Fraction' shows learners how a whole is divided into parts, the name of the parts and the size of the parts. Have learners fold strips of paper, use play dough, blocks, and playing cards, to represent proper fractions. E.g. Colour to show:  *Retrieved from: https://theelementaryprofessor.com/5-fraction-games-to-play-with-a-deck-of-cards/* Use blocks to model fractions e.g. $\frac{1}{3}, \frac{3}{7}, \frac{2}{4}, \frac{1}{4}$

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 *Retrieved from: https://www.teacherspayteachers.com/Product/Fraction-Match-Fraction-Number-Line-Matching-Game-682195* **Examples and Non-examples** - Have learners identify situations in which they use proper fractions in everyday life. Have them take turns to share in groups. Allow peers to discuss whether their statement is an example or non- example.  - Distribute strips of paper and have learners work in small groups to create a fraction chart by folding the strips to represent equal parts of the whole. Asks pupils to write and read the fractional part and say how many equal parts represent the whole. Allow learners to compare their strips with peers in the group. E.g.	 *Retrieved from: https://smarterlearningguide.com/essential-guide-to-unifix-cubes/* - Fold strips to represent different fractional parts then assemble them together to form a fractional chart. Learners can use this to compare fractions.  *Retrieved from: https://topdrawer.aamt.edu.au/Fractions/Misunderstandings/Number-of-parts-only/Paper-folding* Distribute fraction strips or circles to each student or group. Ask students to find and compare fractions like 1/2, 2/4, 3/6, etc. Have them place the fractions on top of each other to visually see that they are the same size. Discuss why these fractions are equivalent, emphasizing the concept of multiplying or dividing the numerator and denominator by the same number. Provide opportunities for learners to listen to stories about equivalence (The Hersey Chocolate Bar Fraction Book) and use concrete materials such as fraction tiles, number lines strips, Cuisenaire rods; and drawings to model, identify and generate equivalent fractions that are of the same size or point on a number line. E.g.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Matching Cards-- Fraction Run - Divide the class into two large groups. Give a fraction card to each learner and have them hold their cards up around their tummy area. Allow each learner to run to the end of the room to get their partner who has an equivalent fraction to match their fraction. Asks each pair to show the fractions and allow peers to discuss and talk about whether the pair of fractions is equivalent. If the fractions are not equivalent give the group a few seconds to find their right partner. Observe and listen to learners as they justify and demonstrate how a fraction is equivalent to another. Use a quick quiz or exit ticket at the end of the lesson to check for understanding of expressing whole numbers as fractions and recognizing equivalent fractions.	$\frac{1}{2}=\frac{2}{4}$ $\frac{1}{4}=\frac{2}{8}$ $\frac{2}{3}=\frac{4}{6}$  *Retrieved from: http://www.amathsdictionaryforkids.com/qr/e/equivalentFractions.html* Provide each student with a printed number line or have them draw one on paper. Mark fractions such as 1/2, 2/4, 1/3, and 2/6 on the number line. Show that 1/2 and 2/4, for instance, occupy the same point on the number line, indicating they are equivalent.  For each fourth, there are two eighths $\frac{3}{4} \times \frac{2}{2} = \frac{6}{8}$ *Retrieved from: https://www.mathcoachscorner.com/2017/03/drawing-number-lines-visualize-equivalent-fractions/* . Divide the class into small groups and give each group a set of flashcards with whole numbers on some cards and their equivalent fractions on others.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Have students match the whole numbers with their corresponding fraction cards (e.g., 4 with 4/1, 1 with 1/1). Once matched, ask groups to explain their reasoning and discuss why the fractions are equivalent to the whole numbers.  *Retrieved from: https://www.funkeymaths.com/product/fractions-maths-cards/*

Useful Content Knowledge:

The development of fraction concepts allows students to extend their understanding of numbers beyond whole numbers, and enables them to comprehend and work with quantities that are less than one. It is essential to have students represent fractional quantities in various contexts, using a variety of materials. Through these experiences, students learn to see fractions as useful and helpful numbers.

Modelling fractions using area, set, and linear models helps students develop their understanding of relationships between fractional parts and the whole. It is important for students to understand that:

- all the fractional parts that make up the whole are equal in size;
- the number of equal parts that make up the whole determine the name of the fractional parts (e.g., if eight fractional equal parts make up the whole, each equal part is one "eighth").

Understanding fractions

1. A *fraction* represents *a part of a whole.*
Example 1.

The whole is divided into four equal parts.
Three part are taken (considered).

2. The corresponding fraction is:

$\frac{3}{4}$

⇐ The *numerator* represents how many parts are taken.
⇐ Fraction line or division bar
⇐ The *denominator* represents the number of equal parts into which the whole is divided.

Retrieved: https://slideplayer.com/slide/8187321/

Reading or writing fractions in words

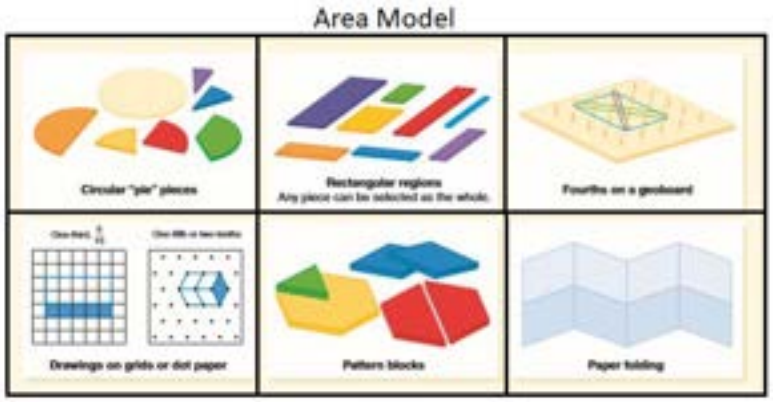
1. You can use words to refer to a part of a whole.
So one whole has:

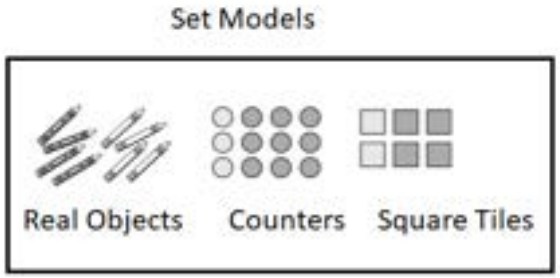
2 halves	7 sevenths	12 twelfths	100 hundredths
3 thirds	8 eighths	13 thirteenths	1000 thousandths
4 quarters	9 ninths	20 twentieths	1000000 millionths
5 fifths	10 tenths	30 thirtieths	1000000000 billionths
6 sixths	11 elevenths	50 fiftieths	

Example 1.

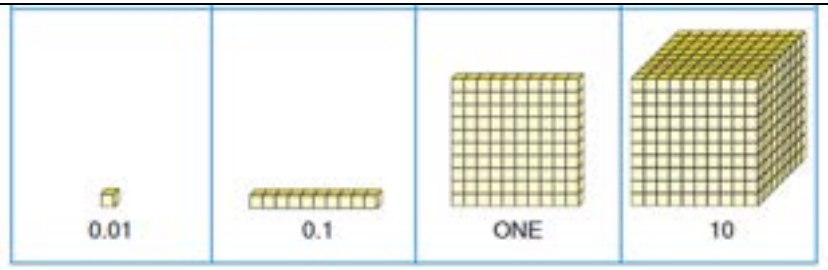
The fraction $\frac{3}{4}$ can be written in words as:

three quarters





Using Base ten blocks to represent and understand decimals
It is important that learners recognize and understand that base ten blocks model numbers, but their values can change depending on which block is defined as the Unit or ONE. For decimals, it's often better to define the flat as the Unit or ONE.



Inclusive Resources and Materials.

- Post it notes
- White board plates
- I have…. Who has card templates
- base ten blocks
- number cards
- playing cards
- play dough

Children's Literature:
Fractions in Disguise: https://youtu.be/GhVE6FJiGOI
If You Were A Fraction: https://youtu.be/fRpz4E3nEvU
The Hersey's Milk Chocolate Bar Fractions Book: https://youtu.be/qPC0rkQ1SEQ
Full House An Invitation to Fractions: https://youtu.be/_qgc_yg-YM4
Fraction song: https://youtu.be/lTce7f6KGE0
Online Math Games: Unit fractions Intro: https://www.mathplayground.com/index_fractions.html

Essential Learning Outcome N:2.2: Learners will recognize, represent, and compare quantitative information and develop quantitative reasoning including additive and multiplicative thinking to make meaningful connections and solve problems.

Grade Four Level Expectations: Numbers to 10 000.

Specific Curriculum Outcomes

Learners will be expected to:

Skill:

1. Compare unit fractions and their fraction families;
2. Compare other fractions with benchmark fractions (E.g., $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$);
3. Compare two fractions with the same numerator or the same denominator by reasoning about their size.

Knowledge:

4. Recognize that comparisons are valid only when the two fractions refer to the same whole.

5. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model;

Value:

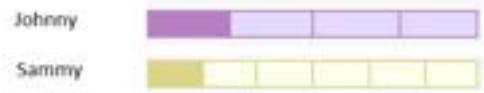
6. Recognize the importance of equivalent fractions when comparing fractions.

Inclusive Assessment Strategies

Observation

- Distribute cards containing problems involving comparison of fractions of the same one - whole and have learners use concrete materials or drawings to represent each fractional part. Listen to learners as they discuss decide which fraction is larger and talk about the sign to use. Observe them as they model the fractions.

Johnny ate $\frac{1}{4}$ of a Tikki and Sammy ate $\frac{1}{6}$ of the same size Tikki. Who ate more? Compare $\frac{1}{4} and \frac{1}{6}$.



Retrieved from: https://www.math.net/fraction-bar

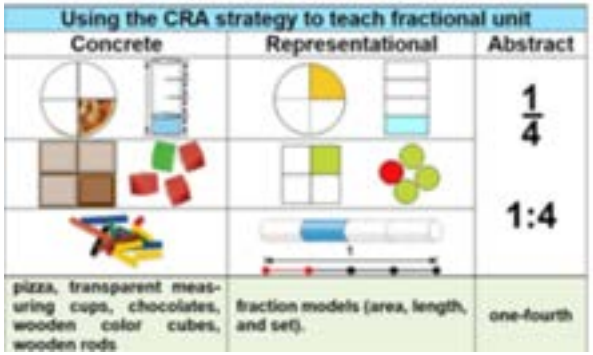
True And False Statements

Gave learners a number of statements and have them decide whether each stamen is True or False. Allow them to justify their answers by using diagrams or models for example. For example,

Statements	True	False	How do you know?
Samuel ate one thirds of a tennis roll while Jason ate half. Jason ate more.	✓		Half is more than one thirds. (they can also draw diagrams to show instead of writing)
Mommy cooked two sixths of a cat fish while aunty Shira cooked		✓	The comparison is referring to two different fishes. Both fish

Inclusive Learning Strategies

- Provide opportunities for learners to model fractions using fraction tiles, number lines, counters, pattern blocks, fraction strips to compare fractions. e.g. comparing thirds and fifths of the same one-whole using fraction tiles.



Retrieved from: https://www.scirp.org/journal/paperinformation?paperid=100348

- Provide opportunities for learners to understand that fractions can only be compared when they are parts of the same whole. Use concrete objects and have students represent and compare fractional parts. Allow them to explore this concept by comparing objects of different sizes.

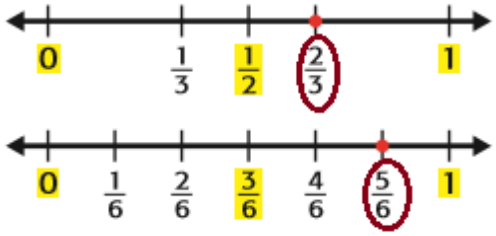
For example, ask them to explain whether one-half is always equal to one-half. Discuss how one-half of a cake differs from one-half of a cupcake, even though "one-half" describes the part-to-whole relationship in both cases. Additionally, illustrate that three-fourths is greater than one-half if both fractions refer to the same whole. However, if comparing three-fourths of a cupcake to one-half of

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

three quarters of a butterfish. Mommy cooked more.			must be the same.

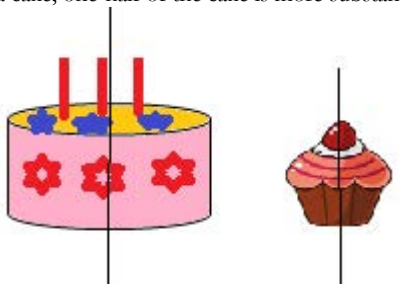
- There is cassava bread in the pan. JJ ate 2 sixths and Jay ate four sixths of the cassava bread. Jay ate more.
- Half of a grape is bigger than half of an orange.

Product— Fraction Number lines
- Pair learners and give them two fractions representing the same whole. Ask them to determine which fraction is larger and explain how they know. Have them work together to represent the two fractions on large number lines, which can later be displayed. Allow them to prove their reasoning through explanation or demonstration. E.g. Which is larger $\frac{2}{3} or \frac{5}{6}$.

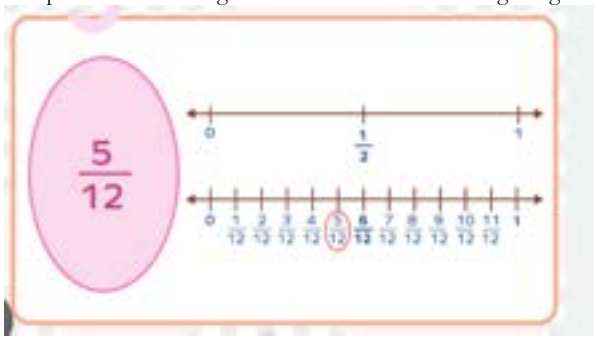


Product Create the Problem
- Have learners work in pairs or small groups and provide each group with a model or pictorial representation of a whole. Ask them to divide the whole among the group members and create a problem based on this activity. Encourage them to demonstrate their problem through drama, stories, or by using models. Observe and listen to see if they recognize that the comparison refers to the same whole.

a cake, one-half of the cake is more substantial.



- Provide opportunities for learners to use benchmarks to compare fractions using concrete materials or drawings. E.g.



Retrieved from: https://www.splashlearn.com/math-vocabulary/fractions/benchmark-fractions

- Provide opportunities for learners to recognize that comparisons are valid only when the two fractions refer to the same whole. E.g. generate problems in contextual situations; Charles ate $\frac{3}{8}$ of the cake while James ate $\frac{2}{8}$. which boy ate the largest share?

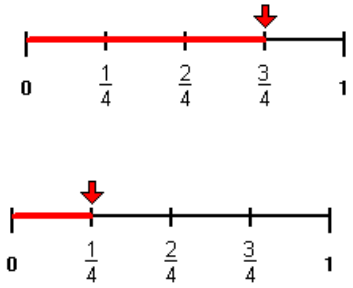
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Matching---- Fraction Challenge Game - Use playing cards to have learners play a game called "Fraction War" in pairs. Observe and listen as they discuss which fractions are larger, smaller, equal, or equivalent. Check to see if they can justify their answers using visual models.  *Retrieved from: https://mathfilefoldergames.com/2013/10/02/fraction-war/* 	 - Use number lines, fraction bars, strips and tiles to compare fractions with like numerators or denominators. E.g.  $\frac{4}{5} \bullet \frac{3}{5}$ - Use symbols <,>, = to record results of comparison and provide opportunities for learners to justify their conclusions by using visual fractions models. E.g. When comparing two fractions with the same denominator, count the diagram or pieces to see which has more. **Comparing two fractions with the same denominator**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Agree & Disagree Statements - Prepare fraction cards with different unit fractions. Distribute at least two cards per learner and allow them to complete each. Have each person then share their cards with the group and listen to them as they provide justification and evidence on their response. E.g	Compare $\frac{5}{8}$ and $\frac{3}{8}$. Use >, <, or =.  - Distribute one strip of paper to each learner and have them work in groups of 4. Have each learner fold strip to represent a fractional part of their choice. E.g. Thirds, sixths, fourths etc. asks each group to assemble their strips together to form a fraction chart. Asks each groups to write and share with the whole four pairs of equivalent fraction. E.g.

Statement	How can you find out
$\frac{4}{7} > \frac{3}{8}$	
Agree ___	
Disagree ___	
It depends on ___	
Not sure _____	
My thoughts:	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 *Retrieved from: https://www.pinterest.com/* $\frac{1}{4} = \frac{2}{8}$ $\frac{1}{2} = \frac{2}{4}$ $\frac{1}{1} = \frac{8}{8}$ **Odd one out** - Provide a list of fractions and have learners work in pairs to identify the odd one out (the fraction that is no equivalent to the others in the set). Listen to their explanations, whether they use oral reasoning or visual models. Ask them: "If these fractions represent the same whole which is the odd one out?" Have them provide an explanation for their choice. $\frac{1}{2}$, $\frac{4}{8}$, $\frac{5}{10}$, $\frac{2}{5}$, $\frac{3}{6}$	

Useful Content Knowledge:
When comparing fractions it is important to have learners use the different fraction models and drawings to represent fractions to determine whether a fraction is greater than (>), less than (,) or equal to (=) another fraction. In comparing fractions it is important for teachers and students to acknowledge that the comparison is made based on the same whole. For example, Katie rode her bike for $\frac{3}{4}$ of an hour while Jess rode hers for $\frac{1}{4}$ of an hour. Which girl rode her bike the longest?



Katie rode her bike longer than Jess.

Ways of Comparing Fractions

If the fractions have like denominators: To compare $\frac{1}{4}$ and $\frac{3}{4}$, think if they are parts of the same one-whole, the fourths are the same size parts but I have only 1 of the fourths with $\frac{1}{4}$ and I have three of those same sized parts when I have $\frac{3}{4}$, so $\frac{1}{4} < \frac{3}{4}$, like numerators

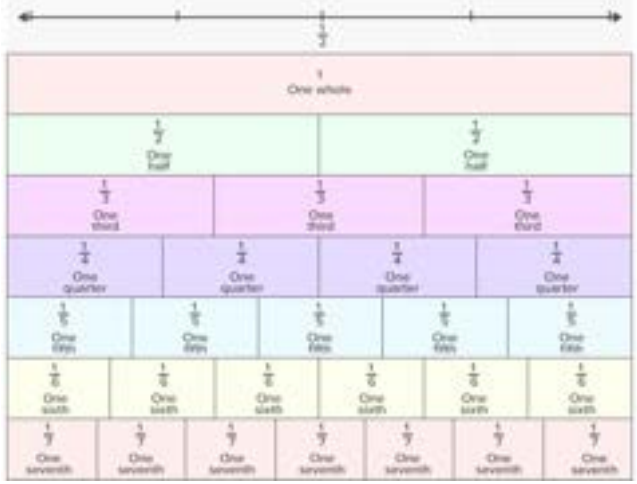
If there are like numerators: to compare $\frac{1}{4}$ and $\frac{1}{8}$, think, I have one of each of the pieces, but fourths are bigger pieces than eighths, so $\frac{1}{4} > \frac{1}{8}$

Benchmarks: To compare $\frac{5}{8}$ and $\frac{2}{6}$ think, $\frac{5}{8}$ *is more than* $\frac{1}{2}$, $\frac{2}{6}$ is less than $\frac{1}{2}$, so $\frac{2}{6} < \frac{5}{8}$

Benchmark fractions are those common fractions that we use often such as $\frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, and \frac{3}{4}$. A number line with benchmarks of 0, $\frac{1}{2}$ *and* 1 can be used to compare fractions. Benchmark fractions are easy to visualize and identify, and therefore, help in estimating the parts.

Benchmark fractions are most helpful when fractions to be compared are placed on a number line against the benchmarks.

Here's a chart of benchmark fractions placed on a number line, which can help in comparing fractions.



Retrieved from: https://www.turito.com/learn/math/benchmark-fractions

Let's sing!

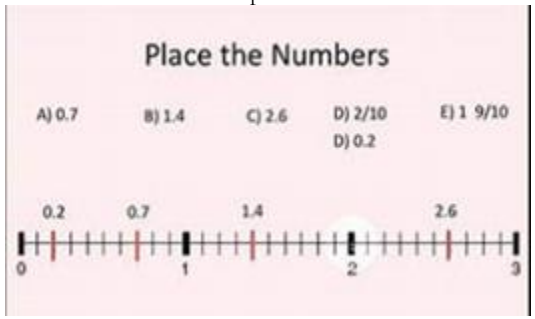
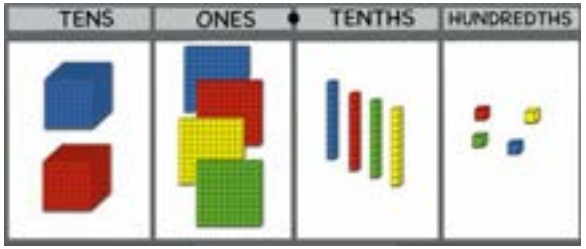
When comparing or ordering two different fractions,
Let benchmark fractions be your guiding action.
Just begin by putting the fractions on a number line
Then, choose the benchmark to compare - It'll be fine!

Inclusive Resources and Materials

- Fraction cards
- Fraction tiles/strips
- Number lines
- number cards
- playing cards
- fraction chart

Children's Literature:
The Hersey's Milk Chocolate Bar Fractions Book: https://youtu.be/qPC0rkQ1SEQ
Fraction song: https://youtu.be/ITce7f6KGE0

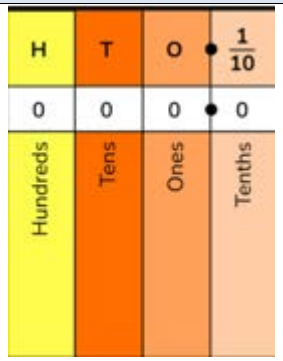
Essential Learning Outcome: N 2.3 Learners will be able to represent decimals in context, verbally and symbolically
Grade Level Expectations and/or Focus Questions: Represent decimals using concrete materials and pictorials (tenths); Describe decimals in context, verbally and symbolically.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge:** 1. Represent decimals using concrete materials (tenths) (base ten blocks). 2. Use appropriate language to describe decimals (tenths) **Skills:** 3. Create pictorial models (number lines, charts) to illustrate decimals (tenths) 4. Write decimals using symbolic notation. (tenths)	Students will be given a number line and will be asked to place a decimal number in its correct place on the number line.  https://i.ytimg.com/vi/w3UCA3LVV2g/maxresdefault.jpg **Math Corner** Create a math corner made up of place value charts, number lines, base ten blocks, games, white boards. Students either individually or in pairs can practice representing decimals using base ten blocks, and place decimals numbers in the correct place values. Students will design pictorial models of decimals that will be placed in the math corner. In addition, students will write decimal notation that corresponds to the manipulatives. A checklist will be used to ensure that the students are doing the appropriate tasks.	**Base Ten Blocks** Introduce base ten blocks as a hands-on tool for representing decimals. Use units, rods, and flats to demonstrate how decimal numbers can be broken down into different place values. For example, show learners how 0.5 can be represented as 5 tenths or 50 hundredths using the blocks.  *Retrieved from* https://mathcurious.com/2020/09/28/representing-decimal-numbers-using-base-10-blocks-printable-and-digital-activity-cards/ Questions: What decimal number is represented by the Base 10 Block? What digit is in the tenths column?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
5. Communicate orally the value of a decimal through tenths. For example, in 999.2, the 2 is in the tenths place and has a value of two tenths (2/10). **Values:** 6. Apply decimal numbers in real life situations.	Checklist: Criteria / Yes / No / Comments The student is able to represent decimals using base ten blocks. The student is able to write a decimal number correctly in the place value chart. The student is able to write the decimal notation that corresponds to manipulatives Students working in pairs. Cards will be given to students with various decimals numbers. One student will show the student a card with a decimal number. The other student will say aloud the correct value of the decimal. Card Game	**Role Play** Students will perform the role of a doctor and will be given medicine droppers or syringes. They will use the medicine droppers or syringes to draw (pull up) a certain amount of water from a container. E.g. 0.5 ml, 0.2 ml etc. Students will use the appropriate vocabulary for decimals during the activity.  *Retrieved from* *https://www.pillcrusher.com/products/1-ml-glass-medicine-dropper*  *Retrieved from* *https://www.viovet.co.uk/Syringes-Without-Needles/c5391/* Questions:

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	A pack of cards will be given to students, and they would be required to read them aloud. The student who gets the most correct responses wins the game. Students will be asked to design colourful charts that show columns for whole numbers and tenths. They will fill the columns with appropriate numbers. Students will be given Bristol board and markers. They will design cards that show a decimal number. A dot (marker) will be placed on a number line and students will be asked to write the decimal number represented by that dot (marker). Students will then write the decimal number in the place value chart.  ***Retrieved from*** ***https://www.khanacademy.org/math/cc-fourth-grade-math/imp-decimals/decimal-fractions-greater-than-1/v/writing-decimals-and-fractions-from-number-lines*** Students will be placed in groups and will be asked to write down the shoe size of each member of the group. **Worksheet** Think Pair Share Students will complete worksheets or activities involving decimals where they will be writing down the value of a decimal (through tenths) and communicating the value to their partners.	What amount of liquid is in the medicine dropper/syringe? What are the decimal values on the medicine droppers? **Creative design** Students use Bristol board/cardboard to design a ruler or number line showing decimal numbers.  *Retrieved from* *https://shopee.com.my/Creative-Cute-Cartoon-Lovely-Animal-City-Scale-Bookmarks-Set-Ruler-Shape-Design-School-Office-Use-Stationery-Gift-Idea-i.494077572.18249923079* Questions What are the decimal numbers shown on the number line? What is the highest value on the number line? What is the lowest value on the number line?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Students will be placed in groups and given a digital radio. Students will be asked to tune to a radio station which plays music and will be asked to write down the radio frequency e.g. 96.1, 105.3.	**Use of real-life activities** Students will be given bottles of fluids of various sizes. Teacher will show the students the exact spot on the label where they can find the amount of liquid contained in the bottle. Students will write down the decimal notation found on the label of the liquid. E.g. 2.0, 1.5, 2.5 etc.  https://www.pinterest.com/pin/422282902555376532/ Questions: What amount of liquid is in the bottle? Which bottle has the least amount? Which bottle has the most liquid? Which bottle can hold the most amount of liquid? **Demonstration Activity/ Visualization** Teacher creates a chart to show the place values (hundreds, tens, ones, tenths) Teacher will model how to read the value of the digits in the tenths place.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 **Retrieved from** https://thirdspacelearning.com/gcse-maths/number/place-value/ Questions: What is the value of the digit in the tenths column? What is the value of the digit in the tens column? Which digit is in the ones column?

Additional Resources and Materials

Magnetic decimal tiles
Decimal Strips
Decimal Dominoes
Measuring tape

Books:

Zero the Hero by Joan Holub

Daisy Decimal's Decimal Disaster by Joan Diaz

Additional Useful Content Knowledge for the Teacher:

fraction is a number that illustrates the relationship between two quantities. It can represent:

Quotient (Division): It shows how many parts a whole is divided into. For example, 3 granola bars shared among 4 people is expressed as 3/4.

Part of a Whole: It indicates a portion of a whole. For example, 1 granola bar divided into 4 pieces means each piece is 1/4 of the bar.

Comparison: It compares parts of the same whole. For instance, if a bag has 3 red beads and 2 yellow beads, the fraction 2/3 shows the ratio of yellow beads to red beads, and 3/2 (or 1 1/2) shows the ratio of red beads to yellow beads.

Operator: It changes the size of a quantity. For example, 3/4 of a granola bar or 3/4 of $100 reduces the original quantity to 3/4 of its size.

In summary, a fraction provides information about the relationship between parts and wholes in various contexts, such as division, parts of a whole, comparisons, and scaling.

The first position to the right of the decimal point represents tenths. Decimal tenths appear in numbers less than 1 (e.g., 0.6) and more than 1 (e.g., 24.7). When using decimal tenths, the whole number should also be indicated.

Decimal tenths can be compared and ordered by their size relative to 1 whole. Decimals represent "in-between" numbers within the base ten system, such as 3.6, which falls between 3 and 4. A zero in a decimal signifies no groups of that size (e.g., 5.0 means 0 tenths), and it's important to understand that 5 and 5.0 are equivalent. Writing a zero in the tenths place can show measurement precision (e.g., 5.0 cm is exact, while 5 cm might be rounded).

Decimals are read differently in daily life (e.g., 2.5 is "two point five", and 0.300 in baseball is "three hundred"). To emphasize their connection to fractions and place value, decimals should be read as fractions, such as "2 and 5 tenths". Tools used for whole numbers can also represent decimals, highlighting tenths instead of wholes. For instance, a base ten rod can show 1 whole partitioned into tenths.

Opportunities for Subject Integration:

Language Arts

- Expository essays on mathematical topics may include the use of decimals to explain concepts such as place value, operations with decimals, and real-life applications involving decimal measurements and comparisons. .

Science

- Reading of weights on a balance for experiment purposes
- Measuring temperatures of liquids in experiments
- Measuring heights of seedlings in a garden or height of a seedling during germination period. Measuring heights of a seedlings under different conditions for germination (e.g. no water, no light).
- measuring lengths of items used in experiments (where required lengths are not whole number values)

Social Studies

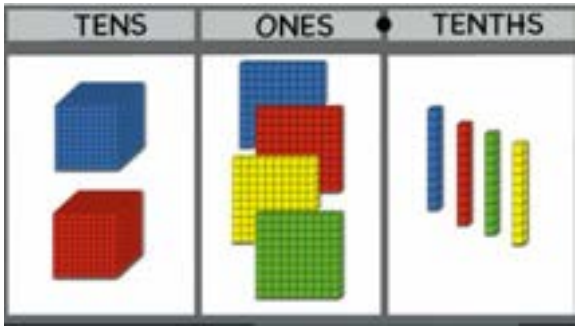
- measurement of rainfall

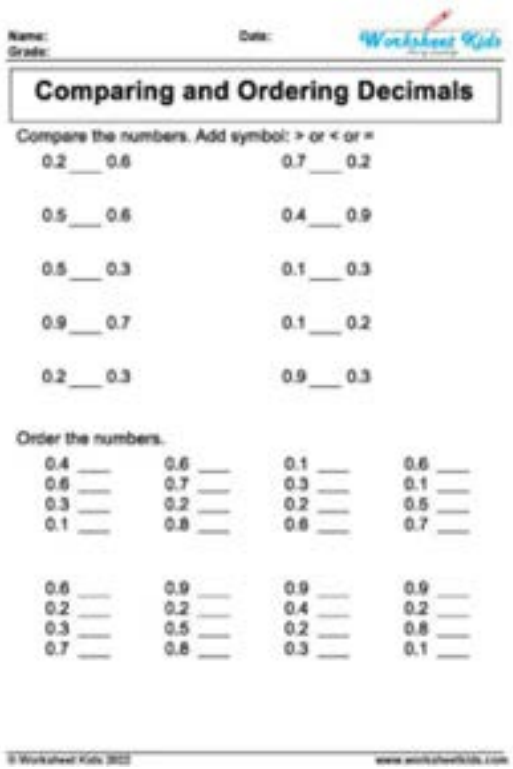
Essential Learning Outcome: N2.4. Fractions, Decimals and Rational Numbers – Comparing and Ordering Decimal

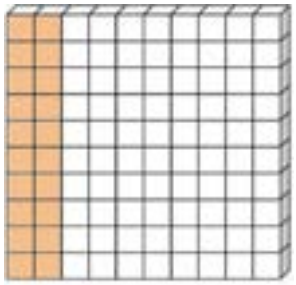
Grade Level Expectations:

Compare and order decimals using appropriate symbols <, >, =; identify the approximate position of decimal numbers on a number line; compare decimals using rounding and estimation; apply strategies to contextual situations involving the comparison of decimal numbers; create story problems involving the comparison of decimal numbers; name decimal numbers that are greater than or less than a given number or between two given numbers

Compare terminating decimals and proper fractions with a denominator of 10 using >, =, and < symbols to record the results of comparisons and justify the conclusions, e.g., by using a visual model; Recognize that comparisons are valid only when the two decimals refer to the same whole; Order decimals to tenths based on place value understanding.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Compare two decimal values using appropriate symbols, <, >, =. 2. Round off decimals to the nearest whole number. 3. Arrange a set of decimal numbers between 0 and 10 in ascending/descending order. 4. Write a decimal number (one decimal place) in the correct position on a number line. **Skills** 5. Use concrete materials or pictorial representations to demonstrate the equivalence between fractions and decimals. **Values**	Product	**Concrete Visual Models** Use visual models for example base ten blocks, to represent decimal values. Students will physically manipulate the materials and visually compare the values. Use the cubes to represent tens, the flats to represent ones and the rods to represent tenths. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
6. Students will display appreciation for comparing decimal numbers in real life situations by applying decimal numbers in measurements.	 Name: Date: Grade: **Comparing and Ordering Decimals** Compare the numbers. Add symbol: > or < or = 0.2 ___ 0.6 0.7 ___ 0.2 0.5 ___ 0.6 0.4 ___ 0.9 0.5 ___ 0.3 0.1 ___ 0.3 0.9 ___ 0.7 0.1 ___ 0.2 0.2 ___ 0.3 0.9 ___ 0.3 Order the numbers. 0.4 ___ 0.6 ___ 0.1 ___ 0.6 ___ 0.6 ___ 0.7 ___ 0.3 ___ 0.1 ___ 0.3 ___ 0.2 ___ 0.2 ___ 0.5 ___ 0.1 ___ 0.8 ___ 0.8 ___ 0.7 ___ 0.6 ___ 0.9 ___ 0.9 ___ 0.9 ___ 0.2 ___ 0.2 ___ 0.4 ___ 0.2 ___ 0.3 ___ 0.5 ___ 0.2 ___ 0.8 ___ 0.7 ___ 0.8 ___ 0.3 ___ 0.1 ___ © Worksheet Kids 2022 www.worksheetkids.com Retrieved from: https://www.worksheetkids.com/comparing-ordering-decimals-worksheet-4th-5th-grade-free-printable-pdf/ Students will complete the worksheet with the aid of the base 10 blocks. Students will be given a set of base 10 blocks (flats and rods)	***Retrieved from:*** ***https://mathcurious.com/2020/09/28/representing-decimal-numbers-using-base-10-blocks-printable-and-digital-activity-cards/#google_vignette*** Students will be given a flat to represent the numeral 1. Students will break the flat into 10 rods. Each rod represents 1/10=0.1. If a student has 2 rods, this represents 2/10 = 0.2 etc. Ten rods would represent 10/10 which is one whole (a flat). **Comparing Decimals Using Number Lines:** The use of number lines to visually represent different decimal values. By representing different values on the number lines, students can identify the decimal values that are less than and greater than another. Students can physically place decimal cards on a number line to compare the values. Decimal tiles can also be used to compare decimals.  *Retrieved from:* *https://passyworldofmathematics.com/converting-percentages-to-decimals/*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Observation Task: ● Students would be required to represent decimals, less than 1, using the base ten blocks. ● Students would compare decimals using the base 10 blocks, to indicate which decimal number is larger or smaller. Checklist: Students was able to: | Yes | No | Comments Represent a decimal less than 1 using base 10 blocks | | | Identify the decimal with the greater value. | | | Justify the decimal with the greater value. | | | **Decimal War Card Game** In pairs, students will be given decimal cards. Students take turns flipping over one card each and comparing the	 **Retrieved from:** https://www.youtube.com/watch?app=desktop&v=e9VnyqWpXsI Questions: What are the values of the decimal numbers shown on the number line? Which decimal number is greater or less ? What strategy did you use to compare these decimals, and /or why did you choose it? Why do you think one decimal is greater than the other?  *Retrieved from:* *https://www.free-math-handwriting-and-reading-worksheets.com/decimal-place-value.html*

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td></td>
<td>
decimals. The student with the greater decimal keeps both cards. The student with the most cards wins.

As students play this game the teacher observes to see if the students are doing the comparisons correctly.

Checklist:

<table>
<tr><td>Student was able to:</td><td>Yes</td><td>No</td><td>Comments</td></tr>
<tr><td>Identify the decimal with the greater value.</td><td></td><td></td><td></td></tr>
<tr><td>Justify the decimal with the greater value.</td><td></td><td></td><td></td></tr>
</table>

Think Pair Share

Students will be given strips of Bristol board to create a number line with decimals (tenth place).
</td>
<td>
Questions:

What is the decimal number represented by the base 10 blocks?

Which set of base 10 blocks show a larger decimal number?

Students will use a number line to show the decimal numbers between two values.

Students will be required to place a mark on the number line. If the mark is close to the whole number, it takes the value of that whole number.

Retrieved from
https://www.onlinemath4all.com/equivalent-fractions-and-decimals.html

Class Discussion

Retrieved from:

https://www.teachoo.com/8092/2624/Decimals-in-number-line/category/Decimals-in-number-line/#google_vignette
</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>
One student will identify a point on the number line and the other student will state the whole number which is closest to the point identified.

The two students will then alternate their roles.

Observation Checklist

<table>
<tr><th>The Student</th><th>Yes</th><th>No</th><th>Comments</th></tr>
<tr><td>Creates the number line with decimals with correct numbering.

Is able to round off the given decimal number to the correct whole number.</td><td></td><td></td><td></td></tr>
</table>
</td>
<td>
A number line that shows values to one decimal place between two whole numbers will be presented to students. Students will identify the midpoint between these two whole numbers.

Various points will be marked on the number line and students will identify the whole number that is closest to the marked point.

Teacher will guide students to form a generalization about rounding off a decimal to the nearest whole number.

Example of generalization:

If the digit to the right of the decimal point is 5 or greater, round up.
For example: 4.6 is rounded to 5.
If the digit is less than 5, round down. For example, 4.3 is rounded to 4.

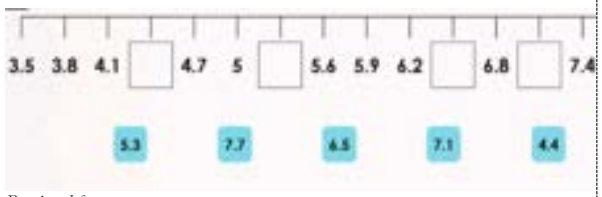
Questions
What is the decimal value exactly halfway between two whole numbers (numbers are given)?

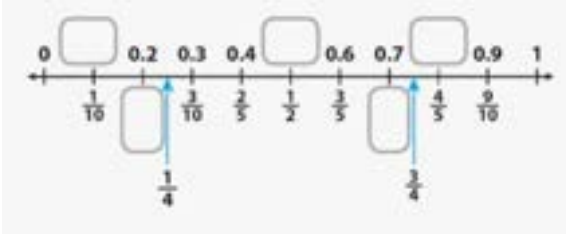
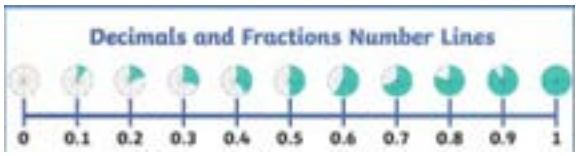
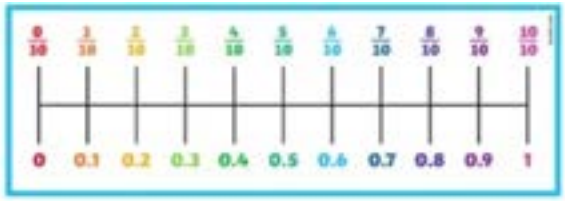
What decimals numbers are more than the halfway mark?
What decimal numbers are less than the halfway mark?

Provide liquids of various temperatures and a thermometer. They will be asked to measure the temperature of the different liquids.

Students will record the different temperatures obtained and then place them in ascending or descending order.

Provide various items to measure, using decimals in measurements, and then they shall compare the lengths of the items.
</td>
</tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Decimal Sorting Students will be given a set of cards with various representations of decimals (decimal notation, fraction notation). Students will work in pairs to sort the cards into ascending or descending order. Teacher will discuss misconceptions in groups and clarify understanding.  *Retrieved from:* *https://ofamilylearningtogether.com/2017/11/29/decimal-pages/* **Decimal Line Activity** Teacher will create a number line on the floor, labelling key decimals. Each student will then be given a decimal card, and they will have to place the card in the correct positions on the number line according to their decimal.  *Retrieved from:* *https://kids.classroomsecrets.co.uk/resource/year-4-tenths-on-a-number-line-game/* Students will create decimal number lines on blank paper, then place decimal numbers on their custom number lines.	Allow for items to be arranged in order from shortest to longest (and vice versa) and place the decimal readings underneath each item. Questions: Arrange the decimal number in ascending order. Arrange the decimal number in descending order. What are the decimal numbers that are higher than 0.5? What are the decimal numbers that are lower than 0.5? **Demonstration** The teacher draws a number line on the board or presents a pictorial model of a number line. The teacher selects a decimal number (e.g. 0.3, 0.5, 0.6) and shows the students its position on the number line. Teacher discusses with students the role of the decimal point and the significance of the tenth digit in determining the placement of the number. Questions: What numbers are missing on the number line? Place the following decimals numbers on the correct position on the number line: 0.4, 0.3, 0.2, 0.6

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Teacher assesses the decimal number for accuracy on the number line. **Matching Game** Students will be given a number line with missing values of fractions and decimals. Students will be given cards with fractions and decimals. Students will draw a card and place it in the correct position on the number line.  *Retrieved from* *https://www.onlinemath4all.com/equivalent-fractions-and-decimals.html* Teacher will observe students placing cards in the correct positions and guide students if errors are made. **Math Journals** Students keep Math journals where they record where they encounter decimals in everyday activities.	Equivalence of fractions and decimals using number line Students will place decimals and fractions on a number line.  *Retrieved from* ***https://www.twinkl.com.au/resource/t2-m-4512-decimals-and-fractions-number-line-display-poster***  *Retrieved from* ***https://www.twinkl.co.uk/resource/t-n-4675-decimals-and-fractions-number-line-bookmark*** Questions: Which decimal numbers on the number line are equivalent to ½, 1/10? Which fraction is equivalent to 0.6?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Real Life Situations With digital thermometers (under arm), students can measure their body temperatures. They can compare these temperatures to normal body temperature.  *Retrieved from:* *https://www.therange.co.uk/health-and-beauty/health-and-wellbeing/first-aid/digital-first-aid-thermometer-for-oral-and-underarm-use/* Students can visit the Met office and get figures for monthly rainfall or yearly rainfall. They can compare the readings to see which month recorded most or least rainfall etc. Questions: In which real life situations are decimals used?

Additional Resources and Materials

Decimal Grids or Charts

Decimal Fraction Bars

Decimal Tiles

Fraction/Decimal circles or strips

Books

Math Curse by Jon Scieszka and Lane Smith

Sir Circumference and All the King's Tens by Cindy Neuschwander

Additional Useful Content Knowledge for the Teacher:

. The fraction 1/10 as a quotient is 1 ÷ 10, which equals 0.1 and is read as one tenth. Counting decimal tenths is equivalent to counting unit fractions of one tenth, which can be written in decimal form (e.g., 0.1 for 1 one tenth, 0.2 for 2 one tenths, 0.3 for 3 one tenths, etc.). Ten tenths make up 1 whole, written as 1.0 in decimal notation. Counting by tenths can exceed 1 whole; for example, 15 tenths is 1 whole and 5 tenths, expressed as 1.5 in decimal notation.

Essential Learning Outcomes: N2.5. Fractions, Decimals and Rational Numbers – Decimal Place Value

Grade Level Expectations and/or Focus Questions: Extend the positional structure of the place value system to include decimals (tenths);
Read and write decimals to tenths using base-ten numerals, number names, and expanded form, e.g., 347.3 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10).
Represent the place value of numbers in various groupings concretely, pictorially, contextually, verbally, and symbolically; explain the pattern regularity of the positional structure of the place value system; identify the value of a digit as determined by its position

Specific Curriculum Outcomes

Learners will be expected to:

Knowledge

1. Read and write the number names for decimals up to tenths using base ten numerals up to 10 000
2. Represent the place value of various groupings concretely, pictorial, contextually and symbolically.

Skills

3.Express decimal numbers up to tenths in expanded form.
4. Describe the regular pattern of the place value system for numbers up to the tenth place.

5. Identify the total values of digits basedthe its place value of numbers up to the tenths place.

Values
6. Solve word problems involving decimals in the context of real-life situations.

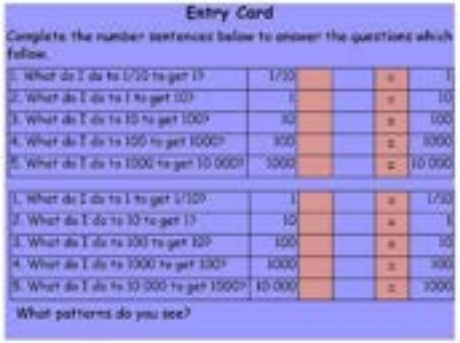
Inclusive Assessment Strategies

The learners complete the following to show their understanding of the pattern regularity of the structure of the place value system.

Place Value	*Unit Value*	*Pattern Regularity*	
ten thousands	10 000	___ x 10	100 000 ÷ __
thousands	1000	___ x10	10 000 ÷ __
hundreds	100	___ x 10	1000 ÷ __
tens	10	1 x ___	___÷10
ones	1	110 x ___	10 ÷___
tenths	110	110	1÷ ____

Inclusive Learning Strategies

Entry Card/Group work/Discussion
In groups, the learners complete the following entry card to understand the relationships among the place values in the base ten number system.



After the learners complete the entry card they are engaged in discussion so they can share the patterns discovered.

They are asked the following questions?
1. What happens to the place values as they move to the left ?
2. What happens to the place values as they move to the right?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

The following checklist is used to assess the understanding to the learners.

Checklist

Place Value	*Unit Value*	*Pattern Regularity*	
ten thousands	10 000	___ x 10	100 000 ÷ __
thousands	1000	___ x10	10 000 ÷ __
hundreds	100	___ x 10	1000 ÷ __
tens	10	1 x ___	___÷10
ones	1	110 x ___	10 ÷___
tenths	110	110	1÷ ___

The learners are engaged in reading and writing the number names for decimals up to tenths using base ten numerals up to
10 000 in words.

A checklist is used to assess the following.
The instructor gives the learners a list of numbers similar to the list shown below.
a. 5.9
b. 23.6
c. 354.8
d. 9245.3

They read and write them in words. An example is presented to the students. Individually the students read the numbers to their teacher. The teacher records the students competence on the checklist below. After the learners are engaged in writing the names of the numbers in words.

Use of flashcards, place value charts
Every learner is given a worksheet with the following place value chart.

Number	*ten thousands*	*thousands*	*hundreds*	*tens*	*ones*

The learners are engaged in identifying whole numbers by name flashed at them by their instructor. The activity begins with the instructor flashing single digit numerals, then 2- digit numerals, after 3 digit numerals, four digit numerals and lastly the numerals 10, 000.

The numerals are flashed randomly. The learners are questioned about the place values of the digits in the numerals. After they have read the numeral, the learners write the numeral in the number section, then they represent the digits in the correct position on a place value chart.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Example: 3778.9
Students would say the following to the teacher and would write the same on their notebooks.
Three thousand, seven hundred seventy eight and nine tenths

Observation Checklist

Number	Can Read	Can Write	Observations

The learners are engaged in creating values using the following base ten blocks in pairs. Each pair is given two flash cards with differing numbers. They then represent the values on a place value chart and in expanded notation.

After reading whole numbers, the learners are given another place value chart but this one includes decimal tenths like the one below.

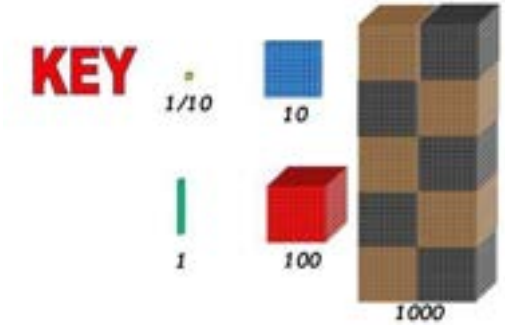
number	*ten thousands*	*thousands*	*hundreds*	*tens*	*ones*	*tenths*

They are engaged in reading numbers including decimal tenths and are also engaged in representing them in the place value chart assigned to them.

The learners read decimal numbers up to tenths.

The learning activity begins with the learners identifying only tenths decimal numbers. The learners are flashed the number 0.1. The instructor brings the point in the number to the attention of the learners. The instructor explains this is a decimal point. The instructor further explains the first digit to the immediate left of the decimal place point is in the ones place and the first digit to the immediate right of the decimal point is in the tenths place. The learners are then challenged to read the numeral and are asked what number this is?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies



For Example
A pair is given the following flashcards.

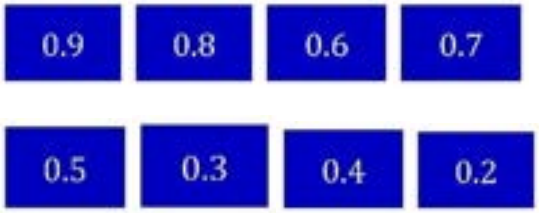
The learners use the blocks to represent the numbers then they write the numbers in expanded notation. The following checklist is used to assess the students ability to complete the tasks.

Observation Checklist

Criteria	No.	No.	Comments
Representation of thousands value			

The learners are encouraged to represent the number in the place value chart to help them. They will be aided in recognizing the one in the tenths place is one tenth.

The same is done until the learners have read one tenth, two tenths. three tenths up to nine tenths randomly after the numerals are flashed to the them.



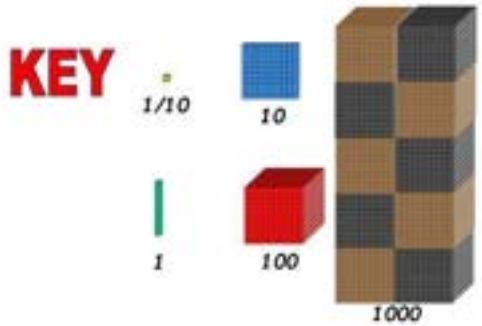
They are then asked how do you think we write ten tenths? The learners are engaged in viewing the video attached to the next activity to help them answer this question.

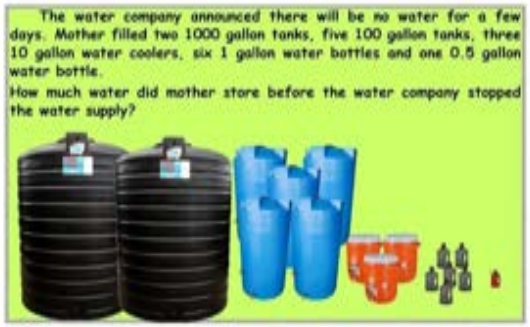
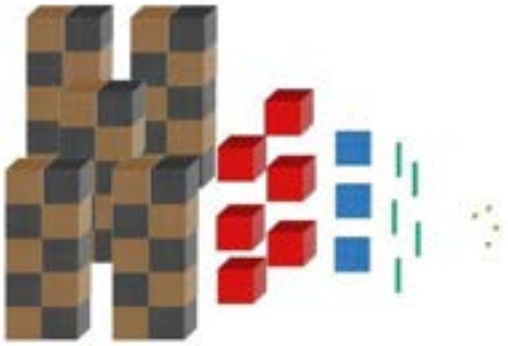
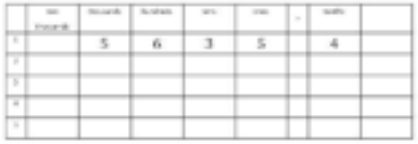
Use of Technology

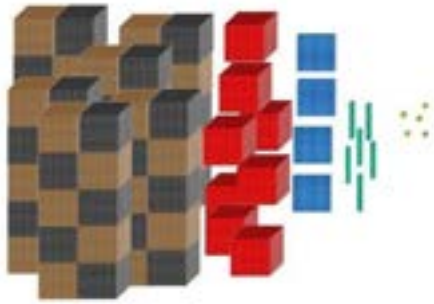
The learners view a video showing decimal models representing tenths. the learners will see how tenths are written as a decimal number and also as a fraction. Some of the models will include wholes so that the learners see the representation of wholes in the model.

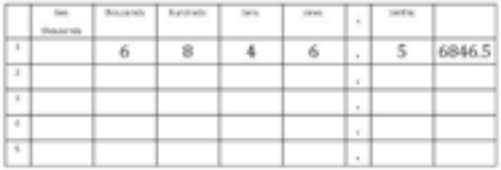
https://youtu.be/asOD7H6C8ig

How do we read decimal numbers?
We read the whole number seen before the decimal point. At the decimal point we say and, then we read the decimal number according to its place value.
For example:
5 678 . 5 is read as
five thousand, six hundred seventy eight and five tenths.
The learners are engaged in reading several numbers using this guide. They are also engaged in writing the numbers in words to help them.

Specific Curriculum Outcomes	Inclusive Assessment Strategies				Inclusive Learning Strategies
	Representation of hundreds value				**Use of Manipulatives** The learners are given representations of numbers using base ten blocks. They organize the information then they complete the activity in the table below.  This is the key for how the base ten blocks will be used in this activity.  The learners are given a number representation using the blocks. They interact with the representation in the following way: 1. They group the blocks based on their values. 2. They count how many blocks they find in each value and write it under the corresponding column in the table above. 3. Then the students count the total values of each grouping starting with the set with the largest value first. Then the next largest value until they get to the one with the least value.
	Representation of tens value				
	Representation of the ones value				
	Representation of the tenths value				
	Wrote the correct digit in the thousands place in the chart				
	Wrote the correct digit in the hundreds place in the chart				
	Wrote the correct digit in the tens place in the chart				
	Wrote the correct digit in the ones place in the chart				
	Wrote the correct digit in the tenths place in the chart				
	Wrote a correct number sentence representing the number in expanded notation.				

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Exit Cards **The learners are engaged in solving real life problems involving place value.**  The water company announced there will be no water for a few days. Mother filled two 1000 gallon tanks, five 100 gallon tanks, three 10 gallon water coolers, six 1 gallon water bottles and one 0.5 gallon water bottle. How much water did mother store before the water company stopped the water supply? A merchant had 7 bags of 1000 kg of sugar, 9 bags of 100 kg of sugar 8 bags of 10 kg, 9 bags of 1 kg of sugar and 1 bag of 0.7 kg of sugar. How much sugar did the merchant have in all?	4. The students write a vertical number sentence to find the sum of the number representations. 5. They write the sum in the number column of the chart. For example, the learners are presented with the following representation.  1. They group the blocks based on their values. (This is already done in this representation). 2. They count how many blocks they find in each value and write it under the corresponding column in the table above.  3. Then the students count the total values of each grouping starting with the set with the largest value first. Then the next largest value until they get to the one with the least value. 4. The students write a vertical number sentence to find the sum of the number representation.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		5000 600 30 + 5 0.4 5635.4  At this point the instructor explains that the total values were used to find the number. The learners are then engaged in expressing numbers in expanded notation using the total values of the digits. The numeral 6 846.5 is written on the board. Firstly, the learners are asked to read the numeral. Secondly, they are asked to use the blocks like shown in the example below to represent the number.  Then the learners are asked to find the total value of each digit in the order of the largest digit to the digit with the least value. The learners should write: 6000, 800, 40, 6, 510/0.5

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		These values are then used to express the number 6846.5 in expanded notation in the following manner. 6846.5 = 6000+800+40+6+5/10 or 6000+800+40+6+0.5 These same processes can be used to help the learners write numbers in expanded notation using the base ten blocks. Another method which could be used to write numbers in expanded notation is through the use of the place value chart. The number 6846.5 is represented in a place value chart.  The learners are guided in the completion of the following at first: _ x 1000 + _ x 100 + _ x 10 + _ x 1 + _x 1/10 or _ x 1000 + _ x 100 + _ x 10 + _ x 1 + _ x 0.1 The learners complete the above like shown below. The instructor explains this representation is writing a number in expanded form. 6846.5 = **6** x 1000 + **8** x 100 +**4** x 10 + **6** x 1 + **5** x 1/10 or 6846.5 = **6** x 1000 + **8** x 100 +**4** x 10 + **6** x 1 + **5** x 0.1 The learners complete each multiplication and then represent the number 6846.5 in expanded notation as shown below. 6846.5 = 6000 + 800 + 40 + 6 +0.5

Additional Resources and Materials

Base-Ten Blocks: Manipulatives that include units, rods, flats, and cubes to represent ones, tens, hundreds, and thousands, respectively, along with smaller units to represent tenths.
Place Value Charts: Visual aids that help students understand the position of digits in a number, extended to include decimals.
Decimal Number Lines: Tools for students to plot and visualize decimals on a number line.
Worksheets and Workbooks: Exercises focusing on reading, writing, and expanding decimals.
Interactive Software: Programs like Khan Academy, IXL, and Math Playground that provide interactive lessons and practice problems

The following are decimal stories. The first introduces the concept.
https://youtu.be/5uJwSZU5HcI

The second one continues decimal number and place value understanding.
https://youtu.be/gvXYFydMTgI

Additional Useful Content Knowledge for the Teacher: Base ten refers to the place value system that uses decimal numbers. It is in common use around the world. It forms the basis of a place value number system and is also known as the decimal number system. Base ten uses ten digits from 0 to 9 to represent any number.
The digits used in the base ten number system are: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. These digits are combined to form numerals. Depending on the position of the digit in the numeral, each position has a value in powers of ten.
As it uses the decimal number system, the value of each digit in a numeral depends on its place in relation to the decimal point. Each digit in a numeral is ten times the value of the digit to its right.

Opportunities for Subject Integration:

Science
Measurement and Data Analysis

Activity: When conducting experiments, students can measure quantities (such as length, mass, or volume) using decimal values. For example, they can measure the length of objects to the nearest tenth of a centimeter.
Integration: Students can record and analyze their measurements, writing the values in decimal form and explaining the place value of each digit.
Social Studies
Economic Literacy

Activity: Teach students about currencies and prices, incorporating decimals to represent money (e.g., $347.30).
Integration: Students can practice reading, writing, and calculating with decimals when learning about budgeting, prices, and economic exchanges.

Language Arts
Writing and Comprehension

Activity: Have students write a short story or report that includes data presented in decimal form, such as a narrative about a trip where they describe distances traveled (e.g., 3.7 miles) or money spent.
Integration: Encourage students to use base-ten numerals, number names, and expanded form in their writing to reinforce their understanding of decimals.

Art
Symmetry and Patterns

Activity: Explore patterns and symmetry in art using measurements that include decimals.
Integration: Students can create geometric designs that require precise measurements, such as 3.5 cm or 7.2 cm, and explain the importance of each digit's place value in ensuring accuracy.

Physical Education
Fitness and Health Tracking

Activity: Have students track their fitness activities and health metrics using decimals (e.g., running 2.5 miles, drinking 1.7 liters of water).
Integration: Students can record and analyze their data, discussing how the place value of each digit represents the different aspects of their fitness goals and achievements.

Music
Rhythms and Beats

Activity: Introduce musical concepts that use decimal timing, such as dividing beats into tenths for precise rhythm.
Integration: Students can read and write rhythms using decimals, understanding how the place value system helps in breaking down complex musical patterns into manageable parts.

Technology
Coding and Computer Science

Activity: In coding exercises, use decimal values for setting parameters or coordinates (e.g., placing objects at specific positions like $x = 3.4$, $y = 7.2$).
Integration: Students can write and debug code that incorporates decimals, explaining how the place value affects the outcome of their programming tasks.

Operations with Numbers

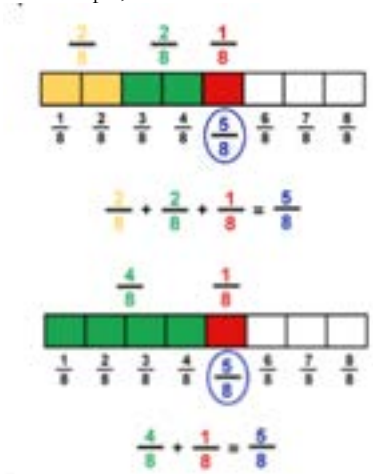
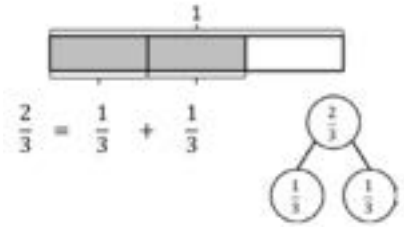
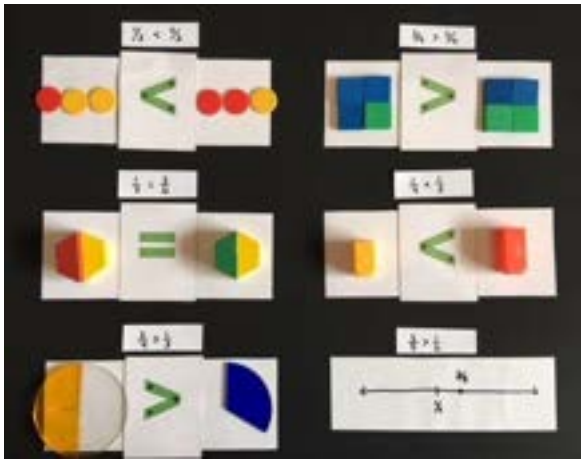
Introduction To Strand

Operations with numbers are crucial for Grade 4 students as they lay the foundation for advanced math concepts and enhance problem-solving and critical thinking skills. Mastery of basic arithmetic operations—addition, subtraction, multiplication, and division—improves overall numeracy, builds confidence, and contributes to academic success across the math curriculum. These skills are also essential for daily activities like shopping, cooking, and managing money, fostering logical reasoning and practical life skills that students will use throughout their lives.

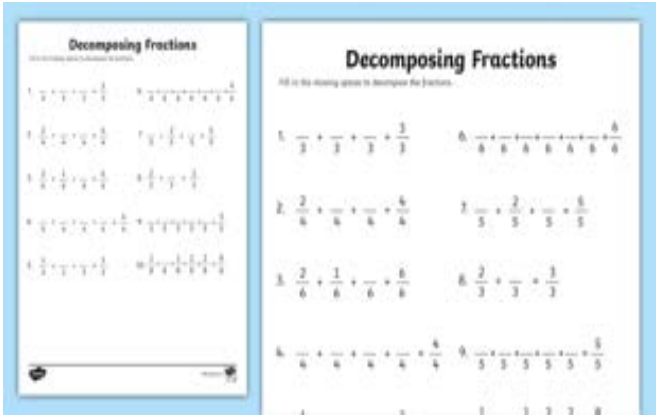
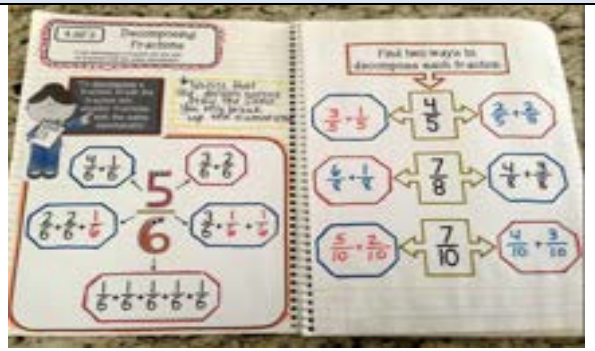
Essential Learning Outcome O1.1: Additive Thinking – Understanding the Meaning of Addition and Subtraction and How They Related

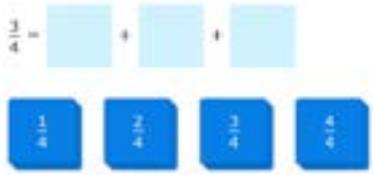
Grade Level Expectations and/or Focus Questions:
Understand a fraction a/b with a > 1 as a sum of fractions 1/b; Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation.

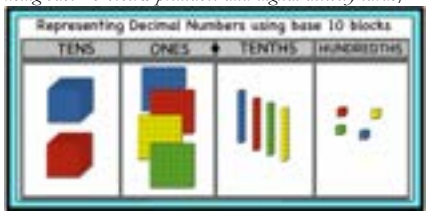
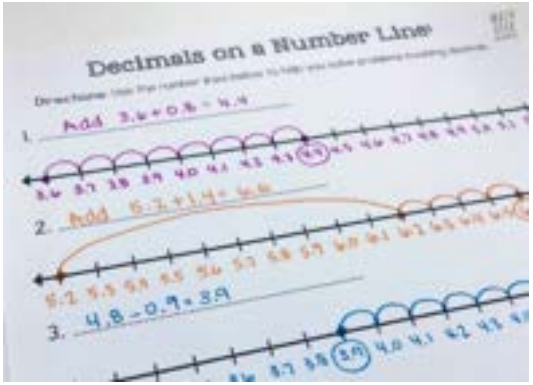
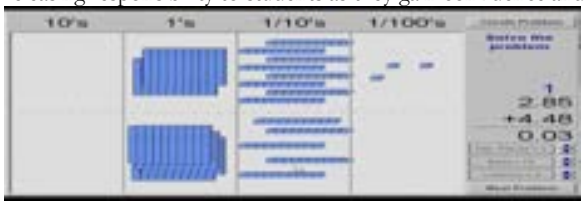
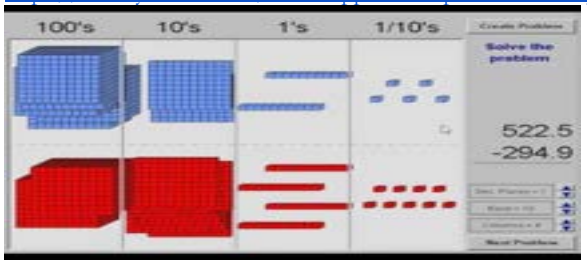
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Decompose a fraction less than or equal to 1 into a sum of fractions with the same denominator in more than one way, recording each decomposition with an equation. 2. Justify decompositions with a visual model, such as a tape diagram or number line. 3. -use concrete models or drawings and strategies based on place value to add and subtract decimals to tenths. 3. Accurately Add and subtract decimals in base 10 up to tenths, including lining up the decimal points and carrying over when necessary.	**Product- Fraction Plate** Distribute a paper plate to each student and have them decompose the whole to represent different fractions e.g. thirds, fifths, eights, tenths, etc. learners can choose their own fraction or the teacher can write a fraction name at the back of each plate.  *Retrieved from : https://mamaslatinas.com/parenting-pregnancy/153696-educational-crafts-for-kids-of-all-ages* **- Use Think –pair and share**	**Visual Models and Manipulatives:** Use visual models such as fraction bars, fraction circles, or area models to represent fraction decomposition visually. - Have learners use concrete materials such as fraction tiles, fraction bars/ strips, and Cuisenaire rods to decompose a fraction into a sum of fractions with the same denominator in more than one way. E.g. 

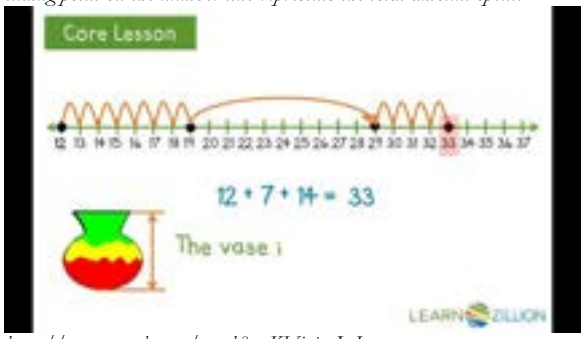
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 5. Accurately perform addition and subtraction of fractions by understanding and applying the relationship between the numerator and denominator. 6. Demonstrate using models how fractions can be decomposed into a sum of fractions with the same denominator. 7. Manipulate place value models, such as base-ten blocks or grids, to visually represent and carry out addition and subtraction of decimals to tenths. 8. Represent the addition and subtraction of decimals on a number line, recognizing the movement to the right for addition and to the left for subtraction. **Values** 9. Work collaboratively to decompose fractions with like denominators .	Place learners in pairs, ask them to decompose a given fraction in as many ways as possible. - Listen to learners as they talk about each decomposition. Can they justify the decomposition? - Observe them to see if they are recording each decomposition correctly. For example,  *Retrieved from: https://www.teacherspayteachers.com/Product/Fraction-War-Card-Game-4157237*  *Retrieved from: https://ccssmathanswers.com/eureka-math-grade-4-module-5-lesson-1/*	*Retrieved from: https://msricepirates.weebly.com/math/fractions-and-pattern-blocks* Incorporate manipulatives like fraction tiles or base-ten blocks to provide tactile experiences for students who benefit from hands-on learning.  *Retrieved from: https://cindyelkins.edublogs.org/2018/02/* **Differentiated Instruction:** Differentiate instruction by offering multiple entry points and varying levels of challenge. Make use of concrete , pictorial and abstract representation. ***Interactive Demonstrations:*** Conduct interactive demonstrations where students can actively participate in fraction decomposition. Use interactive whiteboards or digital math

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Differentiated Tasks: Provide a range of tasks with varying levels of complexity and scaffolding to meet the diverse needs of students. Offer extension activities for students who grasp the concept quickly and additional support for those who require it. For example, **Basic Level:***John has 3/4 of a pizza. He eats 1/4 of the pizza. How much pizza does he have left?* Have a real pizza to solve the problem.  **Intermediate Level:** *Ron has 4/6 of a bag of marbles. She gives away 2/6 of the marbles to her friend. How many marbles does she have left?* Use pictorial representation to solve the problem. **Advanced Level:** *Emily has 7/10 of a bag of candies. She shares 4/10 of the candies with her siblings. How many candies does she have left?* Solve problem abstractly. **Additional Challenge:** *Create your own word problem involving addition or subtraction of fractions referring to the same whole and having like denominators. Solve the problem and provide the solution.*	tools to engage students in real-time fraction manipulations and explorations. Note: If there is no whiteboard in the school, a projector can be used.  https://www.pbs.org/video/good-know-decomposing-fractions-grade-4/ **Peer Collaboration:** Encourage peer collaboration through cooperative learning activities. Assign group tasks where students work together to decompose fractions, share strategies, and explain their reasoning to one another before questioning the teacher.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Flexible Grouping: *Incorporate collaborative assessment tasks where students work in pairs or small groups to decompose fractions. This allows for peer support and fosters a sense of belonging and collaboration among students of different abilities.*  *https://www.twinkl.co.uk/resource/us2-m-149-decomposing-fractions-activity-sheet* ***Assistive Technology:*** *Integrate technology tools, such as interactive whiteboards, educational apps, or assistive software, to support students with diverse learning needs, including those with disabilities or English language learners.* *https://www.splashlearn.com/math-vocabulary/fractions/decomposing-fractions*	 *Retrieved: https://klublr.com/ena/decompose-fractions* ***Role playing*** Collaborating with others can provide new perspectives and deepen your understanding. ***Title: Anansi and the Decomposing Fractions*** *Once upon a time, in a cozy village nestled deep within the lush jungles of Jamaica, there lived a mischievous spider named Anansi. Anansi was known far and wide for his cunning ways and clever tricks. However, there was one thing Anansi struggled with – fractions!* *One sunny day, as Anansi was lounging lazily in his web, he heard the village children talking excitedly about fractions. "Fractions are easy," they said. But for Anansi, fractions were like tangled webs that he couldn't unravel.* *Determined to understand fractions once and for all, Anansi decided to seek help from his wise old friend, Owl. Owl was known for his knowledge of numbers and mathematics.* *Anansi scurried through the jungle until he reached Owl's treehouse. "Owl, please teach me about fractions!" Anansi pleaded.*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Fill in the missing numbers to write $\frac{3}{4}$ as a sum of unit fractions.  *Retrieved From: https://www.ixl.com/math/grade-4/decompose-fractions* ***Collaborative Problem-Solving Tasks:*** Design tasks that require students to work together to decompose fractions with different denominators. For example, provide groups with sets of fraction cards and challenge them to organize the cards into equivalent fractions by decomposing them into smaller parts. Assess students based on their ability to communicate effectively, negotiate solutions, and support each other in the process. **Verbal and Written Explanations:** Allow students to explain their thought process verbally or in writing when solving decimal problems. This accommodates auditory and linguistic learners, as well as those who may struggle with written calculations but can articulate their understanding verbally. For example, ***Think-Pair-Share:*** *Provide each student with a decimal problem to solve independently.* *After a few minutes of individual work, ask students to pair up and discuss their solutions with a partner.* *Each student takes turns explaining their thought process to their partner, articulating their reasoning and steps taken to arrive at the solution.* ***Written Explanation in Journals:*** *Assign students a set of decimal problems to solve independently.* *After solving the problems, ask students to write a reflection in their math journals, explaining their approach to each problem in writing.* *Encourage students to include details such as how they lined up the decimal points, any regrouping or carrying over performed, and why they chose a particular strategy.*	*Owl, being wise and patient, agreed to help Anansi. "Fractions may seem complex, but let's start by breaking them down into simpler parts," Owl said.* *Anansi listened intently as Owl explained how fractions could be decomposed into smaller fractions. Owl drew circles on a piece of bark and divided them into equal parts. "Imagine each circle represents a whole," Owl said. "Now, if we divide each circle into smaller parts, we can understand fractions better."* *Anansi watched as Owl divided the circles into halves, quarters, and eighths. "Each part represents a fraction of the whole," Owl explained. "For example, if we take one half from two halves, we get one-half. If we take one quarter from four quarters, we get one-fourth."* *Anansi's eyes sparkled with understanding. "So, fractions are like pieces of a puzzle that make up a whole!" he exclaimed.* *"Exactly!" Owl nodded. "Now, let's practice decomposing fractions."* *Anansi and Owl worked together, using sticks and leaves to represent fractions. They decomposed fractions like 3/4 into smaller parts, understanding that it was the same as 2/4 + 1/4.* *As the sun began to set, Anansi realized that fractions weren't as tricky as he thought. With Owl's guidance, he had mastered the art of decomposing fractions.* *From that day on, Anansi became the fraction expert of the jungle. He taught the village children how to decompose fractions using sticks, leaves, and anything they could find. And whenever he encountered a tricky fraction, Anansi would remember Owl's wise words and break it down into smaller parts.* *And so, with a little help from his friends and a lot of determination, Anansi learned that even the trickiest problems could be solved one step at a time. And the village children? Well, they never underestimated the power of fractions – or the cleverness of Anansi the Spider.* ***Peer Teaching:*** Encourage students to take turns teaching and explaining concepts to their group members. Assign each student a specific fraction to decompose, and then have them teach their findings to the rest of the group. This not only reinforces their own understanding but also promotes

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Drawings and Visual Representations: Encourage students to draw visual representations of decimal addition and subtraction problems. This could include number lines, area models, or pictorial representations. Assess their drawings for accuracy and understanding of place value and the operations involved. *Retrieved From: https://mathcurious.com/2020/09/28/representing-decimal-numbers-using-base-10-blocks-printable-and-digital-activity-cards/*  **Relationship Between Addition and Subtraction:** Present assessment tasks that highlight the relationship between addition and subtraction of decimals.  *https://mathgeekmama.com/add-subtract-decimals-number-line/*	collaboration and teamwork as students support and learn from each other. **Modeling and Guided Practice**: Demonstrate the addition and subtraction of decimals using concrete models or drawings, and guide students through the process step by step. Scaffold learning by gradually releasing responsibility to students as they gain confidence and proficiency.  https://www.youtube.com/watch?app=desktop&v=n3R_kSCJftw  *Retrieved from: https://www.youtube.com/watch?v=6-jEuW4q2_k* **Real-World Applications:** Connect the use of number lines to real-world scenarios to make the learning more meaningful and relevant for students. Present word problems involving addition and subtraction of decimals where students can use the number line to solve practical problems for example, ***Shopping Spree**: Sarah went to the grocery store and bought a bag of apples for $3.50. Then, she bought a carton of milk for $1.25. How much did Sarah spend in total?* ***Running Race**: In a race, Sarah completed 5.25 kilometers and Sam completed 3.75 kilometers. How much farther did Sarah run than Sam?* *To solve these word problems using the number line, students can follow these steps:* ***Identify the Starting Point**: Mark the starting point on the number line, which represents the initial quantity or value.* ***Determine Direction**: Based on whether it's addition or subtraction, students move either to the right (for addition) or to the left (for subtraction) on the number line.*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Determine the Distance: *Determine the distance to move on the number line, representing the quantity being added or subtracted.* ***Mark the Ending Point***: *After moving the appropriate distance, mark the ending point on the number line.* ***Find the Answer***: *The ending point on the number line represents the solution to the problem.* *For example, in the first problem "Shopping Spree," students would start at $0 on the number line, move to $3.50 for the apples, and then add $1.25 for the milk. The ending point on the number line represents the total amount spent.*  *https://www.youtube.com/watch?v=KViqjmtL-Io*

Additional Resources and Materials:
Math talks: Facilitate whole-class or small-group discussions where students share their decomposition strategies and reasoning.
Graphic Organizers: Fraction decomposition charts: Provide graphic organizers or templates that help students organize their thinking when decomposing fractions.
Math storybooks: Use books that incorporate fractions and decomposition concepts into engaging narratives to reinforce learning.
Fraction games and apps: Utilize interactive online games or apps that allow students to practice decomposing fractions in a fun and engaging way.
Virtual manipulatives: Online versions of fraction manipulatives that students can use to visually decompose fractions.
Ruler and measuring tape: The use of these materials will aid and concretize the conceptual understanding of addition and subtraction of decimals up to tenths.
Decomposition practice sheets: Provide worksheets with fractions for students to decompose into sums of fractions with the same denominator.

Additional Useful Content Knowledge for the Teacher:
Counting by a fractional amount means counting by a unit fraction. For example, counting by one third goes: 1 one third, 2 one thirds, 3 one thirds, etc. This reinforces that the numerator counts the units. When the count reaches the equivalent of one whole (e.g., 3 one thirds), it shows the whole. Counting can exceed one whole; for instance, 5 one thirds equals 1 whole and 2 one thirds.

The numerator indicates the count of units (denominator). Visual representation can help reinforce the relationship between numerator and denominator. Fewer partitions mean fewer counts to make a whole (e.g., 3 one thirds vs. 5 one fifths). When the numerator is greater than the denominator, the fraction is improper (e.g., 5/3) and can be written as a mixed number (1 2/3). Counting unit fractions is essentially adding unit fractions.

An important part of problem-solving is choosing the right operation for the situation. For additive situations, there are three main types of problems:

Change Situations: A quantity is increased or decreased. The result, starting point, or change amount might be unknown.
Combine Situations: Two quantities are combined. One part, the other part, or the result might be unknown.
Compare Situations: Two quantities are compared. The larger amount, smaller amount, or the difference might be unknown.
Drawings and models, such as part-whole models, help identify the actions and quantities involved, aiding in the selection of the appropriate operation and equation.

Various strategies can be used for addition and subtraction, including algorithms. An algorithm is a set of steps for a procedure. Different cultures have different standard algorithms. In North America, standard algorithms for addition and subtraction use place value to decompose and recompose numbers, starting with the smallest unit and using regrouping strategies.

When adding or subtracting, only common units can be combined or separated, which is crucial when dealing with decimals. For example, to subtract 24.7 from 90, 90 can be written as 90.0 to align the units.

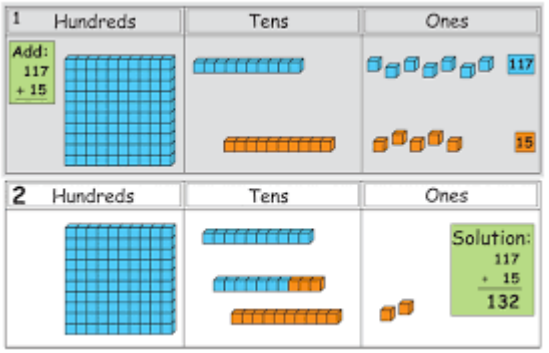
Understanding the efficiency and compactness of standard algorithms strengthens place value comprehension and the properties of addition and subtraction.

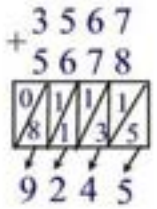
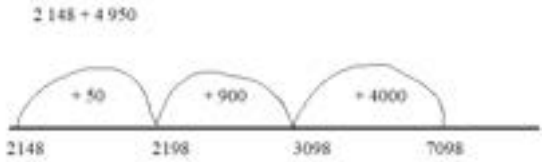
Opportunities for Subject Integration: *(Additional ideas about how the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)*

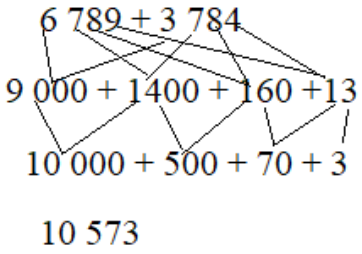
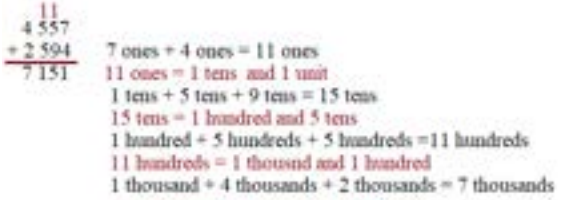
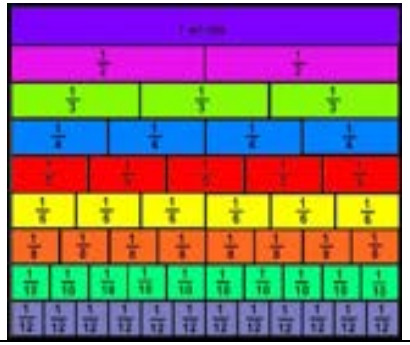
- *Measurement and Data:*
  - *Use addition and subtraction of decimals to tenths to solve problems involving measurements, such as adding or subtracting lengths, volumes, or weights.*
  - *Integrate decimals into data analysis by calculating sums and differences in statistical measures, such as mean, median, or range, which often involve decimal values.*
- *Geometry:*
  - *Apply addition and subtraction of decimals to tenths when working with geometric figures, such as finding the perimeter or area of shapes with decimal dimensions.*
  - *Explore concepts like scale factor and similarity, where decimal values may be involved in resizing or comparing shapes.*
- *Fractions and Decimals:*
  - *Relate addition and subtraction of decimals to tenths to equivalent fractions, helping students understand the connection between fractions and decimals.*
  - *Compare and order fractions and decimals, requiring students to add or subtract decimals to tenths to make comparisons.*
- *Ratios and Proportional Relationships:*
  - *Use addition and subtraction of decimals to tenths to solve problems involving ratios and proportions, such as determining part-to-part or part-to-whole relationships.*
  - *Apply these operations in real-world scenarios, such as scaling recipes or mixing solutions in chemistry.*
- *Financial Literacy:*
  - *Integrate decimals into financial literacy activities, such as budgeting, calculating expenses, or managing accounts.*
  - *Explore concepts like sales tax, discounts, and interest rates, which involve adding or subtracting decimals to tenths in practical situations.*
- *Patterns and Algebraic Thinking:*
  - *Apply addition and subtraction of decimals to tenths in patterns and sequences, identifying relationships and making predictions.*
  - *Use decimals in algebraic expressions and equations, solving problems that involve adding or subtracting decimal coefficients or constants.*
- *Problem Solving:*
  - *Incorporate addition and subtraction of decimals to tenths into multi-step word problems across various mathematical contexts, encouraging critical thinking and problem-solving skills.*
  - *Integrate real-world scenarios into problem-solving tasks, where students must apply decimal operations to analyze and solve practical problems.*

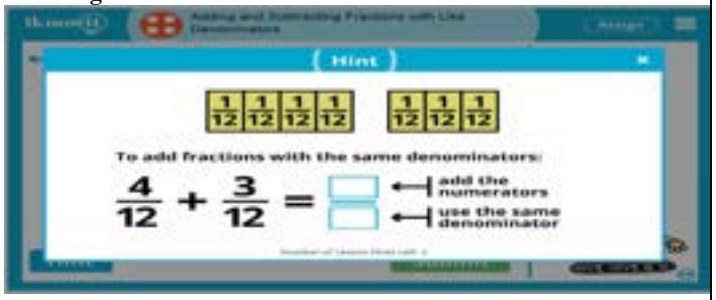
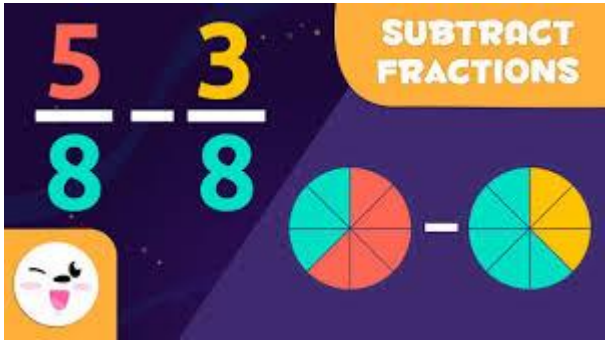
Essential Learning Outcome O1.2: Additive Thinking – Compute Fluently Using Operations (+,-)

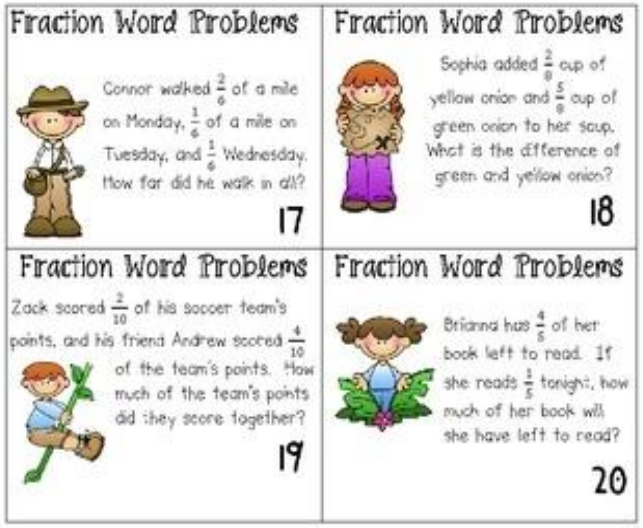
Grade Level Expectations and/or Focus Questions:
Fluently add and subtract multi-digit whole numbers using the standard algorithm; Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem

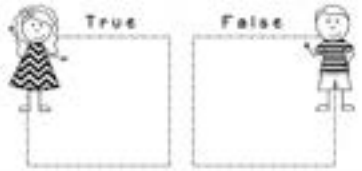
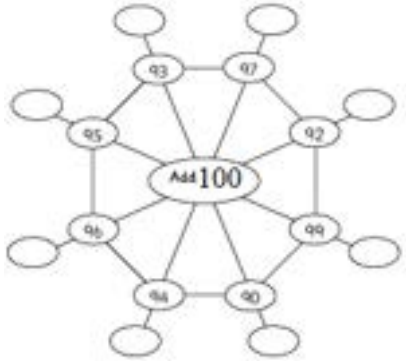
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge:** 1. Recall place value and the value of numbers up to 4 digit in multiple form. **Skills** 1. Use the standard algorithm to fluently add and subtract multi-digit whole numbers. (up to four digits) with and without regroupi 2. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators. e.g., by using visual fraction models and equations to represent the problem. 3. Mentally add 10, 100, or 1000 to any given number; 4. mentally add multiples of ten and hundred e.g. 70 + 20, 500 + 300, 4000 + 5000; , ..	**Visual Representations:** Use visual aids such as place value charts, number lines, or place value mats to illustrate the place value system. Present students with numbers in various forms (e.g., standard form, expanded form, word form) and ask them to identify the value of each digit. Provide opportunities for students to compare and order numbers based on their place value representation. *For example:* ***Task Cards:*** ● *Create task cards with different place value representations (e.g., standard form, expanded form, word form) of numbers.* ● *Provide sets of task cards to small groups of students and ask them to match each representation with its corresponding number.* ● *Include additional tasks on the cards, such as ordering the numbers from least to greatest or writing the numbers in a different form than the one provided.* **Strategy Harvest** Have learners work in small groups. Give each learner an addition or subtraction problem to solve. Encourage each learner to use a different strategy or the strategy he is most comfortable with. At the end of the task have learners take turns to share the strategy they use. They can explain how to use the strategy and how different it is from their peers. Observe learners as they add and subtract multi-digit whole numbers. These questions may guide your observation; - Are they able to employ the steps in using the standard algorithm? - Can they explain what they are doing as they add and subtract? - Do they still require a pictorial or concrete model to perform computations? ***Manipulative Station:*** · *Provide base-ten blocks or place value discs for students to physically manipulate while solving addition and subtraction problems.*	**Manipulatives and Concrete Materials:** Incorporate manipulatives and concrete materials to engage students in hands-on learning experiences. Allow students to physically manipulate objects to represent multi-digit numbers and perform addition and subtraction operations.  https://www.scholastic.com/parents/school-success/learning-toolkit-blog/easy-strategies-adding-and-subtracting-larger-numbers.html **Differentiated Activities:** Provide a range of activities at each station to accommodate diverse learning preferences and levels of fact fluency. Include options such as: ● Hands-on manipulatives for tactile learners, such as base-ten blocks or counting cubes. ● Digital games or interactive apps for students who prefer technology-based learning. ● Written practice activities, including worksheets or task cards, for students who excel in traditional pen-and-paper tasks. ● Collaborative games or partner activities to promote peer learning and cooperation.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	· *Include task cards with multi-digit addition and subtraction problems that require regrouping or borrowing.* · *Students can use the manipulatives to represent the numbers and model the regrouping or borrowing process.* ***Game Station:*** · *Set up a variety of math games focused on addition and subtraction fluency, such as:* · *"Race to 1000": Students roll dice and add the numbers together, aiming to reach a target sum of 1000.* · *"Subtraction Bowling": Students roll a ball to knock down pins labeled with subtraction problems and solve the problems to score points.* ***Task Card Station:*** · *Provide task cards with a mix of addition and subtraction problems, including multi-digit numbers and regrouping or borrowing scenarios.* · *Students can work independently or in pairs to solve the problems on the task cards.* ***Technology Station:*** · *Set up computers or tablets with math fluency apps or online practice platforms that offer activities related to addition and subtraction.* · *Choose apps or platforms that provide adaptive learning experiences and allow students to practice regrouping or borrowing concepts.* ***Writing Station:*** · *Provide whiteboards, markers, and worksheets with addition and subtraction problems written in various formats (e.g., standard form, expanded form).* · *Include problems that require regrouping or borrowing, and encourage students to show their work and explain their strategies.*	**Error Hunt Gallery Walk:** ● *Prepare posters or cards with sample addition and subtraction problems containing common errors.* ● *Hang the posters around the classroom or place the cards on desks in a gallery walk format.* ● *Divide students into small groups and instruct them to rotate around the room, examining each poster or card.* ● *Encourage students to identify the errors in each problem and discuss why they are incorrect.* ● *Facilitate a whole-class discussion where groups share their findings and explanations for the errors.* Use the lattice method, the splitting strategy and open number lines to add four-digit numbers fluently. E.g.  *Retrieved from: https://quizlet.com/explanations/questions/use-the-lattice-algorithm-to-perform-each-of-the-following-addition-problems-a-4358-3864-b-4923-9897-6cab75c6-d3373505-c0d3-4e83-aaea-8e75fd554e68*  Using the splitting strategy you group/add the values of one place value e.g. thousands, hundreds, tens and units as shown below.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Peer Tutoring Station: · *Pair students with different levels of fact fluency together at this station.* · *Provide flashcards or task cards with addition and subtraction problems for students to practice together.* ***Teacher-led Station:*** · *Dedicate one station for direct instruction or guided practice led by the teacher.* · *Use this station to review addition and subtraction strategies, demonstrate regrouping or borrowing techniques, and provide individualized support as needed.* · *Offer mini-lessons or targeted interventions based on students' specific needs and areas of difficulty.* **Conversations** **Mistake Analysis Discussions:** Facilitate whole-class or small-group discussions focused on common errors and misconceptions in addition and subtraction. Present students with sample problems that contain typical mistakes, and engage them in analyzing and discussing the errors. Encourage students to identify the source of the errors and propose strategies for avoiding similar mistakes in the future. ***Addition Problems:*** ***Error:*** *In the problem 258 + 134, a student incorrectly adds the digits vertically without aligning them by place value.* ***Correction:*** *Remind students to align digits by place value (ones, tens, hundreds) before adding. Encourage them to stack numbers vertically so that each place value is aligned.* ***Error*** *In the problem 476 + 29, a student forgets to carry over the digit when the sum of the ones column exceeds 10.* ***Correction:*** *Emphasize the importance of regrouping or carrying over when the sum of the digits in a column exceeds 9. Encourage students to carry the extra value to the next higher place value column.*	 . Allow learners to talk about the steps involved in the standard algorithm. Use strategies that will allow them to peer teach and reinforce concepts.  - Allow learners to create story problems involving addition and subtraction of fractions. Give them opportunities to act out the problems to arrive at solutions. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Error: *In the problem 837 + 46, a student incorrectly adds the hundreds, tens, and ones places together in a single step without regrouping.* ***Correction:*** *Reinforce the concept of adding place values separately, starting from the rightmost column (ones) and moving left. Encourage students to regroup when necessary before proceeding to the next column.* ***Subtraction Problems:*** *.For example:* ***Error:*** *In the problem 631 - 459, a student forgets to borrow or regroup when the digit in the minuend is smaller than the corresponding digit in the subtrahend.* ***Correction:*** *Emphasize the importance of regrouping or borrowing when necessary to subtract digits. Encourage students to borrow 10 from the next higher place value column.* *Engage students in analyzing and discussing these errors by asking questions such as:* • *What mistake(s) did the student make in solving this problem?* • *How could the error(s) have been avoided?* • *What steps should the student have taken to correctly solve the problem?* • *Can you explain why regrouping or borrowing was necessary in this problem* **Product** **Fraction Drawing Task**: • *Give students a blank shape (e.g., rectangle, circle) and ask them to divide it into equal parts.* • *Students should then shade a specific fraction of the shape, with the denominator indicating the total number of parts.* • *For example, students could draw a rectangle divided into 8 equal parts and shade 3/8 of the shape.*	*https://www.playingandlearning.co.za/products/3764* *Imagine a pizza cut into 8 equal slices. Each slice represents 1881 of the whole pizza. Here, the denominator (8) indicates that the pizza is divided into 8 equal parts, and the numerator (1) represents one of those parts.* **Modeling**  ***https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.iknowit.com%2Flessons%2Fd-adding-subtracting-fractions-like-denominators.html&psig=AOvVaw1Dy6f4DstWw7rKkYd7-R9o&ust=1713253577340000&source=images&cd=vfe&opi=89978449&ved=0CBIQjRxqFwoTCPjSs4_dw4UDFQAAAAAdAAAAABAh*** 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Fraction Addition and Subtraction Problems: • *Present students with addition and subtraction problems involving fractions with like denominators (e.g., 1/3+2/3, 5/8−3/8).* • *Students solve the problems and explain their reasoning, demonstrating their understanding that fractions with the same denominator can be added or subtracted directly.* Students can add and subtract fractions with the same denominator and like denominators. **Think Pair share:** **Word Problem Task Cards:** • Create a set of word problem task cards that involve addition and subtraction of fractions with like denominators. • Provide a mix of scenarios such as sharing food items, dividing lengths, or combining quantities. • Students solve the problems with another classmate, showing their work and explaining their reasoning for each step. ***Sharing Snacks**: Mia has 3/4 of a chocolate bar, and her friend Alex has 1/4 of the same chocolate bar. If they combine their portions, how much of the chocolate bar do they have altogether?* ***Pencils**: Tim had 10/15 of pencils, but he lost 6/15. How* *many pencils does Tim have left?* **<u>Conversation</u>** **Create the Problem** Have learners work in pairs to create a problem base on the solution given. Allow learners to share their problems and talk about the challenges of creating the problem. Listen to phrases or terms that they use to replace addition and subtraction. For example $\frac{4}{12}+\frac{6}{12}=\frac{10}{12}$ $\frac{7}{10}-\frac{2}{10}=\frac{5}{10}$	**Visual Supports:** • Provide visual supports such as diagrams, pictures, or manipulatives alongside the word problems to help students better understand the context of the problems. • Use illustrations or graphics to represent the quantities and scenarios described in the word problems, making them more accessible to visual learners.  https://www.pinterest.com/pin/fraction-word-problem-task-cards--264587165305491117/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	True and False Statements Have learners sort number sentences into true and false statements. Allow learners to explain and demonstrate why the statement is either true or false.  217 + 100 = 317 — 6 745 - 100 = 6 845 4 675 + 100 = 5 675 — 7 654 - 10 = 7 644 8 976 + 10 = 8 996 — 2 345 - 100 = 2 200 **Product – Addition/Subtraction number pattern** Distribute template to learners have them create card showing addition or subtraction of numbers with multiples of 10 and 100. Allow pupils to identify and explain the pattern shown on the card. 	 https://www.varsitytutors.com/hotmath/hotmath_help/topics/adding-fractions-like-denominators https://www.k-5mathteachingresources.com/fraction-models.html Provide opportunities for learners to add 10, 100, or 1000 to any given number; mentally add multiples of ten and hundred e.g. learners can use the splitting strategy 5673 + 1400. To do this you find the sum by grouping and adding by place value. 5000+ 1000; 600 + 300 + 70 + 3 = 6000+ 900+ 70+ 3

Additional Resources and Materials

(Additional material and resources that are not included in the Inclusive Learning and/or Inclusive Assessment Strategies that may be useful for lesson planning)

Task Cards and Math Centers:

- Task cards with multi-step word problems involving addition and subtraction of multi-digit numbers, allowing for independent or small-group practice.
- Math center activities focused on fraction addition and subtraction, including hands-on manipulatives or games to reinforce concepts.

Online Videos and Tutorials:

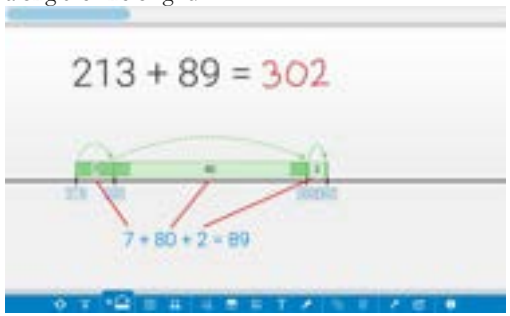
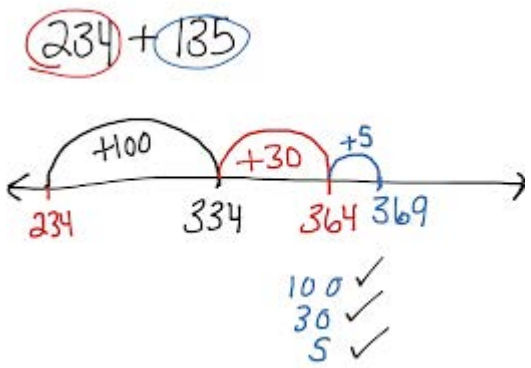
- Educational videos or tutorials explaining the standard algorithm for adding and subtracting multi-digit numbers, providing step-by-step guidance.
- Video lessons or tutorials demonstrating strategies for solving word problems involving fractions with like denominators, offering additional support and reinforcement.

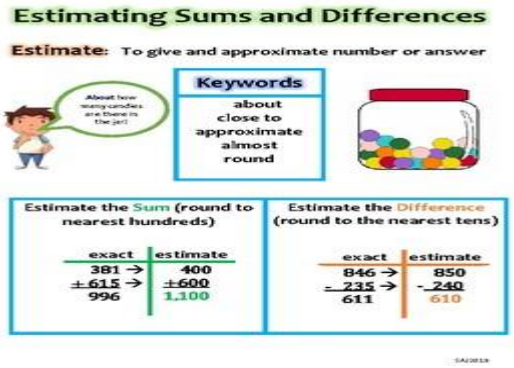
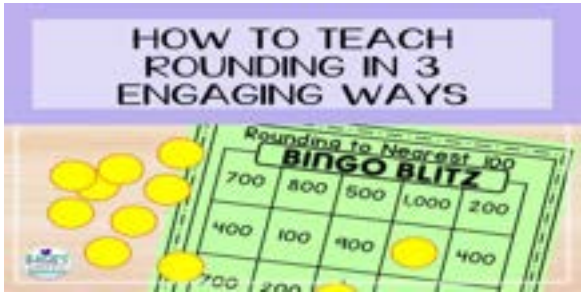
Opportunities for Subject Integration: *(Additional ideas about how the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)*

- *Number Sense and Operations:*
  - *Students can explore the relationship between whole numbers and fractions by comparing and contrasting their properties and operations.*
  - *Teachers can design activities that involve converting between mixed numbers and improper fractions, reinforcing the concept of equivalence and the relationship between whole numbers and fractions.*
- *Geometry:*
  - *Fraction addition and subtraction can be connected to geometric concepts such as partitioning shapes into equal parts. Students can explore how adding or subtracting fractions affects the size and shape of geometric figures.*
  - *Teachers can design activities that involve finding the perimeter or area of shapes with fractional side lengths, requiring students to add or subtract fractions to find the total measurement.*
- *Measurement and Data:*
  - *Students can apply addition and subtraction skills to solve problems involving measurements expressed as mixed numbers or fractions. For example, they can add or subtract lengths, volumes, or time intervals represented as mixed numbers or fractions.*
  - *Teachers can incorporate real-world scenarios, such as cooking recipes or construction projects, where students must add or subtract measurements involving both whole numbers and fractions.*
- *Problem Solving and Reasoning:*
  - *Multi-step word problems that combine whole numbers and fractions provide opportunities for students to apply problem-solving strategies and mathematical reasoning skills.*
  - *Teachers can encourage students to use diagrams, models, or manipulatives to visualize the problem and develop a plan for solving it systematically.*
- *Mathematical Communication:*
  - *Students can explain their problem-solving strategies and justify their solutions when solving word problems involving both whole numbers and fractions.*
  - *Teachers can facilitate classroom discussions where students share their approaches to solving problems, fostering a collaborative learning environment where students learn from each other's strategies and reasoning.*

Essential Learning Outcome O1.3: Additive Thinking – Make a Reasonable Estimation When Using Operations

Grade Level Expectations and/or Focus Questions: Mentally adding and subtracting with 1-, 2-, 3- and multi-digit numbers; Estimating with addition and subtraction of 1-, 2-, 3-, and multi-digit numbers; Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Add 1,2, 3,digit numbers with multi-digits numbers mentally. 2. Subtract 1,2, 3 digits numbers from multi-digits numbers mentally. **Skill** 3. Estimate the addition of 1, 2, 3, digit whole numbers with multi-digits . 4. Estimate the subtraction of 1,2,3, digit whole numbers from multi -digit numbers. 5. Round off whole numbers to the nearest tens hundreds and thousands. **Values** 6. Assess the reasonableness of answers using mental computation and estimation.	**Product** ***Visual Representations:*** Provide visual aids such as number lines, hundred charts, or grids. Encourage students to use these tools to mentally add or subtract by moving along the line or grid.  https://chromewebstore.google.com/detail/number-line-by-the-math-l/ociighkhkffcoplfkofojilfjholclge **Conversations** **Story Problems:** Present real-life scenarios or story problems that require addition and subtraction. This makes the math more relatable and helps students understand the context of the operations. ***Present students with a real life story of marble playing among some boys in the community. Have pupils read the story and perform the operations of addition and subtraction mentally.*** Pupils will validate the correctness of the operations as outlined in the story. Pupils will share their views and mental calculations of the operations in the story. ***Mathematics in Marble Playing***	**Concrete Manipulatives**: Use physical objects like blocks, coins, or counters to represent the numbers. This helps students visualize the addition or subtraction process concretely before transitioning to mental calculations. **Number Lines**: Introduce the concept of number lines to represent the sequence of numbers. Encourage students to move along the number line to add or subtract numbers mentally. This can help them understand the relative position of numbers and the effects of addition or subtraction  https://www.showme.com/sh/?h=pIArCDo **Breakdown Numbers**: Break down larger numbers into smaller, more manageable parts. For example, when adding 28 + 15, students can decompose 15 into 10 and 5, then add 28 + 10 mentally, followed by adding the remaining 5 Use Known Facts: Encourage students to use known addition or subtraction facts to simplify calculations. For instance, if they know 7 + 5 = 12, they can use this fact to quickly solve 17 + 5.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	In the vibrant streets of Grenada, Jamal loved playing marbles with his friends after school. One day, they decided to play a game where they added and subtracted points for each round. *Jamal started with 210 marbles and gained 13 more when he won the first round. Excitedly, he added them up: 210 +13 = 223 marbles. But in the next round, he lost 5 marbles. Quickly, he subtracted them: 223 - 5 = 218 marbles left.* *As the game continued, Jamal's math skills sharpened with each calculation, and he happily shared his newfound knowledge with his friends. Their marble games turned into fun math lessons under the Grenadian sun.* **Product:** ***Estimation Stations**: Set up estimation stations around the classroom with different addition and subtraction problems displayed on cards or posters. Each station should include a variety of one-, two-, and three-digit numbers. Students rotate through the stations, estimating the answers to the problems recording their estimates on a response sheet.* ***Group work:*** ***Estimation Games**: Organize estimation games or activities where students work in pairs or small groups to estimate the sum or difference of multi-digit numbers. For example, you could create a "Guess the Total" game where students take turns rolling dice or drawing number cards to generate numbers, then estimate the total before calculating the actual sum.* **Race to 500**: Divide the class into pairs or small groups. Provide each group with 2 colour dice. Students take turns rolling the dice and adding the number rolled to their running total. The first student to reach 100 wins. To make it more challenging, you can require them to subtract the number rolled instead of adding	**Estimation:** Teach students to estimate sums and differences before calculating them mentally. Estimation helps them develop a sense of number magnitude and identify if their answer is reasonable.  https://www.teacherspayteachers.com/Product/Estimating-Sums-and-Differences-4919555  https://iheartteachingelementary.com/how-to-teach-rounding/ **Problem-Solving Challenges:** Present students with problem-solving challenges that involve multiple steps and require rounding skills. *For instance:* "*You have a budget of $350 to spend on supplies for a science project. One item costs $28, another costs $45, and the third costs $72. Estimate the total cost of all three items. How did you round the prices to make your estimate?*"

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 https://www.dreamstime.com/photos-images/red-dice-1-6.html ***Game:*** ***Estimation Relay:*** *Set up a relay race course with several stations, each containing a different addition or subtraction problem involving multi-digit numbers.* *Divide the class into teams and assign each team to a starting station.* *One student from each team runs to the first station, estimates the answer to the problem, and returns to tag the next teammate.* *The next teammate runs to the next station and repeats the process.* *The first team to complete all stations with the closest estimates wins the relay.* **Open-Ended Questions:** Pose open-ended questions that require students to apply rounding skills in different contexts. *For example, ask students to explain how rounding to the nearest hundred can help estimate the total number of pages in a book or the approximate distance between two cities.* Encourage students	**Comparative Analysis:** Encourage students to compare and contrast different rounding strategies and their implications in various contexts. *For example:* *"Two students are estimating the number of books in the school library. One student rounds to the nearest hundred, while the other rounds to the nearest ten. Discuss the advantages and disadvantages of each rounding strategy. Which strategy would you choose and why?"* **Modeling and Think Alouds:** Model the process of mental computation and estimation for students by thinking aloud as you solve problems. Talk through your reasoning and explain how you decide if an answer is reasonable based on the context of the problem. Encourage students to ask questions and engage in discussions about the reasoning behind your estimations.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	to use mathematical vocabulary and reasoning to justify their responses. **Creative Writing Prompts:** Integrate rounding skills into creative writing prompts that encourage students to apply their mathematical understanding in imaginative contexts. *For example:* *"Write a story about a group of explorers traveling through a forest. Along the way, they encounter various landmarks with distances rounded to the nearest ten miles. Describe how rounding helps them navigate their journey."* **Peer Assessment:** Implement peer assessment activities where students exchange their answers with a partner and evaluate the reasonableness of each other's answers. Encourage students to discuss their reasoning and provide constructive feedback on whether their partner's answers make sense based on the context of the problem. This promotes collaborative learning and allows students to learn from each other's strategies. **Number Talks**: Present students with addition or subtraction problems involving multi-digit numbers and ask them to estimate the answer verbally before solving it. *For example, "Estimate the sum of 356 and 278." Encourage students to explain how they arrived at their estimate, whether they rounded numbers, used compatible numbers, or applied any other estimation strategies.*	

Additional Resources and Materials

Students can perform mental addition and subtraction using number line or grid
https://chromewebstore.google.com/detail/number-line-by-the-math-l/ociighkhkffcoplfkofojilfjholclge
Students can perform addition and subtraction mentally to play bingo games.
https://www.teacherspayteachers.com/Product/Digital-Number-Bingo-Numbers-1-100-Google-Classroom-Printable-6839992

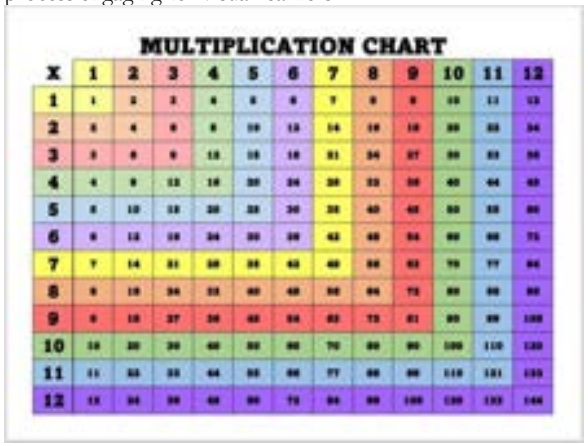
Additional Useful Content Knowledge for the Teacher:
Mental computation lays the groundwork for more advanced mathematical concepts. Proficiency in mental addition and subtraction enables students to tackle more complex operations, such as multiplication, division, and algebraic equations, with greater ease.Mental computation is highly relevant in real-life situations where quick and accurate calculations are needed. Whether calculating prices at the store, determining time intervals, or estimating measurements, mental addition and subtraction skills are essential for everyday problem-solving.

Opportunities for Subject Integration:

Language Arts; Sequencing the operations within the story.
Art/Craft: Using drawing to create numbers and items .

Essential Learning Outcome O2.1: Multiplicative Thinking – Understanding the Meaning of Multiplication and Division and How They Relate

Grade Level Expectations and/or Focus Questions:
Use strategies to recall multiplication facts to 100 and related division facts; Represent multiplication concretely with rectangle and array models using a variety of materials (square tiles, two-sided counters, etc.) and base ten blocks; Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Knowledge 1. Use strategies to recall multiplication and division facts up to 100. 2. Represent multiplication concretely using a variety of materials (square tiles, two-sided counters, etc.) and base ten blocks; 3. Demonstrate the relationship between multiplication and division by using simple examples. Skills 4. Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors. 5. Use multiplication and division in a given equation Value 6. Volunteer to share drawings to represent given multiplication and division problems.	**Product:** **Create visual aids**: Have students create a visual aids such as multiplication tables, arrays, and diagrams to help them to visualize multiplication and division concepts. Let them use colorful illustrations and manipulatives to make the learning process engaging for visual learners.  https://www.etsy.com/listing/1143511191/printable-multiplication-chart-home	**Visual Representations**: Utilize manipulatives like counters, blocks, or arrays to visually demonstrate multiplication and division problems. *For example, showing 3 rows of 4 counters to represent 3 x 4, and then dividing them into equal groups to show 12 ÷ 3.*  https://mathtechconnections.com/2020/01/15/division-strategies-for-upper-elementary-students/ Provide pupils with a number of concrete manipulatives(coloured tiles, counters, counting sticks, cubes, marbles, tooth picks, buttons, corks, square tiles,etc)

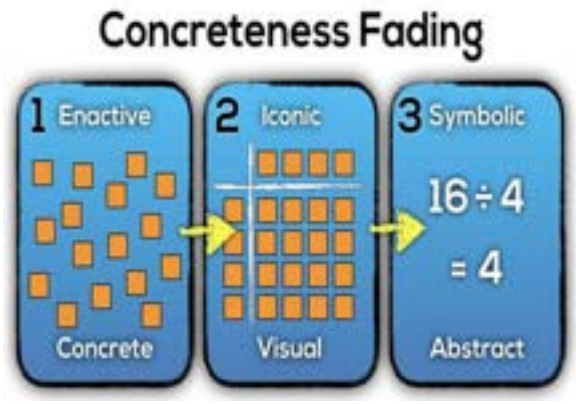
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Criteria	YES	NO
Content: • Does the visual aid show multiplication/ division facts? • Is the information presented accurate? • Does the visual aid avoid unnecessary clutter? **Design:** • Can the text and images be easily seen from a distance (if presenting)? • Do the colours complement each other and provide good contrast for text and images? • Is the font easy to read and large enough for your audience?		

Performance Assessments: Design performance assessments where students demonstrate their understanding of multiplication by using concrete materials to solve real-world problems. Present students with scenarios that require multiplication, such as calculating the total number of items in multiple groups or determining the area of a rectangular garden. Assess students' ability to use manipulatives to represent and solve these problems accurately.

Task: Imagine you are planning a fundraiser for your school's charity club. You need to create posters to advertise the event and calculate the total number of items needed for the fundraiser. Use concrete materials such as square tiles, two-sided counters, or base ten blocks to represent and solve the multiplication problems.

Have pupils arrange given coloured coded manipulatives into groups that show multiplication and division of 1, 2, 3 digit numbers by 1 digit.



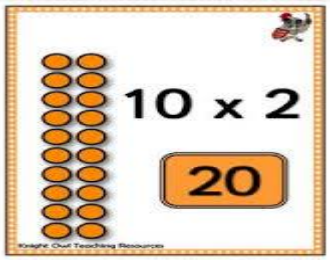
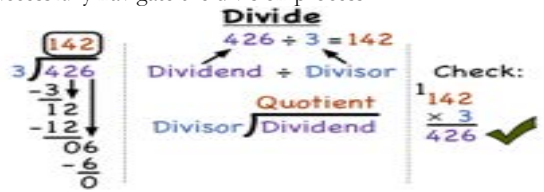
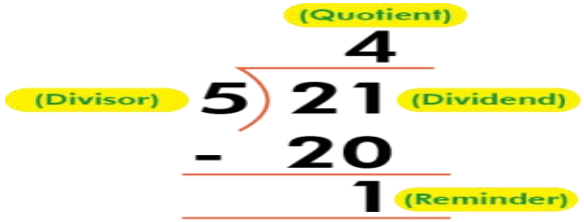
https://makemathmoments.com/progression-of-division/

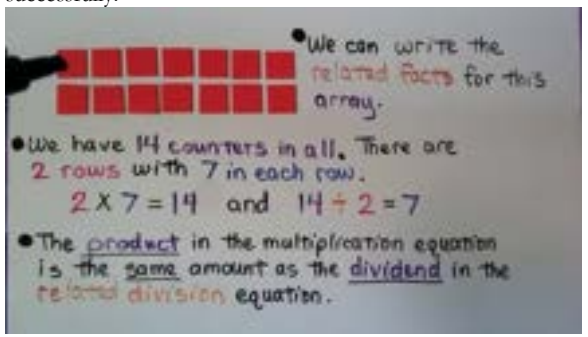
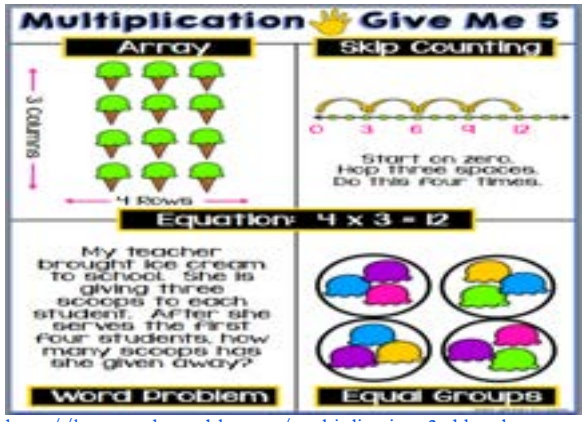
Real-life Contexts: Relate multiplication and division to real-life scenarios to make the concepts more tangible and relatable for students. *For instance, use scenarios involving sharing items among friends or grouping objects in a grocery store.*

Dramatization of a Real life Scenario

In a bustling pizza shop in Grenada, four friends share eight slices equally, each getting two. Later, they realize they need to order more for a party. They calculate: 2 slices each for 10 friends means 20 slices total. Dividing the work, they find they can each buy 5 pizzas with 8 slices each.

Have students in groups dramatize the scenario so that the total amount of slices can be shared equally.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Poster Creation: *Create a poster to advertise the fundraiser event. Include the event name, date, time, location, and a brief description.* *Use colorful markers, crayons, or other art supplies to make your poster eye-catching and appealing.* *Multiplication Representation:* *Choose one multiplication problem related to the fundraiser (e.g., the number of snacks needed for each participant).* *Use concrete materials to represent the problem. Show groups of objects or arrays to illustrate the multiplication expression.* *Label each group or array with the appropriate multiplication expression (e.g., 4 groups of 5 snacks = 4 × 5).* ***Calculation and Total:*** *Calculate the total number of items needed for the fundraiser by solving the multiplication problem.* *Use the concrete materials to count the total number of items visually.* *Record the total number of items on your poster.* ***Checklist for Assessment:*** ***Poster Creation:*** *Poster includes all required information (event name, date, time, location, description).* *Poster is visually appealing and attention-grabbing.*	 **Scaffolded Practice:** Provide scaffolded practice activities that gradually increase in complexity and difficulty. Begin with simpler division problems without remainders and gradually introduce problems with remainders as students become more comfortable with the concept. Offer support and guidance as needed to help students successfully navigate the division process.  https://virtualnerd.com/common-core/grade-4/4_NBT-numbers-operations-base-ten/B/6/divide-three-digit-by-one-digit-example  https://byjus.com/us/math/division-of-1-digit-2-digit-and-3-digit-numbers/ **Problem-Solving Tasks:** Present students with real-world problem-solving tasks that require the application of multiplication and division. Encourage students to analyze the problem, identify the relevant information, and determine

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Multiplication Representation: *Multiplication problem is clearly stated.* *Concrete materials are used to represent the problem accurately.* *Multiplication expression is labeled correctly.* ***Calculation and Total:*** *Multiplication problem is solved correctly.* *Total number of items is counted accurately using concrete materials.* *Total number of items is recorded clearly on the poster.* *Scoring:* ***3: Exceeds Expectations -*** *Student demonstrates a thorough understanding of multiplication concepts and accurately represents and solves the problem using concrete materials.* ***2: Meets Expectations*** *- Student demonstrates a satisfactory understanding of multiplication concepts and effectively represents and solves the problem using concrete materials with minor errors.* ***1: Approaching Expectations -*** *Student demonstrates some understanding of multiplication concepts but struggles to accurately represent and solve the problem using concrete materials.* Have students use multiplication charts to verify the correctness of the multiplication facts up to 12 x12. Have students use a multiplication chart to check division facts of given operations. **For Example** • 7 x 9 = 63 • 63 ÷ 9 = 7 • 63÷ 7= 9 https://www.pinterest.com/pin/57843176444587239/	the appropriate operation(s) to use. Provide scaffolding and support as needed to help students navigate the problem-solving process successfully.  https://www.youtube.com/watch?app=desktop&v=yG9fA1fAD2k  http://kornmath.weebly.com/multiplication-3rd.html **Use a choice board** ***Identify Learning Objectives****: Determine the division and multiplication concepts and skills you want students to practice and master. These may include finding quotients and remainders, solving word problems, using different strategies (e.g., arrays, repeated subtraction), or understanding the relationship between multiplication and division.*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Word Problem: Word problems can be tailored to different learning styles and abilities, making them inclusive for diverse learners. *Samantha has a large box of chocolates. There are 14 rows of chocolates, and each row has 8 chocolates. If Samantha wants to share the chocolates equally with her 2 friends, how many chocolates will each person get?* ***Equation: Samantha ha ;1****4×8=112* *14×8=112 chocolates in total.* *To divide equally among 3 people:* *112 ÷ 3= 37 remainder 1* *So, each person will get 37 chocolates, and there will be 1 chocolate left over.* **Task Cards:** Create task cards with equations that require both multiplication and division operations to solve. Include a mix of numerical expressions and word problems to cater to different learning preferences. Encourage students to use manipulatives or drawings to represent the equations concretely before solving them. *For example, "8 × ? = 24" or "48 ÷ 6 = ?"* **Hands-on activities**: Provide hands-on activities like using manipulatives such as counters, cubes, or even edible items like candies to demonstrate multiplication and division concepts. This can appeal to kinesthetic learners and make abstract concepts more tangible.	***Design the Choice Board****: Create a grid or table with different activities or tasks related to division and multiplication. Each activity should target specific learning objectives and offer students different ways to engage with the concepts. Here's an example of what your choice board could look like:* ***Provide Activity Options****: Populate the choice board with a variety of activity options that appeal to different learning preferences and skill levels. Here are some examples of activities you can include:* *Solve multiplication and division word problems.* *Create arrays to represent multiplication equations.* *Use repeated subtraction to find quotients.* *Write a short story that involves multiplication and division scenarios.* *Play a multiplication or division game (e.g., multiplication bingo, division card match).* *Watch a video tutorial on multiplication or division strategies and summarize the key points.* *Complete a multiplication or division crossword puzzle.* *Practice multiplication and division facts with flashcards or online quizzes.* ***Provide Clear Instructions****: Clearly explain the instructions for each activity option, including any materials needed, steps to complete the task, and expectations for submission or presentation. Ensure that students understand how to complete each activity independently*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 ttps://theteacherscafe.com/teaching-4-nbt-b-6-find-whole-number-quotients-remainders-with-up-to-four-digit-dividends-one-digit-divisors/ **Choice-based Assessment:** Offer students multiple options for how they can represent multiplication and division problems, including drawings, written explanations, manipulatives, or digital tools. By providing choice, students can select the method that aligns with their strengths and preferences, ensuring that diverse learning styles are accommodated.	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		

Name: _____

Multiplication Choice Board

Directions: Choose an activity to complete. When you're finished, color in the box.

PROBLEM SOLVERS Write 5 multiplication word problems. Have a partner solve them.	**ARRAY HUNT** Go on an array hunt around the classroom. Draw each array, tell where you found it, and write a multiplication number sentence to match it.	**GAME TIME** Create a new game to practice your multiplication facts. Be sure to include the directions and anything you need to play. Try it with a friend.
SING-A-LONG Write a song to help you remember your multiplication facts. Teach it to the class.	**STUDENT CHOICE** Choose an activity that will help you practice your multiplication facts. Write about what you did.	**MONEY MATTERS** Marie reached into her pocket and found 6 pennies, 8 dimes, 7 nickels, and 4 quarters. Use multiplication to find out how much money she has.
GARDEN DESIGN Seeds come in packs of 12. You have 3 packs - tomato, cucumber, and pepper seeds. Draw an array to show your garden. You must plant all the seeds. Label where the different types of seeds are planted. Write a multiplication fact for the whole garden.	**HOW OLD ARE YOU?** There are 365 days in a year and 24 hours in a day. Use a calculator and what you know about multiplication to find out how many hours old you are. Now, find out how many hours old your teacher is.	**FACT PRACTICE** Set a timer for 2 minutes. See how many multiplication questions you can answer before the timer goes off. Do it again to see if you can break your record.

TeacherVision

https://gsmgoodssk.life/product_details/7361605.html

Additional Resources and Materials

https://www.pinterest.com/pin/multiplication-crossword-puzzle--12244230209343388/
ttps://theteacherscafe.com/teaching-4-nbt-b-6-find-whole-number-quotients-remainders-with-up-to-four-digit-dividends-one-digit-divisors/
https://www.pinterest.com/pin/57843176444
587239/

https://www.etsy.com/listing/1143511191/printable-multiplication-chart-home

Additional Useful Content Knowledge for the Teacher:

Mastering multiplication and division facts allows students to solve problems more quickly and efficiently. When they don't have to spend time calculating basic facts, they can focus on more complex mathematical concepts. In addition, multiplication and division are fundamental operations that are used extensively in higher-level math courses. A strong understanding of these operations lays the groundwork for success in algebra, geometry, and beyond.

Opportunities for Subject Integration:
Language Arts; Sequencing the operations within the story.
Art/Craft: Using drawing to create numbers and items .
Drama; Students engage in dramatization to solve problems involving multiplication and division.

Strategies that Support the Curriculum and Assessment Framework

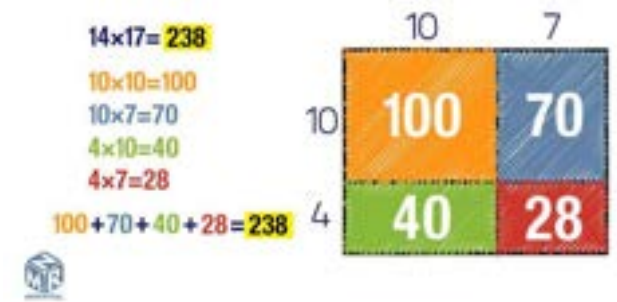
This section is optional and intended to assist writers as they check the curriculum to the Curriculum and Assessment Framework. It can be used at the discretion of the Team Leads and PICT Subject Specialists. It will be used to guide the writing but will not appear in the curriculum guides.

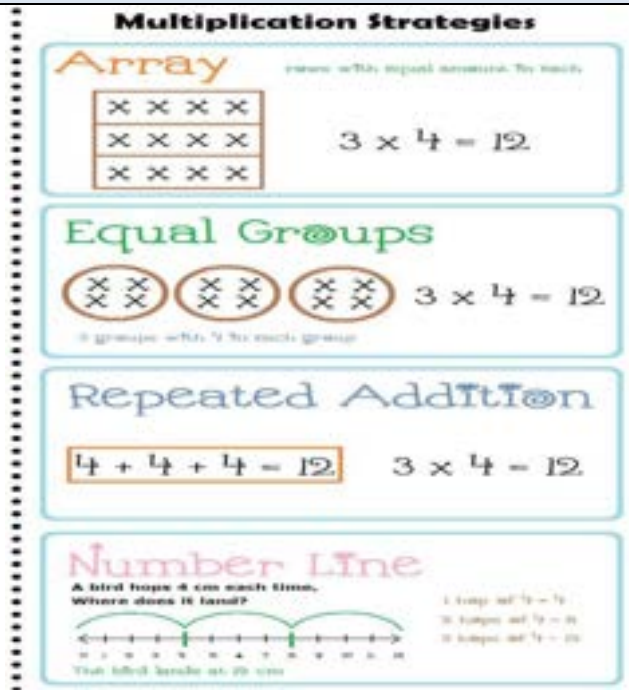
Elements that are integrated across subjects:
Elements from Local Culture, Technology, TVET, Environment that are integrated:

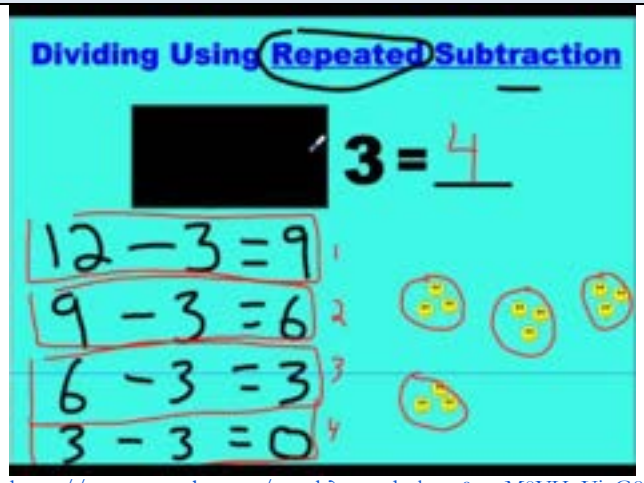
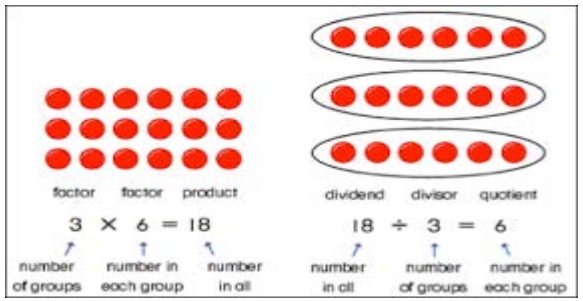
Essential Learning Outcomes:
2.2: Multiplicative Thinking – Compute Fluently with Operations (x&÷)
2.3 Multiplicative Thinking – Make Reasonable Estimation When Using the Operation (x&÷)

Grade Level Expectations and/or Focus Questions:
O2.2 - Compute 1, 2, and 3-digit by 1 or 2-digit multiplication and division problems.
O2.3 - Use multiplication/division fact strategies to 10x10; Mentally multiplying with 2- and 3-digit numbers by a 1-digit number; Estimating with multiplication of 2- and 3-digit numbers by a 1-digit number

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Multiply single-digit numbers by single-digit numbers accurately and efficiently. 2. Multiply numbers with up to three digits by one and two-digit numbers such as the area model/ partial products, or standard algorithm. **Skills** 3. Solve real-world problems involving multiplication, such as calculating the total area of rectangular fields or finding the total cost of multiple items. 4. Divide numbers with up to three digits by one-digit divisors using strategies like repeated subtraction, skip counting 5. Divide two and three digit numbers by two digit divisors using appropriate strategies 6. Solve real-world problems involving division, such as sharing equally among a given number of people or distributing items into equal groups 7. Compute products up to 10 x 10 quickly and accurately by applying multiplication fact strategies. 8. Solve real-world problems involving the multiplication of 2 and 3-digit numbers by a 1 digit number using mental math techniques. 9. Estimate products of multiplication problems involving 2- and 3-digit numbers by a 1-digit number.	**Observational Assessment:** *Observe students as they manipulate the manipulatives to represent multiplication problems.* *Take note of their strategies, interactions with the materials, and level of engagement.* *Look for evidence of understanding, such as correct grouping of manipulatives and accurate counting.* ***Observation checklist***	**Concrete Manipulatives** Use manipulatives such as **counters**, blocks, or beads to represent the multiplication process concretely. ***Example: Multiplying 3 by 4*** 1. Create 3 rows (representing the first factor, 3) and 4 columns (representing the second factor, 4) of counters. 2. Arrange the counters in neat rows and columns to clearly represent the groups. **O O O O** **O O O O** **O O O O** 0. Count the total number of counters to find the product. **Total count** = 3 rows × 4 counters per row = 12 counters **Visual Representations:** ● *Teach students how to use the area model to visually represent and decompose multiplication problems into smaller, more manageable parts.* ● *Demonstrate how to break down numbers into expanded form or place value columns to facilitate the use of partial products.* ● *Use color-coding or highlighting to emphasize different parts of the multiplication process and make it more accessible to visual learners.*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 **SCO 2** **Performance Tasks:** ● Design performance tasks that require students to solve multiplication problems using different strategies, including the area model/partial products, and standard algorithm. ● Provide a variety of multiplication problems with varying levels of complexity to assess students' understanding and proficiency in applying different multiplication methods.	 https://youtu.be/Ah-r3I4lD4U **SCO 3** **Solve word problems using different strategies.** *An apartment has 3 bedrooms. Each bedroom has 4 bookcases. How many bookcases are there in the apartment?*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Sample Performance Task: Multiplication Mastery ***Objective:*** *Students will demonstrate proficiency in solving multiplication problems using various strategies, including the area model and standard algorithm.* ***Task Description:*** *You are a mathematician tasked with solving a series of multiplication problems. You will use the area model or the standard algorithm to find the products.* ***Instructions:*** 1. *Solve each multiplication problem using the designated strategy.* 2. *Show your work neatly and clearly, indicating the steps you took to find the product.* 3. *Provide explanations or annotations where necessary to demonstrate your understanding of each strategy.* 4. *Check your solutions for accuracy.* ***Multiplication Problems:*** ● 23 × 4 ● 12 × 38 ● 497 × 6 ● 342 × 25 ***Strategy Assignments:*** *For each problem, use the following strategies:* ● *Problem 1: Use the standard algorithm.* ● *Problem 2: Use the area model.* ● *Problem 3: Choose any strategy you prefer.* ● *Problem 4: Choose any strategy you prefer.* ***Assessment Criteria:*** ● *Accuracy of solutions.* ● *Application of the designated strategy for each problem.* ● *Clarity and organization of work shown.*	 https://www.pinterest.com/pin/229050331026042326/ **Modeling and Explanation:** ● Begin by explaining the concept of division and how it involves partitioning a number into equal groups. ● Model how to use repeated subtraction to divide a larger number by a one-digit divisor. For example, to divide 234 by 3, demonstrate subtracting 3 repeatedly until reaching zero or a remainder.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• *Explanation of reasoning and understanding of each strategy.* • *Adher*ence to instructions and completion of all tasks. **Differentiated Problem Sets**: Offer problem sets with varying levels of complexity to accommodate the diverse needs and abilities of students. Provide different versions of the same problem, each tailored to different skill levels. For example, students who need additional support can work on problems with smaller numbers or guided prompts, while advanced students can tackle more challenging problems involving larger numbers or multiple steps. ***Low Complexity (Level 1 - Basic Skills)***: *Emma has 3 baskets, and each basket has 4 apples. How many apples does Emma have in total?* ***Medium Complexity (Level 2 - Moderate Skills)***: *There are 6 shelves in a library, and each shelf holds 9 books. How many books are there in the library in total?* ***High Complexity (Level 3 - Advanced Skills)***: *A factory produces 120 toys per day, and it operates for 5 days a week. How many toys does the factory produce in a month?* **SCO 4, 5 and 6** **Written Assessments:** • Administer written assessments that include a variety of division problems for students to solve using repeated subtraction and skip counting strategies. • Include both numerical problems and word problems to assess students' comprehension and application of division concepts in different contexts. **Sample Grade 4 Division Assessment** ***Part 1: Repeated Subtraction*** Solve the following division problems using repeated subtraction: a) 72 ÷ 6 =	 https://www.youtube.com/watch?app=desktop&v=M0YHpVigG8M • Explain how skip counting can also be used as a division strategy by counting backward in multiples of the divisor. https://www.youtube.com/watch?v=qmb0alBt59w **Concrete Manipulatives:** • Introduce concrete manipulatives such as counters and base-ten blocks to represent division problems visually. • Guide students in using manipulatives to model the division process, emphasizing the concept of partitioning the dividend into equal groups 

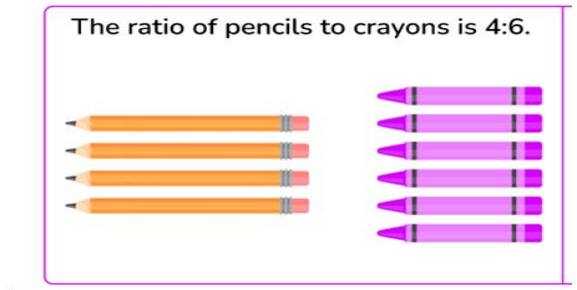
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Part 2: Skip Counting Use skip counting to divide the following numbers by the given divisor: a) 96 ÷ 8 = ***Part 3: Word Problems*** Solve the following word problems using either repeated subtraction or skip counting: *There are 108 candies in a jar. If each bag can hold 9 candies, how many bags can be filled?* Jason has 80 marbles. He wants to arrange them in rows with 10 marbles in each row. How many rows will he have? ***Part 4: Challenge Problems*** Solve the following division problems using either repeated subtraction or skip counting: a) 337 ÷ 7 = b) 472 ÷ 8 =	https://www.scholastic.com/parents/school-success/learning-toolkit-blog/multiplication-and-division-models-and-strategies.html **Multiplication Fact Games:** Incorporate games and activities that reinforce multiplication facts up to 10 x 10, such as multiplication bingo, multiplication war, or multiplication fact races. **Multiplication Bingo** https://www.teacherspayteachers.com/Product/Multiplication-Facts-Digital-Bingo-Game-up-to-10-x-10-Distance-Learning-6767244
	Timed Multiplication Quizzes: • Administer timed quizzes where students have a set amount of time (e.g., 5 minutes) to complete as many multiplication problems up to 10x10 as they can. • Provide a mix of multiplication problems and encourage students to use multiplication fact strategies to solve them quickly and accurately. *For example:* ***Grade 4 Multiplication Timed Quiz Instructions:*** • *You will have 5 minutes to complete as many multiplication problems as you can.* • *Use your multiplication fact strategies to solve the problems quickly and accurately.* • *If you're unsure about a problem, skip it and come back to it later.* • *Work at a steady pace and do your best!*	**Multiplication War** https://www.education.com/activity/article/multiplication_math_war_fourth/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	1. ***4 x 6 =____*** 2. ***7 x 3 =____*** 3. ***9 x 8 =____*** 4. ***2 x 5 =____*** 5. ***10 x 9 =___*** **Think-Aloud Protocols:** Have students verbalize their thought process as they solve mental multiplication problems. Encourage them to explain the strategies they use, such as breaking numbers into smaller parts, using known facts, or applying properties of multiplication (e.g., distributive property). This allows you to assess their understanding of mental math techniques and identify any misconceptions. **Estimation Tasks:** ● Design assessment tasks require students to estimate the products of multiplication problems within real-world contexts or practical situations. ● Present students with scenarios where estimation skills are needed, such as estimating the total cost of items when shopping or the number of guests at an event based on given information. **Sample Estimation problem** 1. Tom wants to buy 6 packs of juice boxes for a school picnic. Each pack contains 24 juice boxes. Tom estimates that each juice box costs about $0.50. **Estimate the total cost of purchasing the juice boxes for the picnic.** 0. Mrs. Johnson is planning to bake cookies for her daughter's class. She needs to make 14 batches of cookies.	**Real-World Contexts:** ● Present real-world scenarios and word problems that require students to apply mental multiplication techniques to solve practical problems. **S*ample Real-World Scenarios/Problems*** 1. *Sarah bought 3 bags of apples, with each bag containing 56 apples. How many apples did she buy in total?* 2. *Emily feeds her cat 3 cans of food each day. If each can contains 180 grams of food, how many grams of food does she feed her cat in a week?* 3. *Tom walks his dog 4 times a week, and each walk is 45 minutes long. How many minutes does he spend walking his dog in total?* **Front-End Estimation:** ● Teach students to focus on the leftmost digits of the numbers being multiplied to quickly estimate the product. ● For example, when multiplying 2-digit numbers by a 1-digit number, students can round the numbers to the nearest tens and then multiply to get an approximate estimate of the product. **Estimation Games:** ● Incorporate estimation games or activities into lessons to make estimation practice more engaging and enjoyable. ● Provide opportunities for students to compete or collaborate with classmates to see who can make the closest estimate to the actual product. **Websites for Online Estimation Games** ● Estimation 180 ● Math Playground ● Prodigy ● CoolMath4Kids

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Each batch requires 126 chocolate chips. Mrs. Johnson estimates that each bag of chocolate chips costs around $1.80. **Estimate the total cost of purchasing chocolate chips for all the batches of cookies**	

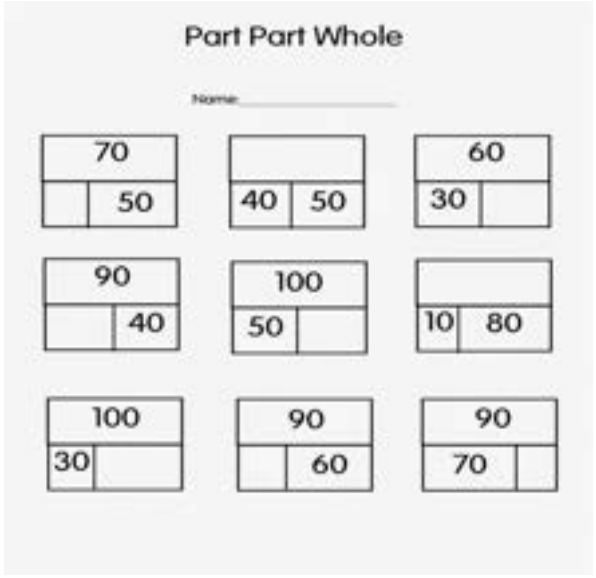
Essential Learning Outcome O3.1: Proportional Reasoning – Representing and Working with Rates and Ratios

Grade Level Expectations and/or Focus Questions:
Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities; Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship.

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies:
Learners will be expected to: **Knowledge** 1. Explain the concept of a unit rate associated with a ratio a:b, where b≠0. 2. Apply rate language effectively within the context of ratio relationships. **Skills** 3. Use unit rates in situations involving measurement conversions or rates of change. 4.Demonstrate Part-Whole Relationships: understanding of part-whole relationships by partitioning and combining concrete materials to represent different ratios and their corresponding quantities, ensuring that the total remains consistent within the context of 100. **Value** 5. Communicate their understanding of ratios clearly and precisely, both verbally and in writing, using appropriate mathematical language and notation to express ratio relationships and unit rates accurately.	**Verbal Expression:** ***Oral Presentations:*** Allow students to verbally explain their understanding of ratios, either individually or in small groups. This accommodates auditory learners and provides an opportunity for students to articulate their thoughts and learning processes. ***Toy Store Inventory:*** • *Present a scenario where students are managing inventory at a toy store and need to restock shelves based on a given ratio of different types of toys.* • *Each student or group presents their restocking plan orally, describing how they determined the ratios for each type of toy. They might explain that if they're restocking dolls and action figures in a 2:3 ratio, for every 2 dolls, they'll stock 3 action figures.* **Problem Solving** : Students are given 20 assorted candies. Pupils are given the opportunity to write a variety of ratios . Students' tasks are assessed using a checklist .	**Using Manipulatives**: Provide concrete manipulatives like blocks or counters for students to create and compare ratios. This supports tactile learners and those who benefit from hands-on activities.  https://study.com/academy/lesson/what-is-ratio-in-math-definition-lesson-quiz.html 

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies:
	 https://allcitycandy.com/products/skittles-sub-original-54-oz-bag Examples • The ratio of cherry candy to grape candy • The ratio of strawberry candy to the packet of candy.	Nb: Students should be first introduced using 1 : 1 . Students are presented with a variety of fruits which are shared in a 1 : 1 ratio to introduce   **Role play and dramatization:** Students dramatize a scene in the kitchen that depicts the baking of a cake. *1.Students participate in a baking activity and they are given the materials to bake a cake .* 4 cups of flour 2 cups sugar 1 lb butter

FEATURES	***YES***	***NO***
Can the student identify pairs of quantities that are being compared in a ratio?		
Can the student recognize the correct format for expressing ratios?		
Can the student write ratios for given situations ?		
Can the student create visual representations to illustrate given ratios ?		

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies:
	Hands-on Task Cards: • Create task cards with scenarios or problems related to part-whole relationships and ratios within 100. • Provide students with physical task cards and sets of manipulatives. • In small groups or individually, students solve the problems on the task cards by partitioning and combining the manipulatives to represent the given ratios, ensuring that the total quantity remains consistent. • Encourage students to discuss their solutions and strategies with their peers, fostering collaboration and peer learning.  https://www.pinterest.com/pin/1552335183815670 09/	 https://www.myrecipes.com/how-to/cooking-questions/cups-in-pound-of-flour  https://www.dreamstime.com/stock-photography-cup-sugar-image15987132

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies:
	 *https://www.theschoolrun.com/what-ratio*	 https://www.pricesmart.com/site/tt/en/pdp/302163 Discussion is initiated on the materials provided to introduce ratio language and develop the concept of a ratio ; in addition to comparing ratio quantities. Students are also given extension exercises for example :the materials needed to bake 4 similar cakes. **Storytelling :** Teacher reads folktale on Brer Anansi and Brer Rabbit to students while using realia to demonstrate sharing occurring in the story. Additionally, students participate in discussion on the concept of ratio. *One sunny day, Anansi and Brer Rabbit decided to spend the afternoon fishing at Grand Anse Beach, known for its stunning beauty and abundant marine life. Armed with their fishing rods and a bucket of bait, they set off on their adventure.* *After patiently waiting for hours, their patience was rewarded when they caught a magnificent dolphin, gleaming in the sunlight. Excitedly, they decided to cook the fish together and share the delicious meal.* *As they made their way back to Anansi's cozy home nestled among the banana trees, they began to discuss how they would divide the fish. Anansi, always eager for more, shouted three pieces for me and two for you.* *Brer Rabbit, with a twinkle in his eye, replied, "Ah, but my dear Anansi, wouldn't it be fairer if you got two pieces and I get two pieces. If we do that we all will get an equal share."* *Anansi, unwilling to share equally, argued, "But I'm the one who caught the fish! I should get the lion's share." Brer Rabbit got angry and they argued about it. Anansi didn't bother with his friend and went on to share. Three for me, two for you.*

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies:
		Brer Rabbit in his calm and timid self quietly took his fish and quickly headed home. Knowing that his friend is greedy painted his children in different colours and placed them at different spots on the way to Anansi's home. *As he was heading home, he spotted the first rabbit, then the second and decided they will make a good meal. Hurriedly, he put down his basket of fish and ran to catch the rabbit but when he got to the place he saw the rabbit, there was no rabbit.* *Speedily, he ran to the second rabbit and when he got there both the basket of fish and the rabbit was nowhere in sight. Soon after, Brer Rabbit passed with a big smile on his face. That's when Anansi realized he was tricked and to this day they are not speaking to each other.* **Inductive teaching:** Allow students to create their own visual representations of ratios to demonstrate their understanding and give explanations. Use blocks to represent the ratio 4 : 3.  http://www.empoweringparentstoteach.com/math/linking-cubes-to-teach-ratio/

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies:
		 https://www.youtube.com/watch?v=77bF5vhkXgE

Additional Useful Content Knowledge for the Teacher: (*any additional knowledge that the writers believe would be helpful for the teacher such as reading material at a lower or higher grade level, links to curriculum documents for other grades)*

Ratio is defined as the comparison of two quantities of the same units that indicates how much of one quantity is present in the other quantity.

Ratios can be classified into two types:

- One is part to part ratio and the other is part to whole ratio.
- The part-to-part ratio denotes how distinct entities or groups are related.

The general form of representing a ratio of between two quantities say 'a' and 'b' is **a: b,** which is read as **'a is to b'.**

https://www.cuemath.com/commercial-math/ratio/

https://www.mathsisfun.com/numbers/ratio.html

Opportunities for Subject Integration: *(Additional ideas about how the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum) :*

Literacy : Students write a recipe and expository essay.
Science : Students compare mass to volume of items, plants to animals in the community.
Civics : Students compare family types in the community (nuclear to single family) .

Patterns and Relationships

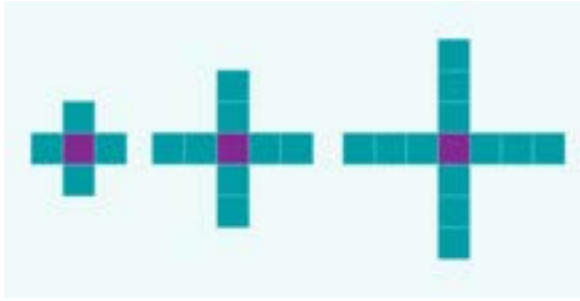
Introduction to the Strand : Patterns and relationships are the building blocks of mathematical thinking in grade 4. Identifying these connections helps students become "math detectives" who can unlock the secrets hidden in numbers and shapes. By analyzing repeating elements, students can predict what comes next in a sequence, solve problems more efficiently, and even create their own beautiful patterns. It's like learning a secret code that unlocks the world of math!

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

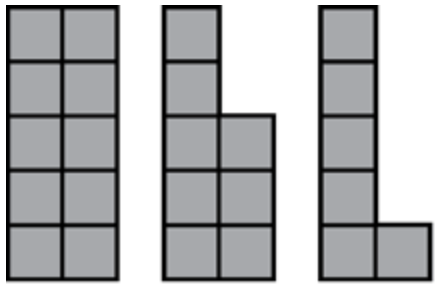
Grade Level Expectations and/or Focus Questions: Identify and describe repeating, growing, and shrinking patterns, including patterns found in real-life contexts.

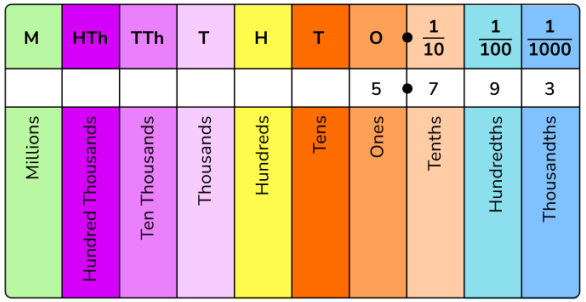
Identify patterns in equivalent fractions and place value patterns in decimal numbers;(tenths)

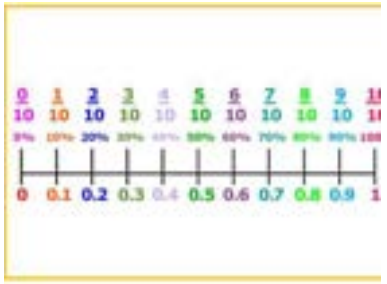
Create and translate patterns using various representations, including shapes and numbers.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge**: 1. Determine pattern rules and use them to extend patterns 2. Identify missing elements in repeating, growing, and shrinking patterns 3. Identify and explain the patterns in equivalent fractions 4. Identify and explain the patterns in decimal numbers up to tenths. -	Observation Listen to learners as they discuss and demonstrate on a white board, chalkboard how to identify the patterns and calculate the rule. In their Talking circles(groups), Listen to learners as they generate ideas and explain on how to solve the equation. Teachers can use a ball to pass around in the circle to facilitate taking turns to speak in the circle. *Observation Checklist*	**Inclusive Learning Strategies:**  In pairs or small groups ask students to:

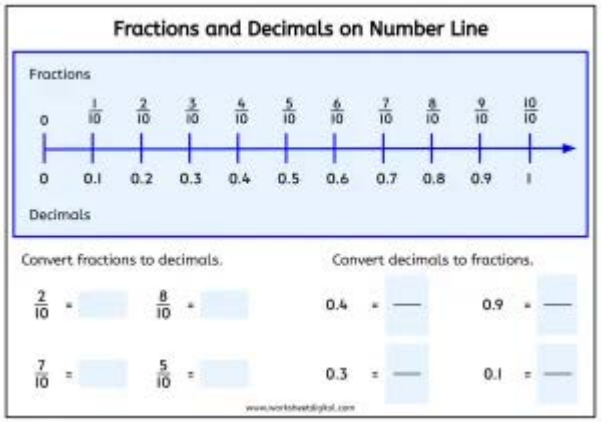
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 5. Translate patterns using various representations, including shapes and numbers. 6. Create and describe patterns to illustrate relationships among whole numbers and decimal numbers. 7. Represent a fraction as a decimal. 8. Represent a decimal as a fraction based on the specific place value of the digit in the decimal. **Values:** 9. Choose to share examples of real-life patterns. 10. Recognize the importance of pattern when solving problems.	 **Criteria** / **YES** / **NO** Do students discuss repeating elements in the problem? (Shapes, numbers, sequences) Can they articulate the order or rule of the pattern? Do students explain how to find the missing element or next term in the pattern? Can they express the rule mathematically (e.g., +2 each time, multiplied by 3)? Do students actively participate in generating ideas for solving the equation? Are there diverse approaches or strategies shared within the group? Do students provide clear explanations of their solutions to the group? Can they use appropriate mathematical vocabulary to explain their thinking?	● predict and create the next image in the sequence (this could be drawn or modelled with concrete materials) ● explain what is happening each time ● identify the counting pattern After some time, bring the groups of students together to share their findings. Encourage students to explain their patterns, noting the various approaches used by students. For example, did students: ● add four each time (one to each 'arm') ● recognise counts of 5, 9, 13 and notice a difference of four each time ● see each arm expanding from 1s to 2s to 3s ● count the total as 1 + 1 + 1 + 1 + 1; 1 + 2 + 2 + 2 + 2; 1 + 3 + 3 + 3 + 3 ● find it challenging to explain the pattern, even though they have continued the pattern ● clearly explain their thinking Present students with another pattern.  Give students matchsticks or toothpicks to replicate the model. Give students time to think about: ● What they notice ● predict and create the next image in the sequence (this could be drawn or modelled with concrete materials) ● explain what is happening each time ● identify the counting pattern Explore: In pairs, take turns creating a hidden growing pattern made up of three steps. Describe the hidden pattern to your partner so they can replicate it. For the above example, the description might be: "Start with 3 matchsticks. Add 2 each time."

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 Repeat the process with the following pattern. Distribute the following worksheet below to further revision https://www.mathworksheets4kids.com/patterns/repeating-growing-mixed1.pdf Instruct students that for each pattern, they must: 1. identify a repeating pattern or growing pattern. 2. Translate patterns using various representations, including shapes and numbers on the repeating pattern. as seen in the example below.  3. Identify the missing pattern element. 4. For the growing pattern identify the rule. Discussion: Explain that patterns in numbers are present in all aspects of Mathematics/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Name _____ K.W.L Chart Date _____ Topic _____ What I Know | What I Want to Know | What I Have Learned *Observation:* *Observe students as they discuss the points in their KWL chart.*	Ask students to share what they know about place value and how it relates to decimals. Give students a KWL chart to complete the 1st 2 columns. Display a decimal number and have students identify the place value of each digit. 0.4, 0. 6 Show students a visual representation of a decimal using a place value chart.  M | HTh | TTh | T | H | T | O • $\frac{1}{10}$ | $\frac{1}{100}$ | $\frac{1}{1000}$ 5 • 7 | 9 | 3 Millions | Hundred Thousands | Ten Thousands | Thousands | Hundreds | Tens | Ones | Tenths | Hundredths | Thousandths Ask students to identify the place value of each digit in the decimal. 0.4, 0. 6 Demonstrate how to identify the place value of each digit in the decimal and convert it to a fraction.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Think-Pair-Share Activity: Representing Decimals as Fractions Step 1: Think Think individually and silently about the following questions: • What is a decimal? • How can you represent a decimal as a fraction? • What is the importance of identifying the place value of the digit in the decimal when converting it to a fraction? • Can you provide an example of representing a decimal as a fraction? Step 2: Pair 1. Pair up with a partner and share your thoughts and answers to the questions from Step 1. 2. Discuss any differences or similarities in your understanding of representing decimals as fractions. 3. Clarify any doubts or misconceptions you may have. Step 3: Share 1. As a pair, share your understanding of representing decimals as fractions with another pair of students. 2. Each pair should take turns explaining their thought process and providing an example of representing a decimal as a fraction. 3. Listen actively and respectfully to the other pairs' explanations.	Provide guided examples where students practice identifying the place value of digits in decimals and converting them to fractions. Walk students through the steps and provide support as needed. For example: 0.4 = 4/10 0.6 = 6/10 Demonstrate how to change a fraction to decimal. Provide students with the following strip.  Have students identify the pattern observed. For example: A repeating pattern is evident in the place value. Decimals in the tenths place is the equivalent of a fraction with a denominator of tenths. Both decimals and Fractions use the same ordinal number tenths to represent its value. Pair students up and provide each pair with a set of decimal cards.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	4. Take notes on any new information or insights shared by other pairs. Note: The teacher should facilitate the sharing session, encourage participation from all students, and provide guidance or clarification if needed. ● *Provide each student with a mini-whiteboard and marker.* ● *Display a decimal number and have students write the fraction representation on their whiteboards.* ● *Students hold up their whiteboards simultaneously for the teacher to assess.*	● Students should take turns drawing a card, identifying the place value of the decimal, and representing it as a fraction. Distribute bottled, canned packaged products. Be mindful to choose items that show tenths. Have students identify the decimal and represent the decimal a fraction.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 *Students will complete a similar worksheet.* *Provide each team with a set of decimal cards and fraction cards.* *Students should work together to sort the cards based on the matching decimal and fraction representation.*  **Bottled water -** 16.9 = 16 and 9 tenths = 16 and 9/10	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 **Doritos** 28.3 = 28 and 3 tenths = 28 and 3/10	

Additional Resources and Materials

KWL CHART

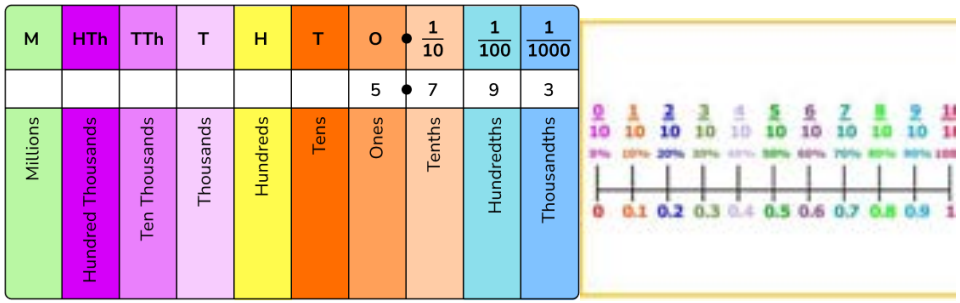
https://timvandevall.com/wp-content/uploads/KWL-Graphic-Organizer.pdf

Reading Comprehension Assignment: Representing Decimals as Fractions

https://docs.google.com/document/d/1o1S8-IMKHgPBQt00YXn4wHIsxxvA7dcMsAfTCU17TSE/edit#heading=h.ep752p9oyhfs

unifix blocks, matchsticks or toothpicks,.

Additional Useful Content Knowledge for the Teacher: (*any additional knowledge that the writers believe would be helpful for the teacher such as reading material at a lower or higher grade level, links to curriculum documents for other grades)*



. A Decimal number contains a decimal point. We use decimals to write fractions as a single number. The decimal point shows where the fractional part of a number begins.

Understanding how to represent decimals as fractions is an important skill in mathematics. By identifying the place value of digits in a decimal, we can convert them into fractions and better comprehend their value.

Opportunities for Subject Integration: *(Additional ideas about how the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)*

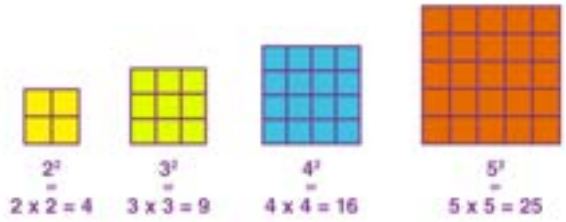
Language Arts:
Reading Comprehension :
https://docs.google.com/document/d/1o1S8-IMKHgPBQt00YXn4wHIsxxvA7dcMsAfTCU17TSE/edit#heading=h.ep752p9oyhfs

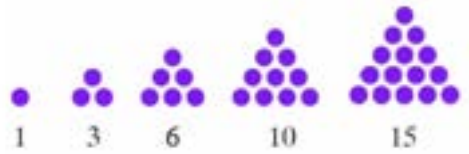
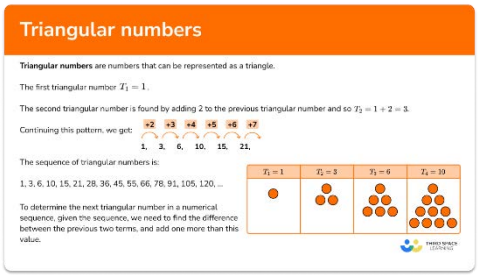
Essential Learning Outcomes:

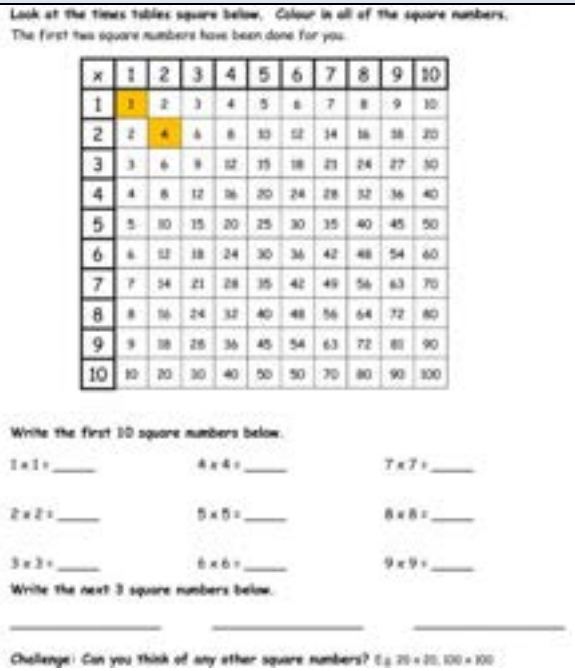
- **P 1.2. Recognizing, describing and extending patterns – Increasing and Decreasing Patterns**
- **P 2.1. Variables and Relationships – Representing Unknowns**

Grade Level Expectations and/or Focus Questions:

- **Demonstrate an understanding of the role of patterns in square and triangular numbers;**
- **Demonstrate an understanding of the role of patterns in examining multiplication/division situations, the multiplication chart, and multiplication/division by 10, 100, and 1 000.**
- **Demonstrate an understanding of open sentences in addition/subtraction and simple multiplication/division problems with whole numbers.**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** **1.** Identify and explain the patterns in square numbers up to 12. 2. Identify and explain the patterns in triangular numbers up to 12. 3. Recall and explain the patterns observed in multiplication and division situations. 4. Find missing numbers in open sentences with addition and subtraction. 5. Find missing numbers in open sentences with simple multiplication and division. **Skills** 6. Create visual representations of square and triangular numbers to demonstrate patterns.	**Comparison of Patterns in Square & Triangular Number** **Written Explanation** **Task:** Write a paragraph explaining the patterns in square and triangular numbers. **Diagram Comparison** **Task:** Create two diagrams, one representing a square number pattern and the other representing a triangular number pattern. Compare and contrast the two patterns. **Pattern Identification** **Task:** Given a set of numbers, determine whether each number is a square number, a triangular number, or neither. Justify your answers. Say what two numbers come next in each pattern given. **Rubric (Use this rubric to mark the assessment above)**	Provide opportunities for students to build patterns with square numbers using materials such as square tiles such eg.  *Retrieved from: https://byjus.com/maths/perfect-squares/* Have learners draw and colour patterns with square numbers on grid paper. Encourage learners to identify patterns in square numbers in multiplication charts. E.g Allow learners to build patterns with triangular patterns using unifix cubes, two sided counters, match sticks etc. E.g

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
7. Analyze and compare the patterns in square and triangular numbers through written explanations or diagrams. 8. Multiply and divide numbers by 10, 100, and 1,000 with accuracy. 9. Utilize the multiplication chart to solve multiplication and division problems efficiently. 10. Ssolve open sentences in addition and subtraction problems with whole numbers. 11. Identify and explain the term open sentence in simple multiplication and division problems with whole numbers. 12. Predict the missing number in an open sentence in addition/subtraction and multiplication/division problems. **Values** 13. Recognize the importance of patterns in solving multiplication and division problems.	 **Criteria** / **0 Points** / **1 Point** / **2 Points** / **3 Points** **Written Explanation**: No written explanation provided / Written explanation is vague or lacks understanding / Written explanation demonstrates basic understanding / Written explanation demonstrates thorough understanding **Diagram**: No diagram provided / Diagram is incomplete or inaccurate / Diagram is clear and accurate / Diagram is clear, accurate, and enhances understanding **Analysis of Patterns**: No analysis of patterns provided / Analysis is incomplete or incorrect / Analysis demonstrates basic understanding / Analysis demonstrates thorough understanding **Comparison of Patterns**: No comparison of patterns provided / Comparison is incomplete or lacks depth / Comparison demonstrates basic understanding / Comparison demonstrates thorough understanding **Overall Presentation**: Presentation is disorganized or contains numerous errors / Presentation is somewhat organized with a few errors / Presentation is organized with minor errors / Presentation is well-organized and free of errors **Exit Questions:** 1. What is the smallest square number that is also a triangular number? 0. Can a number be both a square number and a triangular number at the same time? *Explain your reasoning.* **Group Work** Separate students into groups and have them solve the following problems. Allow the students to present their finding to the class and discuss.	 1 3 6 10 15 *Retrieved from : https://plus.maths.org/content/maths-minute-triangular-numbers* 1) Ask the learners to make these triangles using Unifix cubes or other suitable materials. They should write down the number of cubes it took to build each triangle. 2) Discuss the numbers of cubes needed and explain that the number of cubes in each triangle is called a triangular number. 3) Ask them to look for any patterns in their work. How many cubes do they need to add to the bottom of each triangle to make it larger? Have learners draw and colour patterns using triangular numbers. E.g  Triangular numbers Triangular numbers are numbers that can be represented as a triangle. The first triangular number $T_1 = 1$. The second triangular number is found by adding 2 to the previous triangular number and so $T_2 = 1 + 2 = 3$. Continuing this pattern, we get: +2 +3 +4 +5 +6 +7 1, 3, 6, 10, 15, 21, The sequence of triangular numbers is: 1, 3, 6, 10, 15, 21, 28, 36, 45, 55, 66, 78, 91, 105, 120, ... To determine the next triangular number in a numerical sequence, given the sequence, we need to find the difference between the previous two terms, and add one more than this value. $T_1 = 1$ $T_2 = 3$ $T_3 = 6$ $T_4 = 10$ Square & Triangular Numbers **Worksheet**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Problem #1 - Sarah is arranging square tiles on the floor to create a square-shaped pathway in her garden. Each side of the square pathway consists of 5 tiles. How many tiles does Sarah need in total for the pathway? How can we find the total number of tiles Sarah needs for the square pathway? ***Problem #2*** **-** Ethan is stacking oranges in the shape of a triangular pyramid. The first layer has 3 oranges, the second layer has 6 oranges, and the third layer has 9 oranges. If Ethan continues this pattern, how many oranges will be in the 5th layer? What is the formula to find the number of oranges in any given layer of Ethan's triangular pyramid? ***Problem #3*** **-** Emily wants to create a path in her garden using square-shaped tiles. She decides to use square tiles that measure 1 foot by 1 foot. If she needs to cover an area of 16 square feet, how many tiles will she need? How many square tiles measuring 1 foot by 1 foot does Emily need to cover an area of 16 square feet in her garden? **Multiplication Chart Rubric** This rubric can be used to test the students knowledge of using a multiplication chart for both multiplying and division.	 Look at the times tables square below. Colour in all of the square numbers. The first two square numbers have been done for you. Write the first 10 square numbers below. 1 x 1 = _____ 4 x 4 = _____ 7 x 7 = _____ 2 x 2 = _____ 5 x 5 = _____ 8 x 8 = _____ 3 x 3 = _____ 6 x 6 = _____ 9 x 9 = _____ Write the next 3 square numbers below. _____ _____ _____ Challenge: Can you think of any other square numbers? E.g. 20 x 20, 100 x 100 **Quick Draw** Give each student a small whiteboard or a piece of paper and ask them to quickly draw a square and a triangle. Then, challenge them to count the number of squares and triangles within their drawings. This will introduce the concept of square and triangular numbers in a visual and interactive way. **Square & Triangular numbers** ***Step #1:*** Use manipulatives (such as square tiles or counters) to create visual representations of the first 5 square and

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Criteria	0 Points	1 Point	2 Points	3 Points
Demonstrates understanding of multiplication concepts				
- Unable to correctly use the multiplication chart	X			
- Attempts to use the multiplication chart but with errors		X		
- Uses the multiplication chart accurately			X	
- Uses the multiplication chart accurately and efficiently				X
Demonstrates understanding of division concepts				
- Unable to correctly use the multiplication chart	X			
- Attempts to use the multiplication chart but with errors		X		
- Uses the multiplication chart accurately			X	
- Uses the multiplication chart accurately and efficiently				X

Think, Pair, Share

Students will apply their understanding of place value patterns to solve word problems involving multiplication and division by 10, 100.

Think

Students will take a moment to think about the following questions:

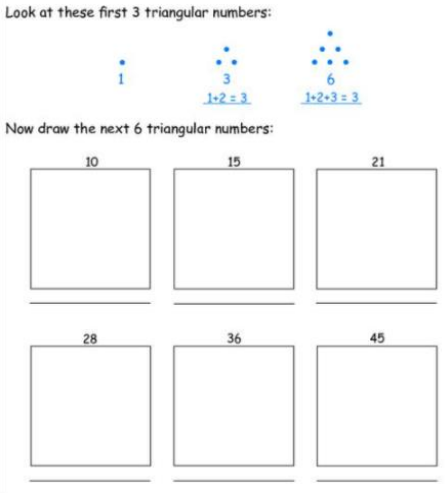
1. How does multiplying a number by 10, 100, or 1,000 affect its value?
2. How does dividing a number by 10, 100, or 1,000 affect its value?

triangular numbers *(this can be done in separate areas of the classroom to encourage student movement)*.

Step #2: Write down the square or triangle of each number and draw the corresponding visual representation.
Questions (can be asked orally or the students can answer individual in their notebooks or device):

1. What pattern do you notice in the visual representations of square or triangular numbers?
2. How does the area of the square relate to the square number?
3. How does the number of objects in each row relate to the triangular number?
4. Can you write an equation to find the square or triangular number?

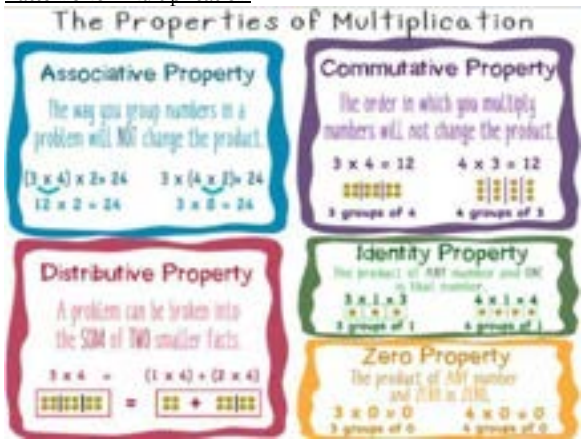
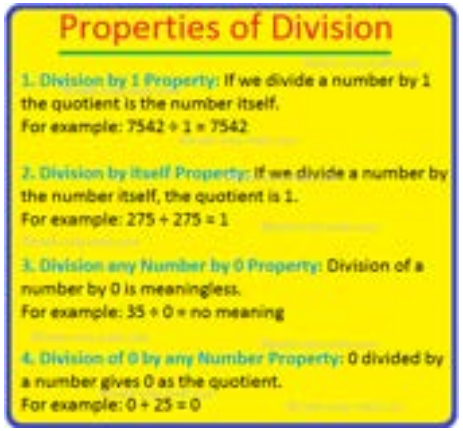
Worksheet

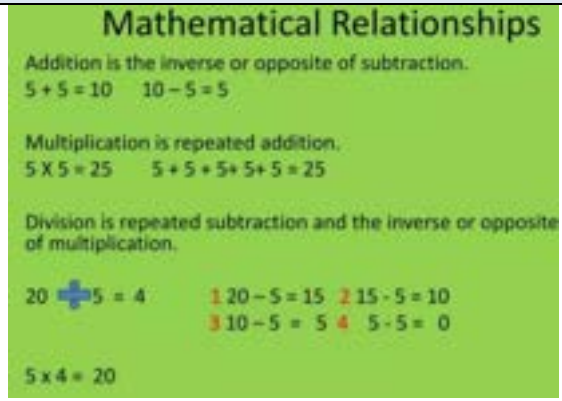
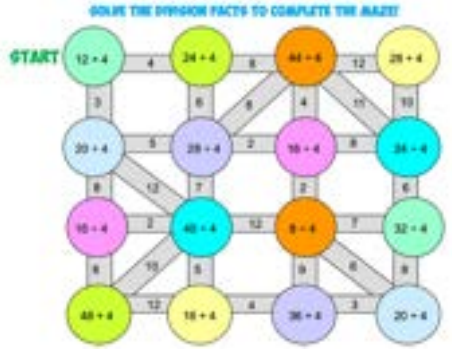


Finding the Next Square Number

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	3. Can you think of any real-life situations where knowing how to multiply or divide by 10, 100, or 1,000 would be useful? **Pair** 1. Find a partner and share your thoughts on the questions above. Discuss your understanding of place value patterns and how it relates to multiplication and division by 10, 100, and 1,000. 2. Take turns listening to each other and ask clarifying questions if needed. **Share** 1. Each pair will take turn sharing their thoughts and findings with the whole class. 2. As a class, they will discuss some real-life situations where knowing how to multiply or divide by 10, 100, or 1,000 would be useful. 3. They will also discuss any challenges or insights they gained from this activity. **Pop Quiz** Students will be given problems with multiplying and dividing by 10, 100 or 1,000 to solve within a given time. **Quiz**	Triangular Numbers **Comparison of Patterns in Square & Triangular Number** The following can be used as an introductory activity for comparing square and triangular numbers. **Give the students the following information to complete (orally or written).** First, let's understand square numbers. A square number is the result of multiplying a number by itself. For example, 3 x 3 = _____. We can write this as 3^2 = _____. Now, let's move on to triangular numbers. Triangular numbers are formed by adding consecutive numbers. For example, 1 + 2 = _____. We can write this as T2 = _____. Let's compare the patterns between square and triangular numbers. . Square numbers: 1, 4, 9, 16, 25, ... Triangular numbers: 1, 3, 6, 10, 15, … Notice how the square numbers increase by adding an odd number each time (1, 3, 5, 7, ...). On the other hand, the triangular numbers increase by adding consecutive numbers (1, 2, 3, 4, ...). Now it's your turn! Fill in the blank spaces and complete the patterns: Square numbers: 1^2 = _____, 2^2 = _____, 3^2 = _____, ... Triangular numbers: T1 = _____, T2 = _____, T3 = _____, ...

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Name:_____ **Date:**_____ **Multiple Choice Questions:** 1. Fill in the missing number: 8 + __ = 15 a) 5 b) 6 c) 7 d) 9 2. Fill in the missing number: 18 - __ = 9 a) 6 b) 7 c) 8 d) 9 3. Fill in the missing number: __ + 12 = 20 - 5 a) 7 b) 8 c) 9 d) 10 4. Fill in the missing number: 23 - __ = 15 + 3 a) 3 b) 5 c) 8 d) 12 5. Fill in the missing number: __ + 6 = 13 - 3 a) 4 b) 6 c) 7 d) 10 **Vocabulary Matching:** Match the following vocabulary terms with their definitions: 1. Sum 2. Difference 3. Addend 4. Minuend 5. Subtrahend a) The answer in an addition problem. b) The number being subtracted. c) One of the numbers being added. d) The largest number in a subtraction problem. e) The result of subtracting one number from another. 1. Sum _____ 2. Difference _____ 3. Addend _____ 4. Minuend _____ 5. Subtrahend _____ **<u>Deep Questions</u>** **These questions can be used as a whole class, group or individual discussion to check the students' knowledge of the concept.** 1. How can you use addition and subtraction to find the missing numbers in open sentences? 2. Can you provide an example of an open sentence with addition and subtraction where the missing number needs to be found? How would you go about solving it? 3. Why is it important to understand how to find missing numbers in open sentences with addition and subtraction? How might this skill be useful in real-life situations?	**Worksheet** **Instructions:** Solve the following problems related to square and triangular numbers. Show all your work and write your answers in the space provided. Part 1: Square Numbers 1. Determine whether the following numbers are square numbers or not: a) 9 b) 15 c) 25 d) 36 2. Fill in the missing square numbers in the sequence: a) 1, 4, __, 16, 25, __ b) __, 49, 64, 81, __, 100 3. Calculate the square root of the following numbers: a) 64 b) 100 c) 81 d) 144 Part 2: Triangular Numbers 1. Determine whether the following numbers are triangular numbers or not: a) 10 b) 21 c) 28 d) 36 2. Fill in the missing triangular numbers in the sequence: a) 1, 3, __, 10, 15, __ b) __, 21, 28, __, 45, 55 3. Find the sum of the first 5 triangular numbers. Part 3: Mixed Problems 1. Determine which of the following numbers are both square and triangular numbers: a) 9 b) 16 c) 25 d) 36 2. Find the next triangular number after 45. 3. Find the square number that is between 30 and 40. 4. Challenge: Find the first 3 triangular numbers that are also square numbers.

	Jigsaw Activity: Identifying and Explaining Open Sentences in Multiplication and Division Problems with Whole Numbers Introduction: Explain to the students that they will work in groups to learn specific content and then share their knowledge with students from other groups. Group Formation: Divide the class into four groups (Group A, Group B, Group C, and Group D). Make sure each group has an equal number of students. Assign each group a specific content area to focus on. Group A: Identifying Open Sentences in Multiplication Problems Provide Group A with the following materials: • A set of multiplication word problems with blank spaces for numbers (e.g., 3 x __ = 15) • Manipulatives or visuals to help solve the problems (e.g., counters, pictures) Group A's Task: 1. Each member of Group A will solve one multiplication problem from the set independently, filling in the blank space with the correct number. 2. Once everyone has completed their problem, they will come together as a group and discuss their solutions. 3. As a group, they will identify the open sentences in the multiplication problems and explain how they solved them. 4. They will create a summary of their findings to share with the other groups. Group B: Explaining Open Sentences in Multiplication Problems Provide Group B with the following materials: • Completed multiplication problems with open sentences (e.g., 3 x __ = 15) • Whiteboards or chart paper for writing explanations Group B's Task: 1. Each member of Group B will receive a multiplication problem with an open sentence.	Patterns for Multiplication  Double and Half of a Number | Kids Videos The Properties of Multiplication Song | 3rd Grade - 4th Grade Patterns of Division 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	2. Individually, they will solve the problem and write down a step-by-step explanation of how they arrived at their answer. 3. Once everyone has completed their explanation, they will come together as a group and compare their approaches. 4. As a group, they will discuss and refine their explanations, making sure they are clear and concise. 5. They will create a summary of their explanations to share with the other groups. Group C: Identifying Open Sentences in Division Problems Provide Group C with the following materials: ● A set of division word problems with blank spaces for numbers (e.g., 24 ÷ __ = 8) ● Manipulatives or visuals to help solve the problems (e.g., counters, pictures) Group C's Task: 1. Each member of Group C will solve one division problem from the set independently, filling in the blank space with the correct number. 2. Once everyone has completed their problem, they will come together as a group and discuss their solutions. 3. As a group, they will identify the open sentences in the division problems and explain how they solved them. 4. They will create a summary of their findings to share with the other groups. Group D: Explaining Open Sentences in Division Problems Provide Group D with the following materials: ● Completed division problems with open sentences (e.g., 24 ÷ __ = 8) ● Whiteboards or chart paper for writing explanations	 **Games** Multiplication Facts Online Games Inverse Operation Card Game  **Multiplying and Dividing using the Multiplication Chart** Demonstrate how to use the multiplication chart to solve a multiplication problem step by step. Emphasize the importance of finding the row and column corresponding to the given factors and finding their intersection to determine the product. Provide students with a few multiplication

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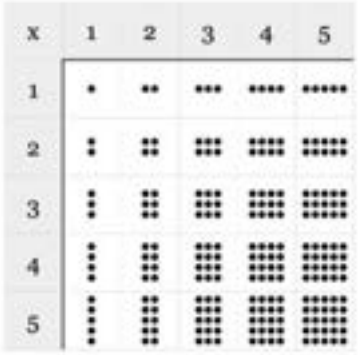
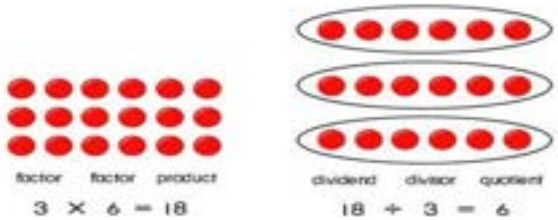
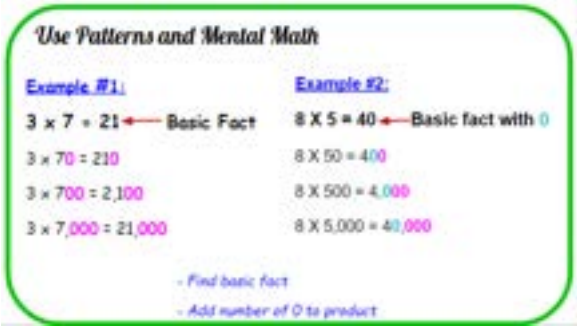
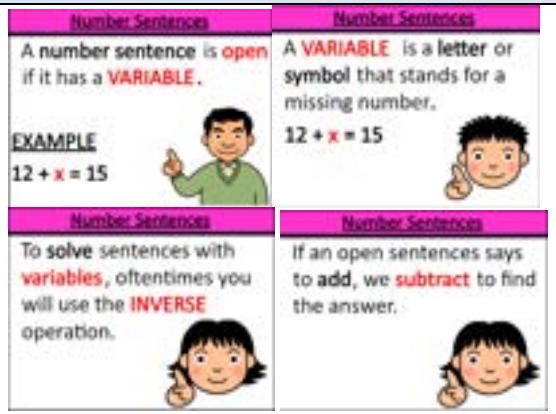
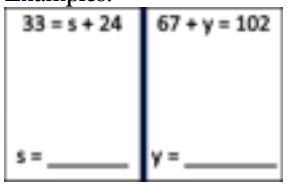
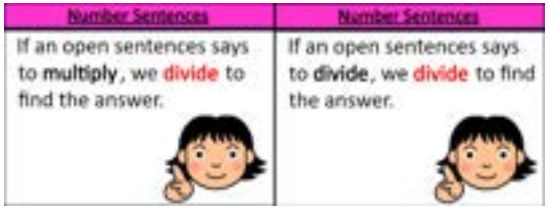
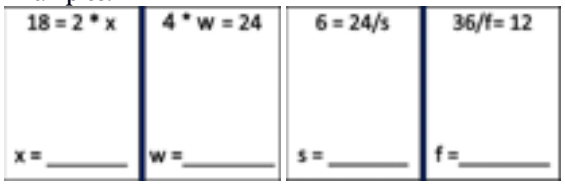
	Group D's Task: 1. Each member of Group D will receive a division problem with an open sentence. 2. Individually, they will solve the problem and write down a step-by-step explanation of how they arrived at their answer. 3. Once everyone has completed their explanation, they will come together as a group and compare their approaches. 4. As a group, they will discuss and refine their explanations, making sure they are clear and concise. 5. They will create a summary of their explanations to share with the other groups. Expert Groups: After each group has completed their tasks, form new groups called "Expert Groups" with one member from each initial group (Group A, B, C, and D). Expert Group Tasks: 1. Each member of the Expert Group will take turns sharing their group's findings and explanations. 2. As a group, they will discuss similarities and differences between the multiplication and division problems. 3. They will collaborate to create a comprehensive summary of identifying and explaining open sentences in multiplication and division problems with whole numbers. 4. The Expert Group will present their summary to the whole class, ensuring that all students understand the concept. Conclusion: Wrap up the jigsaw activity by discussing the importance of open sentences in multiplication and division problems. Reinforce the idea that understanding open sentences helps in solving problems accurately. **Deep Questions**	problems and guide them through the process of solving them using the multiplication chart. Use dots in rectangular arrays to represent products and explore patterns in multiplication tables e.g.  *Retrieved from: https://mathforlove.com/lesson/multiplication-table-sums/* Have learners examine arrays of numbers to show the relationship between multiplication and division eg.  A.5.5 - Using a Multiplication Table for Division **Multiplication Chart Challenge** - Give each student a blank multiplication chart and ask them to fill it out within 5 minutes. Encourage them to use strategies like skip-counting or finding patterns to complete the chart efficiently. The student who completes the chart first with the fewest mistakes wins. **Multiplication Story Problems -** Students will write a set of story problems that involve multiplication and division. They will use the numbers from the multiplication chart to create engaging scenarios for their classmates to solve. **SCO #8 & 15**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	1. What is the relationship between multiplication and division in simple problems with whole numbers? 2. How can you determine if a multiplication or division problem is an open sentence? 3. Why is it important to provide an explanation when solving open sentence problems in multiplication and division?	Multiplication Songs: Multiplication by 10, 100, 1000 and their Multiples  10 1 patterns in division **Practice** 1. 160 ÷ 2 = _____ 2. 240 ÷ 3 = _____ 3. 700 ÷ 1 = _____ 4. 3,200 ÷ 8 = _____ 5. 210 ÷ 7 = _____ 6. 3,000 ÷ 6 = _____ 7. 1,600 ÷ 20 = _____ 8. 630 ÷ 70 = _____ 9. 1,800 ÷ 60 = _____ 10. 3,200 ÷ 80 = _____ 11. 5,000 ÷ 5 = _____ 12. 21,000 ÷ 300= _____ **Problem Solving** Maria is saving money to go on a trip to the beach. She decides to save 10 each week. After 4 weeks, Maria realizes that she has saved a total of 40. Meanwhile, her friend, John, is also saving money for the same trip. John decides to save 100 each week. After 5 weeks, John counts the money he has saved and realizes he has a total of 500. **Question 1:** How much money will Maria have saved after 10 weeks? **Question 2:** If John wants to save $1,000 for the trip, how many weeks will it take him?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 **Examples:**  **Worksheets** Open Sentence Worksheet 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Game **Maths Riddles** **Students can solve orally or written, whoever answers correctly first wins.** 1. I am a number. If you add 5 to me, you get 12. What number am I? 0. I am a number. If you subtract 8 from me, you get 4. What number am I? 0. I am a number. If you add 9 and subtract 3 from me, you get 10. What number am I? **Four Corners Game: Find the Missing Numbers** **Game Rules** 1. Divide the classroom into four corners and assign each corner a category: - Corner 1: Addition with missing numbers - Corner 2: Subtraction with missing numbers - Corner 3: Mixed addition and subtraction with missing numbers - Corner 4: No missing numbers 2. Provide students with a list of 10 questions, where each question corresponds to one of the four categories. 3. Read out a question and give students a moment to think about the answer. 4. After the question is read, students should move to the corner that represents the correct category for the answer. 5. Once students have gathered in their chosen corners, reveal the correct answer and ask students to return to the middle of the room. 6. Repeat steps 3-5 for each question. 7. At the end of the game, discuss the correct answers and provide explanations if needed. ****Question List:****

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		1. What type of open sentence involves finding a missing number when adding two numbers together? 2. Which category focuses on finding the missing number when subtracting two numbers? 3. In which corner should you go if the open sentence includes both addition and subtraction with missing numbers? 4. Which corner represents open sentences without any missing numbers? 5. If the equation is 7 + __ = 15, which corner should you go to find the missing number? 6. Which corner would you choose for the equation 19 - __ = 12? 7. What category would you select for the open sentence 4 + __ - 2 = 10? 8. If an equation has no missing numbers, which corner should you go to? 9. What type of equation would you find in Corner 3? 10. Which corner represents open sentences with missing numbers in both addition and subtraction operations? Scenario-Based Questions: Find Missing Numbers in Open Sentences with Addition and Subtraction 1. **Scenario:** Emma has a collection of marbles. She knows that she had 12 marbles in the morning, and after playing with her friends, she ended up with 7 marbles. She wants to figure out how many marbles she lost during her playtime. Can you help her find the missing number in this open sentence using subtraction? **Question:** If Emma started with 12 marbles and ended up with 7 marbles, how many marbles did she lose during her playtime? 2. **Scenario:** Sara loves to read books and has a goal to read 20 books this month. She has already finished reading 13 books and wants to know how many more books she needs to read to reach her goal. Can you help her find the missing number in this open sentence using subtraction? **Question:** If Sara has read 13 books already and her goal is to read 20 books this month, how many more books does she need to read to reach her goal?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		3. Scenario: Tom is organizing a basketball tournament at his school. He knows that he has 18 basketballs, but he needs a total of 23 basketballs for each team to have enough. He wants to figure out how many more basketballs he needs to borrow from his friends. Can you help him find the missing number in this open sentence using addition? **Question:** If Tom has 18 basketballs and he needs a total of 23 basketballs, how many more basketballs does he need to borrow from his friends?  **Examples:**  **Math Puzzles** Provide each student with a small puzzle or brain teaser related to multiplication or division. Make sure the puzzles are challenging but solvable within 5 minutes. Students can work individually or in pairs to solve the puzzles. Offer a small prize or recognition to the students who solve the puzzle correctly. **Mystery Numbers** Write a series of open sentences on the board with a missing number in each equation. Instead of writing the missing number with a blank space, replace it with a question mark. Ask the students to solve the equations mentally and shout out the missing numbers. This activity can be done as a whole class or in small groups.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Learning Stations Activity: Open Sentences in Real-World Scenarios Students will be placed in groups to visit each station. They will complete the task at each station in the classroom. This activity will aid their understanding of creating open sentences using the four operations. Station 1: Grocery Shopping **Task:** Create a shopping list for a family gathering. Include at least 5 items with their corresponding prices. **Questions:** 1. Write an open sentence that represents the total cost of all the items on your shopping list. 2. Solve the open sentence and find the total cost of the items on your shopping list. 3. Explain how you can use number operations to find the total cost of the items on your shopping list. Station 2: Party Planning **Task:** Plan a birthday party for a friend. Determine the number of guests, party favors, and food items needed. **Questions:** 1. Write an open sentence that represents the total number of party favors needed for the birthday party. 2. Solve the open sentence and find the total number of party favors needed. 3. Explain how you can use number operations to find the total number of party favors needed. Station 3: Time Management **Task:** Create a schedule for your daily routine. Include at least 5 activities with their corresponding durations.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Questions: 1. Write an open sentence that represents the total time spent on all the activities in your daily routine. 2. Solve the open sentence and find the total time spent on all the activities in your daily routine. 3. Explain how you can use number operations to find the total time spent on all the activities in your daily routine. Station 4: Classroom Supplies **Task:** Determine the number of supplies needed for the classroom. Consider items like pencils, notebooks, and erasers. **Questions:** 1. Write an open sentence that represents the total number of pencils needed for the classroom. 2. Solve the open sentence and find the total number of pencils needed. 3. Explain how you can use number operations to find the total number of pencils needed. Station 5: Travel Expenses **Task:** Plan a family vacation. Determine the costs of transportation, accommodation, and activities. **Questions:** 1. Write an open sentence that represents the total cost of transportation, accommodation, and activities for your family vacation. 2. Solve the open sentence and find the total cost of the family vacation. 3. Explain how you can use number operations to find the total cost of the family vacation.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Scenario-based Questions Students can complete individually or paired to solve the word problem by writing an open sentence and solve. 1. Shopping Spree: Sarah wants to buy a new bicycle that costs 250. She has already saved up 100. If she receives $20 every week from her allowance, how many weeks will it take for Sarah to save enough money to buy the bicycle? Write an open sentence to represent this situation and solve it. 2. Baking Challenge: Joey is baking cookies for a school event. The recipe requires 2 cups of flour. Joey has already used 1 cup of flour and wants to know how much more he needs to add. Write an open sentence to represent this situation and solve it. 3. Garden Expansion: Mr. Johnson wants to expand his rectangular garden by adding an extra row of plants on each side. If the original garden is 8 feet wide and 10 feet long, and each additional row of plants requires 2 feet of width, what will be the new dimensions of Mr. Johnson's garden? Write an open sentence to represent this situation and solve it.

Additional Resources and Materials

(Additional material and resources that are not included in the Inclusive Learning and/ or Inclusive Assessment Strategies that may be useful for lesson planning)

[4th Grade Math 4.4, Divide Tens, Hundreds, and Thousands by 1-digit Using Basic Facts]

[Open Sentences | Math Lesson for Primary School | Learning Videos for Kids]

Opportunities for Subject Integration: *(Additional ideas about how the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)*

Arts & Craft

Multiplication Art - Use the multiplication chart as inspiration to create a piece of artwork. Each number on the chart can represent a different color or shape. Allow students' creativity to flow as they design their masterpiece.

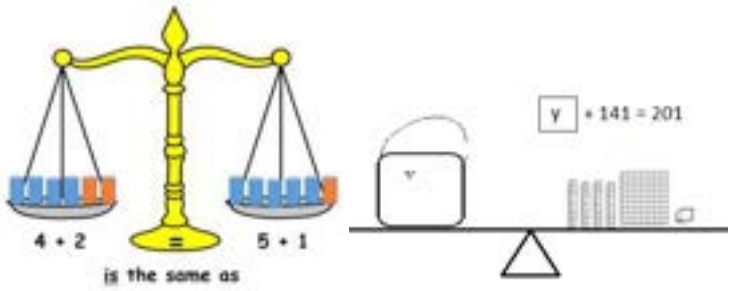
Language Arts

Reading Comprehension - Apply Understanding of Place Value Patterns by reading and answering questions from a comprehension passage on the topic.

Create a Story - Students can write a story that involves open sentences with missing numbers. Include both addition and subtraction examples. Allow them to be creative and use their storytelling skills!

Essential Learning Outcome P2.2: Variables and Relationships – Understanding and Representing Equivalence

Grade Level Expectations and/or Focus Questions: P 2.2 Determine if and explain why two given quantities or measures are equal or unequal in expressions involving single-digit multiplication and division and preservation of equality in all four operations

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Recognize when two expressions are equal and when they are not equal in addition, subtraction, multiplication and division using mathematical language 2. Apply properties of multiplication and division (commutative, associative, distributive) to determine equality or inequality. 3. Manipulate the given objects to create different combinations (involving addition, subtraction multiplication and division) to preserve equality. 4. Rewrite expressions to ensure equality is preserved. **Skill** 5. Calculate the operations to determine whether they are equal and unequal 6. Share to ensure the equality is preserved **Value** 7. Students should discuss ways in which preservation of equality is important in everyday life.	**Mathematical Investigations**: Assign mathematical investigations or open-ended tasks where students explore different expressions involving single-digit multiplication and division. Have them investigate patterns, make conjectures, and justify their conclusions about equality or inequality.F For example ***Investigating Factors***: ***Task:*** *Explore all the pairs of single-digit numbers whose product is less than 10. Investigate if there are any patterns in the factors of these products.* ***Example:*** *Students may find that the factors of these products are always smaller than or equal to the numbers being multiplied.* ***Exploring Remainders***: ***Task:*** *Divide single-digit numbers by other single-digit numbers and observe the remainders. Investigate if there are any patterns in the remainders for different divisions.* ***Example:*** *Students might observe that when dividing by certain numbers, the remainders follow a specific pattern (e.g., always 0, or always less than the divisor).* ***Multiplication and Division Chains***: ***Task:*** *Create chains of multiplication and division using single-digit numbers. Investigate if certain sequences of operations lead to specific results or patterns.*	**Inductive Teaching :** Provide opportunities for learners to listen and read stories that involve equivalence for E.g. 'The Balancing Act' and use balances to model and prove equality. - Have learners build a balance and use base ten blocks to demonstrate equivalence in quantities or measures  **VISUAL AIDS AND MANIPULATIVE** Use physical objects like blocks, counters ,beads or fruits to represent quantities in multiplication and division problems. This hands-on approach helps students visualize the concept of equal groups and understand the relationship between multiplication and division. Provide opportunities for students to physically group and regroup objects to demonstrate equality or inequality.

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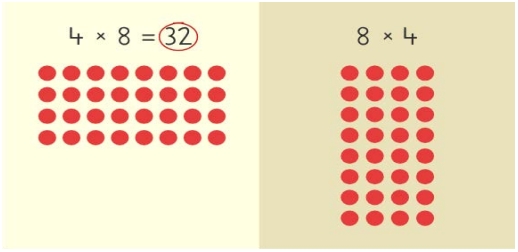
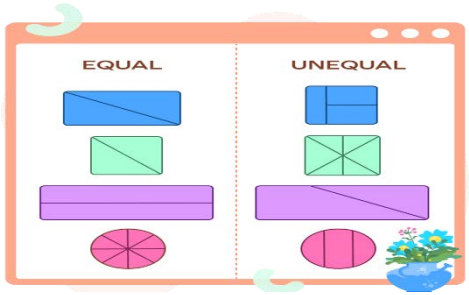
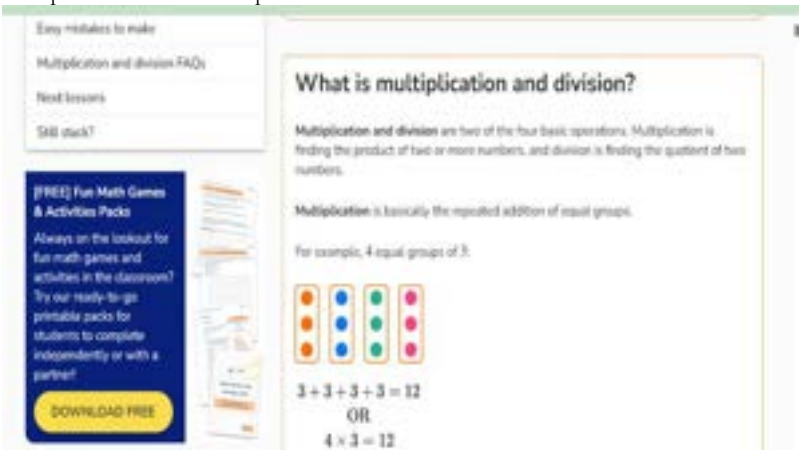
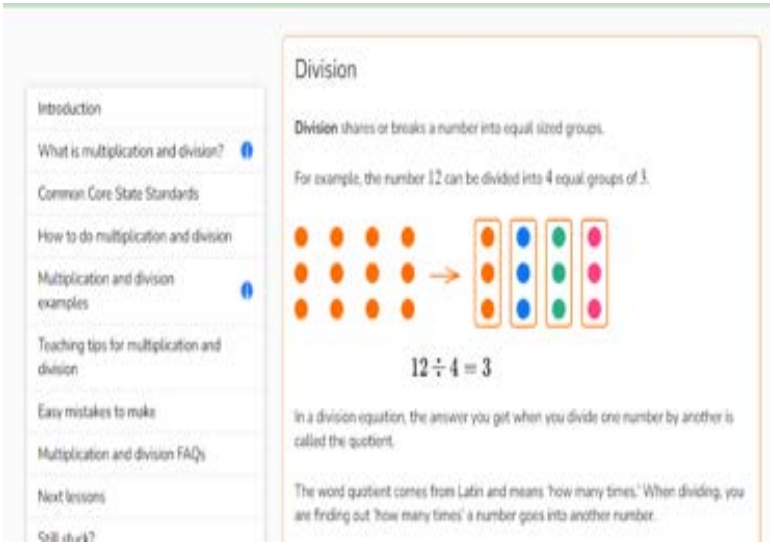
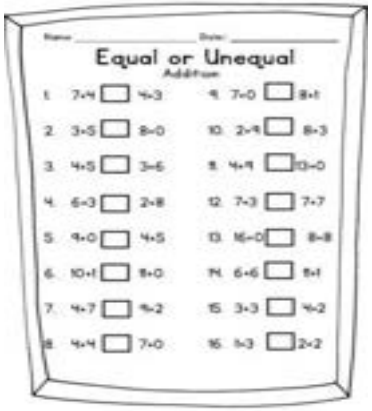
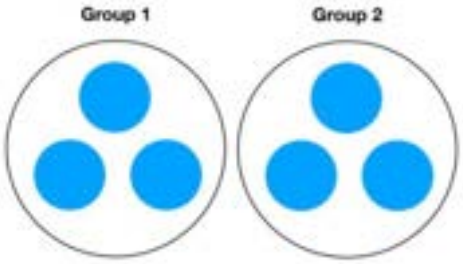
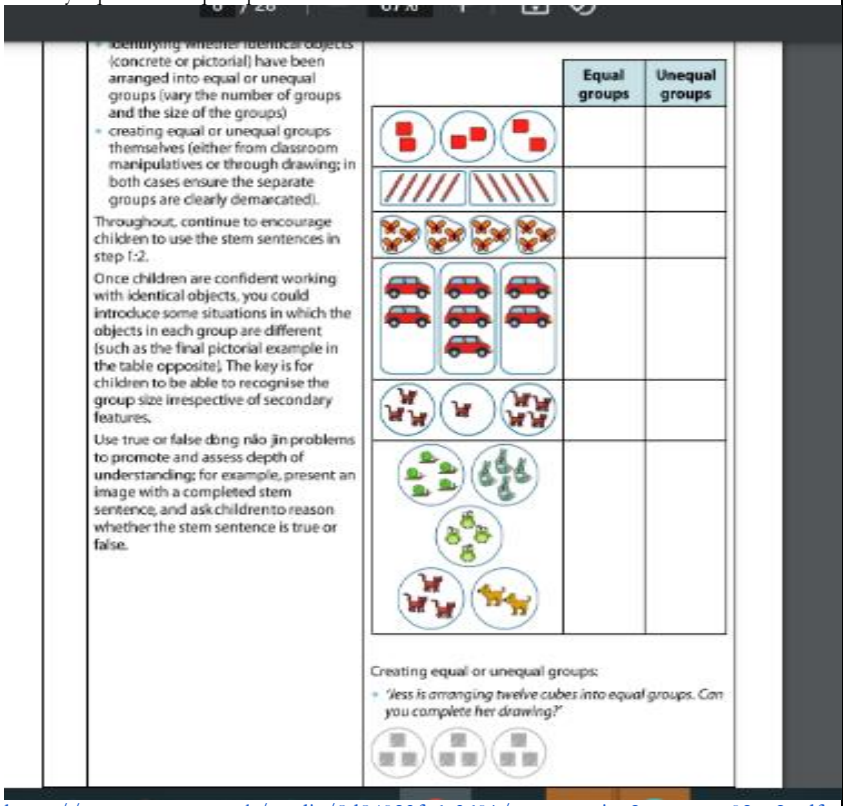
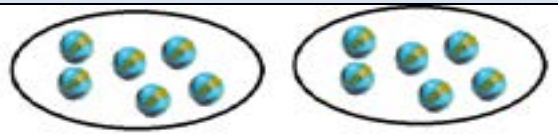
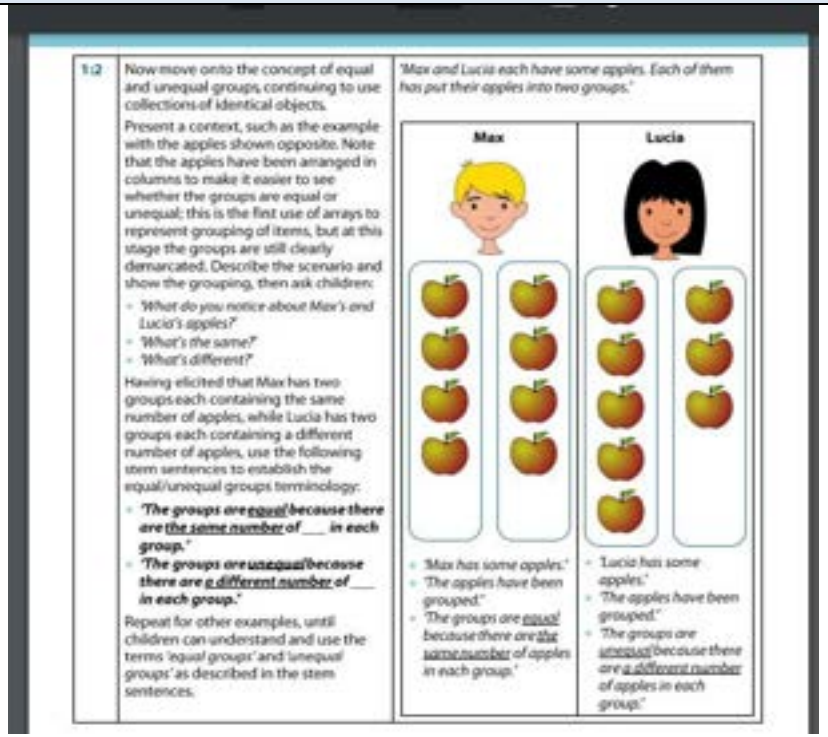
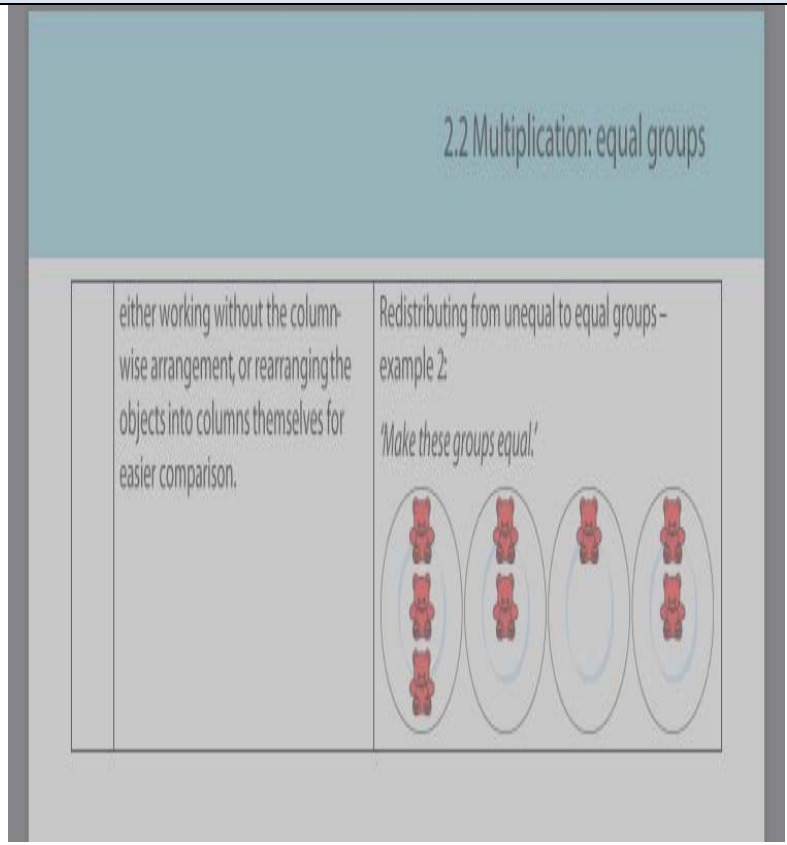
	Example: *Students might explore sequences like 2 × 3 ÷ 2 = 3, and observe how the order of operations affects the result.* **Math Journals**: Implement math journals where students write about their thinking processes, strategies, and reflections on determining equality or inequality in mathematical expressions. Review their journals to assess their understanding and provide feedback. For example *Today, we explored expressions involving multiplication and division to determine equality. I used visual representations like arrays to help me visualize the expressions better. For example, when comparing 3 × 4 and 2 × 6, I drew three rows of four dots and two rows of six dots. By counting the total dots, I found that both expressions have the same product, which is 12. So, I concluded that they are equal. However, when comparing 10 ÷ 2 and 8 ÷ 3, I found that their quotients are not the same. This showed me that even if the numbers are different, the expressions can still be equal.* ***Feedback:*** *Your use of visual representations to compare multiplication and division expressions is commendable. Keep practicing with different sets of numbers to strengthen your understanding of determining equality in various contexts.* **Error Analysis**: Present students with equations or expressions where equality has been compromised due to errors. Ask them to identify and correct the errors, explaining why the equality was not preserved and how they rectified the situation. ***Incorrect Addition****: Equation: 3+4=6* *Error: In this case, the error occurs during addition. The correct sum of 3+4 is 7, not 6.* ***Incorrect Subtraction****: Equation: 9−5=2* *Error: Here, the error arises from subtraction. The correct difference of 9−5 is 4, not 2.*	 https://www.shutterstock.com/search/yellow-guava Use concrete manipulatives such as counters, blocks, or tiles to demonstrate the properties of multiplication and division. For example, have students arrange counters in different ways to show that the order of multiplication doesn't affect the product (commutative property).  https://us.sofatutor.com/math/videos/commutative-property-of-multiplication Provide opportunities for students to physically group and regroup objects to demonstrate the associative property.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	***Incorrect Multiplication**: Equation: 2×3=5* *Error: The error happens during multiplication. The correct product of 2×3 is 6, not 5.* ***Incorrect Division**: Equation: 8÷2=6* *Error: In this case, the error is in the division. The correct quotient of 8÷2 is 4, not 6*  https://www.splashlearn.com/math-vocabulary/counting-and-comparison/equal-parts	Draw diagrams or use visual aids such as arrays, bar models, or number lines to illustrate multiplication and division problems.  

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 https://www.teacherspayteachers.com/Product/Equal-or-Unequal-6012538 **Problem-Solving Tasks:** Present students with mathematical expressions and pupils should manipulate objects in involving single digit addition, subtraction, multiplication or division to preserve equality EXAMPLE 2 + 4 = 6  https://mathmorning.com/multiplication-learning-skills-2nd/ 3 + 3 =6 2 x 3= 6	https://thirdspacelearning.com/us/math-resources/topic-guides/number-and-quantity/multiplication-and-division/ Visual representations can help students see the relationship between the numbers and identify equal or unequal quantities.  https://www.ncetm.org.uk/media/8d84023fc6a3601/ncetm_spine2_segment02_y2.pdf

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 12 /2 = 6  7 -1 =6 **Real-Life Math Problems:** Present students with real-life math problems that highlight the importance of equality. *For example, ask students to calculate and compare the costs of items at different stores to ensure fair pricing and equality in shopping experiences.* Encourage students to discuss how understanding mathematical equality can help them make informed decisions in daily life.	 https://www.ncetm.org.uk/media/8d84023fc6a3601/ncetm_spine2_segment02_y2.pdf Encourage students to annotate their visual representations with labels or annotations to explain their reasoning.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 https://www.ncetm.org.uk/media/8d84023fc6a3601/ncetm_spine2_segment02_y2.pdf **Storytelling :** Teacher reads story to students while using realia to demonstrate two given quantities or measures are equal or unequal in expressions involving single-digit multiplication and division and preservation of equality in all four operations. For example :

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		In the agricultural village of Birchgrove in St .Andrew's there lived two sisters, Aisha and Leela. Aisha tended to her garden of nutmeg trees, while Leela cared for her flourishing cocoa plantation. One day, as the sun dipped low over the horizon, casting a golden glow across the land, the sisters gathered for their evening meal. Aisha boasted about the abundance of nutmeg she had harvested, while Leela proudly proclaimed the richness of her cocoa yield. *Eager to settle their friendly dispute, the sisters decided to count their produce. Aisha had gathered 2 baskets of nutmegs, each containing 15 nutmegs. Across from her, Leela had harvested 6 sacks of cocoa pods, with 5 pods nestled within each sack.* *As they carefully counted their harvest, they were met with a surprising realization. Despite their different crops and quantities, they had each collected an equal number of fruits: 30 nutmegs for Aisha and 30 cocoa pods for Leela.* *In awe of this unexpected symmetry, the sisters exchanged smiles and embraced in celebration. They marveled at the beauty of their island home, where equality could be found amidst the diversity of nature's bounty.*  https://spiceworld.ca/products/nutmeg https://buenafrutafarm.  com/cacao-chocolate-pods-organic-and-fresh/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Real-Life Examples: Provide real-life examples where mathematical concepts of equality are relevant. *For instance, discuss scenarios like splitting a pizza equally among friends, sharing toys or treats equally, or distributing classroom supplies fairly.* Encourage students to identify the mathematical principles of equality at play in these situations.

Additional Resources and Materials

Manipulatives and Visual Aids
Base-Ten Blocks and Counters:

Purpose: To visualize multiplication and division problems.
Activity: Use base-ten blocks or counters to represent and compare two quantities. For example, show that 3×4 is equal to 12 by grouping blocks, and compare it to another expression like 2×6.
Number Lines:

Purpose: To provide a visual representation of the equality and inequality of quantities.
Activity: Place markers on a number line to show multiplication and division steps. For instance, show that $3 \times 3 = 9$ and $1 \times 9 = 9$ are equal on the number line.
Educational Videos:

Purpose: To provide visual and auditory explanations.
Resource: Videos from platforms like YouTube or Khan Academy that explain multiplication, division, and equality concepts.
Interactive Math Apps:

Purpose: To offer interactive practice and immediate feedback.
Resource: Apps like SplashLearn, Prodigy, or Mathletics where students can practice and compare quantities through guided activities.

Additional Useful Content Knowledge for the Teacher: (*any additional knowledge that the writers believe would be helpful for the teacher such as reading material at a lower or higher grade level, links to curriculum documents for other grades)*

Understanding of the operations

- 3×4
- 3×4 means multiplying 3 by 4.
- 6+6
- 6+6 means adding 6 to 6.

Evaluating the Expressions:

- 3×4=12
- 3×4=12
- 6+6=12
- 6+6=12

Checking for Equality:

- Both sides are equal:
- 12=12
- 12=12

Preservation of Equality:

- Since both sides are equal, we can perform any operation to both sides of the equation while maintaining equality. For example, we can subtract 6 from both sides, and the equation will still hold true:
- 12−6=12−6
- 12−6=12−6.

So, in this case, the two quantities are equal, and the equality holds true for all four operations.
Now, let's consider another example where the quantities are unequal:
Given expression:
5×3=4+4
5×3=4+4

Understanding the Operations:

5×3

5×3 means multiplying 5 by 3.

4+4

4+4 means adding 4 to 4.

Evaluating the Expressions:

5×3=15

5×3=15

4+4=8

4+4=8

Checking for Equality:

The two sides are not equal:

$15 \neq 8$

Preservation of Equality:

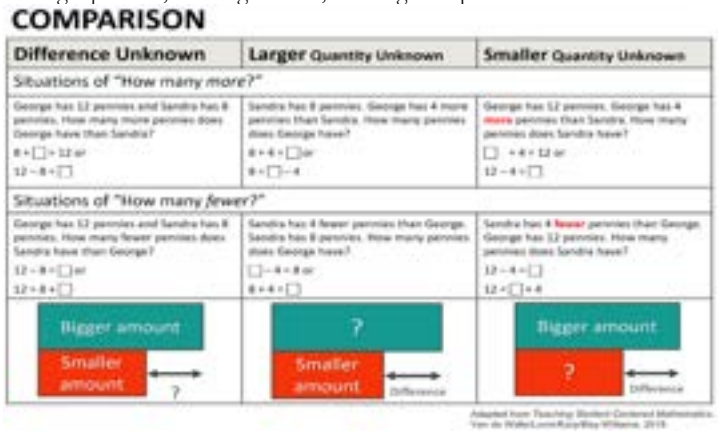
Since the two sides are not equal, we can't apply the same operations to both sides of the equation while maintaining equality.

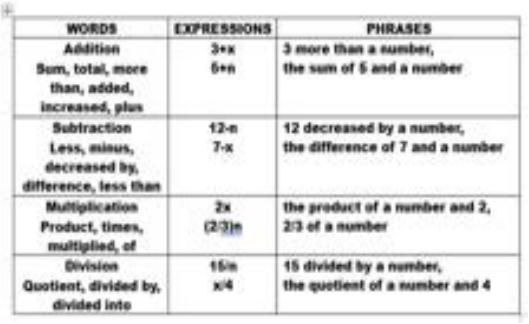
To determine if two given quantities or measures are equal or unequal in expressions involving single-digit multiplication and division while preserving equality in all four operations, carefully evaluate both sides of the equation and ensure that the equality holds true for all four operations.

Opportunities for Subject Integration: *(Additional ideas about how the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)*

Literacy:
Create visual representations with labels or annotations to explain their reasoning
Have *discussions about ways in which the preservation of equality is important in everyday life.*
Civics

Essential Learning Outcome P 2.3: Variables and Relationships – Writing Expressions and Equations
Grade Level Expectations and/or Focus Questions: Create simple expressions and equations in all four operations.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Create expressions and equations in all four operations 2. Translate word problems into mathematical equations and expressions. 3. Write word problems for given expressions and equations. 4. Create expressions and equations for the pictorial and concrete representations **Skills** 5. Use visual aids such as number lines, bar models, or diagrams to represent expressions and equations. 6. Manipulate concrete objects such as counters, cubes, or base-ten blocks to represent equations and expression.	**Choice Boards:** Provide a choice board with a variety of tasks that require students to create expressions and equations using addition, subtraction, multiplication, and division. Include options for different learning styles and abilities, such as writing equations, drawing models, or using manipulatives.  https://dignicevs.pics/product_details/41646655.html	Create opportunities for learners to listen or read statements and write simple expressions based on all four operations. E.g. write an algebraic expression for each verbal expressions (a) five times a number (b) four times a number increase Provide contextual situations for learners to generate represent and solve real life problems using an equation. E.g. Write an equation to represent the situation. Crystal needs 47 cupcakes. She only baked 18. How many more cupcakes does crystal need to bake? Step 1- write a verbal model A number + 18 = 47 Step 2- Define variables for unknown quantities Let n= the number of cupcakes Step 3 – write an equation using a variable for any unknown quantity n + 18 = 47 47= n + 18 47 = 18 + n n= 47 – 18 47 – 18 = n - Provide contextual situations for learners to solve equations through role play or concrete demonstration using money, coins, marbles, or materials from classroom shop corner. E.g Trevor wants to buy a toy car that costs $ 2600. He only has $2300. How much more does Trevor need to buy the car? Write and solve the equation for this problem. **Gallery Walk:** Display various problem-solving tasks around the classroom. Divide the class into groups and have each group rotate around the classroom, examining and discussing the different problems. Encourage groups to create expressions or equations for each problem and record their solutions on chart paper.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		

Name: _____

Multiplication Choice Board

Directions: Choose an activity to complete. When you're finished, color in the box.

PROBLEM SOLVERS Write 5 multiplication word problems. Have a partner solve them.	**ARRAY HUNT** Go on an array hunt around the classroom. Draw each array, tell where you found it, and write a multiplication number sentence to match it.	**GAME TIME** Create a new game to practice your multiplication facts. Be sure to include the directions and anything you need to play. Try it with a friend.
SING-A-LONG Write a song to help you remember your multiplication facts. Teach it to the class.	**STUDENT CHOICE** Choose an activity that will help you practice your multiplication facts. Write about what you did.	**MONEY MATTERS** Marie reached into her pocket and found 5 pennies, 8 dimes, 7 nickels, and 4 quarters. Use multiplication to find out how much money she has.
GARDEN DESIGN Seeds come in packs of 12. You have 3 packs - tomato, cucumber, and pepper seeds. Draw an array to show your garden. You must plant all the seeds. Label where the different types of seeds are planted. Write a multiplication fact for the whole garden.	**HOW OLD ARE YOU?** There are 365 days in a year and 24 hours in a day. Use a calculator and what you know about multiplication to find out how many hours old you are. Now, find out how many hours old your teacher is.	**FACT PRACTICE** Set a timer for 2 minutes. See how many multiplication questions you can answer before the timer goes off. Do it again to see if you can break your record.

https://sellommk.life/product_details/31288759.html

Problem solving

Present word problems and allow students to translate them into numerical expressions and equations and vice versa. For example,

***Problem**: Jenny has **5** times as many stickers as Michael. If Michael has **8** stickers, how many stickers does Jenny have?*

***Numerical Expression**: 5×8*

***Equation**: **J=5M,** where **J** represents the number of stickers Jenny has and **M** represents the number of stickers Michael has.*

***Problem**: There are **24** students in a classroom. Each student needs **4** colored pencils. How many colored pencils are needed in total?*

***Numerical Expression**: 24×4*

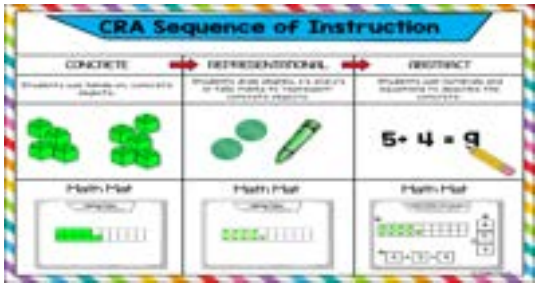
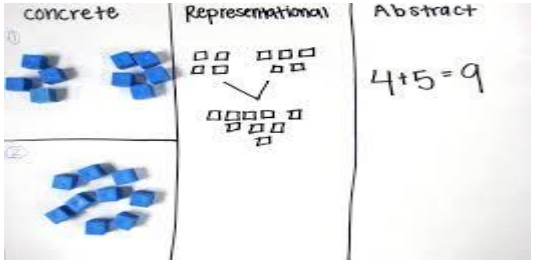
***Equation**: **C=24×4**, where **C** represents the total number of colored pencils needed.*

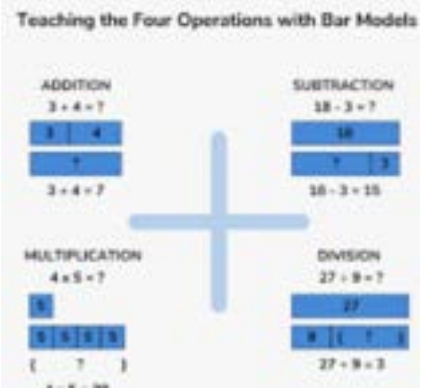
***Problem**: Sarah has saved **$15** each week for the past **n** weeks. If she has saved a total of **$90**, how many weeks has she been saving?*

WORDS	EXPRESSIONS	PHRASES
Addition Sum, total, more than, added, increased, plus	3+x 6+n	3 more than a number, the sum of 5 and a number
Subtraction Less, minus, decreased by, difference, less than	12-n 7-x	12 decreased by a number, the difference of 7 and a number
Multiplication Product, times, multiplied, of	2x (2/3)n	the product of a number and 2, 2/3 of a number
Division Quotient, divided by, divided into	15/n x/4	15 divided by a number, the quotient of a number and 4

Show a pictorial representation to students, such as a picture of 3 groups of 4 apples.
Ask students to describe what they see and then guide them to create an expression (e.g.,3x4).
and discuss how it represents the picture.
Extend this to an equation if applicable (e.g., 3×4=12).
Distribute manipulatives to the students.
Present a concrete problem using the manipulatives (e.g., "Use blocks to show 2 groups of 5 blocks each").
Have students create an expression based on their arrangement (e.g., 2×5).
Ask students to write down the expression and, if possible, solve it to form an equation (e.g., 2×5=10).
Repeat with several examples, varying between addition, subtraction, multiplication, and division.

Give students a set of pictorial cards, each showing different scenarios (e.g., 7 apples and 3 oranges).
Ask students to create expressions and, where possible, equations based on these pictures.
Encourage them to use both addition and multiplication (e.g., 7+3, 2×5).
Have students share their expressions and equations with the class.
Discuss the different ways students represented the same picture with expressions and equations.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Numerical Expression:*15×n=90* ***Equation***: *15n=90* ***Problem***: *A farmer has* ***3*** *fields of corn. Each field has* ***18*** *rows of corn. How many rows of corn does the farmer have in total?* ***Numerical Expression***: *3×18* ***Equation***: ***R=3×18****, where* ***R*** *represents the total number of rows of corn.* ***Problem***: *Emily has* ***$45****. She wants to buy n books, and each book costs* ***$9****. How many books can Emily buy?* ***Numerical Expression***: *45÷9* ***Equation***: *45=9n* **Drawings and Diagrams:** Encourage students to draw pictures or diagrams to represent the problem scenario. *For instance, if the problem involves sharing candies equally among friends, students can draw circles to represent the candies and divide them into equal parts. Then, they can write expressions or equations to represent the division.*  https://matheasily.com/division-with-pictures.html	Highlight the importance of understanding the relationship between the pictorial/concrete representations and their corresponding mathematical expressions and equations.  https://djgnicevs.pics/product_details/18634557.html  https://mathteachingstrategies.wordpress.com/2008/11/24/concrete-and-abstract-representations-using-mathematical-tools/ Allow students to use number lines, bar models, and diagrams to represent and solve mathematical expressions and equations. Teacher should demonstrated of each method. Students then practice using number lines, bar models, and diagrams with guided and independent activities. They share and discuss their work with the class to reinforce understanding.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Story Writing Writing a story for an expression 34 + 18 1. What do you notice about the expression? 2. Who is the story about? 3. Where is the story taking place? 4. What is happening in the story? 5. What do the numbers represent in the story? https://www.mathcoachscorner.com/2022/08/you-write-the-story-math-word-problems/ **Matching** Pupils should be able to match word problems or concrete and pictorial representation with the correct expression or equation **Checklist** Teachers use rubrics and checklist to assess students as they solve problems using equations and expressions as well as write problems to represent the given equations and expressions	 *Retrieved from: https://thirdspacelearning.com/blog/teach-bar-model-method-arithmetic-maths-word-problems-ks1-ks2/*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		

Criteria	YES	NO
Understand the problem statement and identify the key information.		
Determine the appropriate operation(s) needed to solve the problem (addition, subtraction, multiplication, division).		
Write an equation or expression to represent the problem accurately.		
Solves the equation or expression correctly to find the answer.		
Checks the solution for reasonableness and accuracy in the context of the problem.		
Understands the given equation or expression and its meaning in context.		
Creates a problem scenario that matches the given equation or expression.		
Writes a clear and coherent problem statement that includes all necessary information.		
Uses appropriate mathematical symbols and notation in equations and expressions.		
Demonstrates understanding of the relationship between mathematical symbols and real-world quantities.		
Communicates mathematical reasoning clearly and logically.		
Provides explanations or visual representations to support problem-solving processes.		
Responds to questions and feedback by elaborating on mathematical thinking and making revisions as needed.		
Demonstrates accuracy in performing mathematical operations and solving equations.		
Applies efficient strategies to simplify expressions and solve equations.		
Creativity and Critical Thinking		
Applies critical thinking skills to analyse problem situations and make connections between mathematical concepts.		
Shows flexibility in approaching problems from multiple perspectives and considering alternative solution methods.		

Additional Resources and Materials

(Additional material and resources that are not included in the Inclusive Learning and/or Inclusive Assessment Strategies that may be useful for lesson planning)
Nutmeg, cocoa, guava, blocks , counters , plums, marbles

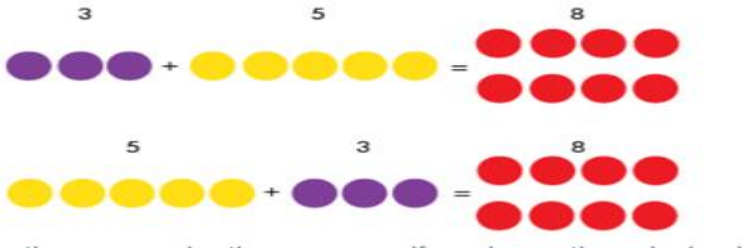
Additional Useful Content Knowledge for the Teacher: (

Equations are mathematical statements containing two algebraic expressions on both sides of an 'equal to (=)' sign.
It shows the relationship of equality between the expression written on the left side with the expression written on the right side.
In every equation in math,the L.H.S = R.H.S (left hand side = right hand side).
Equations can be solved to find the value of an unknown variable representing an unknown quantity.

A mathematical expression is a combination of numbers, variables, and mathematical operations (such as addition, subtraction, multiplication, division, exponentiation, etc.) that represents a value.
EXAMPLES
2+3
x - 4
7x5
An equation is a mathematical statement that shows that two mathematical expressions are equal. For instance, x + 5 = 14 is an equation, in which x + 5 and 14 are two expressions separated by an 'equal' sign.

Commutative property:

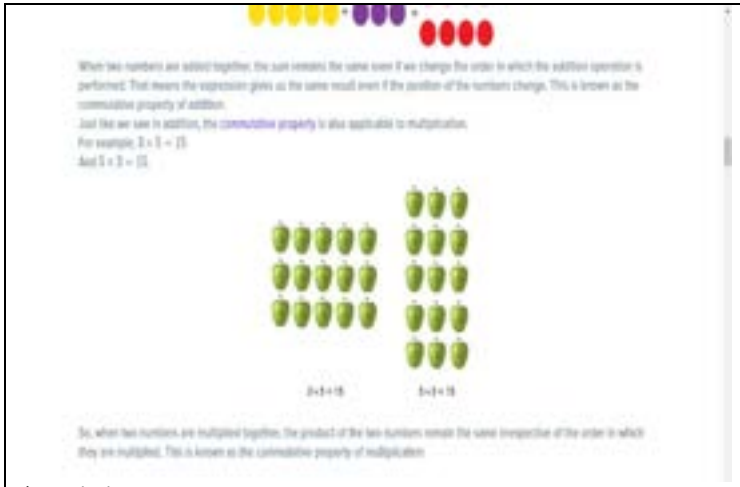
Commutative property states that changing the order of addends or factors does not change the sum or the product.
Example :3 + 5 = 5+ 3



The commutative property is also applicable to multiplication.

For example, 3×5=15

And 5×3=15
.



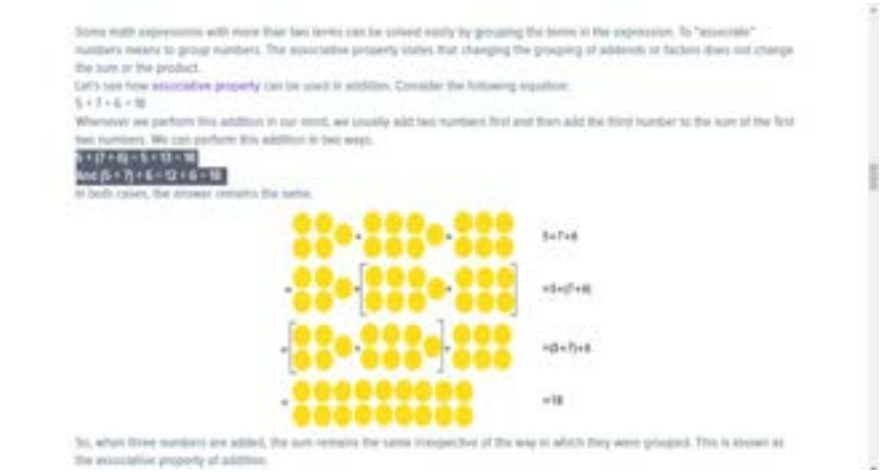
Associative property

The associative property states that changing the grouping of addends or factors does not change the sum or the product.

For example :

5 + (7 + 6) = 5 + 13 = 18

And (5 + 7) + 6 = 12 + 6 = 18

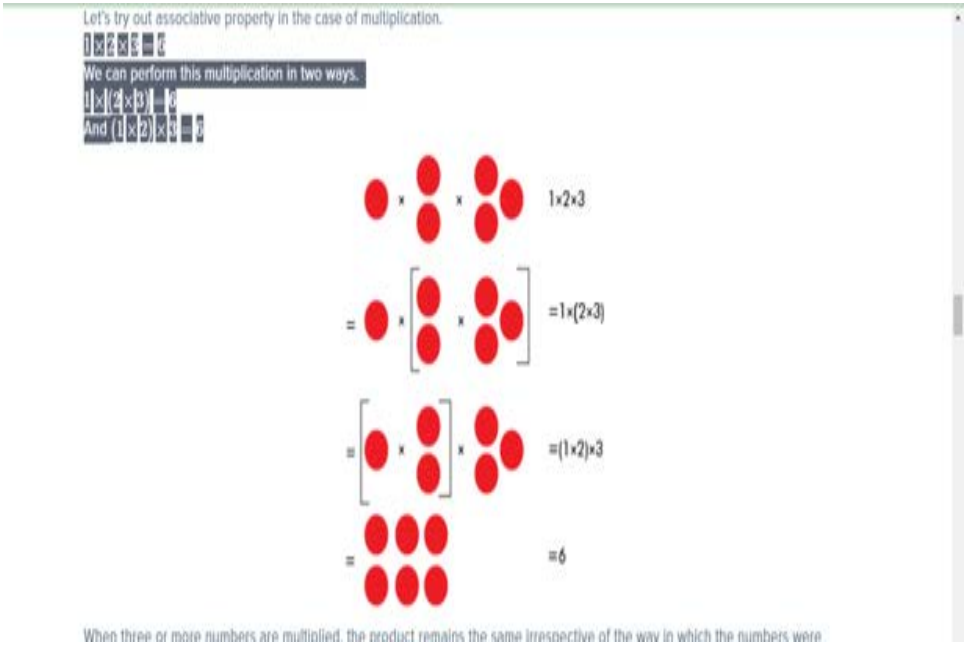


The associative property is also applicable to multiplication.

1×2×3=6

1×2×3=6

We can perform this multiplication in two ways.
1×(2×3)=6
1×(2×3)=6
And
(1×2)×3=6



Identity property:

Identity property states that when a number is added, subtracted, multiplied or divided by a specific number, the result will be the same as the original number. Let's find out more about the identity property of addition and subtraction and the identity property of multiplication and division.

Identity property of addition and subtraction

0 is considered as the additive identity in the case of addition and subtraction. When we add or subtract 0 to any number, we get the same number.
For example, 7 + 0 = 0, 0 + 2 = 2, and 5 – 0 = 5

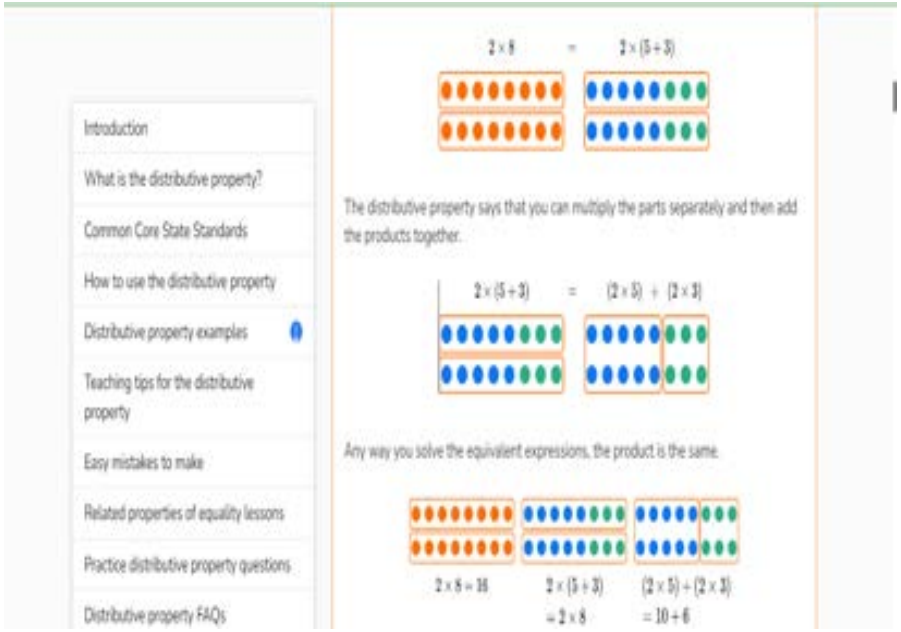
Identity property of multiplication and division

1 is considered as the multiplicative identity in the case of multiplication. If we multiply any number by 1, we get the same number.
For example,
5×1=5,1×7=7
5×1=5,1×7=7
This holds true for division as well. Any number divided by 1 gives the same number.
For example,
5÷1=5
5÷1=5.

https://byjus.com/us/math/numbers-properties/#:~:text=There%20are%20four%20number%20properties,%2C%20subtraction%2C%20multiplication%20and%20division.

Distributive property

Distributive property states that multiplying the sum of two or more addends by a number is the same as multiplying each addend individually by the number and then adding the products together. Interestingly, the distributive property is also applicable to subtraction. Let's take a look at an example.



https://thirdspacelearning.com/us/math-resources/topic-guides/number-and-quantity/distributive-property/

Opportunities for Subject Integration: *(Additional ideas about how the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum*

Science

Measurement and Data Analysis

- **Activity**: Simple experiments involving measurement.
  - **Example**: Measure the growth of a plant over several weeks. Use variables to represent days and height, and write simple equations like H=2D+3H = 2D + 3H=2D+3 (where HHH is height and DDD is days).
  - **Integration**: Have students track and predict the growth of their plant using the equation.

Social Studies

Economic Concepts

- **Activity**: Simple budgeting and spending exercises.
  - **Example**: Create a classroom store where students can "buy" items with classroom currency. Use variables for costs and equations like T=P×QT = P \times QT=P×Q (where TTT is total cost, PPP is price per item, and QQQ is quantity).
  - **Integration**: Students can practice adding and multiplying to keep track of their spending and savings.

Language Arts

Story Problems and Word Problems

- **Activity**: Create and solve story-based math problems.
  - **Example**: Write a short story where characters need to divide treasure equally among pirates. Use variables and equations like T=P×NT = P \times NT=P×N (where TTT is total treasure, PPP is pirates, and NNN is number of pieces each pirate gets).
  - **Integration**: Students can write their own stories and exchange them with peers to solve.

Art

Scale and Proportion

- **Activity**: Drawing to scale.
  - **Example**: Draw a picture and then create a larger version using a scale factor. If the original is 5 cm and the scale is 2, write an equation L=5×2L = 5 \times 2L=5×2 (where LLL is the length of the scaled drawing).
  - **Integration**: Discuss how multiplication changes the size of the drawing.

Patterns

- **Activity**: Create and extend patterns.
  - **Example**: Use shapes to create a pattern and use variables to describe it. For example, if a pattern has 2 circles followed by 3 squares, represent it as C=2×NC = 2 \times NC=2×N and S=3×NS = 3 \times NS=3×N (where NNN is the number of repeats).
  - **Integration**: Have students predict the next elements in the pattern using their equations.

Physical Education

Fitness and Health Tracking

- **Activity**: Track exercise.
  - **Example**: If a student runs 3 laps of 200 meters each, use T=L×DT = L \times DT=L×D to calculate total distance (where TTT is total distance, LLL is laps, and DDD is distance per lap).

- **Integration**: Students can set fitness goals and track their progress using simple equations.

Music

Rhythm and Beats

- **Activity**: Counting beats in music.
  - **Example**: If a song has 4 beats per measure and there are 8 measures, use T=B×MT = B \times MT=B×M to find total beats (where TTT is total beats, BBB is beats per measure, and MMM is measures).
  - **Integration**: Students can write their own rhythms and use equations to count beats.

Technology

Basic Programming and Algorithms

- **Activity**: Use simple coding platforms like Scratch.
  - **Example**: Create a program that moves a character a certain number of steps. Use variables to represent steps and write an equation like S=10×NS = 10 \times NS=10×N (where SSS is total steps, and NNN is number of times the movement is repeated).
  - **Integration**: Students can experiment with different values and see the outcomes.

Essential Learning Outcome P3.1: Modelling Quantitative Relationships and Analyzing Change – Modelling Patterns and Relationships with Equations and Functions

Grade Level Expectations and/or Focus Questions: Identify and describe situations with constant or varying rates of change and compare them.

Specific Curriculum Outcomes

Learners will be expected to:

Knowledge:

1. Identify situations in everyday life where rates of change occur.

2. Distinguish between situations with constant rates of change and situations with varying rates of change.

3. Describe situations with constant rates of change using appropriate vocabulary

4. Describe situations with varying rates of change using appropriate vocabulary.

Inclusive Assessment Strategies

Mathematical Games:
Incorporate mathematical games and puzzles that involve rates of change. For instance, you can create scavenger hunts where students have to calculate and compare rates of change to solve clues and find hidden objects.

Scavenger Hunt: "Math Detectives"

Objective: *Use your math skills to solve clues and find hidden objects around the school.*

Clue 1: *"Start your adventure where numbers abound, Find the place where measurements are found. Look for the tool that tells us the time, Calculate its rate, and crack the first rhyme."*

Hidden Object: *Clock in the school hallway*

Clue 2: *"Next, head to where the water flows, A fountain waits, but nobody knows. Count the droplets falling from the top, Compare their speed, and don't stop!"*

Hidden Object: *School Tap*

Clue 3: *"Now it's time to hit the track, Where runners sprint and never look back. Measure the distance of one full lap, Calculate the pace, and close the gap."*

Hidden Object: *Track starting line/ where game are played*

Inclusive Learning Strategies

Role-playing: Encourage role-playing activities where students act out scenarios with constant or varying rates of change. *For example, students can pretend to be plants growing at different rates or cars speeding up and slowing down on a race track.*

Involve learners in a variety of situations that model varying or constant change. Examples:

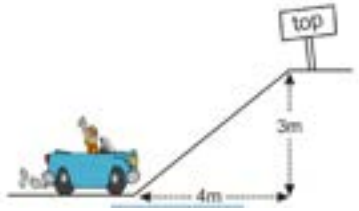
i) observing, measuring and recording the growth of a seedling over a period of time. (In this situation the teacher can ask learners to describe the growth pattern: does the plant grow by the same amount each day?)

ii) mark off 2metre distances on a line(e.g 10m line)and have learners walking the whole distance as you observe and record the time in seconds they take to pass each 2 metre mark.

Display graphs and tables and engage students in rich discussions as they identify and describe constant and varying rates of change. E.g

Table shows the ages of a child and the corresponding ages of his father.

My age (x) (years)	MyMothersr's age (y) (years)
6	28
7	29
8	30
10	31

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Clue 4: *"To solve the final riddle, take a trip, To the spot where numbers make you flip. Count the steps from here to there, And find the treasure with great care."* ***Hidden Object:*** *Treasure box hidden near the school entrance* ***Instructions:*** *Divide students into small groups and provide each group with a copy of the scavenger hunt clues.* *Explain the rules of the scavenger hunt and emphasize the importance of using math skills to solve the clues.* *Allow students to work together to solve each clue and find the corresponding hidden objects.* *Encourage students to calculate rates of change, compare measurements, and apply other math concepts as they progress through the scavenger hunt.* *Once all groups have found the hidden objects, reconvene to discuss their findings and share their calculations.* *Award prizes or certificates to the groups that successfully complete the scavenger hunt in the shortest amount of time or with the most accurate calculations.* **Projects** Pupils can plant a particular crop in different conditions in their school garden • measure plants every week • record the measurement • analyse the rate of growth every week • Compare the rate of change on a weekly basis • Explain the rate of change using appropriate vocabulary such as fixed, same, regular and irregular, stable and unstable	**Field Trips** Pupils go to the school garden or one in the community over a week or two week period and observe - measure, record and analyze the change. ***Or*** count and record the number of vehicles that pass by between the same time each day of the school week to develop a pattern and then discuss their observations.  *Retrieved from: https://www.turito.com/row* Ask prompting questions like: -why do you think the above situation represents varying rates of change or constant rate of change. Can you prove it? How? Encourage learners to compare situations that model rates of change. e.g Markis running at a constant speed of 2m/s and Mary is running at 3m/s. If they both start running at the same time, use an illustration of your choice to show the distance each of them cover in their first 5 seconds of motion. Time(s) | Distance covered by Max | Distance covered by Molly

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	or Children have to make electrical circuits and record observations when more batteries or lamps are added **Verbal Descriptions:** Encourage students to verbally describe situations with constant rates of change using appropriate vocabulary. ***CONSTANT*** *Provide sentence starters or prompts to scaffold their responses, such as "In this situation, the rate of change is constant because..." or "I can tell the rate of change is steady because..." or "In this scenario, the rate of change remains the same because..." or "I can tell the rate of change is constant because..."* ***VARYING*** *"In this scenario, the rate of change differs because..."* *"I can tell the rate of change is varying because..."* *"The rate of change in this situation fluctuates because..."* *"One way I know the rate of change is different is..."* *"When the rate of change varies, it means that..."* *"I can predict future values because the rate of change..."* *"If we calculate the change over equal intervals, we find that..."*	<table><tr><td>1</td><td>2m</td><td>3m</td></tr><tr><td>2</td><td>4m</td><td>6m</td></tr><tr><td>3</td><td>6m</td><td>9m</td></tr><tr><td>-</td><td></td><td></td></tr><tr><td>-</td><td></td><td></td></tr></table> Learners can use the number line also or use counters to build the patterns created Create and tell stories that illuminate the concepts of varying and constant rates of change and ask learners to make up their own stories to same model. Example: - Jermain lives 300 metres away from the school. If he takes 2 minutes to cover every 50 metres, how long will his journey from home to school take? Use a diagram to prove that your answer is correct. Allow learners to use geoboards and rubber bands to make graphs depicting constant or varying rates of change. **Story telling** *Once upon a time, on the beautiful island of St. Vincent, there lived a little farmer named Diego. Diego had a small vegetable garden where he grew tomatoes, his favorite crop.* *Diego noticed something fascinating about his tomato plants. Every day, they grew taller by the same amount. No matter the weather or the time of year, the plants always reached exactly 5 inches taller by the end of each day.* *Diego loved watching his tomato plants grow steadily. He would tell his friends, "The height of my tomato plants increases by the same amount every day. That means the rate of growth is constant!"*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Diego's friends were amazed by his observation. They marveled at how the tomato plants seemed to grow at a steady pace, just like the hands of a clock ticking away the seconds. *From that day on, whenever they visited Diego's garden, they would talk about the constant rate of change of the tomato plants. They learned new words like "steady," "unchanging," and "consistent" to describe the miraculous growth they witnessed.* *And so, Diego and his friends continued to enjoy the wonders of nature, learning and exploring the concept of constant rates of change through the simple beauty of growing tomato plants.* ***or*** *In the lush forests of St. Vincent, there lived a curious young girl named Maya. Maya loved exploring the wonders of nature, especially the tall trees that reached up toward the sky.* *One day, Maya decided to study the growth of the trees in the forest. She noticed something interesting: some trees seemed to grow faster than others. As Maya wandered through the forest, she discovered that the trees in the sunny clearings grew taller at a much quicker pace than those in the shaded areas.* *Maya excitedly shared her findings with her friends, saying, "The trees in the open areas grow faster because they receive more sunlight! Sunlight helps the trees make food through a process called photosynthesis, which fuels their growth."* *Her friends were intrigued by Maya's discovery. They observed how the trees in the bright sunlight stretched their branches upward, reaching for the warmth and energy of the sun. Meanwhile, the trees in the shade grew more slowly, their leaves straining to capture whatever sunlight filtered through the dense canopy above.* *Maya and her friends marveled at the varying rates of growth in the forest, using words like "faster," "slower," "quicker," and "more gradual" to describe the different speeds at which the trees grew.* *From that day on, Maya and her friends continued to explore the forest, learning about the fascinating ways in which nature adapts and thrives in response to its surroundings. And as they watched the trees grow and change with the seasons, they gained a deeper understanding of the concept of varying rates of change.*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Additional Resources and Materials

(Additional material and resources that are not included in the Inclusive Learning and/or Inclusive Assessment Strategies that may be useful for lesson planning)

Technology Integration: These tools can provide virtual experiments and simulations that allow students to explore different scenarios and see the effects of changing variables. For Example,

Prodigy*: Prodigy is a math game-based learning platform that offers adaptive math practice for students in grades 1 through 8. It covers various math topics, including rates and ratios, through engaging gameplay that adapts to each student's skill level.*

Math Playground*: Math Playground is a website that offers a wide range of math games, activities, and interactive tools for elementary students. It includes games and simulations related to rates of change, such as graphing activities and proportional reasoning games.*

Khan Academy*: Khan Academy offers free online lessons, exercises, and instructional videos covering a wide range of math topics, including rates of change. Students can practice solving problems related to rates, ratios, and proportions at their own pace with instant feedback.*

National Library of Virtual Manipulatives (NLVM)*: NLVM provides interactive virtual manipulatives and simulations for K-12 mathematics. They offer simulations related to rates of change, such as graphing tools, proportional reasoning activities, and dynamic geometry explorations.*

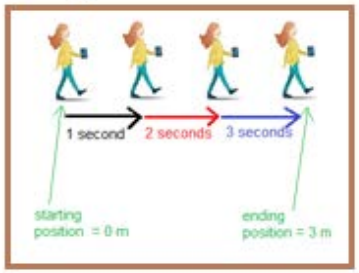
IXL Math*: IXL Math provides interactive practice exercises for students in grades K-12. It covers a wide range of math topics, including rates of change, with adaptive questions that adjust to each student's skill level.*

Mathletics*: Mathletics offers online math activities, games, and challenges for students in elementary and middle school. It includes interactive lessons and practice exercises related to rates of change and other mathematical concepts.*

Additional Useful Content Knowledge for the Teacher:

A rate of change is a rate that describes how one quantity changes in relation to another quantity. A constant rate of change is predictable. A varying rate of change if often not predictable. Graphs and tables can be used to identify, describe and compare the different rates of changes. It is important for learners to be involved in activities that model the rates of changes in order for them to develop a solid understanding of the concepts.

Modelling constant rate of change



Examples of tables and charts that can be used to record data

Time	Temperature

# of tickets sold	Money earned

side length	perimeter
1	4cm
2	8cm

Hours	Number of customers

A rate of change is simply how fast something is changing in relation to something else. We can express this ratio as:

Rate of change = change in y/change in x

Constant rate, means that the amount of change per unit of time remains consistent.

Examples

A car travels 60 miles every hour, its speed is changing at a constant rate of 60 miles per hour.

A plant grows 2 inches every week, the growth rate is constant at 2 inches per week.

The rate of change of the minute hand's position with respect to time is constant within each hour. Similarly, the hour hand completes a full rotation every 12 hours, so its rate of change is also constant within each 12-hour interval.

Uniform Motion: A pendulum swinging back and forth exhibits a constant rate of change in its position over time. The time it takes for each swing (period) remains consistent if external factors like air resistance are negligible.

Regular Paycheck: If someone earns a fixed salary, the rate of change of their earnings over time is constant. For example, if they earn $500 per week, their earnings increase by $500 each week, demonstrating a constant rate of change.

Subscription Services: Some subscription services charge a fixed amount per month. The rate of change of the cost over time remains constant, as the subscription fee is consistent each month.

Fuel Consumption: In some cases, fuel consumption in vehicles can exhibit a constant rate of change. For instance, if a vehicle burns fuel at a constant rate while idling, the amount of fuel consumed per unit of time remains consistent.

Varying rate of change means that the rate at which something changes is not consistent over time. It may speed up, slow down, or change direction altogether. For instance, the speed of a car in city traffic might vary due to traffic lights, congestion, or changes in speed limits. Similarly, the growth rate of a plant may vary depending on factors like sunlight, water, and temperature.

Traffic Flow: The rate of change of traffic density on a road varies throughout the day. During rush hour, traffic density increases rapidly as more vehicles join the road, while during off-peak hours, the rate of change slows down as fewer vehicles are on the road.

Temperature Changes: The rate of change of temperature throughout the day is not constant. For example, in the morning, temperatures might rise rapidly as the sun comes up, but the rate of change may slow down or even decrease in the evening as the day cools off.

Population Growth: The rate of change of population in a city or region can vary over time. During periods of high birth rates or immigration, the population growth rate increases, while during economic downturns or emigration waves, the growth rate may decrease or become negative.

Learning a Skill: When learning a new skill, such as playing a musical instrument or mastering a sport, the rate of improvement can vary. Initially, rapid progress might be made as basic techniques are learned, but as proficiency increases, the rate of improvement may slow down.

Bank Account Balance: The rate of change of a bank account balance can vary depending on factors such as deposits, withdrawals, and interest accrual. For example, when money is deposited into the account, the balance increases rapidly, but the rate of change may slow down if withdrawals are made or if interest is accrued periodically.

Growing Plants: The rate of growth of plants can vary depending on factors such as sunlight, water, and temperature. In optimal conditions, plants may grow quickly, but the rate of growth may slow down during periods of drought or extreme temperatures.

Speed of a Vehicle: The rate of change of the speed of a vehicle can vary depending on factors such as traffic conditions, road terrain, and weather. For example, the rate of acceleration may be high when a car is speeding up on a straight road, but it may decrease when encountering traffic congestion or uphill slopes.

Opportunities for Subject Integration: *(Additional ideas about how the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)*

Science

Plant Growth

Activity: Measure and record the growth of a plant over time.
Example: Measure the height of a plant every week for six weeks. Discuss whether the plant grows at a constant rate (e.g., 2 cm per week) or at a varying rate.
Integration: Create a graph showing the plant's growth and identify periods of constant and varying rates of change. Compare the growth rates of different plants.

Temperature Changes

Activity: Track daily temperature changes over a month.
Example: Record the temperature at the same time each day and graph the results.
Integration: Identify days or weeks with constant rates of temperature change and those with varying rates. Discuss how weather patterns affect these rates.

Social Studies

Historical Population Growth

Activity: Study the population growth of a specific city or country over a century.
Example: Use historical data to create a timeline of population changes.
Integration: Identify periods of constant population growth and periods with significant changes. Discuss factors that contributed to these changes, such as wars, natural disasters, or economic booms.

Economic Growth

Activity: Analyze the growth of a fictional economy over time.
Example: Present students with a story where a village's economy grows at different rates during different periods.
Integration: Compare periods of constant economic growth with periods of varying growth, identifying possible causes for the changes.

Language Arts

Reading and Writing

Activity: Write stories or read books with themes of change.
Example: Read a story where a character experiences constant or varying rates of change in their life, such as learning a new skill or adapting to a new environment.
Integration: Discuss how the rates of change affect the character's development and the story's plot. Write a story that includes a timeline of events showing constant and varying rates of change.

Art

Creating Timelines

Activity: Create a timeline of an artist's work or a historical art movement.
Example: Track the number of artworks created by an artist each year.

Integration: Identify periods of constant and varying artistic output. Discuss factors that might influence these rates, such as personal circumstances or historical events.
Patterns and Sequences

Activity: Create artwork using patterns with constant and varying changes.
Example: Design a repeating pattern that changes at a constant rate, then create another pattern with varying changes.
Integration: Compare the visual effects of constant and varying changes in patterns and discuss how this can be applied in art.

Physical Education
Fitness Tracking

Activity: Track physical activity over time.
Example: Record the number of jumping jacks performed each day for two weeks.
Integration: Identify days with constant or varying activity levels. Discuss factors that might influence these rates, such as energy levels or other commitments.
Sports Performance

Activity: Analyze the performance of a sports team or athlete over a season.
Example: Track the number of goals scored by a soccer team in each game.
Integration: Identify periods of constant performance and periods with varying performance. Discuss factors like training, injuries, or changes in strategy.

Music
Rhythm and Tempo

Activity: Explore constant and varying tempos in music.
Example: Listen to a piece of music and identify sections with constant tempo and sections with varying tempo.
Integration: Compare the effect of constant and varying tempos on the overall feel of the music. Create a simple piece of music with sections of constant and varying tempos.
Technology
Data Analysis

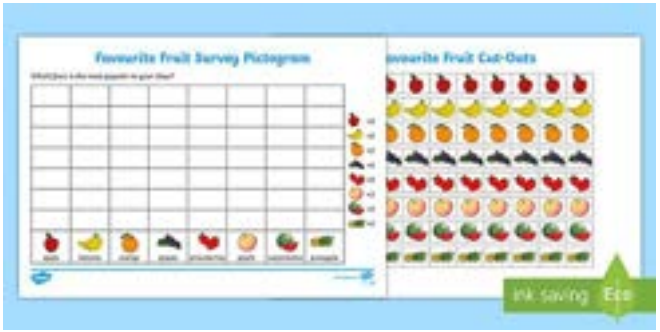
Activity: Use spreadsheet software to analyze data sets.
Example: Input data on daily screen time over a month and create graphs to visualize the data.
Integration: Identify periods with constant and varying screen time and discuss possible reasons for these patterns.
Coding and Algorithms

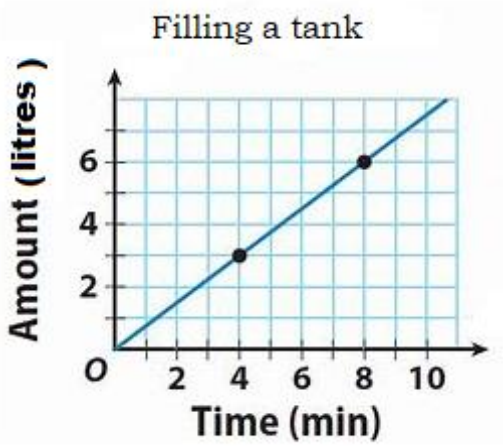
Activity: Write simple programs that simulate constant and varying changes.
Example: Create a program that models the growth of a savings account with constant and varying interest rates.
Integration: Compare the outputs of the programs and discuss how different rates of change affect the results.

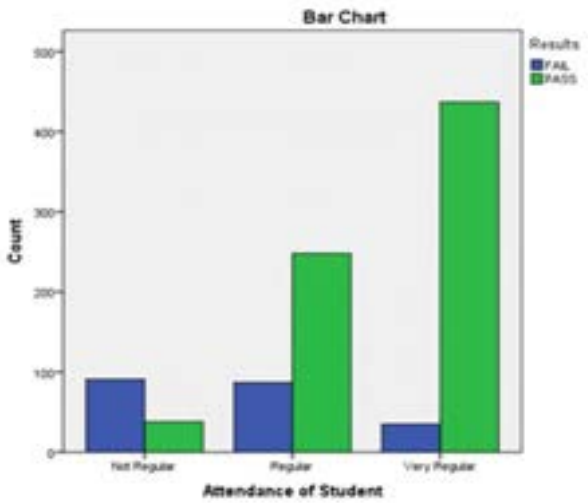
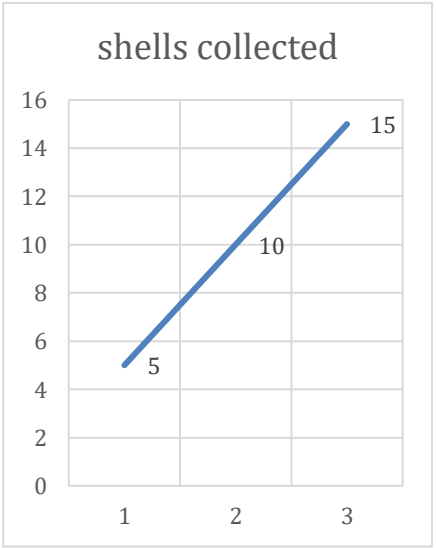
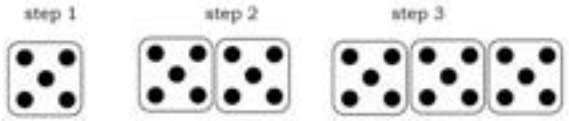
Essential Learning Outcome P3.2: Modelling Quantitative Relationships and Analyzing Change – Representing Functions and Relationships

Grade Level Expectations and/or Focus Questions: Demonstrate how a change in one variable relates to a change in a second variable.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: 1. Recognize and describe patterns and relationships between two variables. 2. Interpret and explain relationships shown in simple graphs. 3. Predict how changes in one variable may affect another in simple contexts. Skills 1. Use tables to organize and analyze data showing relationships between variables. Values 1. Apply understanding of variable relationships to solve real-world problems.	Strategy: explain patterns and relationships ***Example:*** Pair students and ask them to discuss the relationship between the number of students in the classroom (variable 1) and the number of chairs needed (variable 2). Encourage them to explain their observations to each other. ***Hands-on Activities***: Incorporate hands-on activities where students create their own graphs using materials like colored blocks or stickers. This allows for tactile and kinesthetic learning. *Example:* Provide each student with a set of stickers representing different types of fruits and ask them to create a pictograph showing the number of each fruit they eat in a week.	Peer Collaboration: ***Strategy:*** Foster peer collaboration through cooperative learning activities where students work together to analyze patterns. ***Example:*** Divide students into small groups and provide them with a set of data showing the relationship between the number of pages read (variable 1) and reading comprehension scores (variable 2). Have students discuss the patterns they observe and explain their findings to each other. Use a variety of situations and materials to demonstrate how change in one variable relates to change in a second variable. E.g Ask one learner to raise both hands, then ask a second learner to do the same, and a third and so on. Complete the table below and discuss how the number of learners affect the number of hands raised. Number of learners — Number of hands raised

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 https://www.twinkl.com/resource/t-t-2370-favourite-fruit-pictogram ***Storytelling*** *Encourage students to identify patterns within the story and describe the relationships between different elements.* ***Title: The Magical Garden*** *Once upon a time, in a quaint village nestled between rolling hills and lush greenery, there was a magical garden. This garden, hidden away behind a rusty gate, was known to be full of wonders. The villagers whispered stories about its enchanted flowers that changed colors with the phases of the moon and its trees that whispered secrets to the wind.* *One sunny morning, a curious girl named Lily decided to explore the garden. With a twinkle in her eye and a skip in her step, she tiptoed through the gate and into the magical world beyond.* *As Lily wandered deeper into the garden, she noticed something peculiar. The flowers seemed to be arranged in a specific order. Red, blue, yellow, red, blue, yellow... It was a pattern! Each row of flowers alternated colors in the same sequence. Lily giggled with delight as she followed the colorful trail, admiring the beauty of the pattern.* *But the surprises didn't end there. As she strolled further, she stumbled upon a group of trees standing tall and majestic. They were arranged in a circle, with each tree holding a different type of fruit – apples, oranges, pears, apples, oranges, pears... Another pattern!*	1 2 2 4 3 6 -Tell learners that there are 10 spiders in a jar. Ask them how many spider legs will be in the jar if: 1 spider came out 2 spiders came out 5- spiders came out 3 more spiders were added -There are 52 cards in a deck and there are four players. At the beginning of every round each player draws 4 cards. How is the number of cards in the deck changing as the rounds increase? How do you know this? Represent this change in at least 2 different ways.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Lily marveled at how the trees seemed to dance in harmony, each one contributing to the rhythm of the circle. *Feeling like an explorer uncovering hidden treasures, Lily continued her journey through the magical garden. Soon, she came across a pond shimmering in the sunlight. To her amazement, colorful fish darted beneath the surface in a synchronized dance. They swam in circles, forming ripples that mirrored the patterns of the trees and flowers.* *As the day drew to a close, Lily sat beneath a giant oak tree at the heart of the garden. She gazed around, marveling at the beauty of the patterns she had discovered – the repeating colors of the flowers, the circular arrangement of the trees, the synchronized movements of the fish.* *In that moment, Lily realized that patterns were everywhere, woven into the very fabric of the world around her. And as she closed her eyes, she felt a sense of wonder and gratitude for the magic of the garden and the patterns that connected all living things.* *And so, with a heart full of joy and a mind buzzing with newfound knowledge, Lily bid farewell to the magical garden, knowing that she would always carry its secrets within her.* **Visual Representations**: Use visual aids such as graphs, charts, tables, or diagrams to illustrate relationships between variables. Provide examples where changes in one variable are represented graphically and ask students to predict how these changes will affect another variable. Allow students to interpret the visual data and make predictions based on their observations. **Bar Graph**: Example: A bar graph showing the number of hours in school attendance by students (variable 1) and the corresponding grades obtained (variable 2) *Variable 1:* Hours attending school (in hours) *Variable 2:* Grades obtained (Pass, Fail) Students can predict how changes in the number of hours attending school will affect their grades. For instance, they can predict that spending more hours in school will lead to more passes.	 Ask learners to study the graph above and explain the pattern that they observe. Ask learners to represent this pattern of change in another way, for example in a table. Guide learners in modelling multiple representations of the same relationship. Example: Give learners a table showing a relationship between two variables. p q 1 5 2 10

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 https://www.researchgate.net/figure/Bar-chart-for-results-Pass-and-Fail-by-participation-engagement-level_fig4_316068585 (change graph) **Real-World Problem Solving:** Present students with authentic, real-world problems that require them to apply their understanding of variable relationships to find solutions. Use scenarios relevant to students' lives, such as budgeting money, planning a garden, or measuring ingredients for a recipe. *For example:* ***Budgeting Money for a Birthday Party:*** ***Scenario:*** *Sarah wants to plan a birthday party for her friend. She has a budget of $100 to spend on decorations, food, and activities for the party. Problem: Sarah needs to decide how much money to allocate to each aspect of the party while staying within her budget. She must consider variables such as the cost of decorations, food, and entertainment, as well as any potential discounts or sales.*	3 15 Have learners to write a story problem that matches the relationship. That is, Ravi had 5 shells after his first trip to the beach, 10 after his second, 15 after his third….  Encourage learners to build use concrete material to build the pattern. E.g 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Ask learners to represent the relationship on a graph. **Story Mapping**: Provide a visual story map template where students can chart the plot elements of a story, including characters, events, settings, and key actions. Encourage them to identify patterns and relationships between these elements, such as cause and effect or character interactions. ***Manipulatives and Hands-On Activities:*** Utilize manipulatives such as blocks, counters, or objects to demonstrate changes in variables and their effects. ***For example,*** use blocks to represent quantities of items in a shopping scenario and ask students to predict how changes in prices will affect the total cost. **Cooperative Learning:** Encourage students to share ideas, discuss strategies, and support each other in finding solutions. *For example* ***Measuring Ingredients for a Recipe:*** ***Scenario:*** *Emma wants to bake cookies for her family. She has a recipe that requires various ingredients, such as flour, sugar, butter, and chocolate chips.* ***Problem:*** *Emma needs to measure the correct quantities of each ingredient to make the recipe. She must understand the relationship between different measurements (e.g., cups, teaspoons) and adjust the recipe based on the number of cookies she wants to bake. She also needs to consider variables such as taste preferences and dietary restrictions when choosing ingredients.*

Additional Resources and Materials
(Additional material and resources that are not included in the Inclusive Learning and/or Inclusive Assessment Strategies that may be useful for lesson planning

Geoboards and rubber bands
Measuring Tape
Stop Watch
Blocks
Graph paper
Counters

Additional Useful Content Knowledge for the Teacher: At this stage, it's essential for learners to see multiple representations of the same relationship and be able to compare them. Since change is a natural part of everyday life, teachers should use familiar scenarios and examples. Students can use tools like geoboards to create graphs or represent geometric patterns, and they can build patterns using blocks or other suitable materials. It's important to provide opportunities for students to describe how a change in one variable affects another.

Opportunities for Subject Integration: *(Additional ideas about how the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)*
Science
Plant Growth and Light Exposure

Activity: Conduct an experiment to observe how different amounts of light affect plant growth.
Example: Grow two sets of plants, one with full sunlight and one with limited sunlight, and measure their growth over a few weeks.
Integration: Discuss how the change in the amount of light (variable 1) relates to the change in plant height (variable 2). Create charts to visualize the relationship.
Temperature and Reaction Rate

Activity: Observe how temperature affects the melting rate of ice.
Example: Place ice cubes in different temperature environments (room temperature, refrigerator, and freezer) and record the time taken for them to melt.
Integration: Discuss how the change in temperature (variable 1) affects the melting rate (variable 2). Graph the results to show the relationship.

Social Studies
Population and Resources

Activity: Study how the availability of resources affects population growth.
Example: Look at historical data of a city's population growth alongside the availability of water and food resources.
Integration: Discuss how changes in resource availability (variable 1) relate to changes in population size (variable 2). Create a timeline or chart to visualize the data.
Historical Events and Technological Advancements

Activity: Explore how technological advancements have influenced historical events.
Example: Discuss how the invention of the steam engine (variable 1) affected industrial growth (variable 2) during the Industrial Revolution.
Integration: Create a cause-and-effect diagram to show the relationship between technological changes and their impacts on society.

Language Arts
Reading Comprehension and Vocabulary Knowledge

Activity: Examine how increasing vocabulary knowledge affects reading comprehension.

Example: Have students read passages with new vocabulary words and then assess their understanding.
Integration: Discuss how a change in the number of known vocabulary words (variable 1) affects reading comprehension scores (variable 2). Create a bar graph to display the results.
Story Writing

Activity: Write stories that include cause-and-effect relationships.
Example: Write a story where a character's decision (variable 1) leads to a series of events (variable 2).
Integration: Highlight the cause-and-effect relationships within the story and create a flowchart to illustrate these connections.

Art
Color Mixing

Activity: Explore how mixing different colors affects the resulting color.
Example: Mix primary colors in different ratios and observe the resulting secondary colors.
Integration: Discuss how changing the amount of one color (variable 1) affects the resulting color (variable 2). Create a color wheel or chart to show the results.
Shape and Size Relationships

Activity: Create artwork using different shapes and sizes.
Example: Draw a series of shapes and gradually change their size to see how it affects the overall composition.
Integration: Discuss how changing the size of one shape (variable 1) affects the appearance of the artwork (variable 2). Compare different compositions to understand the impact of size changes.

Physical Education
Exercise and Heart Rate

Activity: Measure how different exercises affect heart rate.
Example: Have students perform various exercises (jumping jacks, running, walking) and measure their heart rate after each activity.
Integration: Discuss how the type of exercise (variable 1) relates to changes in heart rate (variable 2). Create a line graph to display the relationship.

Music
Tempo and Rhythm

Activity: Experiment with changing tempos and observe how it affects rhythm.
Example: Play a piece of music at different tempos and discuss how the speed (variable 1) affects the rhythm (variable 2).
Integration: Record and compare the performances at different tempos, creating a chart to show the changes.
Volume and Dynamics

Activity: Explore how changing the volume affects the dynamics of a piece.
Example: Play a song at different volume levels and discuss the emotional impact.
Integration: Discuss how changing the volume (variable 1) affects the perception of the music (variable 2). Create a visual representation of the dynamics.

Technology
Screen Time and Eye Strain

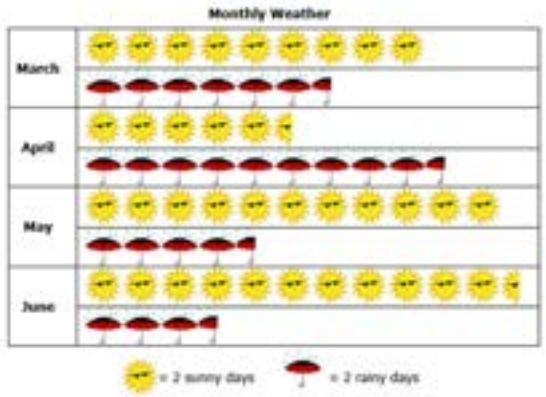
Activity: Investigate how screen time affects eye strain.
Example: Have students record their screen time and any symptoms of eye strain.
Integration: Discuss how the amount of screen time (variable 1) relates to the severity of eye strain (variable 2). Graph the results to visualize the relationship.

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

Grade Level Expectations and/or Focus Questions: Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Identify and describe apparent features of patterns, such as increasing or decreasing intervals, repeating sequences, or alternating values. 2. Explain how changes in the rule or starting number affect the pattern's characteristics, such as its shape, direction, or rate of change. **Skill** 3. Create and extend number patterns using addition, subtraction, multiplication, or division rules. **Values** 4. Apply understanding of number patterns to solve problems in real-world contexts, such as calculating distances, predicting future values, or analyzing data trends.	**Pattern Recognition Games**: Incorporate pattern recognition games or puzzles into the assessment process. Provide opportunities for students to identify patterns in sequences of numbers, shapes, colors, or other elements. Games such as *"What Comes Next?"* or "Find the Rule" can challenge students to identify and describe features of patterns in a fun and interactive way. **Game** ***What Comes Next?***: *In this game, students are presented with a sequence of numbers, shapes, colors, or other elements with a pattern. They have to identify the pattern and predict what comes next in the sequence.* *For example,* if the sequence is 2, 4, 6, 8, students must recognize that the pattern is adding 2 each time and predict that the next number is 10. **Guided Exploration and Reflection**: Provide students with a series of pattern sequences, each with a different rule or starting number. For example; **Rule: Adding 3** Starting Number: 2 Sequence: 2, 5, 8, 11, 14, ... ***One possible rule:*** *interchange of odd and even each time 3 is added*	**Multi-Sensory Approach:** *Incorporate a multi-sensory approach to pattern recognition games, allowing students to engage with the material using different senses. Provide visual cues such as colorful patterns and diagrams, auditory cues such as verbal instructions or sound effects, and tactile cues such as manipulatives or textured cards.* Allow learners to explore a variety of number patterns and shape patterns. Encourage the learners to represent and extend these patterns in a variety of ways. Give enough and adequate practice with increasing and decreasing patterns using number and shapes.  https://www.youtube.com/watch?app=desktop&v=CzFLDtvN_Xk  https://www.braingymmer.com/en/brain-games/patterned_logic/play/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Rule: Adding 4 Starting Number: 7 Sequence: 7, 11, 15, 19, 23, .. ***One possible rule***: *when an even and an odd number are added the sum is odd* *Guide students through the exploration of how changing the rule or starting number affects the pattern's characteristics.* *Encourage students to reflect on their observations and articulate their understanding of the changes in the pattern.* *Offer prompts and guiding questions to scaffold students' thinking and help them make connections between the rule or starting number and the pattern's characteristics.* *Provide opportunities for students to share their findings with peers and engage in collaborative discussions about the patterns they explored.* **Problem-Solving Task:** Present students with a real-world problem that requires them to create and extend a number pattern. ***For example,*** give a scenario where a farmer is planting a garden and needs to determine how many plants they will have after each week of growth, with a different rule for each week ***(e.g., adding 3 plants each week, doubling the number of plants each week).*** Ask students to use addition, subtraction, multiplication, or division rules to calculate the total number of plants after a certain number of weeks and explain their reasoning.	**Reflection and Metacognition:** *Encourage students to reflect on their learning and articulate their understanding of how changes in the rule or starting number affect the pattern's characteristics. For example,* ***Rule: Adding 3*** *Starting Number: 2 Sequence: 2, 5, 8, 11, 14, ...* ***Rule: Adding 3*** *Starting Number: 4 Sequence: 4, 7, 10, 13,16 ...* *Provide opportunities for students to engage in metacognitive processes such as self-monitoring, self-questioning, and self-reflection.* *Ask students to explain their thinking processes and reasoning behind their observations, helping them develop their metacognitive awareness and critical thinking skills.* **Extending number patterns** **Problem 1: Number Pattern Creation** *Sarah* ***starts with the number 5. She adds 3 to each number*** *to create a pattern. Help Sarah extend her pattern to the next three terms.* **Problem 2: Pattern Analysis** *Jackson has a pattern where he* ***starts with 10 and subtracts 2*** *from each number to create his sequence. Analyze Jackson's pattern and identify the next three terms in the sequence.* **Problem 3: Multiplication Pattern** *Emma* ***starts with the number 4 and multiplies each number by 5*** *to create a pattern. Extend Emma's pattern to the next four terms.*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Performance task **Task: Weather Watchers** ***Objective:*** *Students will analyze temperature data from a specific location over a period of time, identify patterns, and make predictions about future temperatures.* ***Materials Needed:*** *Temperature data (can be provided by the teacher or sourced from online weather databases), Graph paper or digital graphing software, Writing materials* ***Instructions:*** ***Data Collection:*** *Provide students with temperature data for a specific location (e.g., daily high temperatures for a month). Ensure that the data spans a sufficient period of time to identify trends and patterns.* ***Graph Creation:*** *create a line graph representing the temperature data over time. The x-axis should represent the dates or time periods, and the y-axis should represent the temperature values.* ***Pattern Identification:*** *Guide students through the analysis of the graph to identify any patterns or trends in the temperature data. Encourage them to look for recurring patterns, such as fluctuations between hot and cold days, seasonal changes, or overall trends in temperature increase or decrease.* ***Prediction Making:*** *Based on the patterns identified in the temperature data, challenge students to make predictions about future temperatures. Prompt them to consider factors such as seasonal changes, historical trends, and any anomalies or special events that may impact temperatures.* ***Justification and Explanation:*** *Ask students to justify their predictions using evidence from the temperature data and their understanding of patterns. Encourage them to explain their reasoning, including any observations or insights they gained from analyzing the data.* ***Reflection:*** *Facilitate a class discussion where students share their predictions and reasoning with their peers. Encourage students to compare*	**Problem 4: Division Pattern** *Liam has a pattern where he* ***starts with 36 and divides each number by 4*** *to create his sequence. Extend Liam's pattern to the next five terms.*  https://www.math4texas.org/Page/383

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	and contrast their predictions and discuss any discrepancies or areas of uncertainty. ***Extension Ideas:*** *Challenge students to compare temperature data from different locations or time periods and identify similarities or differences in patterns.* *Invite students to research the factors that influence temperature fluctuations, such as latitude, elevation, proximity to bodies of water, and weather patterns.* *Encourage students to explore additional data visualization techniques, such as bar graphs or histograms, to represent temperature data in different formats.*	

Useful Content Knowledge for the Teacher about the Outcome:
Patterns can be used to make important predictions and solve problems in our daily lives. Learners should have the opportunity to unlock rich possibilities of exploring patterns. Students should also explore the many patterns in the hundred chart. The hundred chart is a useful model to provide opportunities for students to find and describe a variety of patterns as well as identifying missing elements and errors. Students should use vocabulary, such as vertical, horizontal, diagonal, row, and column to help describe patterns.

Rounding to the nearest 10

Three times table

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Inclusive Resources and Materials:
Hundred Chart

Counters: rocks, corks, beans, etc.
Geoboards and rubber bands
Blocks
Shaded Parts
Pictures
Crayons
Number lines
Measuring ruler
A 10 by 10 multiplication matrix
Counters

Opportunities for Subject Integration:

Art and Craft
drawing and colouring shapes
creating shapes of plants and animals
Creating tile patterns

Language Arts
Learning adjectives to describe shapes and patterns
Reading stories about shapes and solids
Composing stories and poems of shapes and solids
Making concept maps using 2D shapes

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

Science
Relating shaped to the earth, moon and moon phases

HFLE:
Learning to appreciate colleagues when working in groups
Accepting challenges
Adopting problem solving strategies
Developing rational argument and reasoning

Children's Literature Suggestions:
Anno, Mitsumasa *Anno's Magic Seeds* (Patterns)
Friedman, Aileen *The King's Commissioners* (Patterns, Multiplication)
Walsh, Ellen Stoll *Balancing Act* (Balance, Equal)
Kroll, Virginia *Equal Shmequal* (Balance, Equal, Equality)
Neuschwander, Cindy *Patterns in Peru: An Adventure in Patterns* (Repeating and increasing patterns)

VOCABULARY Terms: PATTERNS AND RELATIONS
Equations expressions extending patterns functions repeating patterns square numbers triangular numbers unknown variable

Geometrical Thinking

Introduction to the Strand: The development of awareness of the size, shape, and position of objects is fostered throughout the expectations outlined under geometric thinking. Pupils learn to recognize, draw, and classify basic plane and solid shapes. Through investigation, they develop the skill of identifying the properties of basic plane and solid shapes and using this knowledge to classify shapes and explain common features that link shapes in the same group. They will also develop the skill of describing, extending, and creating geometric patterns and using clear language to communicate their acquired knowledge. Opportunities are provided for pupils to develop and use directional language by locating, translating, and reflecting points and rotating shapes, as well as develop spatial relationships.

Geometrical thinking is critical to helping students understand and describe the fundamental properties of the physical environment around them., solve real -world problems, design structures, and assist other fields such as science, engineering, and art.

Essential Learning Outcome 1.1: Explore and Analyze Geometric Shapes and Relationships- Developing Spatial Sense

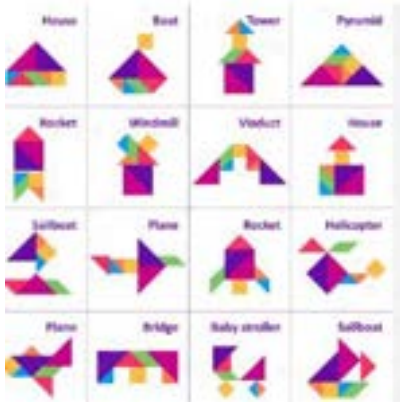
Grade Level Expectations and/or Focus Questions:

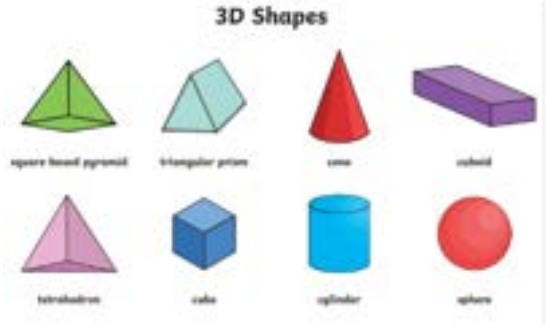
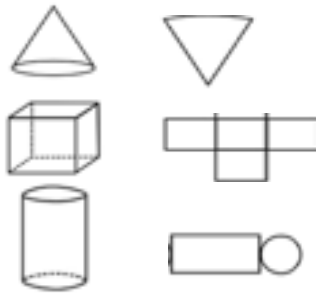
- Use language and gestures that describes shape and space orally and in writing to describe a picture or object in real world contexts or an object undergoing a transformation
- Visualize how a 3D solid can be created by folding a 2D net
- Recognize shapes in various points of view and from various distances
- Draw a picture from a description and vice versa
- Describe and find shapes hidden in pictures or space as well as recognize shapes from various distances and points of view.
- Identify 3D nets, build 3d objects from isometric drawing and make predictions on 2d and 3d composite shapes

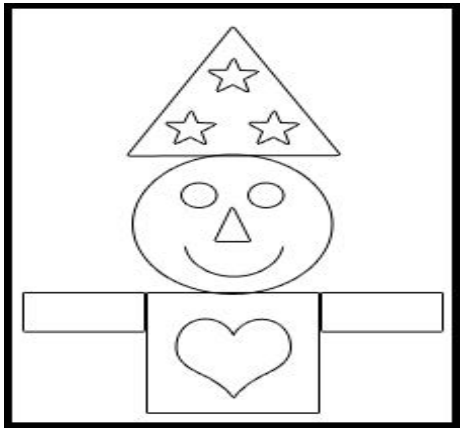
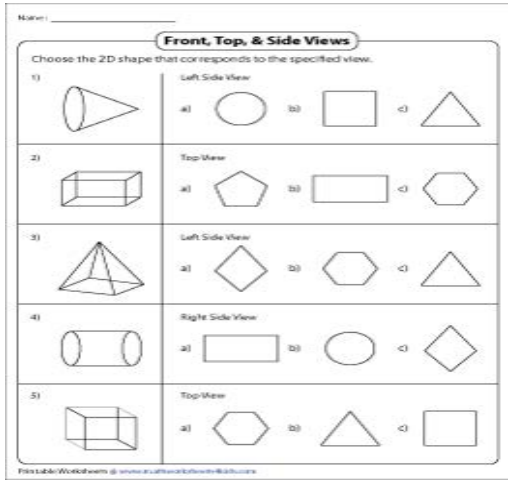
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Specific Curriculum Outcomes Learners will be expected to: **Knowledge** 1. describe shapes in real-life settings using written language or using gestures 2. describe shapes in the picture using Written language or gestures.	**Inclusive Assessment Strategies:** **Entrance Ticket** - Used to assess whether students can identify the properties of shapes. Have students listen to a description of a shape and draw what shape they think it is. Have students label the shape based on its properties (sides/edges, faces, and vertices/corners). **Checklist 60% of students are able to** • draw a shape based on a given description? yes/no • identify the faces ?	**Inclusive Learning Strategies:** ***Intro: Students should be able to identify and describe shapes in real life setting*** ***Discussion*** Allow students to go out and find an object that is an example of a shape in their environment. Students will be guided into specific locations such as the yard, kitchen or library under the supervision of teachers.

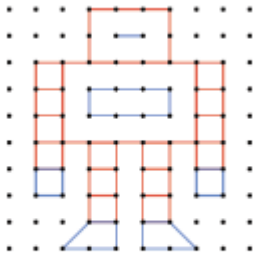
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 3. recognize shapes in pictures or patterns 4. visualize and create 3D shapes by folding nets 5. recognize shapes from varying distances and from various points of view 6 a. draw a picture of 3D models based on given descriptions 6b. construct 3D models based on given descriptions 7.a. Apply spatial reasoning skills to make 2D and 3D composite objects 7. b. Make predictions about 2d and 3d composite objects 8. Produce 3D objects made from isometric shapes **Value** 9. Recognize how geometric relationships enhance the visual appeal of buildings.	yes/ no • correctly identify the vertices of the shape? yes/ no • correctly identify the sides ? yes/no **Observation/Self-Assessment** - to help students to identify shapes with further speed and accuracy Have students look at a picture and identify all the shapes they can see. Let them indicate whether it is 2D or 3D. Also , have them name the object on which you identified the shape. Have them talk about the shapes and discuss other places in their home or school environment that the objects with the same shape can be found. Eg. the shape on the noses of the men in picture 4 is like a ball.  Retrieved from http://www.mathematicshed.com/uploads/1/2/5/7/12572836/shapefind.pdf **Checklist** • I can identify different shapes in a picture ? yes/no • I can name the object on which I found the shape yes/no	 Retrieved from https://www.pinterest.co.uk/pin/37999190580172684/ Allow students to describe their shape to their peers and have them guess the shape. (e.g., tall and has a circle on the top and bottom.) ***Discovery through play*** Model to students the various gestures that can be used to describe various shapes.

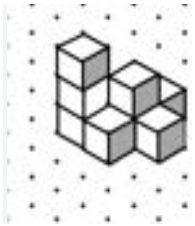
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
. 10.Acknowledge the use of various shapes to create patterns and pictures 11. Use shaped to create new and different objectives	• I can name shapes ? yes/ no • I can group shapes as 2D or 3D ? yes/ no **Conversation/Think, pair , share/Peer Assessment** - to express creativity in using net to form 3D shape Present students with cutouts of nets(Students may also be given the opportunity to create the nets themselves). Have students discuss in their small groups how they think that these nets could be made into 3 d shapes. Listen to students as they discuss the shape that would be made with each net presented. Students will be given to examine diagrams to determine whether it is or is not the net of a closed three-dimensional object **Checklist:** The learner is able to identify nets of 3 dimensional objects • Yes • Somewhat • No **Conversation -** to relate views shared in the video to real-life experiences **(outcome 4)** Review the story which should be read in a previous lesson, to discuss the different views of 3d shapes (link below) with students to get students to understand that shapes have different views https://fun2dolabs.com/math-story-different-views-of-3d-shapes/all-about-the-views/	 ***Retrieved from https://www.pinterest.com/pin/780600547918941087*** ***Allow students to use Tangram pieces to create real life objects with polygons.***

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product - to develop students spatial sense and cater for multiple learning styles Students will be asked to select a 3d shape manipulator and draw sketches to show how their shape would look from different perspectives. Students will present the sketches of the three perspectives to classmates and have them guess what shape they think it is. (Student may also be given time to reflect on their own drawing of a three-dimensional object and consider how it can be improved based on comments of peers.) **Checklist** ● Students were able draw the various views of a shape yes/no ● Students were able to correctly identify a shape from different views ? yes/ no ● Students could correctly identify the vertices of the shape? yes/ no . **Product -Challenge -** to develop students' creative side in manipulating 3D shapes. **The Great Building Challenge** Hold a class challenge where by using shape blocks, students are to build a model based on a given picture. Encourage the children to use as many different kinds of 3D shapes in their building. Children can work alone or in groups depending on availability of blocks. Some shapes like matchboxes and toilet paper rolls could be brought from home.	 ***Retrieved from https://www.splashlearn.com/math-vocabulary/tangrams***  ***Received from https://www.shutterstock.com/search/tangram-animals*** ***Discovery Learning***

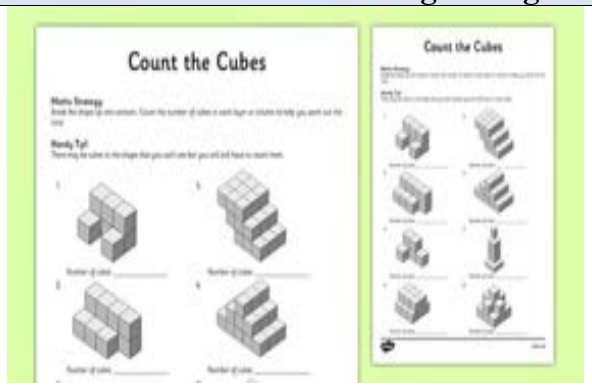
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from https://images.app.goo.gl/6GhCZWU8387xczyV6 **Product Game- t**o cater to different learning styles by describing and drawing One student will be given a picture only they can see while each classmate will be given a sheet of blank paper. The student will describe the picture to the class without the use of any gestures Eg. -Draw a medium-sized circle in the middle of your paper. -Draw a medium-sized square below the circle but have the top of it touch the bottom of the circle. -Draw a medium-sized heart in the square -.Draw two smaller rectangles, one on each side of the square.. The top of each rectangle should line up with the top of the square. -Draw a medium-sized triangle above the circle -.Draw three small stars anywhere inside the triangle. -Draw a small triangle in the center of the medium-sized circle. -Draw an arc which curves up below the small triangle.- -Draw two small circles above the small triangle, one slightly to the right and one slightly to the left. The other students must draw what was described	 Allow students to give examples of objects that are the same shape as those they identified in the picture. ***Discovery using problem solving*** Provide students with pictures of complete and incomplete 3D nets. Ask students to compare pictures and to draw what is missing. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Once done, the students compare what they drew to the picture described.  https://www.homeschoolwithlove.com/wp-content/uploads/2013/11/Draw-My-Picture-Example.jpg **Student Assessment Checklist** This was Easy / I got it / I was confused • Students are able to draw a shape based on a given description? yes/no	***Conceptual Understanding*** Have students work collaboratively to identify the 2d shapes that make up 3D shapes based on the different view of the shapes. For example, Present a worksheet for students to discuss and select the correct view of a given shape.  https://www.mathworksheets4kids.com/solid-shapes/front-top-side-view/view-3d-figures-preview.png ***Differentiation*** **- Think , Pair , Share** Ask students to sit at a table in pairs facing each other with a variety of objects arranged between them. Each student takes a turn at describing what they can see from their position (Eg. I see a circle)They can sketch what they see and write about it. The students still in pairs will then move around the table and repeat this activity. They will continue until they are in the other person's position. Students will discuss their sketches (eg. At which position were you sitting when you saw this shape ?) Students can create their sketch using blocks

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product-Individual Work - to develop students creative skills and build confidence in manipulating shapes Students will be given tangram pieces and be asked to come up with as many different combinations of Tangrams as they can to make squares.(eg. two pieces, three pieces, four pieces) Have students keep score of how many pieces they were able to use . **Observation -** to better identify 3D shapes in varied contexts (isometric and as a solid) Observe students as they identify shapes given an isometric pattern and interpret given isometric drawings . Students will gather 3 d blocks or connecting cubes in order to create a model of the picture..	***Discovery through Play*** Allow students to u se Interactive Geoboards such as the one in the video below to create models based on given instructions or using pictures  Geoboard Retrieved from https://toytheater.com/geoboard/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	  Students may be challenged to use the cube blocks to show the model's three different views and label each view **Checklist** • Students are able to create a model based on a given picture? yes/no • Students were able to successfully show the model from different perspectives ? yes/ no **Exit Ticket - Product -** to assess students' spatial sense by description, construction and giving real-life examples Have students answer a question based on shape eg.. A 3-D shape has exactly 12 edges. What shape could it be? How do you know? Construct the shape. What does the net look like? Give two objects that look like that shape. **Checklist** Students can 1. name yes/no 2. draw yes/no 3. give examples yes/no	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Discovery Learning and Observations a) Allow students to identify the smaller shapes used to create a composite object.  Retrieved from https://childhood101.com/wp-content/uploads/2015/05/2D-shapes-pattern-blocks1.jpg b) Allow students to identify 2 d shapes that can be used to construct 3 d models eg. using triangles and rectangles to make a tent c) Allow students to draw the shape that can be created using two given shapes ***Discovery Learning*** a) Provide opportunities for students to identify the number of cubes necessary to create a given model b) Allow students to count the number of cubes that were used to create a shape based on an isometric model. For example:

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 https://images.twinkl.co.uk/tw1n/image/private/t_630_eco/image_repo/b2/00/T2-M-1578-Year-3-Count-the-Cubes-Activity-Sheet.avif c) Allow students to create isometric patterns on dot papers that could be built using 3 d blocks

Additional Resources and Materials

Students should be able to communicate using the following language:

Two-dimensional shape (2D shape), three-dimensional object (3D object), cone, cube, cylinder, prism, pyramid, sphere, surface, flat surface, curved surface, face, edge, vertex (vertices), net.
In geometry, the term 'face' refers to a flat surface with only straight edges, as in prisms and pyramids, eg a cube has six faces. Curved surfaces, such as those found in cylinders, cones and spheres, are not classified as 'faces'. Similarly, flat surfaces with curved boundaries, such as the circular surfaces of cylinders and cones, are not 'faces'. The term 'shape' refers to a two-dimensional figure. The term 'object' refers to a three-dimensional figure

Prisms have two bases that are the same shape and size. The bases of a prism may be squares, rectangles, triangles or other polygons. The other faces are rectangular if the faces are perpendicular to the bases. The base of a prism is the shape of the uniform cross-section, not necessarily the face on which it is resting. Pyramids differ from prisms as they have only one base and all the other faces are triangular. The triangular faces meet at a common vertex (the apex). Pyramids do not have a uniform cross-section

Additional Useful Content Knowledge for the Teacher:

- **Viewing shapes from different perspectives**

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

- **Interactive Isometric drawing pad**

https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Isometric-Drawing-Tool/

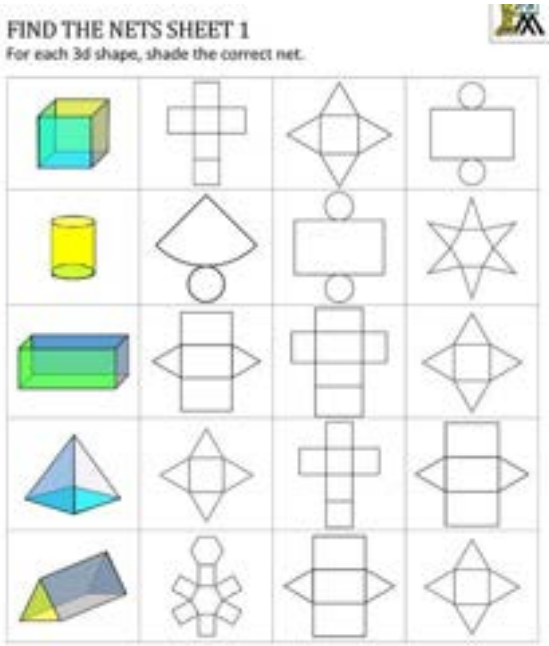
- matchboxes, cereal box, toilet paper rolls, dice, tennis balls

Opportunities for Subject Integration:

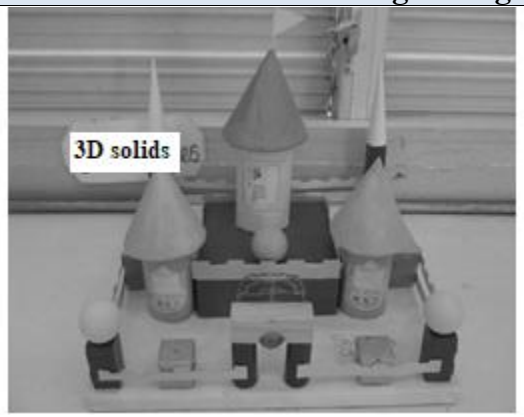
- Spatial reasoning is important to assist in developing Problem Solving Skills.
- Patterns
- Used in Data Handling for pictographs
- Finding Area and Perimeter of 2 D shapes

Essential Learning Outcome	**1.2:** Explore and Analyze Geometric Shapes and Relationships-, Sorting, Patterning and building with 2d and 3d shapes

Grade Level Expectations and/or Focus Questions:
- Work with prisms, pyramids, cones and cylinders as well as their nets, and build models from pictures and vice versa.
- Sketch various types of angles and sort patterns with quadrilaterals and objects

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Specific Curriculum Outcomes Learners will be expected to: **Knowledge** 1. Describe 3D objects (prisms, cylinder, cone and pyramid) using geometric terms such as faces, edges	Generate a discussion on attributes of 3d shapes (cones, cylinders, prisms and pyramids) then students will identify the correct net of a given shape.  Retrieved from https://images.app.goo.gl/JeP3TC4bq9eFJrvF6	**Inclusive Learning Strategies:** **Intro: Students should be able to describe objects using geometric terms and sketch** ***Discovery Meaningful Learning- Group Work*** Give descriptions of shapes and drawing / pictures and allow students to match descriptions to the shapes .  Retrieved from https://www.cgpplus.co.uk/primary/ks1/maths/m1wac8938-3d-shape-match-up-year-2 **Game: Who Am I**: Eg. I have 1 flat surface and 1 curved surface. My flat face is circular . My curved surface makes a sharp point . I have no sides

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
2. Predict 3D shapes that can be created by folding given 2D nets	**Checklist** ● Students were able to define shapes using their characteristics ? yes/ no ● Students could correctly identify shapes based on their description ? yes/ no **Conversation /Group Work -** to correctly identify nets of given shapes Small groups of students will be given a set of 4 or 5 nets of shapes. Each set should consist of one net that can be made into the 3-D object, and 3 or 4 others which cannot be made into the 3-D object. Students will be asked to analyze the nets, without manipulating them, and to determine which one of the nets in the group could be used to create the 3-D object. Invite them to justify their response , and then test their predictions. **Checklist** ● Students were able to define what the nets are ? yes/ no ● Students were able to discuss the attributes of shapes ? yes/ no ● Students could correctly identify the net of an object ? yes/ no	***Video Assisted Learning*** Allow students to use these videos to help them review the properties of pyramids, prisms, cones and cylinders. 3D Shapes Song (Cone and Cylinder) | Tutway Group Work Each student will be given nets to cut out and asked to glue the sides together to create 3D shapes. Students will then create mobiles with the 3D shapes. ***Group Work*** Allow students to play the " Name the Shape Game" where the nets of various shapes will be presented to them and they will have to identify the shape. The first group to correctly identify all the shapes wins.. Provide opportunities for students to construct objects using different types material or shapes. For example:

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 3. Use materials to construct models and shapes from a picture or description.	**Observation and Product -** to allow students to follow a pattern in making a model Students will be asked to create models based on the view/perspective using the stated amount of connecting cubes/ blocks For Example:	

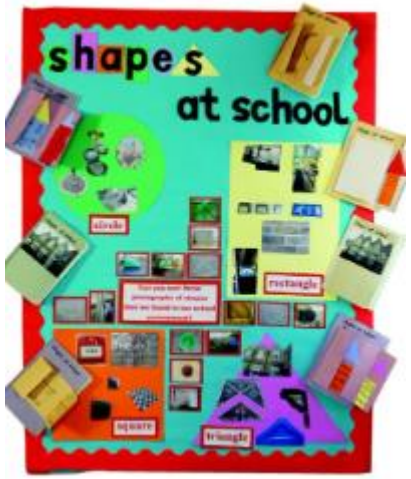
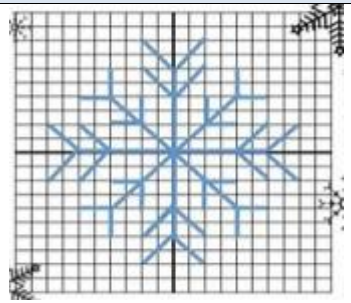
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from https://images.google.com/ **Checklist:** The learner is able create model based on a given view • Yes • Somewhat • No **Product** - to represent and construct prisms and pyramids Students will be given items such as toothpicks / straws and playdough balls and asked to create a prism, pyramid, cylinder and cone.	.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
4.Deconstruct 3D shapes	Students will then be asked to complete the tables of resources needed to complete each shape. Shape / Number of straws/ toothpicks / Number of dough balls pyramid prism cylinder cone **Checklist** • Students are able to create a shape/ model based on given instructions ? • Students were able to identify the necessary material used to create shapes ? yes/ no **Conversation and Observation/Group Work/ Peer Assessment -** to allow students to deconstruct objects and name the shapes they see In their groups students will be given pre-assembled 3d objects , safety scissors, rulers and blank sheets of paper. Students will be asked to cut the objects along the indicated lines and identify the shapes. Students will discuss their observations and present their findings to the class eg.	***Video Assisted Learning and Guided Learning into the types of quadrilaterals*** Provide multiple opportunities for students to discover the types of quadrilaterals. For example: Watch the video below to learn about types of quadrilaterals . Quadrilateral Song | Geometry and Polygons | 2nd-3rd Grade Math | eSpark Music

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Knowledge 5. Identify the different types of quadrilaterals	When I deconstruct a cylinder I get _____ When I deconstruct a prism I get _____ **Checklist** • Students were able to deconstruct shapes into nets yes/ no • Students need help deconstructing yes/no • Students were able to correctly identify the shapes after deconstruction? yes/no • Students need help identifying shape yes/no **Observation and Conversation-Think , Pair , Share -** to share students' concept of quadrilaterals Students will collect picture cut outs of shapes and together sort the shapes as either being quadrilaterals or not . Listen to students discuss their reasoning for their decision. **Checklist** • Students are able to identify and discuss the attributes of quadrilaterals? yes/ no • Students were able to identify shapes that are not quadrilaterals? yes/ no	Give an activity based on identifying the different types of quadrilaterals and coloring them.  https://www.teacherspayteachers.com/Product/Quadrilateral-Sort-4076781?st=7cac66bf8693372e93b8036d85250d90 ***Representing /Conceptual Understanding*** a) Provide opportunity for students to identify quadrilaterals from real life situations. For example, give shown pieces of designed fabric to identify the quadrilaterals and used to create the pattern on them.

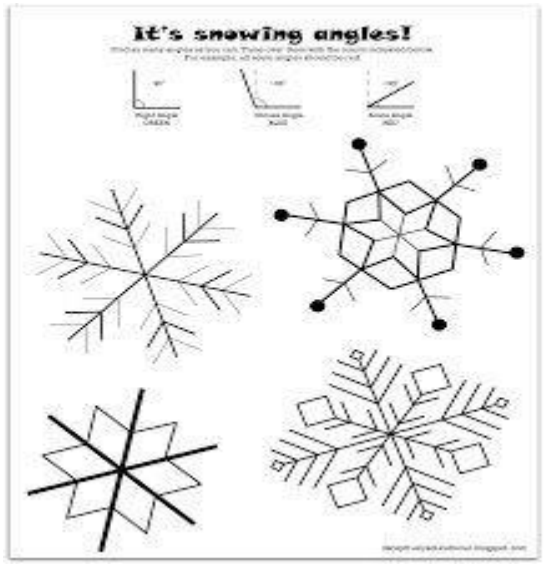
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 6. Sort shapes by grouping (quadrilaterals) 7.Create pattern with quadrilaterals and objects	**Product** - Students will apply their knowledge of creating patterns to work with quadrilaterals Students will be given straws or sticks and be asked to arrange them in ways to create as many different quadrilaterals as possible.	 *Retrieved from https://down-ph.img.susercontent.com/file/b087b2d1c99d63f757a9353b4b11f0ad* b) Allow students to complete or extend patterns using quadrilaterals. c) Allow students to design and color a pattern of their own for a class mural. ***Video Assisted Learning*** Listen and sing along to a song about Angles below Angles Song | Acute, Obtuse, & Right Angles | 3rd & 4th Grade ***Discovery through Play/Game - Making Angles*** Allow students to use their body parts to form and recognize angles. For example, have students stand and put their left arm straight out to the side , toward 3 O' clock while placing their right arm straight up towards 12 O'clock. Have students say what kind of angle they were making (right

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Knowledge 8. Identify angles that are right angles , more than right angles and less than right angles	**Talking Circles -** Review students ability to describe and identify angles Listen to students as they select a shape from previous lessons and explain them, identifying and pointing at any angles that they have. **Checklist** ● Students were able to correctly explain the angles ? yes/ no ● Students could correctly identify the angles in a shape? yes/ no **Product -** to build students confidence in drawing angles Students will be given templates of each type of angle as well as a ruler.Students will be asked to sketch each angle using the ruler with the template serving as a guide. **Checklist** Students can sketch each angle yes/no Students can sketch ⅔ angles yes /no Allow students to create a poster showing shapes in their environment (outcome 10)	angle). Have students now move that right hand over to the right a bit at about 10 O'clock. Have students say what angle they are making (obtuse angle). Have students recall whether it is less or more than a right angle. Have students observe how large the opening is. Have students stretch that right arm until it almost meets the left,at about 2 O'clock and have students observe how small the opening of the angle is and identify it as an acute angle. ***Modeling*** Allow students to practice forming angles using different concrete objects such as two popsicle sticks, coconut leaves, cardboards etc.  *Retrieved from https://blogger.googleusercontent.com/img/b/R29vZ2xl/AVvXsEiURs-6xuFV-HZ1LOtdwv7ksnTdOq70MvWUmckxR0sOADUmPTMdnwrUS6F5vwYBAeEBExbgI1w5wOb6AWSo5fbd0Gze983fz5Ym4_iZwXRJxmxNKurXYRP1LAQr_nJ1gJiEW5yFswMBIX4/w1200-h630-p-k-no-nu/acute+angle.jpg* ***Enhancing conceptual understanding*** Have students work collaboratively to discuss and recognize the different types of angles. For example Provide different picture cards and ask students to name and draw the angles that they see and discuss their findings with a partner.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
9. Sketch angles (right, less than right , more than right)		 Retrieved from https://images.app.goo.gl/BZoFyxtwq3E5U7BBA

Rubric

10 or more item (5)	7 - 9 itens (4)	4 - 6 items (3)	1- 3 (2)	
5 or more shapes (5)	4 shapes (4)	3 shapes (3)	(2 shapes (2)	
4 types of angles (4))	types of angles (3)	types of angles (3)	types of angles (2)	
Presentation				



Retrieved from https://i.pinimg.com/564x/80/6d/a5/806da567a4d5b01363686b5b847c2c3a.jpg

Discovery Learning

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values 10. Share on the role shapes and angles play in the construction and in the architecture	**Conversation /Guest Speaker** - to present a different perspective on angles and construction a) Invite a builder or architect to visit the class to speak to students about the role of shapes and angles in the designing and construction of buildings. . b) List three buildings in your community which depict the shapes and angles discussed during the presentation. _____ _____ _____ **Checklist** The learner is able to recall three important uses of shapes and angles discussed by the guest or observed in the community. ● Yes ● Somewhat ● No **Exit Ticket** - at assess conceptual understanding catering for the varied learning styles **(outcomes 2, 5,6 & 7)** Students will be seated to form a circle and a ball will be passed as music plays. When the music stops the student holding the ball will be asked to identify the shape being presented from its net or the quadrilateral presented (image could be projected, printed or drawn)	Provide opportunities for students to interact with shapes in real life situations. For example, walk through the school yard to observe, discuss and appreciate the shapes and angles on buildings.

Additional Resources and Materials

- **Using shapes to build composite shapes (website)**
  https://www.mathplayground.com/3d_builder.html

- **Review of folding nets to make shapes**
  https://www.youtube.com/watch?v=fm5vsD2T6Ck

- **Contractor, architect or similar personnel**

- **straws and clocks (hands) to show angles**

Additional Useful Content Knowledge for the Teacher:

An angle is formed when two straight lines or rays meet at a common endpoint. The two rays are called the sides of an angle, and the common endpoint is called the vertex. Angles are measured in degrees and the symbol is °.

An acute angle measures less than 90°, but more than 0°. A right angle measures exactly 90°. An obtuse angle measures more than 90°, but less than 180°. A straight angle measures exactly 180°.

A quadrilateral is a flat / plane 2 dimensional closed shape that has four sides, four angles, and four vertices.

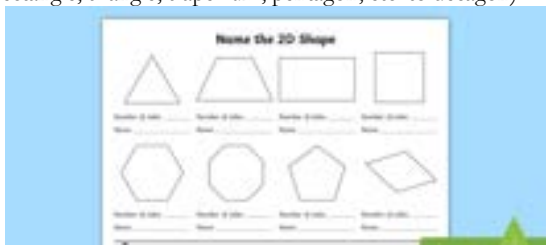
Opportunities for Subject Integration:

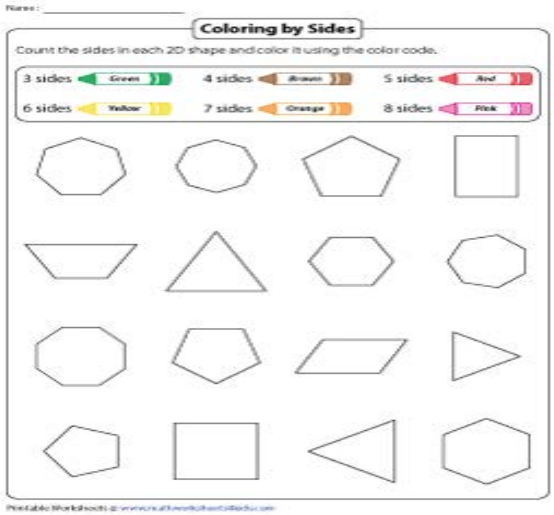
-Calculating the lengths of sides
*-Calculating length , perimeter and drawing shapes.
-Identifying types of angles using analog clocks
-Identifying types of triangles
-Identifying types of lines
-Structuring with blocks can support the development of spatial reasoning and scaled construction skills
-Statistics - deconstructing geometric shapes helps with concepts related to the properties of shapes, as well as reading graphs and exploring functions

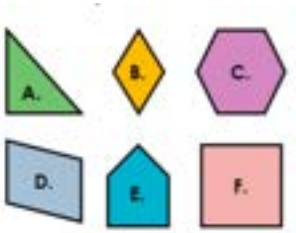
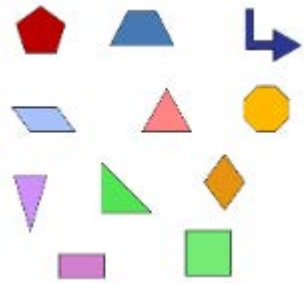
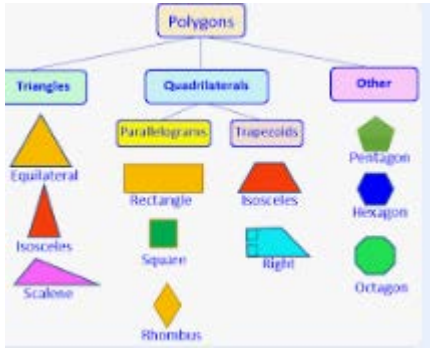
Essential Learning Outcomes 2.1: Recognizing Naming, and Describing Shapes- Analyzing and describing shapes

Grade Level Expectations and/or Focus Questions:

- Understanding that shapes in different categories (eg; rhombuses, rectangles and others) may share attributes (e.g., having four sides) and that the shared attributes can define a larger category (e.g., quadrilaterals)
- Justify why a shape is a shape (quadrilaterals) using the number of sides, angles parallel lines and symmetry(reflective rotation)

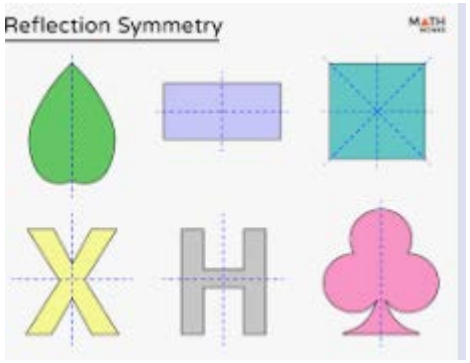
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Identify shapes (polygons /2D by number of sides and angles. 1b Arrange shapes (polygons /2D by the number of sides and angles. 2. Name/define shape based on special shared attributes: (number of sides number of angles)	**Conversation/Observation-** to discuss and name shapes, then group them according to their attributes Name these shapes (square, rectangle, triangle, trapezium, pentagon, etc. to decagon)  Retrieved from https://images.app.goo.gl/vE42DMPPjMB6otAW6 **Checklist** The learner is able to correctly name and group shapes according to their attributes. • Yes • Somewhat • No	***Intro: to get students able to discuss/ share their knowledge on shapes using geometric terms*** ***Discussion:*** Review students' previous knowledge on shapes/polygons presenting on the board. Allow students to name the shape giving any information observed. (sides. Angles, any other facts they know) The teacher uses the examples below to provoke conversation  Retrieved from https://www.vecteezy.com/free-vector/stop-sign

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product - define 2D shapes based on attributes Group these shapes based on the number of sides, and angles.  mathworksheets4kids.com eg: all those with 4 sides are:_____ **Checklist:** The learner is able to correctly name/define shapes according to their attributes. • Yes • Somewhat • No **Product/conversation -** to confirm students' understanding of the attributes that make a special category of shapes	 Retrieved from https://en.numista.com/catalogue/pieces2602.html  Retrieved from https://www.cleverpatch.com.au/products/by-product/sewing-and-textiles/design-your-own-kite ***Research*** a) Provide many pictures of named polygons to be grouped by number of sides or angles.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 3. Justify a shape based on the number of sides, angles,parallel lines and symmetry (reflective rotation)	Complete as follows Which picture(s)/shape(s) belongs to eg: quadrilaterals:_____ pentagon:_____  Retrieved from https://images.app.goo.gl/CruVns4LV42bueFW6 2. What do we call a shape with 6 sides and 6 angles?_____ 3. Name 4 different shapes which belong to Quadrilaterals._____ 4. What is a decagon? 5. What can you state or is true about the number of sides and angles of any particular polygon? **Conversation/Peer Assessment** - allow for participation and expression, analyze facts and draw conclusions. 1. Each student will be given sentence strips with shape attributes to place in the correct column on the board. Eg. I have four sides, 4 angles (2 acute and 2 obtuse), 2 lines of symmetry. 2. Class refers to the board and confirms whether the strips are placed in the correct column.	 Retrieved from https://www.storyboardthat.com/lesson-plans/introduction-to-geometry/polygons b) Allow students to research the names given and put the groups of pictures to the name. c) Allow students to write the characteristics that are similar between polygons. (**triangle/quadrilateral/pentagon/hexagon/heptagon/octagon/nonagon/decagon)** Allow students to draw a concept map or another graphic organizer to show the relationship between polygons 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values 4. Value differentiating between 2D shapes based on attributes	3. If any does not belong, class discussion as to why and its correct position 4. Students will draw the shapes based on any two sentence strips. **Student Self- Assessment Checklist** 👍 Too Easy | 😀 I got it Both correct | 😬 I need a little help | 😡 I'm confused **Individual work/Self Assessment** - to summarize the attributes of a particular shape Name the shape described 1. With no lines of symmetry but 4 angles,4 sides..=_____ 2. 8 sides,8 angles,8 lines of symmetry,4 pairs of parallel lines=_____ 3. 2 lines of symmetry, 4 sides, 4 angles 2 pairs of parallel lines=_____ 4. What are the key features that make a shape 5. fit into a particular category?	**Retrieved from romromhttps://msgarciamath.edublogs.org/geometry/polygons/**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Whole class Discussion Provide sentence strips that describe/state an attribute of a particular shape. Eg I have four equal sides, 4 right angles, 4 lines of symmetry. Students will place /stick them on the board in the correct column. that is under the correct shape heading. Tri | Quadri | Penta gon | etc squ | rect ***Discovery Learning in Group Work*** Use videos to help discover lines of symmetry. For example: 1. Watch the video https://youtu.be/Kah5w06eyCo?si=Vt-Z7RjUb1dnv62a **2. Allow students to fold paper cut in varied shapes to determine lines of symmetry.**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		   Retrieved from https://kitchenfloorcrafts.blogspot.com/2015/07/4-ways-to-explore-symmetry-at-home.html  Retrieved from https://mathmonks.com/symmetry/reflection-symmetry

Additional Resources and Materials

- Relevant Mathematics textbook
- Computer for researching
- Coloring and activity books

Additional Useful Content Knowledge for the Teacher:

Regular polygons are geometric shapes all sides and all angles equal. A shape is a geometric figure defined by its outline or boundary, representing the outer surface of an object.

Only shapes with an even number of sides have parallel lines. the number of parallel lines = half the number of sides

The number of lines of symmetry in a regular polygon where all the sides are equal is equal to the number of sides.

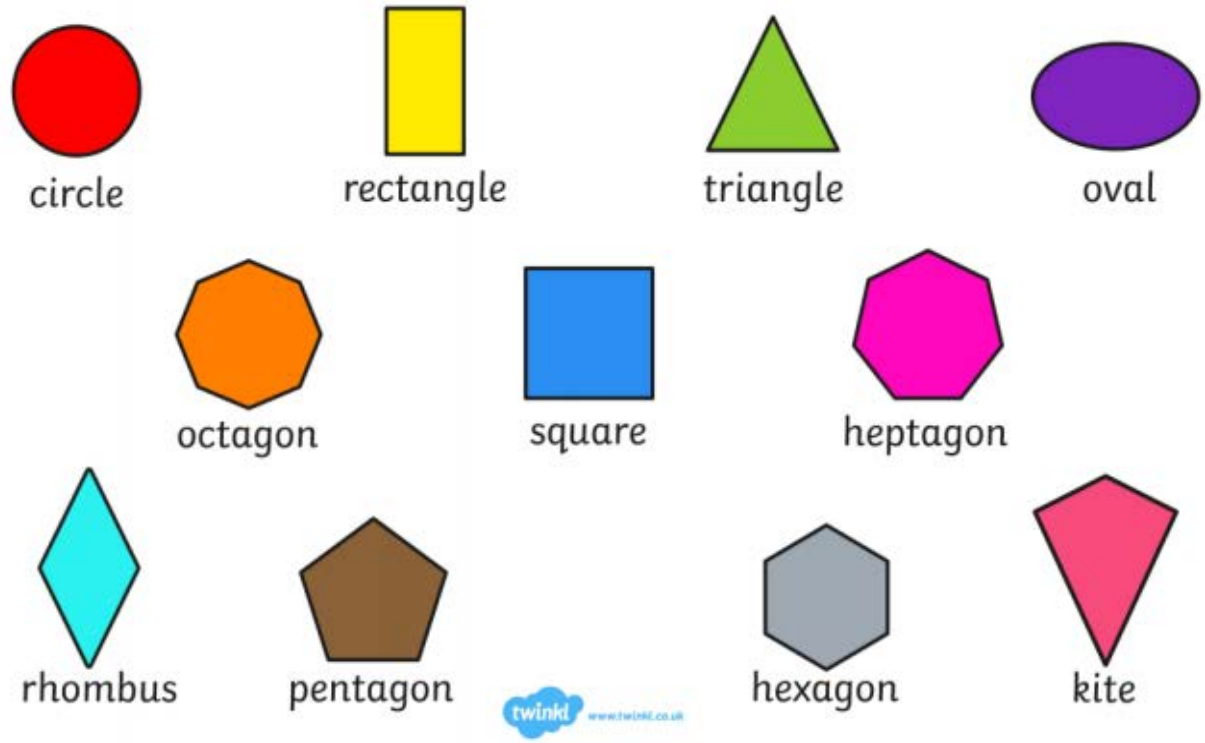
A line of symmetry is a line that cuts a shape exactly in half. This means that if you were to fold the shape along the line, both halves would match exactly. Equally, if you were to place a mirror along the line, the shape would remain unchanged.

A trapezoid and parallelogram do not have lines of symmetry

Shapes can be classified into various categories, including:

1. **2D (Two-Dimensional) Shapes: These are flat figures that have only two dimensions: length and width. Examples include squares, rectangles, circles, ellipses, triangles, and trapezoids.**
2. 3D (Three-Dimensional) Shapes: These have three dimensions: length, width, and height (or depth). Examples include cubes, rectangular prisms, spheres, cylinders, cones, and pyramids.
3. **Polygons: These are 2D shapes with straight sides and angles. Polygons can be categorized based on the number of sides they have: triangles (3 sides), quadrilaterals (4 sides), pentagons (5 sides), hexagons (6 sides), heptagons (7 sides), octagons (8 sides), nonagons (9 sides), and decagons (10 sides).**
4. Organic Shapes: These are irregular shapes that occur in nature or are designed by humans to resemble natural forms. Examples include clouds, mountains, trees, and animals.
5. Symmetrical Shapes: These are figures that have symmetry along one or more axes. Examples include squares, rectangles, circles, and equilateral triangles.
6. Asymmetrical Shapes: These are figures without symmetry along any axis. Examples include freeform organic shapes and many polygons with different side lengths or angles.

Understanding shapes is essential for various disciplines such as mathematics, engineering, architecture, art, and design.



What are Regular Polygons?

Regular polygons are geometric shapes with a specific number of straight sides and equal interior angles. In a regular polygon, all sides and angles are congruent, meaning they have the same length and measure. These polygons can be classified based on the number of sides they have, with common examples including equilateral triangles (3 sides), squares (4 sides), regular pentagons (5 sides), regular hexagons (6 sides), regular octagons (8 sides), and regular decagons (10 sides).

Properties of Regular Polygons

Regular polygons have several unique properties that set them apart from irregular polygons. Some of these properties include:

Equal Sides and Angles: In a regular polygon, all sides and angles are congruent. This means that each side has the same length, and each angle has the same measure.Sum of Interior Angles:

The sum of the interior angles of a regular polygon can be calculated using the formula: (n - 2) * 180°, where n is the number of sides.

Parallel lines are two or more lines that are the same distance apart, never merging and never diverging. We recall that lines are never-ending, so parallel lines continue forever in two directions.

They don't have to be straight lines, as long as they are always the same distance apart.

Polygons with parallel sides could have *one* pair of parallel sides like an isosceles trapezoid, *two* pairs of parallel sides like this square and rectangle, or even *four* pairs of parallel sides like a regular octagon:

Parallel shapes - four pairs of parallel sides octagon

Every regular polygon with an even number of sides will have pairs of parallel sides.

The regular polygon will have half as many pairs of parallel sides as it has sides (because two sides make a pair).

That is an interesting property of regular polygons, and of parallel sides. A regular dodecagon (12 sides) will have *six pairs* of parallel sides, but a regular tridecagon (13 sides) will have *no* parallel sides.

Parallel sides of a quadrilateral, or any polygon, must be straight sides. They can be sides of equal length, but they do not have to be.

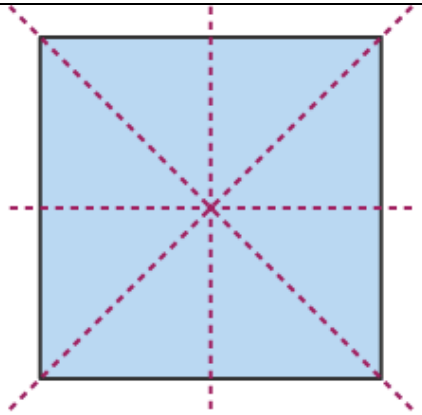
Another property of parallel sides in polygons is that the distance between the two parallel sides will never change, even if we elongate the shape:

What are parallel sides

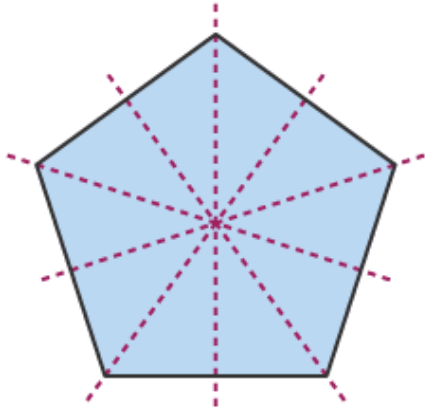
Line symmetry in regular polygons

A square is a regular polygon. It has four lines of symmetry and four sides.

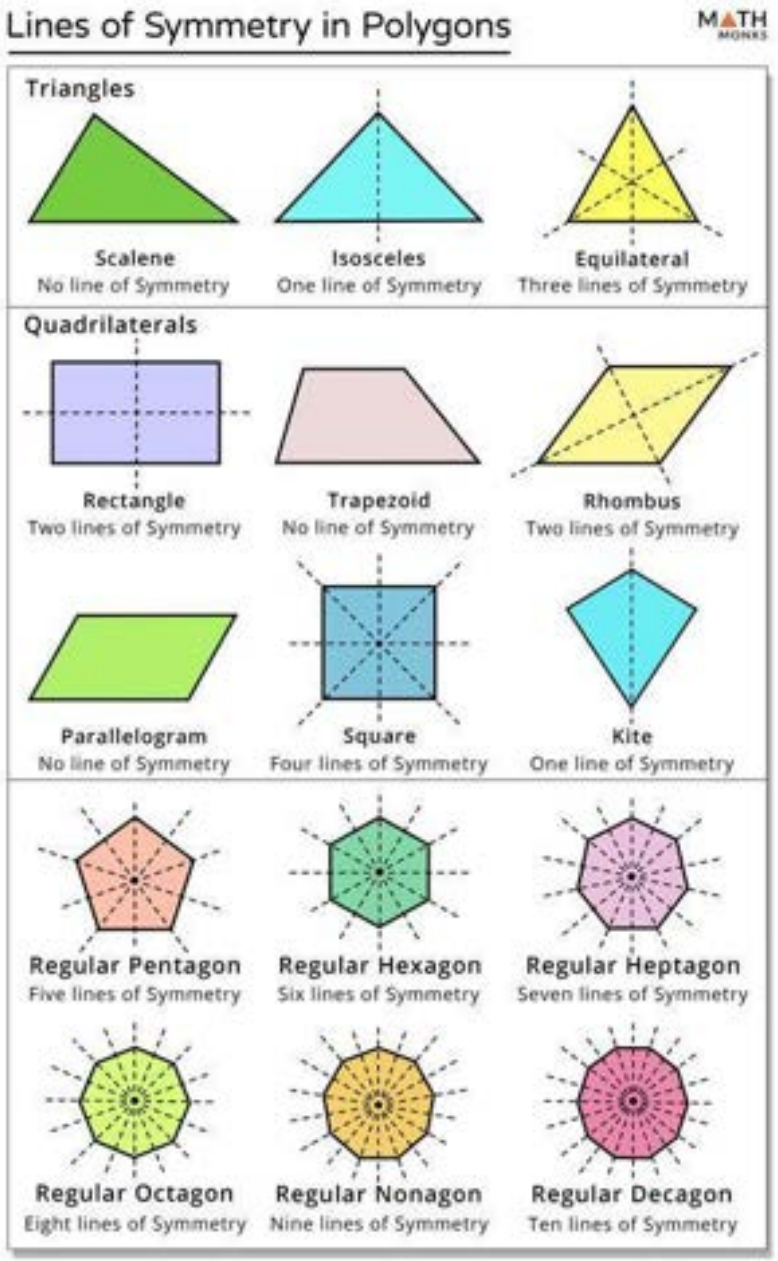
A regular pentagon has 5 sides and 5 lines of symmetry.



Regular square



Regular pentagon


Lines of Symmetry in Polygons
MATH MONKS
Triangles
Scalene
No line of Symmetry
Isosceles
One line of Symmetry
Equilateral
Three lines of Symmetry
Quadrilaterals
Rectangle
Two lines of Symmetry
Trapezoid
No line of Symmetry
Rhombus
Two lines of Symmetry
Parallelogram
No line of Symmetry
Square
Four lines of Symmetry
Kite
One line of Symmetry
Regular Pentagon
Five lines of Symmetry
Regular Hexagon
Six lines of Symmetry
Regular Heptagon
Seven lines of Symmetry
Regular Octagon
Eight lines of Symmetry
Regular Nonagon
Nine lines of Symmetry
Regular Decagon
Ten lines of Symmetry

Opportunities for Subject Integration:

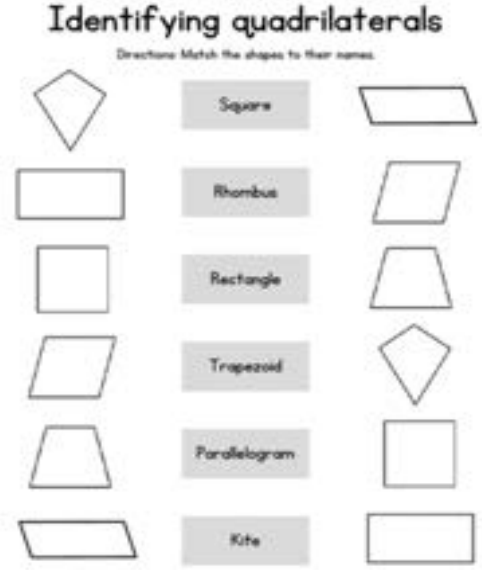
-Identifying the length of sides can be integrated into measurement: length, perimeter and drawing the shapes.
-types of angles
-types of polygons
-types of lines

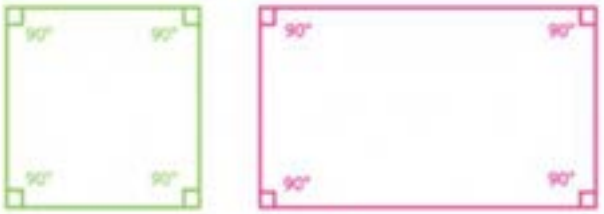
Essential Learning Outcomes: Recognizing, Naming and Describing Shapes- Naming 2D and 3D shapes

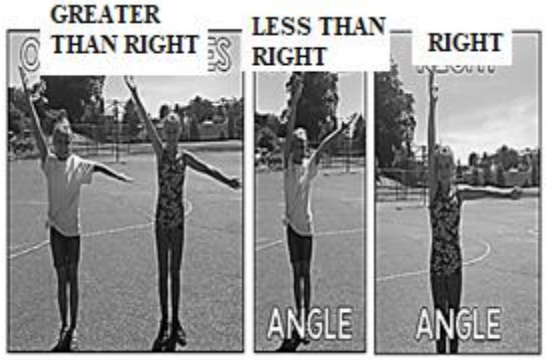
Grade Level Expectations and/or Focus Questions: Recognize, name, and classify 2D shapes (quadrilaterals) and 3D shapes (prisms and pyramids), as well as recognize and identify types of angles in relation to the right angle.

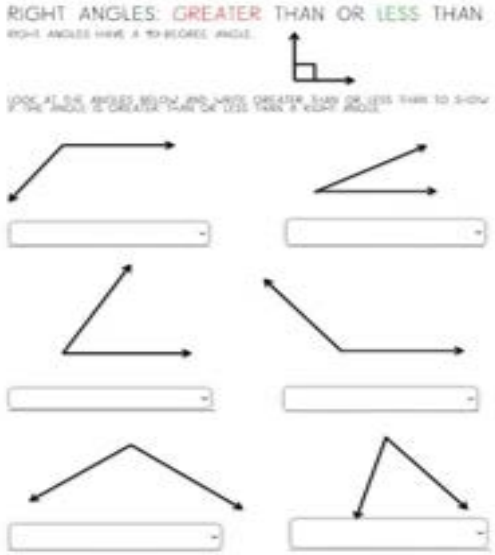
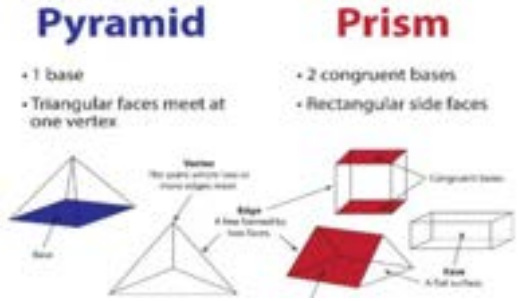
Draw examples of quadrilaterals that do not below that do not belong to any of the subcategories,

Recognize, identify and classify right angles in various positions in space; compare and describe angles as right angles, less than right angles and greater than right angles

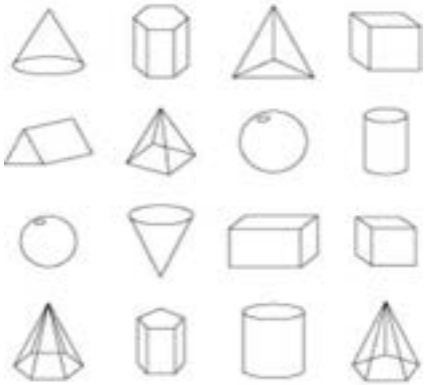
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Specific Curriculum Outcomes **Learners will be expected to:** **Knowledge** 1. Identify and name 2D shapes (rhombuses, rectangles, kites, and squares) as examples of quadrilaterals. 2. Identify and name 3D objects (prisms and pyramids). 3. Recognize and identify right angles as well as angles greater than and less than right angles. **Skills** 4. Classify 2D shapes (rhombuses, rectangles, kites, and squares) as examples of quadrilaterals.	**Inclusive Assessment Strategies:** **Product: Entry Ticket -** To diagnose the extent to which learners are familiar with the concept of quadrilaterals.  Retrieved from https://www.tes.com/teaching-resource/identifying-quadrilaterals-match-up-worksheets-12711267 **Checklist:** The learner is able to accurately match the shapes to their names.	**Inclusive Learning Strategies:** **Video-assisted learning (VAL) and guided discovery will be used to enable learners to have a better conceptual understanding of the main types of quadrilaterals, examples and non-examples of right angles, and differentiating between prisms and pyramids.** ***Video-assisted learning*** a) Have learners watch a video describing and classifying quadrilaterals. *Note* Most videos at this level do not include the description of kites; therefore, this has to be taught separately.*  Retrieved from https://krejcicreations.com/classifying-quadrilaterals/ Topic 15.3: Classifying Quadrilaterals

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
5. Classify 3D objects as prisms and pyramids. 6. Draw examples and non-examples of quadrilaterals. 7. Classify right angles and angles greater than and less than right angles in various positions in space. 8. Compare angles as right angles, greater than right angles, or less than right angles. **Values** 9. Value identifying and classifying quadrilaterals, among other 2D shapes. 10. Play games by matching positions with right angles, angles greater than and less than right angles. 11. Create posters showing prisms and pyramids.	• Yes • Somewhat • No **Observation/Self Assessment:** To determine learners' ability to identify quadrilaterals among other 2D shapes as well as their ability to draw quadrilaterals. Give each student a sheet with pictures of different polygons. Observe as they identify the quadrilaterals from the set by colouring them. Alternatively, have students draw examples and non-examples of quadrilaterals.  Retrieved from https://www.mathworksheets4kids.com/quadrilateral/identify/recognize-1.pdf **Observation:** To engage learners in an activity using concrete materials to teach and reinforce the concept of quadrilaterals. Place students in pairs and give each pair a set of hot dog sticks, toothpicks (cut off sharp ends prior), straws, or craft/popsicle sticks. Give students adhesive to form	b) Break up the term quadrilateral into two words for learners to easily remember the definition. ***Quad means four, and lateral means sides.*** c) Teach learners this catchy song to help them identify and classify quadrilaterals. Quadrilateral Song | Geometry and Polygons | 2nd-3rd Grade Math | eSpark Music ***Representing conceptual understanding in a chart.*** Allow students to assist in creating a chart for the class on quadrilaterals, based on information (***focus will be on the square, rectangle, rhombus and kite***) ***Conceptual Understanding - Identifying right angles*** Use the square and rectangle to teach students about the right angle (see additional content). Ask students to identify non-examples of right angles from the chart on quadrilaterals as well as around the classroom (e.g., corners of doors, windows, and desks). Check to see if they can decipher which angles are greater or smaller than right angles.  Retrieved from https://images.google.com/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	shapes with their material. Ask students to use the materials given to construct quadrilaterals. • Form a rectangle • Form a square • Form a rhombus • Form a kite  Retrieved from https://cuppacocoa.com/busy-box-3-velcro-craft-sticks/ **Checklist:** The learner is able to correctly use the materials to form quadrilaterals. • Yes • Somewhat • No **Product/Group work /Peer Assessment-** To use peer-learning to help learners solidify their knowledge of right angles. **(Outcomes 7 and 8)** Allow students to work in groups to compare and describe angles as right angles, greater than right angles, or less than right angles in various positions in space.	***Modelling right angles*** Use a retractable math angle demonstrator to model the formation of angles. To display angles larger than a right angle, open the device; to display angles smaller than a right angle, close it. Change the position in space to see if students are still able to recognize the angle shown. Later, allow students to manipulate their own tool to form angles and identify.  Retrieved from https://www.ebay.co.uk/itm/314930826076 Allow learners to use arms to demonstrate a right angle, an angle greater than and less than a right angle.  -Sing song "Head and shoulders knees and toes ". Have learners identify where angles are formed on their body.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from https://www.liveworksheets.com/node/5692116 **Checklist:** The learners are able to correctly determine whether the angles shown are right angles, greater than right angles, or less than right angles. ● Yes ● Somewhat ● No **Product: Drawing -** To determine whether learners can identify as well as construct right angles and angles less than and greater than right angles. Allow students to draw and label representations of right angles and angles less than and greater than right angles. **Checklist:** The learner is able to correctly draw right angles and angles less than and greater than right angles.	***Differentiating between prisms and pyramids (Outcomes 2 and 5)*** With the use of a video, assist students in recognizing, identifying and classifying 3D shapes as prisms or pyramids Prisms and Pyramids | Grade 3 & 4 Math | TutWay ***Representing /conceptual understanding in a chart.*** Assist students in making a class chart comparing prisms and pyramids, after they have watched the video.  Retrieved from https://www.teachstarter.com/gb/teaching-resource/pyramid-and-prism-poster-gb/ ***Enhancing conceptual understanding through sorting*** Have students sort 3D objects as prisms, pyramids, or neither. Students can also identify quadrilaterals from the faces of some of the objects given, e.g., a rectangle from a cuboid.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• Yes • Somewhat • No **Conversation*:*** To determine whether learners have attained conceptual understanding using Video-Assisted learning. **)** Following the video on prisms and pyramids ***(see Inclusive Learning Strategies)***, engage students in a discussion on the differences between prisms and pyramids. Check that students can identify prisms and pyramids by drawing examples on the board and labelling some of them incorrectly. Discuss why labelled shapes are pyramids, prisms, or not. **Checklist:** The learner is able to accurately distinguish between prisms and pyramids. • Yes • Somewhat • No **Product: Worksheet -** To engage learners in a fun activity that helps to ascertain their ability to differentiate between prisms and pyramids. Have students identify prisms and pyramids by colouring them according to a given colour code	 Retrieved from https://www.amazon.com/Learning-Advantage-Mini-Geometric-Solids/dp/B014V0M624

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from https://www.mathworksheets4kids.com/identifying-3d-shapes.php **Checklist:** The learner is able to correctly identify prisms and pyramids, among other 3D shapes. ● Yes ● Somewhat ● No	

Additional Resources and Materials

- Local materials to include: hot dog sticks, toothpicks, straws, craft/popsicle sticks, two equal lengths of wood/sticks with a moveable angle, retractable math angle demonstrator
- 3D manipulatives
- Worksheets
- Relevant mathematics text

Additional Useful Content Knowledge for the Teacher:

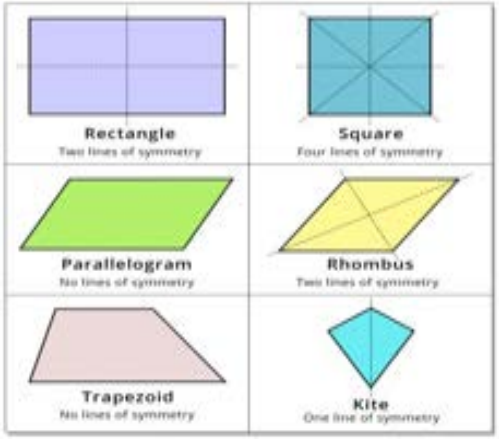
- A quadrilateral is defined as a two-dimensional shape with four sides, four vertices, and four angles. The angles have a sum of 360 degrees.
- In a kite, there are no parallel sides.
- An angle is where two lines meet. A right angle is an angle measuring exactly 90°. The corners of rectangles and squares are right angles (**shaped like an ∟**).

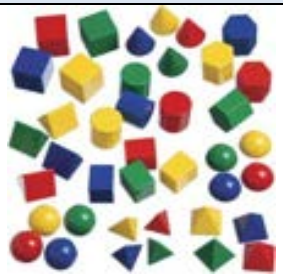
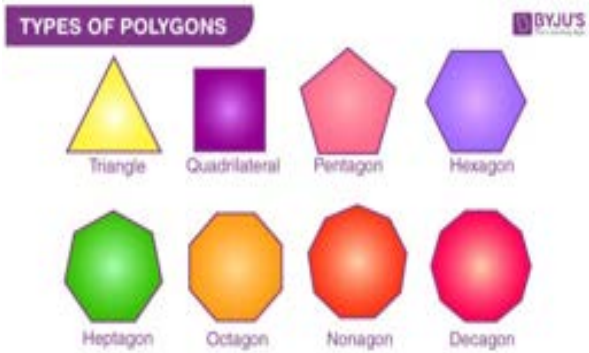
Opportunities for Subject Integration:

-Measurement (calculating area, perimeter, time)
-Statistics (use of shapes to represent data in pictographs)
-Problem solving involving shapes
- Use of shapes to form patterns

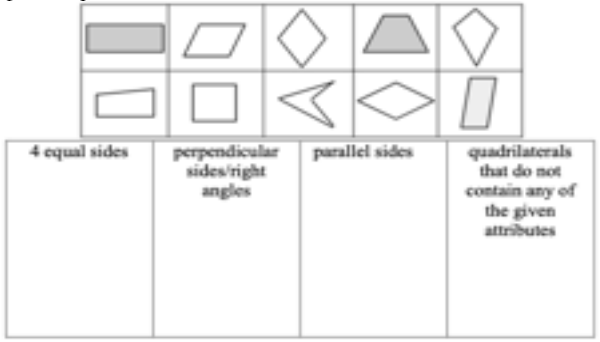
Essential Learning Outcomes: Recognizing, Naming and Describing Shapes-Describing relationships between and among shapes

Grade Level Expectations and/or Focus Questions: Recognize, describe, and compare 2D shapes (including quadrilaterals) and 3D shapes based on their attributes.
Recognize, describe, and compare 2D shapes (including quadrilaterals): including lengths of sides, parallelism and number and size of angles).
Make and test conjectures about properties of shapes related to attributes (sides, angles, parallel sides, convex and non convex)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Specific Curriculum Outcomes **Learners will be expected to:** **Knowledge** 1. a. Describe various quadrilaterals based on their attributes (sides, angles, parallel sides, diagonals and rotational and reflective symmetry. 1.b. Recognize various quadrilaterals based on their attributes (sides, angles, parallel sides, diagonals and rotational and reflective symmetry. 2. Recognize 3D shapes (prisms, pyramids, cylinders, and cones) based on their attributes. **Skills** 3. Compare the attributes of various quadrilaterals (sides, angles, parallel	**Inclusive Assessment Strategies:** **Observation:** To allow learners to make conjectures and then discover attributes of quadrilaterals. Give students cut-outs of various quadrilaterals and ask them to 1. Name the quadrilaterals. 2. ***Guess, then count*** the number of sides, angles, diagonals, and lines of symmetry. 3. Fold the shapes and record the diagonals and lines of symmetry, if any.  Retrieved from https://mathmonks.com/quadrilateral/lines-of-symmetry-in-quadrilateral	**Inclusive Learning Strategies:** **Use Video-assisted learning (VAL) and guide discovery to teach the attributes of 2D and 3D shapes. These will reinforce conceptual understanding.** **Video-assisted learning** Allow students to discover the different types of quadrilaterals. For example, by watching videos GCSE Maths - Types of Quadrilateral #101 ***Peer instruction*** Provide resources for students to discover the attributes of quadrilaterals. For example, print this table on the attributes (sides, angles, diagonals, symmetry) of various quadrilaterals. Place students in pairs, and give each pair a quadrilateral to study. Have pairs present the attributes of their quadrilaterals to the class. https://thirdspacelearning.com/gcse-maths/geometry-and-measure/types-of-quadrilaterals/ ***3D manipulatives*** - Have students manipulate solids, describe them (prisms, pyramids, cylinders, and cones) based on their attributes, and make comparisons among them.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
sides, diagonals, including rotational and reflective symmetry 4. Compare and classify 2D shapes based on their properties (e.g., a nested family of quadrilaterals). 5. Compare properties within a shape (quadrilaterals: length of sides, parallelism, and number and size of angles). 6. Test conjectures about properties of shapes related to attributes (sides, angles, parallel sides, diagonals, convex and non-convex). 7. Compare 3D shapes (prisms, pyramids, cylinders, and cones) based on their attributes. **Values** 8. Play games by matching 2D shapes to their attributes. 9. Design unique shapes using 3D objects to	**Checklist:** The learner is able to correctly name the quadrilaterals and record the number of angles, diagonals, and lines of symmetry. ● Yes ● Somewhat ● No **Product: Attribute table-** To give learners a hands-on experience to help them determine the attributes of various 3D shapes. Have students construct various 3D shapes from their nets (prisms, pyramids, cylinders, and cones). Allow students to feel the shapes, count the faces, vertices, and edges of each, and place that information in an attribute table.  Retrieved from https://babbledabbledo.com/math-art-idea-3d-geometric-shapes/	 Retrieved from https://www.amazon.com/Learning-Advantage-Mini-Geometric-Solids/dp/B014V0M624 ***Provide opportunities for students to recall through drawing the different types of polygons and learning prefixes (Outcome 4)***  Retrieved from https://byjus.com/maths/what-is-a-regular-polygon/ Draw half of each type of 2D shape on the board and have learners copy and complete the shape on their books. Count the sides and classify the shapes based on the number of sides. Teach learners the meaning of the Greek prefixes of the different names so that they will remember how to name the shapes (e.g., tri-three, quad-four, penta-5, hexa-6, hepta-7, octa-8, nona-9 and deca-10). Learners can also use Geoboard to draw the different types of 2D shapes.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from https://minimadthings.com/blogs/news/3d-shapes **Checklist:** The learner is able to accurately determine and record the attributes of different solids through manipulation • Yes • Somewhat • No **Product: Group 2D sorting game/Peer Assessment -** To encourage learning through play. Play a sorting game where groups sort 2D shapes by their number of sides. Each group gets a bag of shapes that are colour-coded according to the group (e.g., group 1-green shapes, group 2- yellow shapes). Set up bins labeled with shape categories. Groups place shapes in the correct bins. Check which group(s) sorted all the shapes correctly.	https://toytheater.com/geoboard-shape/ ***Meaningful Learning*** Make individual items with the shape of solid faces and have the information/attributes written on or contained within the items. For eg. a purse with a trapezoid face can have attributes written on cards contained within it.  

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist: The learners are able to correctly sort various 2D shapes. • Yes • Somewhat • No **Observation/Conversation/Self Assessment: Quadrilateral Attribute Match-Up -** To check that learners can match quadrilaterals to their correct attributes with explanations. Create sets of cards with different attributes written on them, such as "opposite sides parallel," "four right angles," "two pairs of equal sides," etc. Provide students with a set of quadrilateral cards labeled with shape names (e.g., square, rectangle, parallelogram). Instruct students to match each quadrilateral card with the attribute cards that describe its properties. Encourage discussion about why certain attributes match with specific quadrilaterals.  Retrieved from https://www.cpalms.org/PreviewStandard/Preview/15333	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Additional Resources and Materials

- 3D manipulatives
- Straws, craft sticks, and construction paper
- Worksheets
- Relevant mathematics text

Additional Useful Content Knowledge for the Teacher:

- **Reflective symmetry** is the symmetry in which a line divides an object into two coincidental parts (mirror-images of each other). Retrieved from https://flexbooks.ck12.org/cbook/ck-12-cbse-maths-class-7/section/14.1/primary/lesson/introduction-to-symmetry/

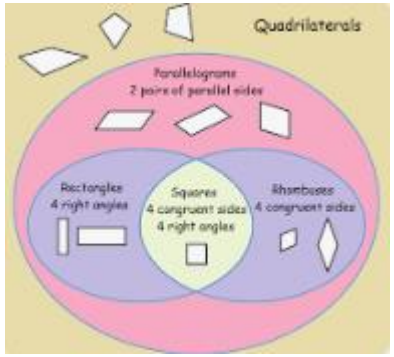
- **Rotational symmetry** of a shape is the number of times the shape can be rotated and still look the same. Retrieved from https://mmerevise.co.uk/gcse-maths-revision/symmetry/

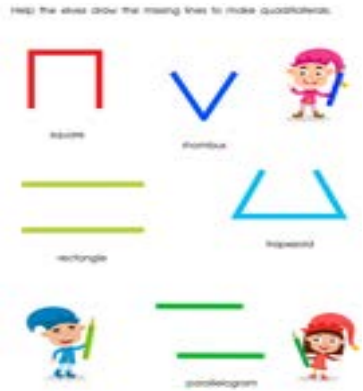
- Quadrilaterals can be convex or concave.
  A **convex quadrilateral** has four sides and also has four interior angles that each measure less than 180 degrees. A **concave quadrilateral** has four sides, but one of the interior angles measures more than 180 degrees.

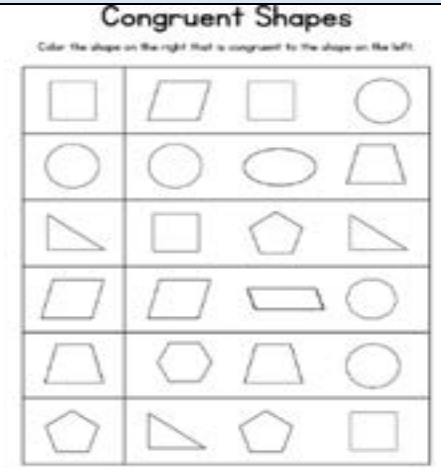
Opportunities for Subject Integration:
-Measurement-calculating area and perimeter
-Problem Solving involving missing sides in shapes
-Use of quadrilaterals to for patterns in tessellations

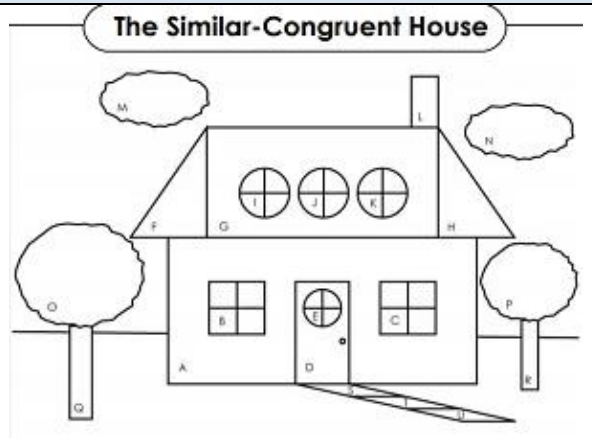
Essential Learning Outcome 3.1: Composing, Decomposing and Transforming Shapes – Combining Shapes

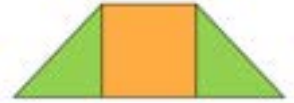
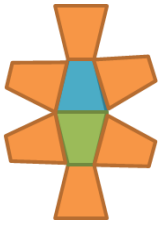
Grade Level Expectations and/or Focus Questions: Students are expected to construct quadrilaterals and composite shapes (various quadrilaterals) from congruent polygons; as well as the construction of nets for various 3-D objects

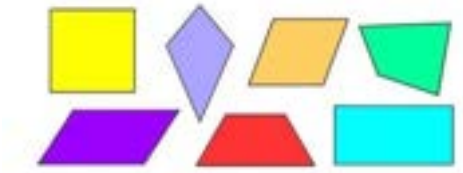
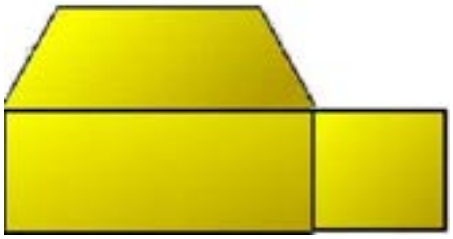
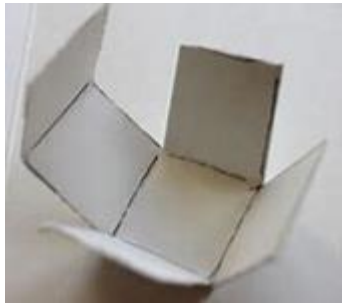
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to : **Skills** 1. Construct quadrilaterals using concrete materials (e.g. popsicle sticks, pipe cleaners, etc 2. Construct composite shapes (various quadrilaterals) from congruent polygons 3. Construct nets for a given 3-D shape **Knowledge** 4. Explain in their own words the term congruent 5. Identify congruent shapes 6. Explain and identify composite shapes	**Entrance Slip /Self Assessment -** Use to assess the identification of shapes using emotions. Students will select a shape of their choice name the shape and state one attribute. Students will then tell the emotion depicted.  *Retrieved from: https://www.freepik.com/free-vector/children39s-cartoon-geometric-shapes-with-expressions_86677055.htm#query=shapes%20kids&position=1&from_view=keyword&track=ais&uuid=d6a9145b-0b88-498f-82e8-da5879d9e56c*	- Provide opportunities for learners to differentiate between a square, rectangle, parallelogram, rhombus, trapezoid and kite by looking at their similarities and differences. Use a Venn diagrams to show similarities and differences of Quadrilaterals. For example:  Retrieved from https://www.onlinemath4all.com/identify-and-classify-polygons.html **Engage students in questioning to help them to realize that both rectangle and square have 4 right angles and both square and rhombus have all sides equal** - Allow learners to construct quadrilaterals based on properties.

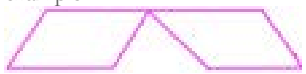
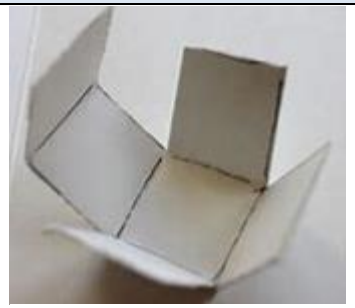
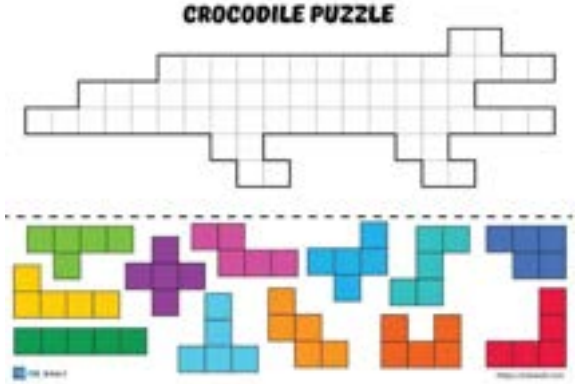
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values 7. Create nets for unique shapes.	**Students' Checklist** I can identify a variety of shapes presented • Yes • No • Somewhat **Observation** - to promote students retention by doing. a) Students will be given popsicle sticks, pipe cleaners, or any other resources available that can be used to create all six basic quadrilaterals—common quadrilateral, trapezoid, parallelogram, rhombus, rectangle, and square..  *Retrieved from:https://montessoriinspiredco.com/f/the-quadrilateral-family* b) Students will trace quadrilateral figures to make the family tree and then paint them before labeling them	For example: a. Watch video in order to identify and construct quadrilateral shapes. *https://youtu.be/QTkoxBFYRk4?si=8WptWB9zC4kyd4vh* a) Complete the drawing by inserting the missing lines to create the quadrilateral labeled below.  *Retrieved from: https://www.kidsacademy.mobi/printables/make-quadrilaterals/* - Provide opportunities for learners to identify composite shapes. ***Discovery using critical thinking*** Provide the opportunity for students to look at different videos to help them with their understanding of the term congruent and how to identify congruent shapes. For example: CONGRUENT shapes | GRADE 4

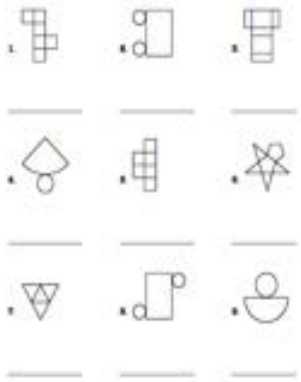
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 *Retrieved from:https://montessoriinspiredco.com/ff/the-quadrilateral-family* **Checklist** Learners can construct and identify quadrilaterals • Yes • No • Somewhat **Think, Pair and Share/Peer Assessment -** To promote collaborative learning in the construction and identification of congruent shapes. Place students in pairs, and give each pair a blank sheet of paper and a pair of scissors. Allow one student to draw a shape and the other student to draw the same shape on the paper. Each student will color and cut out their shape. The	 Retrieved from https://images.app.goo.gl/5BqbPqorp7igfZsg8 ***Discovery using critical thinking*** Allow learners to work in groups and look at the images to identify similar and congruent shapes. For example, students can complete the following activity and justify their solutions.

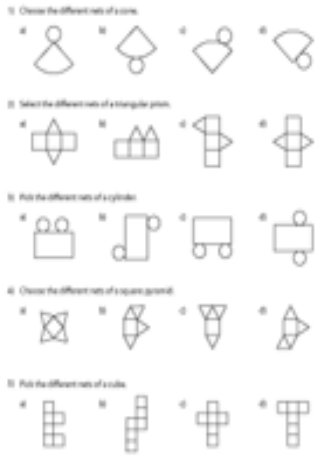
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	shapes are shared with the class to discuss if they are congruent. **Checklist** Learners can construct and identify congruent shapes ● Yes ● No ● Somewhat **Observation :** application of critical thinking in the identification of congruent shapes Students are given a shape and some are placed in a box. Taking turns students will search for the shape congruent to the one they are holding	 1. Which window is congruent to window B? _____ 2. Is the window on the door congruent to the windows on the roof? _____ 3. Name one rectangle that is similar to D? _____ 4. Name a shape that is congruent to H. _____ 5. How many shapes are congruent to N? _____ 6. Is P congruent to O? _____ 7. Is Q similar to R? _____ 8. How many shapes are congruent to S? _____ 9. Draw two more windows on the house. Make the windows similar, but not congruent. ***Discovery using critical thinking*** Provide learners with the opportunity to identify the shapes used to composite shapes. Tick the correct box.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 | 👍 Too Easy | 😜 I got it | 😬 I need a little help | I'm conf | | | | | | **Think and Share (product) :** to apply the use of congruent shapes in arts. Using congruent pattern blocks, students will create composite shapes of any sort. examples provided below. Students will name the shape used to create the composite shape and display it on the desk for all to see.	What shape is composed here?  • square • triangle • trapezoid /trapezium • rectangle What shape is composed here?  • square • triangle • trapezoid • rectangle *Retrieved from: https://images.app.goo.gl/ox81Jcg48ceH3owA7* ***Discovery using creative art (outcome 6 and 7)*** Allow learners to use congruent shapes to compose a new shape. For example: Use the shape given below to construct a diagram. The shape can be used multiple times.  Sample 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 **Sample** *Retrieved from: https://images.app.goo.gl/ox81Jcg48ceH3owA7* **Checklist** Learners can use congruent shapes to create artistic designs • Yes • No • Somewhat **Observation -** To apply the use of congruent quadrilateral in the formation of composite shapes. Using congruent shapes from the group below, Allow students to draw various composite shapes. A shape can be used more than once. Students will present their drawings and discuss the process with the class 	- Allow learners to construct composite shapes (quadrilaterals) from congruent polygons. Example  - Allow learners to make 3D solids using 2D nets. For example, learners can use 3D solids within their environment, deconstruct and look at net.  Give learners the opportunity to identify, name and describe the 2D net of 3D solids. Example allows learners to describe the net of the solid below lowing at congruency and number of faces

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	https://images.app.goo.gl/mTufFCNJzFXe13sR8 example  **Checklist** Learners can construct composite shapes using quadrilaterals ● Yes ● No ● Somewhat **Observation/Discussion-** To allow students to recognize the use of congruent shapes in real-life situations. Students will look at the plan of a two-story building and identify similar shapes used by the architecture to construct the plan. The discussion will unfold as students identify all the similar shapes  **Checklist** Learners can construct and identify quadrilaterals ● Yes ● No ● Somewhat	 Provide opportunities for students to work collaboratively For example : Complete the puzzle below with suitable nets.  https://eslvault.com/printable-tetris/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Game (Product)/Self Assessment -To develop critical thinking skills through playing and the application of building composite shapes. Play Tetris | Free Online Game Allow students to play a game of Tetris which is developed using composite shapes. The student who plays the longest should be given a token. Checklist Learners can construct composite shapes • Yes • No • Somewhat **Observation :** to promote following instructions, and student retention All you need to make these paper 3d shapes is paper, scissors, a pencil, a ruler, and tape. To make each of these 3d nets, use an 8 1/2 x 11 sheet of paper. Students will follow the steps to construct each net.	***Discovery using critical thinking and collaboration*** Have students work in pairs and complete activities identifying a shape for each net. If it is not a shape, write **'NONE' or "NOT ONE".** Have whole class discussions for students to provide reasons for selections. For example, see the worksheets below.  https://images.app.goo.gl/2yaSegMJpzpen7qBA

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	How to Make a 3d Cone: For the cone, trace a large circle and then cut a wedge out of the circle. Wrap it up and add a piece of tape to secure it.  Retrieved from: https://teachbesideme.com/3d-paper-shapes/ **How to Make a 3d Cube**: For the 3d cube, you need a cross-like shape with even squares. You need four squares going down and three going across.  Retrieved from: https://teachbesideme.com/3d-paper-shapes/ **How to Make a 3d Triangular Prism:** The Triangular Prism is made by dividing the paper into thirds. Then in the center section, you will make your triangular cut-outs. Measure the sides of paper sections to make the triangle side the same length.  Retrieved from: https://teachbesideme.com/3d-paper-shapes/	 https://images.app.goo.gl/2yaSegMJpzpen7qBA

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	How to Make a 3d Square Based Pyramid: A Square-based Pyramid is started with a square and then triangles coming out from each side. Make sure each side of the triangle is equal to the sides of the square.  Retrieved from: https://teachbesideme.com/3d-paper-shapes/ **How to Make a 3d Cuboid:** For the cuboid, divide the paper into fourths. Then one of the sections needs a square cut-out. Make this by cutting into the other parts and removing the sections.  Retrieved from: https://teachbesideme.com/3d-paper-shapes/ **Checklist** Learners can construct 3-D nets ● Yes (All) ● No ● Somewhat (1-3) **Think and Share (product)/Peer Assessment** - To promote and enhance students' creativity whilst learning the nets of different 3D shapes Using creative thoughts, students modify some net plans to create the same 3D shapes. Students will share with the class and prove their nets work.	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist Learners can construct 3-D nets ● Yes ● No ● Somewhat **Exit Slip** 1. Students will look at the nets and identify the 3-D shapes they can create. Retrieved from: https://www.toppr.com/guides/maths/visualising-solid-shapes/what-are-solid-shapes/ **Checklist** Learners can construct and identify quadrilaterals ● Yes ● No ● Somewhat	

Additional Resources and Materials

-Items around the home such as cans, boxes, party hats for 3D shapes
-Magnetic shapes
-legos

Additional Useful Content Knowledge for the Teacher:

Symmetry is defined as a balanced and proportionate similarity that is found in two halves of an object. It means one-half is the mirror image of the other half. The imaginary line or axis along which you can fold a figure to obtain the symmetrical halves is called the line of symmetry.

Congruent Shapes: Two shapes are described as congruent. if they are identical. The lengths of sides (edges) and sizes of angles must be equal between the two shapes for them to be congruent.

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. We see composite shapes every day. The shape of your curved bookcase, the mouse you are scrolling, and the bag you are carrying are all composite shapes.

Opportunities for Subject Integration:

Patterns and relations: Students can create patterns by putting shapes together.

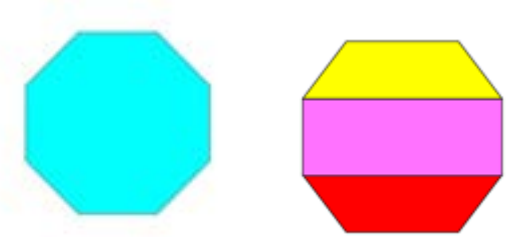
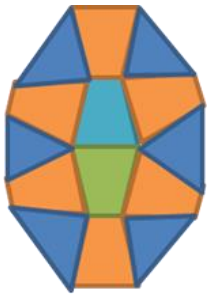
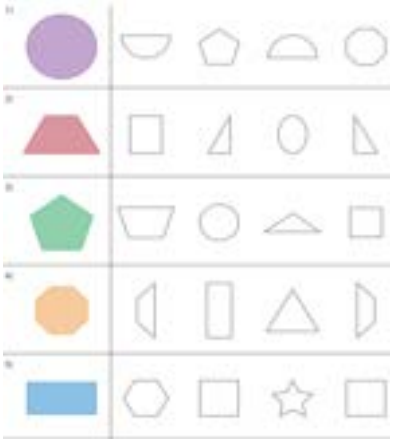
Measurement: The composition of shapes can be used to teach the area of irregular shapes

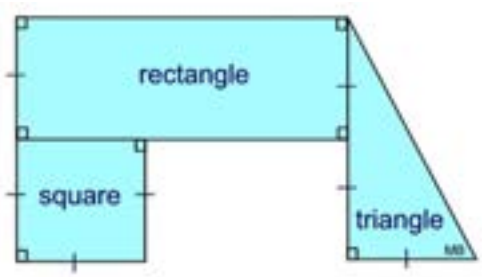
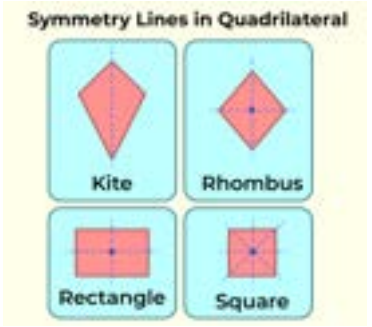
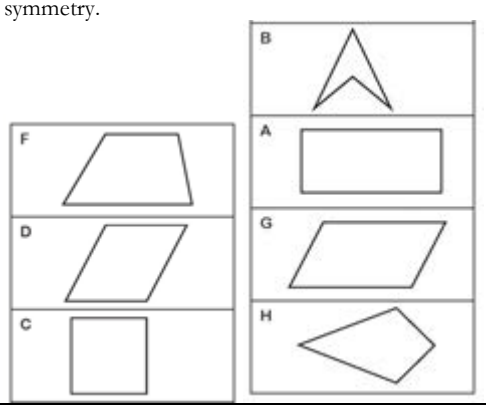
Statistics: When drawing graphs, shape composition can be used such as bar graphs and histograms.

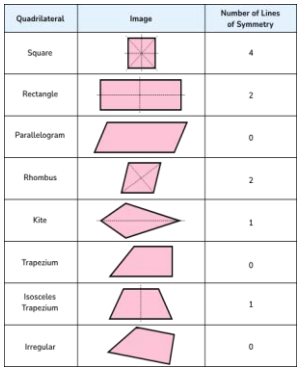
Essential Learning Outcome 3.2: Composing, Decomposing, and Transforming Shapes - Deconstructing Shapes

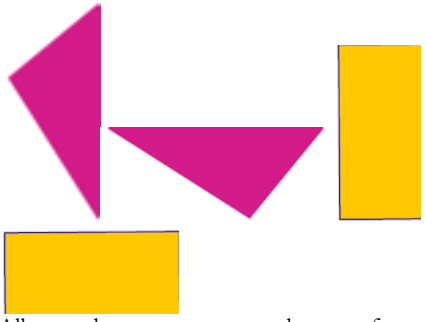
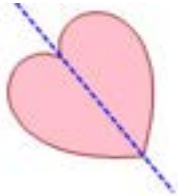
Grade Level Expectations and Focus Questions: Students are expected to deconstruct shapes, using symmetry and folding to subdivide quadrilaterals into two congruent triangles and two congruent quadrilaterals.

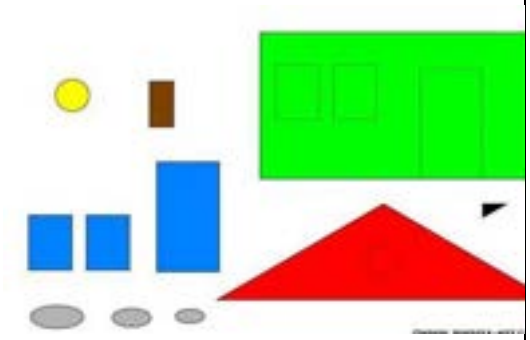
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to : **Knowledge** 1. Discuss the phrase "deconstruction of 3D shapes" 2. Demonstrate shape deconstruction **Skills** 3. Deconstruct composite shapes and identify the shape used to construct the composite shape.	**Entrance Product -** Use to assess students' understanding of the term "symmetry". Have students look at the video and discuss terms associated with symmetry. For example, mirroring. https://youtu.be/Kah5w06eyCo?si=T85ieDrVgBfClxVU **Checklist** Learners demonstrate understanding of the term 'Symmetry'. ● Yes ● No ● Somewhat **Listen-** Use to assess students' understanding and to demonstrate using technology to deconstruct shapes. Allow students to listen to the video and discuss their understanding by using probing questions such as 1. Name one shape deconstructed 2. How was the shape you named deconstructed? https://youtu.be/zr3ROX6ThzM?si=9RPB7UXugt2I1TAx	**Learners will be using guided discovery and Video Assisted Learning (VAL), to identify the differences in the objects making them symmetrical or through deconstruction** ***Discovery using inquiry-based learning*** Provide students with stimulus to identify 3D shapes. For example using pictures. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist Learners can name one shape deconstructed and describe briefly how it was done • Yes • No • Somewhat **Think Pair and share /Peer Assessment -** Use to assess students' cognitive ability to decompose composite shapes. Allow students a minute to look at the diagram below, then ask them to identify the quadrilaterals within the shape. Have them discuss, draw, or show their findings to class. 	***Discovery using critical thinking.*** Deconstruct the shape below and state the shapes used to compose it  https://www.mathfunworksheets.com/compose-and-decompose-shapes/ Provide students with the opportunity to identify the deconstruction of 2D shapes. Colour the 2D shapes on the right that make each shape on the left 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Knowledge 4. a. Recognize and categorize various shapes resulting from folding. 4. b. Identify lines of symmetry within folded shapes.	**Sample of labeling the shape**  **Checklist** Learners can decompose the shape(s) presented to them • Yes • No • Somewhat **Group Work -** used to assess students' cognitive ability to create and identify shapes using lines of symmetry Students are given printed quadrilateral shapes a pair of scissors, and a worksheet with the same cut-out shapes.  https://images.app.goo.gl/iZpJ3CDGmY9CMfCo6	***Student-centered learning using collaboration*** **Folding activity** Have students identify lines of symmetry in different quadrilateral. For example, Look at the quadrilaterals below with the lines of symmetry and identify the different shapes formed from the lines of symmetry.  Draw the lines of symmetry of each shape if there is and then draw the shape derived from the line of symmetry. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 5. a. Employ folding techniques to deconstruct quadrilaterals into two congruent triangles. 5. b. Utilize folding methods to subdivide quadrilaterals into two congruent quadrilaterals.	Students will fold each shape in half and cut along the folded line. The students will compare each piece to determine if they are symmetrical and discuss the shape derived from it. **Checklist** Learners can draw lines of symmetry of shapes presented to them ● Yes ● No ● Somewhat **Self Assessment -** to promote students confidence in identifying shapes derived from lines of symmetry Students will look at these shapes (Quadrilaterals) and think of ways to fold each to create another shape.   https://thirdspacelearning.com/gcse-maths/geometry-and-measure/lines-of-symmetry/	**Retrieved from** https://images.google.com/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values 6. Show your artistic abilities using different shapes. 7. Recognize the important role of the different architectural designs around you.	**Checklist** I can draw lines of symmetry on at least one shape and identify the new shapes formed using lines of symmetry ● Yes ● No ● Somewhat **Observation -** to assess students' problem solving skills to deconstruct shapes using the folding method  Allow students to use cut-out shapes to form quadrilaterals. e.g. Joining two triangles to make a rectangle.	- Provide opportunities for learners to understand the concepts of symmetry and congruency.   ***Student-centered learning using collaboration and critical thinking***

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist Learners can deconstruct shapes using the folding method ● Yes ● No ● Somewhat **Symmetry Game** **(outcome 7)** https://www.abcya.com/games/world_wonders_spot_difference **Checklist** Learners can identify symmetrical shapes presented to them ● Yes ● No ● Somewhat	Have students work collaboratively and reconstruct images using the different shape from a deconstructed image. For example a) Look at the deconstructed figure. Put the pieces together and reveal the image created.  **https://toddler-net.com/worksheets/shapes/shapes_htmls/shape-worksheet-house.html** b) Deconstruct the shape below. Identify any congruent shape.  **https://toddler-net.com/worksheets/shapes/shapes_htmls/shape-worksheet-house.html**

Additional Resources and Materials

-www.splashlearn.com
-https://quizizz.com/?lng=en

Additional Useful Content Knowledge for the Teacher:

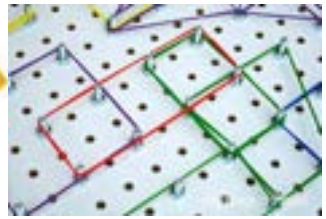
Deconstruction means to study the object and break it down into simplified form, ignoring the details and focus on revealing the core structure
Symmetry is defined as a balanced and proportionate similarity that is found in two halves of an object. It means one-half is the mirror image of the other half. The imaginary line or axis along which you can fold a figure to obtain the symmetrical halves is called the line of symmetry.
Congruent Shapes: Two shapes are described as congruent. if they are identical. The lengths of sides (edges) and sizes of angles must be equal between the two shapes for them to be congruent.

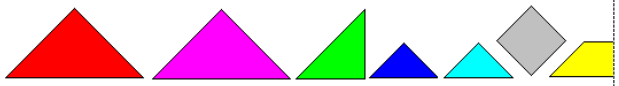
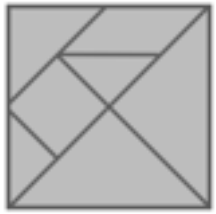
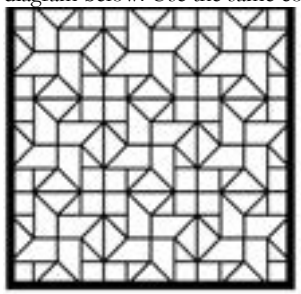
Opportunities for Subject Integration:

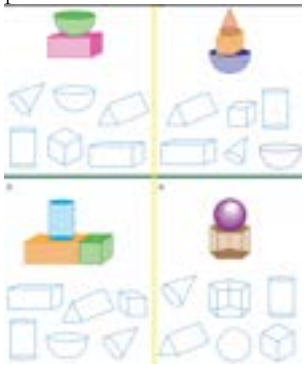
-Measurement: Decomposition of shapes to find the area of composite shapes
-Relations and Patterns: Use to plot graphs and create shapes
-Statistics : Data representation of a fraction of a symbol for pictographs

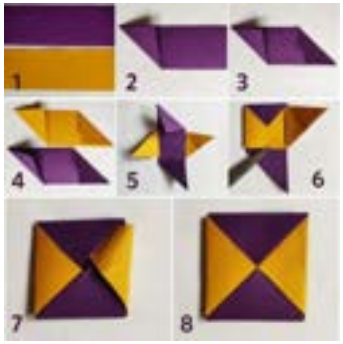
Essential Learning Outcome 3.3: Composing, Decomposing and Transforming Shapes -Transforming Shapes

Grade Level Expectations and/or Focus Questions:
Transform 2D shapes and 3D objects using concrete materials (pattern blocks, paper folding, tangrams, etc) to represent various quadrilateral Transform nets for given 3-D objects (cube, triangular, rectangular prisms, and rectangular pyramids)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Skills** *Students will be able to:* 1. Transform 2D objects using concrete materials to represent various quadrilaterals 2. Construct quadrilaterals using concrete materials 3. Transform 3D objects using concrete materials 4. Construct 3D shapes using paper folding **Values** 1. Promote artistic design skills through shape transformation	**Inclusive Assessment Strategies:** **Entrance Slip -** Use to assess students' understanding and to demonstrate using technology to transform shapes. Using a Geoboard either online or physically, students will create various quadrilaterals   **Checklist** Learners can transform 2D objects using concrete materials to represent various quadrilaterals • Yes • No • Somewhat	**Inclusive Learning Strategies:** Provide opportunities for learner to transform 3D solids using concrete materials to represent various quadrilaterals .Allow learners to decomposed solids within their environment to identify the number of quadrilaterals. Example: Let learners decompose the solid below and identify the quadrilaterals.  Allow learners to obtain the nets of given 3-D solids by deconstructing given solid. Give learners solids to deconstruct and trace net. Then fold net to form solid to verify. Example: Deconstruct the solid below, trace net and then fold to verify.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Group Work/Peer Assessment In small groups, students will use all the shapes provided below to create a square.  Sample  **Checklist** Learners can transform shapes into quadrilaterals • Yes • No • Somewhat **Observation** - Use to assess students' understanding and application of the constructions of quadrilaterals. Students are required to log in to the website and use the provided instructions to create various types of quadrilaterals using their creative skills. https://toytheater.com/geoboard/ 1. Choose a color on the right-hand side. Multiple colors can be used 2. Select a point on the geoboard you wish to begin and drag to create a line. Continue by dragging left or right until you have created a quadrilateral. Be creative in your design.	 Provide opportunity for students identify all the quadrilaterals in the diagram below. Use the same colors to identify your findings.  ***Discovery using simulation learning and creative arts*** Provide opportunity for students to make a use of origami. For example, use stepper box, this origami gift box has 3 – 4 levels and is easy to make. Boxes can be made in different lessons. a) https://youtu.be/INilWTzUh5s?si=pI6lNfZg8-zAtNpV b) https://youtu.be/q8nX91GxLBU?si=erak9CvNmg2_TPuX

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Checklist Learners can identify and construct quadrilaterals using concrete materials. ● Yes ● No ● Somewhat **Group Work /Conversion-** Use to assess students' understanding of 3D shapes **transformation.** In groups, students will use a variety of 3-D shapes as shown below to create and transform new objects. Each group will present and discuss their work object.  htttps://www.mathfunworksheets.com/compose-and-decompose-shapes/ **Checklist** Learners can transform 3D objects using concrete materials ● Yes ● No ● Somewhat	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Observation/Self Assessment - Use to assess students' understanding by using paper folding to transform shapes into 3D shapes. Using two pieces of colored paper, allow students to follow the steps to create 3D shapes  **Students' Assessment Checklist** 👍 Too Easy | 😃 I got it | 😬 I need a little help | 😡 I'm confus | | | |	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Group Work/Product  To make the cubes, you'll need ● 6 pieces of square paper. ● 6 x 6-inch origami paper, which is ideal, but regular copy paper will work also **Step 1:** Start by folding a piece of paper in half, and then open it back up  **Step 2:** Fold each side over to the center line and crease it well  **Step 3:** Flip the paper over.	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 **Step 4:** Fold the bottom left corner up and over to the right and crease it well.  **Step 5:** Then fold the top right corner over to the left and crease it well.  **Step 6:** Now turn the paper so that the points face directly up and down. Fold the top corner down and crease.  **Step 7:** Then fold the bottom corner up and crease. Your paper should look like this:  **Step 8:** The corners will pop back up, but that's fine. You don't need them to stay down anyway.	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Then make five more of these paper sections! It's fun to use 6 different colors. Three colors works well.  **Step 9:** Now it's time to start fitting the pieces together. Slide the end flap of one piece into the center fold of another   Here's how the finished cube should look.	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 **Checklist** Learners can construct 3D shapes using paper folding • Yes • No • Somewhat	

Additional Resources and Materials

-Construction paper
-Shapes from home such as a ball, box, cone etc
-Colors, Paints
-www.splashlearn.com
-www.quizziz.com

Additional Useful Content Knowledge for the Teacher:

A quadrilateral is a polygon having four sides, four angles, and four vertices. The word 'quadrilateral' is derived from the Latin words 'quadri,' which means four, and 'latus', which means side.

Opportunities for Subject Integration:
Patterns and Relations- use to transform points into shapes and geometric patterns
Measurement - area and perimeter of transformed shapes
Fractions - fractions of shapes

Measurement

Introduction to the Strand:

This section recognizes that measurement is essential in daily life. It offers teachers a structured approach to help students develop these skills. The core idea is for students to learn how to measure things like length, area, weight, volume, time, and even money. To achieve this, students will practice reading scales, estimating amounts, taking measurements, comparing them, and keeping track of their findings. A key part of learning measurement is choosing the right tool or unit for the job and explaining why that choice is the best one. Students will also be encouraged to figure out relationships between different units, convert between them, and understand what those conversions mean.

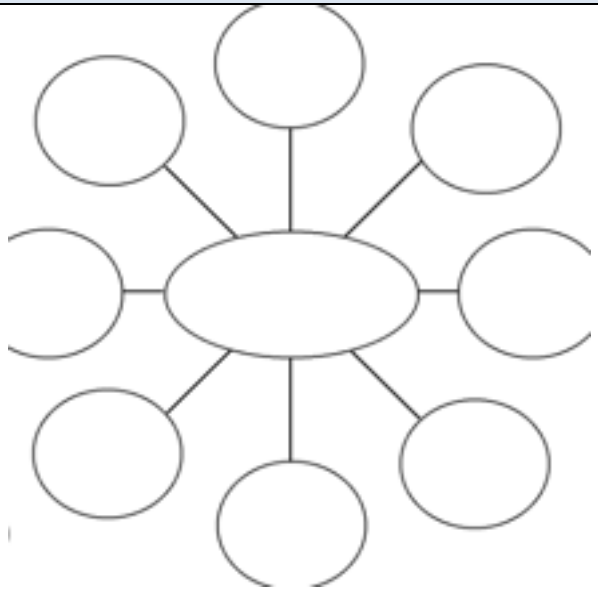
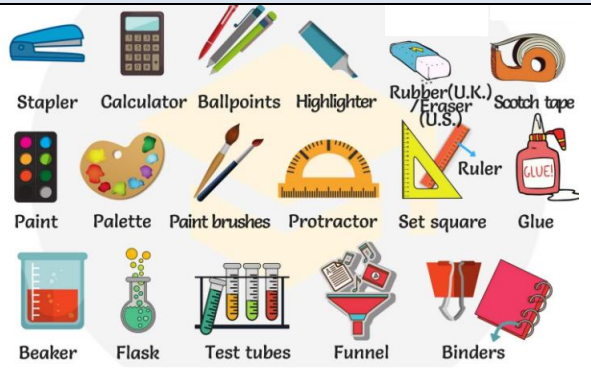
(adapted from: OECS Primary Grades Learning Standards, 2017)

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

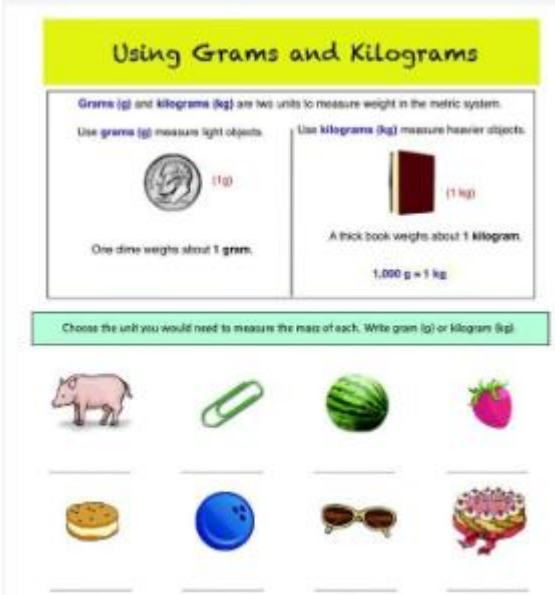
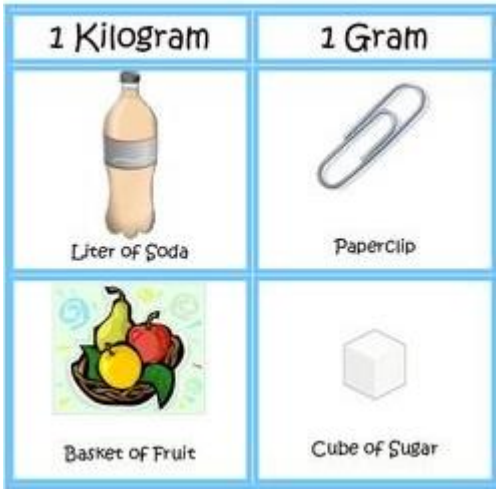
Grade Level Expectations and/or Focus Questions:

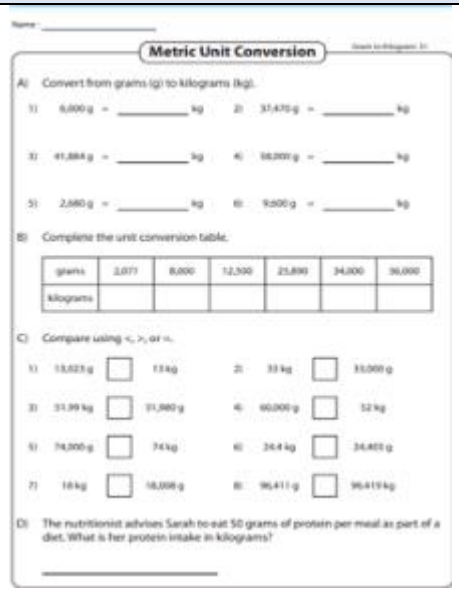
-Develop and apply language relating to measurement terms for mass and capacity
- Know the relative sizes of measurement units within one system of units
- Explain the relationships between grams and kilograms as metric units of mass, and between liters and milliliters as metric units of capacity, and use benchmarks for these units to estimate mass and capacity
-Use metric prefixes to describe the relative size of different metric units, and choose appropriate units and tools to measure length, mass, and capacity

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to : **Knowledge** 1. Use language relating to measurement terms (mass, kg, g) 2. Differentiate between items using measurement of mass and capacity	**Product activity - to assess students prerequisite knowledge of mass** Have students complete a classroom word web using words relating to mass.	***Intro :To develop language relating to mass.*** ***Meaningful Learning*** Create a classroom grocery shop using objects around the classroom. Have students decide whether they should measure the mass and or the item can measure the capacity

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
3. Name relative sizes of the measurement units within one system of units (grams and kilograms). 4. State the relationship between grams and kilograms 5. Estimate the mass of objects using benchmarks 6. Explain the relationship between liters and millilitres as metric units of capacity, 7. Use benchmarks items as examples when estimating capacity	 Retrieved from https://images.google.com/ **Checklist** Students can list at least five (5) words or terms related to mass • Yes • No **Fill in the Blank (Product) - to assess students' knowledge of examples of units of measurement.** 1. Name two units of measurement for measuring: Mass:_____ _____ Capacity_____ _____ 2. 6 kg of flour refers to (mass/capacity)	 Retrieved from https://7esl.com/classroom-objects-vocabulary-english/ ***Discussion and Discovery*** • Describe a short scenario involving the term mass based on their experiences. Eg. The students in science class gathered around a table with various objects. Using a balance scale they weighed each object and compare the mass of a hairpin a textbook. • Allow students to brainstorm and give words relating to mass based on experiences. For example, heavy, light, weight, scale, measure, etc. The teacher guides students. • Give scenarios to bring out terms. E.g., "What does the shopkeeper use to measure a pound of flour?" 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
8. Use metric prefixes to describe the relative size of different metric units. 9. Choose appropriate units to measure length mass and capacity 10. Choose appropriate tools to measure length mass and capacity	**Conversation (in pairs) - to develop a better understanding of the metric units of measurement, the relationship between them, and which unit is best for measuring a certain quantity.** Have class compare each side of the equation and and explain the situation below, seen on a balance 4 x 250 g =1 kg (mass of four small bags of nuts = mass of 1 large bag) **Checklist** Each pair can outline at least **one** comparison. **Product- identify suitable objects measured in grams or kilograms** a) state which would be more appropriate unit for measuring each: (grams/kilograms)	Retrieved from https://www.picxy.com/photo/2691300 Allow students to use a scale to weigh items in both grams and kilograms and compare their answers Items | Grams | Kilograms Text book Shoe Bottle of water The teacher leads students to the realization the 1kg = 1000g ***Meaningful learning*** After weighing allow students to identify objects that weigh 1 gram and 1 kilogram and can be used as benchmarks :  ***Retrieved from:*** ***https://www.youtube.com/watch?v=CQ4JiXTokr4***

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 11. Estimate the mass and capacity of given items and containers **Values** **12.** Design a poster to show the appropriate terms and units of measurement 12. recognize the importance of estimation by solving everyday problems involving units of measurement	 Retrieved from https://www.pinterest.com/pin/742319951069932187/ **Checklist** Students can name ⅗ units correctly • Yes • No b) Complete the worksheet that requires the conversion from grams to kilograms and vice versa	 ***Retrieved from fromhttps://www.pinterest.jp/pin/507358714268157159/*** Give students objects with a mass of one gram and objects weighing one kilogram and students find objects which weigh similar mass to those objects. ***Meaningful Learning*** Use metric measuring cups, syringes, beakers, and cylinders to fill different capacity containers. Place students in small groups to compare capacity using ml and *l*. Eg. Fill a container holding 50 ml. How many are needed to fill a container holding 100 ml. Eg. How many 5 ml spoons of medicine can we get from a 125 ml bottle of cough syrup?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Name: _____ **Metric Unit Conversion** A) Convert from grams (g) to kilograms (kg). 1) 6,000 g = _____ kg 2) 37,470 g = _____ kg 3) 41,884 g = _____ kg 4) 98,000 g = _____ kg 5) 2,680 g = _____ kg 6) 9,600 g = _____ kg B) Complete the unit conversion table. grams | 2,071 | 8,000 | 12,500 | 25,890 | 34,000 | 36,000 kilograms | | | | | | | C) Compare using <, >, or =. 1) 13,023 g ☐ 13 kg 2) 33 kg ☐ 33,000 g 3) 31.99 kg ☐ 31,980 g 4) 60,000 g ☐ 52 kg 5) 74,000 g ☐ 74 kg 6) 24.4 kg ☐ 24,400 g 7) 18 kg ☐ 18,008 g 8) 96,411 g ☐ 96,419 kg D) The nutritionist advises Sarah to eat 50 grams of protein per meal as part of a diet. What is her protein intake in kilograms? _____ **Retrieved fromhttps://www.mathworksheets4kids.com/grams-kilograms.php** **Product activity/Self Assessment-** To help determine students' understanding of the relative size of different metric units using metric prefixes and to enable them to	Eg. A muffin recipe requires 500 ml of milk. How many *l* will be needed for 3 such recipes? **Observation/Conversion/ Peer Assessment** Have students work collaboratively,, using a 100ml container, fill different containers holding ½ litre, 1 litre,. 2 litres. Allow students to fill the 100ml container and record the amount of water left after filling each container  (i) 150 mℓ (ii) 1 ℓ (iii) 2 ℓ (iv) 10 ℓ (v) 100 mℓ (vi) 500 mℓ (vii) 50 mℓ (viii) 5 ℓ Observe other groups to see who comes up with 1L = 1000ml. Have groups present. ***Meaningful Learning* - Game: Metric Prefix Relay Race:** Allow students to play games to practice Metric Prefixs: a) Divide the class into teams and assign each team a metric prefix (e.g., kilo, centi, milli).

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td></td>
<td>
choose appropriate units and tools for measuring length, mass, and capacity.

a) State which unit is most appropriate for measuring (ml or L)

1. small bottle of glue.
2. the large water bottle.
3. mop pail filled with water.
4. tears from your eyes.

b) complete the table.

<table>
<tr><th>scenario</th><th>capacity or mass</th><th>ml or L
g or kg</th></tr>
<tr><td>eyelashes</td><td></td><td></td></tr>
<tr><td></td><td></td><td>kg</td></tr>
<tr><td>yourself</td><td></td><td></td></tr>
<tr><td></td><td></td><td>ml</td></tr>
</table>

<table>
<tr><td>large Fruta juice box</td><td></td><td></td></tr>
<tr><td>the ink in your pen</td><td></td><td></td></tr>
</table>

c) Match the tool to the measurement strand.
</td>
<td>
b) have students engage in a Scavenger hunt. For example, Place various objects of different lengths, masses, and capacities around the room and provide appropriate prompts for students to find.

Retrieved from fromhttps://tr.pinterest.com/luanaveras77/classroom-objects/

c)Provide each team with a list of items to measure and each group has the choose the most appropriate measuring instruments from the tools given.
</td>
</tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	measuring cup capacity tape line/metre stick mass Balance length d) Estimate to your best the following 1. the mass of your math textbook. 2. the capacity of a regular mug/cup. 3. the mass of your teacher. 4. the capacity of fluid you can hold in one palm. 5. the mass of a loaf of bread 6. the capacity of the classroom dustbin.	 Retrieved from fromhttps://www.kidsacademy.mobi/printables/measuring-tools-mixup/ d) Allow teams to measure each item using the each prefix and record their measurements in a suitable table. e) The first team to accurately measure all items and report back wins the relay race. ***Game - Metric Scavenger Hunt***

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		a) Create a list of items with varying lengths, masses, and capacities, along with their corresponding metric units.  Retrieved from https://www.woodwardenglish.com/lesson/classroom-objects-vocabulary/#google_vignette b) Hide these items around the classroom or schoolyard. c) Allow students to work in pairs to hunt for objects. After the hunt, each pair will state a benchmark object and corresponding metric unit for each object found. (about 20 minutes of hunting time). c) the pair with the most objects along with accurate responses wins.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Meaningful learning a) Provide students with measurement tools such as rulers and measuring cups to use to measure different items. Have students determine which tool is most appropriate for given items.  Retrieved from https://www.pinterest.com/pin/591104323332592 3/ b) Allow students to find each item on the list and measure it using the appropriate metric unit and prefix. c) Allow students to record their measurements and the corresponding units on a worksheet. d)Engage students in games such as, placing students in teams to measure items accurately. The team that measured the most items within a given time wins the scavenger hunt.

Additional Resources and Materials

-Video tutorials
https://www.youtube.com/watch?v=DCI7y_NcWUM

- Stationary classroom shop corner equipped with : where items are grouped by capacity and mass, and a scale

Additional Useful Content Knowledge for the Teacher:

Teacher will select relevant content for students

The two most common metric measures of capacity are milliliters and liters. Measuring mass in grams and kilograms, one kilogram (kg) is equal to 1000 grams (g).
One liter (L) is equal to one thousand milliliters (mL).
A single milliliter (mL) of water weighs one gram (g).
One centimeter (cm) is equivalent to one millilitre (mL) of liquid.
While both standard and non-standard units are equally accurate when measuring (as long as the measurement is performed correctly), standard units enable consistent and understandable communication of lengths and distances.
Scientists use the metric system exclusively because it uses standard prefixes for conversions and measurements. In all but three of the world's nations, metric units are the norm.

Mass:

1 kilogram (kg) is equivalent to 1000 grams (g)

Benchmarks:

1 gram: a paper clip, a leaf

25 grams: a spoon

50 grams: 10 nickels, a small chicken egg

500 grams: a brick of butter, 3 large apples

capacity:

1 litre (L) is equivalent to 1000 millilitres (mL)

Benchmarks:

1 millilitre: 20 drops of water

5 millilitres: 1 teaspoon

15 millilitres: 1 tablespoon

200 millilitres: a juice box

350 millilitres: a mug

1 litre: a milk carton

Opportunities for Subject Integration:

Statistics - data collection in measuring students' mass
Statistics - used in pictographs for data analysis
Geometry- comparing container shapes

Essential Learning Outcome 1.2 : Measurement - Understanding What and How We Measure - Comparing and ordering based on measurable attributes

Grade Level Expectations and/or Focus Questions: Students will be able to compare and order solids based on their lightness, heaviness, estimated weight, and mass.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Students will be able to: differentiate between weight and mass 2. Explain the term weight 3. Explain the term mass	**Product:** Assess students' prerequisite knowledge of mass and weight. Say whether mass or weight is being referred to in each scenario. 1. Jack wants to know how much material his ball is made up of. _____ 2. The nurse weighed the baby to know how heavy or light he is. _____ 3. The scale reads is 4.5kg of meat ._____ 4. 5. The chicken has 2.5 kg of muscle and 2 kg of fat._____ **Product/Conversation/Observation/Peer Assessment** **Group Activity:** to help students understand the concept of heavy and light and to record the weights of these objects, and arrange them as directed and answer questions.	***Intro: Students will engage in activities which compare and contrast the concepts of weight and mass*** ***Meaningful learning*** Engage students with a question: "What do you think is the difference between weight and mass?" Allow students to view YouTube videos on Mass and weight. https://youtu.be/ivAD44nh0D0 Learners engage in an online game answering questions on mass and weight.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 4. Compare objects by measuring and ordering based on their heaviness/lightness 5. Solve real world and mathematical problems involving area of rectangles, including finding the area given the side lengths, finding an unknown side length, and exhibiting rectangles with the same area, with the same perimeter and different areas or with the same area and different perimeters. 6. Estimate the area of shapes and other objects	• Divide the class into small groups and assign each group a different set of solids. • Have each group compare and order their solids based on mass, lightness, heaviness, etc. and present their findings Which is the heaviest object?_____ Which is the lightest object?_____ • Have groups present their findings to the class and discuss any patterns or observations Students use a balance to find the mass of objects and record these in a table. Object / Mass math textbook empty water bottle wooden cube Students create a poster showing the drawings of items in ascending order of mass. _____,_____,_____,_____ Which object has the smallest mass?_____ Which two objects have a similar mass? _____ and _____ What is the difference in weight between the heaviest and lightest objects?	 Link:https://wordwall.net/resource/56315319 Discuss students' responses and introduce the concepts of mass and weight. • Define mass as the amount of matter in an object. • Show examples of objects with different masses and discuss how we measure mass using a balance scale. • Conduct a hands-on activity where students measure the mass of various objects using the balance scale.

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td>7. Estimate the weight and mass of objects

Values

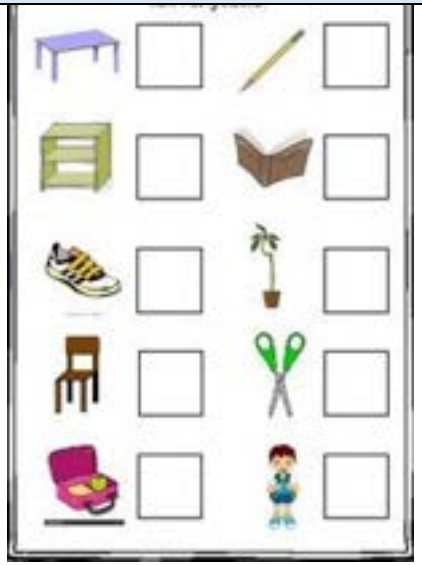
8. Ensure the accuracy in estimating mass by paying close attention to detail

9. Design a poster on measuring everyday solids</td>
<td>Product/observation/Individual Work/Self Assessment
to develop students skill in estimating and figure out what certain weights/masses feel like)

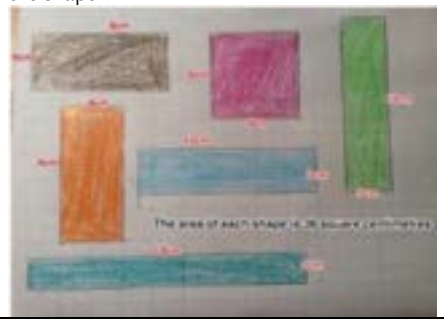
Students follow the instruction
1. estimate the mass of the object
2. find the actual mass
3. calculate the difference.
(a difference of less than 2 close more than 2 far)

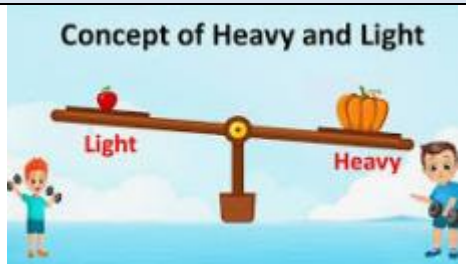
Students complete the table

<table>
<tr><td>object</td><td>estimate mass</td><td>actual mass</td><td>difference close/far</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

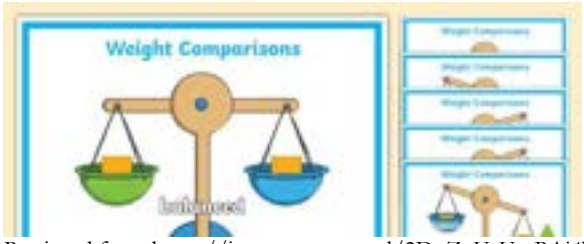
Provide students with the opportunity to identify which item is heavy and which item is light by completing the worksheet.</td>
<td> 

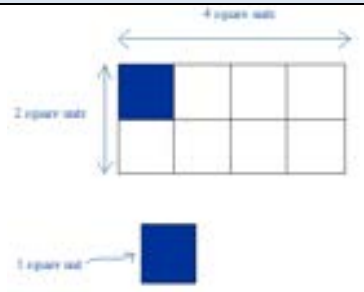
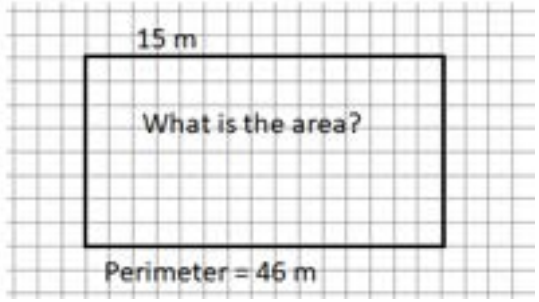
• Have a nurse come in to weigh students and discuss the concepts of mass and weight.</td>
</tr>
</table>

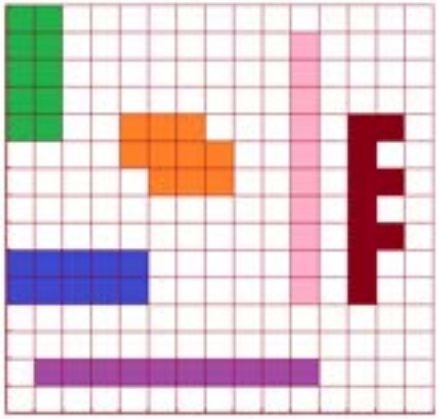
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Retrieved from https://15worksheets.com/worksheet-category/comparing-measurements/ - Give learners grid paper, or sheets with different rectangles varying in sizes. Have learners work in groups to cover each rectangle with square tiles or blocks or they can colour the squares on the grid paper. Allow learners to talk about the differences between the area and the perimeter of the shape. Check to see if learners can identify the length and width of the shape. 	 Retrieved from https://www.alamy.com/stock-photo-nurse-weighing-girl-on-scales-37504944.html ***Meaningful learning*** **a)** ***Sorting Activity: Light vs. Heavy (weight)***

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Observation Have learners use geo-boards to make a variety of rectangles. Asks them questions such as: How many different rectangles did you make? What is the length of one side of the rectangle? What is the area of one of your rectangle? Can you make a rectangle with length 5 units and width 3 units? What will be the area of this shape? Would the perimeter be the same? How do you know? **Group task and Gallery Walk** Provide learners with 1 cm square tiles and 1 cm grid page and challenge them to make composite shapes. Let them trace the outline then below, write the area and perimeter and cover it with a piece of paper. Allow viewing and comments of each group's work. Each visiting group must guess the area and perimeter before checking the answer. Eg.  Area: 24 cm² Perimeter: 36 cm	 1.Provide a variety of solid objects to the students.  2.Have them sort the objects into two groups: light and heavy. 3.Encourage students to discuss their reasoning for categorizing each object and that heavy and light are relative terms. For example, a bag of cement may be heavy for the student, but may be light for adult who is a construction worker ***b) Comparing Mass with Balance Scales:***

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Make one guess Group | Area | Perimeter 1 2 3 4	Provide pairs of objects and have students determine which object is heavier or lighter Students predict which is heavier or lighter and then verify by comparing their masses using the balance scales. ***c) Ordering Solids by Weight:*** Give each student a set of solids with different masses. Have them order the objects from lightest to heaviest or vice versa. Encourage students to justify their reasoning for the order they choose. ***d) Classroom Experiment: Finding Mass:*** Conduct an experiment where students measure the mass of different solids using a scale. Record the mass of each object and compare the results. Discuss any discrepancies and possible reasons for them. ***Real-life Applications*** Explain where knowing the mass or weight is important Estimation Station:

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Set up a station with various solids of different weights and masses. Have students pick up each object and estimate its weight. Provide a scale nearby to allow students to weigh the objects and compare their estimates to the actual weights.  Retrieved from https://images.app.goo.gl/dPYkKxAZFkHDuiBj7  Retrieved from https://images.app.goo.gl/2DqZvUsUmRAj4bYo9 Provide opportunities for learners to use concrete materials such as square tiles blocks, geo-boards and grid paper to display concretely and pictorially the area and perimeter of rectangles. E.g. learners can use blocks to form a rectangle or cover the space on a rectangle.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 - Provide opportunities for learners to solve real world and mathematical problems involving area of rectangles, including finding the area given the side lengths, finding an unknown side length. Jake had a farm with a perimeter of 46 m. The length of the farm is 15 m; calculate the area of the farm. Allow them to use the geo-boards or grid paper.  - Provide opportunities for learners to draw colour or shade given area on a grid. Allow them to build shapes with cubes or blocks and have them record the area and perimeter if each shape constructed. e.g. Shade in a shape with area of 10 square units

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 Allow learners to use grid paper, cheese-it, square tiles, geo-boards, or other similar resource, to make various shapes and take turns to guess area and perimeter after a glance.

Additional Resources and Materials

- **Resource personnel such masons, farmers and carpenters**
- **Comparing Mass: https://youtu.be/o-kS_DJjiq8?si=1FHaH4_C0OA6-cmk**

Additional Useful Content Knowledge for the Teacher:

Weight: how heavy of light something is.expressed in g/kg. etc

Mass: the amount of matter something is made up of. expressed as "x g/kg etc. of ___

We associate mass and weight with the measurement of how heavy an object is. Weight changes depending on position in the universe.

Here are some key points to remember:

Heaviness: Heaviness refers to the amount of force exerted by gravity on an object.

Objects with greater mass tend to feel heavier because they experience a stronger gravitational pull.

When comparing objects, the one with more mass is typically considered heavier.

Lightness: Lightness refers to the perception of an object being less heavy or having less mass.

Objects with lower mass feel lighter because they experience a weaker gravitational pull.

Lightness is relative and can vary based on individual perception and the context of comparison.

Comparing Weight:

When comparing the weight of objects, consider their mass relative to each other.

Use terms like "heavier than," "lighter than," or "about the same weight as" to make comparisons.

Estimating Weight:

Practice estimating the weight of objects by considering their size, material, and density.

Develop a sense of weight through experience and observation.

Opportunities for Subject Integration:

Science

Materials and Properties

Activity: Conduct experiments to measure and compare the weight and mass of different materials.

Example: Provide various objects (e.g., rocks, feathers, wooden blocks, metal pieces) and have students use scales to measure their weight and mass.

Integration: Students can record their findings in a chart and discuss which materials are heavier or lighter. They can also predict which objects will be heavier or lighter before measuring and then verify their predictions.

Density and Buoyancy

Activity: Investigate how different solids behave in water.

Example: Place various solids in water to see which float and which sink. Discuss how weight and mass relate to buoyancy.

Integration: Compare and order the objects based on their buoyancy and mass. Create a graph to display the results.

Social Studies

Trade and Economics

Activity: Discuss how goods were traded based on their weight and value in historical contexts.

Example: Examine how ancient civilizations traded goods like gold, spices, and grains, and how their weight and mass affected their trade value.

Integration: Create a classroom simulation where students trade goods of different weights and discuss the importance of weight in trade.

Language Arts

Descriptive Writing

Activity: Write descriptions comparing the weight and mass of different objects.

Example: Write a paragraph describing a heavy object and a light object, using comparative language.

Integration: Use sensory details to enhance the descriptions and discuss how weight and mass affect the physical experience of handling objects.

Reading Comprehension

Activity: Read passages that include comparisons of weight and mass.

Example: Read a story where characters interact with objects of different weights, and answer questions about how the weight affects the plot or characters' actions.

Integration: Discuss the significance of weight and mass in the story and how they influence the narrative.

Art

Sculpture and Construction

Activity: Create sculptures using materials of different weights and masses.

Example: Use clay, foam, metal, and other materials to build sculptures, considering how the weight of each material affects the stability and structure.

Integration: Compare and order the materials used based on their weight and mass, and discuss the challenges and benefits of working with each type.

Physical Education

Fitness and Strength Training

Activity: Compare and order different types of weights used in fitness activities.

Example: Use dumbbells, medicine balls, and resistance bands, and have students estimate and then measure their weight.

Integration: Discuss how different weights are used for different types of exercises and the importance of selecting the appropriate weight for each activity.

Music

Instrument Weight

Activity: Compare and order musical instruments based on their weight.

Example: Weigh different instruments (e.g., violin, trumpet, drum) and discuss how the weight affects their portability and playability.

Integration: Create a chart to display the weights of various instruments and discuss why certain instruments might be lighter or heavier.

Technology

Robotics and Engineering

Activity: Build simple robots or structures and compare their weights.

Example: Use LEGO bricks or other building materials to construct robots, then weigh them to compare and order based on their weight.

Integration: Discuss how the weight of each robot affects its movement and stability.

Data Analysis

Activity: Use spreadsheet software to record and analyze weight and mass data.

Example: Input the weights of various objects into a spreadsheet and create graphs to visualize the data.

Integration: Compare and order the objects based on their weight and use the data to make informed decisions about material use in projects.

Essential Learning Outcome 1.3 : Measurement - Understanding What and How We Measure - Developing and applying non-standard units of measure

Grade Level Expectations and/or Focus Questions: Measure mass by counting weighted units from improvised units, concrete materials and personal measurement tools (e.g., cubes, counters, marbles).

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge:** 1. Describe scenarios involving mass **Skills:** **2.** a. Find the mass of objects by counting weighted units/objects, improvised units . b Find the mass of objects by using concrete materials (cubes, counters, etc.) (nonstandard method). **(To be balanced: as it refers to Mass/Weight means equal.)**	**Product :** to identify scenarios involving mass Write (true/ false) at the end of each statement. a) The greater the amount of matter in an object, the more mass it is likely to have. __ b) My leg has less mass than my arm. ____ c) A 500 page book is more likely to have more mass than a book with 100 of the same pages. ____ **Observation/Product/Conversation /Peer Assessment** (Activity to boost cooperative work and critical thinking skills) Students complete, in their groups, by walking around the classroom, lifting objects, then drawing to show comparison on the diagram below. Groups present their conclusion to be confirmed by peers.	***Research/Use of Technology*** Students will conduct a guided online research application mass in the real world as it pertains to mathematics. (Class discussion follows.) Eg. Jack wants to know how much material his ball is made up of Allow students to watch the video : Amazing Blue Dot Retrieved from https://www.youtube.com/watch?v=KBzszSr6MWk&pp=ygUNd2hhdCBpcyBtYXNzcw%3D%3D ***Problem solving/Critical thinking/Group work*** Present this situation: Two identical-filled bags are placed on a scale. How do you know which side has the stones and which side has the feathers? Why?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values: **3.** Promote the need for measuring the mass of items.	 A_____ B_____ Retrieved from https://images.google.com/ **Group Work/Product** 2. Using a balance and non standard units, follow the teacher's example to find the mass of at least 6 objects. a) The pen has an equal mass of _____ paper clips. b) _____ paper clips have the same mass as the _____. c) 1 sheet of paper has the mass of _____ counters. d) The maker has equal mass as _____ counters. e) How many paper clips are equal to the mass of the pencil? _____. f) (one of your own)_____.	Which is heavier, 1 kg stones or 1 kg feathers? (**none is heavier as both weigh 1kg)** ***Discussion*** a) Engage students in small group discussions. For example, pose the following questions: 1. Why do you think we need to weigh or know the mass of things/objects before we use or move them? For example, in cooking, we need to know the amount of salt for a reasonable taste. 2. How would you know or measure the mass of an object if you do not have calibrated weights/scales? Demonstrate how to measure the mass of an object using nonstandard units/weights using a balance.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		  Allow students to use counters, paper clips, and cubes to determine how many of each will be needed to balance items in the classroom.

Items	Number of counters	Number of paper clips	
Sharpener			
pencil			
Eraser			
6 inch ruler			
pen			
Sheet of paper			

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Additional Resources and Materials - Measuring Mass (Non-standard Units) Beans, counters, marbles to be used as the non-standard units		
Additional Useful Content Knowledge for the Teacher: Nonstandard units of measurement are units of measurement that are not typically used, such as a pencil, an arm, or a shoe. We can use about anything as a nonstandard unit of measurement. non standard units of measurement are basically a comparative measure of another physical object.		

Essential Learning Outcome 1.4. **Measurement- Understanding what and how we measure-Developing and applying standards units of measure.**

Grade Level Expectations and/or Focus Questions:
-Measure mass by using standard units g, mg, and kg.
-Solve problems involving elapsed time by applying the relationship between different units of time.
-Use Mental Math to estimate and calculate various methods of payment that can be used to purchase goods and services (excluding sales tax)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** **1.** Identify standard units of measure(mass) (mg, g, kg)	**Entrance Slip (Product)** - to get students to differentiate between non-standard and standard units of measuring mass. In their groups, students are given sentence strips to decide whether a standard(S) or non-standard (NS)unit of measurement is/was used. ● Paul took a tablespoon of sugar._____ ● The cook used 4 grams of baking powder._____ ● The teacher was trying to find the mass of the chicken by lifting it._____ ● I took 5mg of medication last night._____ ● 20 kg of meat was needed for the Paleau._____ ● The apple was compared to having the same mass as two bananas._____ **Observation/Homework/Self Assessment:** to develop students estimation skills in using standard units of mass Using items found around your home. list/state 3 items (each) whose mass is measured in milligrams(mg)_____ grams(g)_____ Kilograms(kg)_____	***Intro:: to get students to think critically and talk about their experiences in measuring standard units of mass.*** ***Discussion:*** Engage students in discussions about the need to use standard unit of measuring mass. For example, pose the following: You want to give your relative an exact amount of flour or rice. How would you do that? Why would someone need an exact amount? ***Meaningful Learning*** ***Kitchen Trip/Activity:*** a) Allow students the opportunity to to identify units of mass. For example, have students watch videos to identify the units of mass, such as, https://youtu.be/mGMtyuVJ5to?si=AFCDgouEdZjQxzJk b) Provide opportunities for students to visit places such as the kitchen at school to read/research containers of items to identify the units in which the mass of its content was measured **(teacher supervision mandatory)**

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

2. Measure and read the mass of objects using a kitchen scale.

Values</td>
<td>Product/conversation/observation. - to get students to use and read a kitchen scale and record the mass of items in a table.

In small groups, students weigh/find the mass of items(all groups have 4 identical items and 3 to choose of their own).

<table>
<tr><td>ITEM</td><td>Mass in mg, g or kg</td></tr>
<tr><td>1.the duster</td><td></td></tr>
<tr><td>2. half a stick of chalk</td><td></td></tr>
<tr><td>3. the math textbook</td><td></td></tr>
<tr><td>4. the large bottle of water
5. _____
6. _____
7. _____</td><td></td></tr>
</table>

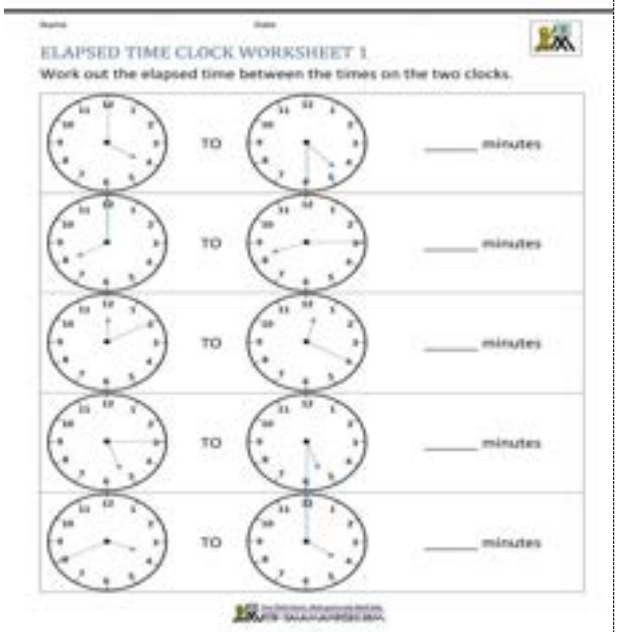
Group work/Product/Peer Assessment -to encourage cooperative teaching and learning</td>
<td>Meaningful learning/Discussion

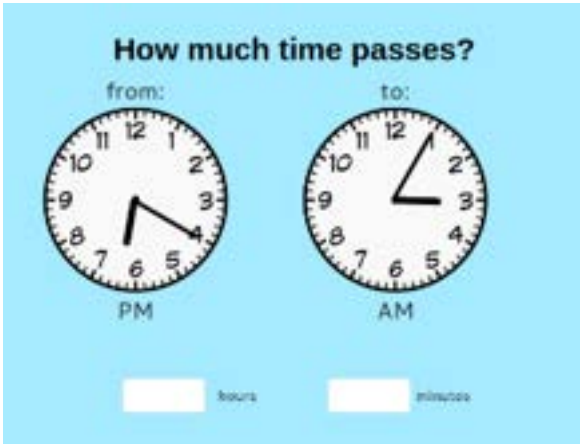
a) Allow students to watch the videos like the one below to learn how to record the mass of each object/item.

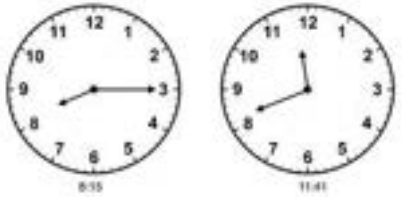
https://youtu.be/A0DdQe66_aY?si=Az6MMEMd3GVJYvd6

b) Utilize a Resource Person (local shopkeeper or kitchen personnel) to conduct a session with the class with, having practicals on measuring mass of basic items”</td>
</tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
3. volunteer to share how to measure the mass of an object. **TIME** **Skills** **4.** Convert minutes to hours and vice versa. time units Seconds,(s) 60 s = 1 minute minutes(m) 60m = 1hr hours/(hr)	Match with your partner who is either holding a minutes card or an hr card. Mins——————————hours a) 120 mins = _____ hrs ___ mins b) 200 mins = _____ hrs ___ mins c) ___ mins = ½ hr d) _____ mins = 3 hrs e) _____ mins = 10 hrs f) 90 mins = _____hrs ___ mins **Group work/Observation/ Conversation** -to develop mastery and further the understanding of time unit relationships. students work in groups using model clock and the count on ..timeline, unit relationship to calculate time elapsed	***Demonstration*** ***Intro: to ensure that students follow logical methods when converting between units of time(mins-hrs)*** a) Allow students to discover converting time to minute and hours for themselves by using videos, such as the link below: https://youtu.be/G_v_QFNYgUE?si=OBDRZQyEij8lAr9M b) Have students observe demonstrations of converting between minutes and hours. And have them creating questions they think their classroom may still want to ask. Eg's. 120 minutes = 120 /60 = 2hrs 3 hrs = 3 x 60 = 12 minutes c) class work on and discuss some examples.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
½ hr = 30 mins ¼ hr = 15 mins 5. Calculate time elapsed using the relationship between units of time. *relationship: counting on to make the next hour. (60 mins = 1hr)* eg: 5:40 to 7:00) (20 more mins to get to 6 + 1hr from 6 to 7) ans= 1hr20 mins or 80 mins	 Retrieved from https://www.math-salamanders.com/ **Product activity** - to help them differentiate among the methods of payment and state the method of payment use the terms cash, debit card, credit card, paper checks, digital money transfer 1)paid with a $50.00 note -_____ 2)payee has to write in the amount and to whom_____ 3)pays by withdrawing money from your account-_____ 4)pay by borrowing money from the bank=_____	***Discussion /Demonstration*** Generate a discussion to compare how much time it takes them to complete different tasks.  Retrieved from https://www.mathnook.com/teaching-tools/elapsed-time-clocks-intro.php *at home * at school a) How much time did it take me? eg. 1) I began dressing at 7am and was done at 7:40am 2) I got to the bus at 8:10am ..rode the bus till 9:20am

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
MONEY **Knowledge** 6. Identify six (6) methods of payment used	5)usually used to pay for things online=_____ 6) usually used to pay large amounts owed._____ **Conversation/Research Project/Product** - students have the opportunity to share based on personal purchasing experience or observing experience of others. **Instructions**: Choose two methods of payment. Discuss the pros and cons of these methods and when best used" **Product activity** - teaches listening and develops mental work and speed. To teacher's statement, students In small groups not more than 3, work mentally to give only the answers as: eg: cost_____ change_____ A hotdog cost $3. What's the cost and change if you bought 4 hotdogs and paid $20?.	b) Provide opportunity for reinforcement of the concept elapsed time by allowing students to watch necessary YouTube videos. https://youtu.be/ML6r7BEZo7M?si=UkyCx1Z1K70W-Y1a c) Demonstrate finding time elapsed by counting on model clocks.  Retrieved from https://www.mathmammoth.com/practice/clocks

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
7. Estimate and calculate the cost of multiple items priced in whole dollar amounts and change needed mentally.		  Retrieved from https://images.app.goo.gl/w7SYaci6D3f8M4eQ8 ***Discovery Learning /Use of Technology*** ***Intro: to expose students to the varied methods of payments for real-life purchases of goods and services*** 1) Allow students to engage in research on methods of payment used to pay for goods and services.  Retrieved from https://okcredit.in/blog/best-ecommerce-payment-methods/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		How do we usually pay for things? state at least three ways. 2.) Utilize a Resource Person (bank/credit union official) to conduct sessions on "methods of payment used" 3) Allow students to work collaboratively in small groups based on class size to role-play different methods of payment. Methods can be rotated so that each group is given exposure to different methods. For example, group 1 pays for building materials with cash, then later pay with a cheque. ***Game Activity -Don't drop the ball*** Have students practice their mental skills in calculating cost of items on a billUsing a tennis ball that goes around the classroom, teacher to student or student to student, send the ball and call out to numbers. Retrieved from: https://www.math-only-math.com/money-bills.html The bill can be prepared as shown below. BILL **Items** / **Quantity** / **Rate per piece ($)** / **Amount ($)** Pen / 1 / 16.50 / 16.50 Books / 1 / 96.25 / 96.25 Pencil box / 1 / 48.50 / 48.50 Notebooks / 2 / 16.50 / 33.00 **Total** / **194.25** if the catcher is wrong or drops the ball he/she is out. (a 5 second timer to answer)

Additional Resources and Materials

- Resource persons(kitchen staff/ bank personal/ shopkeeper)
- make up school shop
- physical clocks
- digital scales
- Expired debit and credit cards

Additional Useful Content Knowledge for the Teacher:

Method of Payments (students)

*cash
*debit card
*credit card
*paper checks
*digital payments(paypal/google pay etc)
*electronic money transfer

Teacher needs to break down this information for pupils to understand

These are other payment methods used for trading(international)

*****Cash-in-advance is the most secure method of payment for the exporter because the importer pays the full or a significant amount of the payment before the goods are shipped. Payment is usually made via wire transfer, credit card, or escrow service.

*A Letter of Credit is a contractual commitment by the foreign buyer's bank to pay once the exporter ships the goods and presents the required documentation to the exporter's bank as proof. As a trade finance tool, Letters of Credit are designed to protect both exporters and importers.

*Cash against Documents. Basically, it is a process where an importer pays for the ordered goods before they are received. Typically, the cash against document is when an exporter (seller or vendor) instructs his bank to release shipping documents to the importer upon the full payment of shipment.

*An Acceptance Credit is a documentary credit that needs provision of a term for the bill of exchange. Usually, the bill is then accepted by the bank on which it is then discounted or drawn. The beneficiary here is paid promptly at that particular discount.

*Consignment is an arrangement in which goods are left in the possession of an authorized third party to sell. A consignment shop, for example, will sell items produced or supplied by someone else, and pay them a portion of the profit.

Time Conversions and Time Elasped Videos
https://youtu.be/nJI7abzFUIg?si=tpG55hzTAHwcOVyb

https://youtu.be/CH-A9E_zwu8?si=I-Np96BYqALPe9aD

Opportunities for Subject Integration:

-Statistics/data. (draw a bar graph showing the mass)
-Operations using number lines involving elapsed time can be integrated into counting on .
- statistics. (survey:most/least popular method) methods of payment can be integrated
Elements that are integrated across subjects:
Language Arts

- Incorporate vocabulary development related to weight, mass, lightness, and heaviness.

- Encourage students to describe their observations and findings using descriptive language.
- Integrate writing activities where students explain their reasoning for their estimations and comparisons.

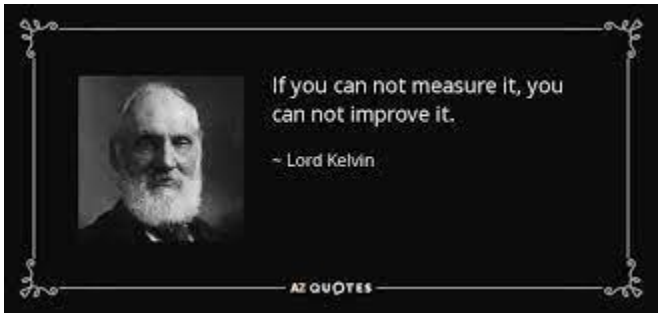
Science

- Explore the scientific principles behind weight, mass, density, and properties of matter in the activities.
- Discuss how objects interact with each other based on their weights and masses.
- Introduce the concept of the scientific method by conducting experiments to test hypotheses about weight and mass.

Social Science

- Discuss how persons of long ago measured and compared weights of objects
- Compare the cultural differences on weights.

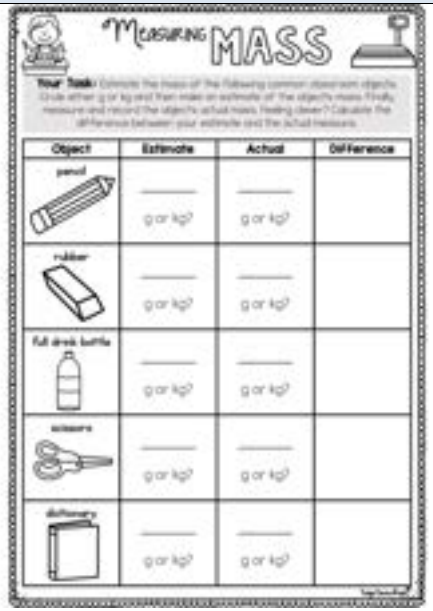
Item of Inspiration:



Essential Learning Outcome: M 2.1 : Applying Techniques, Tools and Formulae for Measuring - Developing personal referents for measuring attributes

Grade Level Expectations: M2.1 Recognize mass as an attribute of solid objects and understand concepts of mass measurement

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Estimate the mass of various objects without weighing them, then verify the estimates by actually measuring their mass. 2. Apply appropriate units of measurement and mathematical operations when solving worded problems related to mass measurement. **Values** 3. Share various objects of their interest with their peers relaying mass measurement and explaining why that unit of measurement is used.	***Observation*** *Learners use their hands to estimate the measurement of items then measure them to see how close they were to the answer. If their answer is close, they get a point. If it is not close, they do not get a point.*	***Whole Class Activity*** Students answer questions correctly based on a collection of data about students' mass. 1. Who is the heaviest? 2. Who is the lightest? 3. What is the total mass of all the students? Name of the children / Weight (in kg) Nisha / 10 Abdul / 18 Sofia / 12 Kuldeep / 20 Rohan / 12 source:https://edurev.gumlet.io/ApplicationImages/Temp/4794054_253da713-a39d-4975-ba8c-a2e362c4169e_lg.png?w=400&dpr=2.6

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 *Source:https://topteacher.com.au/wp-content/uploads/2023/07/Measure-Mass-top-teacher.jpeg*	***Group Activities*** Engage learners in activities that allow them to measure items, so they could be able to estimate mass.  Source:https://i0.wp.com/www.ms915brooklyn.org/wp-content/uploads/2021/02/20170201_085303-1024x768-1.jpg?resize=930%2C620&ssl=1 Provide opportunities for learners to bring different items for show and tell, and the class will estimate their mass and state the unit used to measure them.

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

Teachers observe students to see how accurately they use a scale to measure objects.

Source:https://crisscrossapplesauce.typepad.com/.a/6a00e5511156308834 01761648f575970c-500wi

Checklist for assessing students using the scale

Scale shows zero when empty	
Uses weights correctly	
Reads the measurement correctly	

Learners engage in an online game competing against their peers; answering questions about mass.

</td><td>

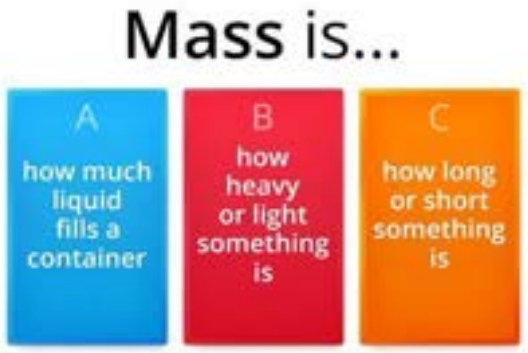
Source:https://k12loop.com/wp-content/uploads/2023/10/Show-And-Tell-Ideas-1-1024x683.jpg.webp

Individual Activity

Allow learners to compare the mass of items using estimates of how bjects feel with their hands.

Source:https://prek-math-te.stanford.edu/sites/default/files/2019-03/Photo%20for%20Measuring%20Up.jpg

</td></tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Link:https://wordwall.net/resource/53592895 ***Conversation*** *Learners explain the difference between weight and mass.*	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 *Source:https://asathirdgrade.weebly.com/uploads/4/5/8/4/45848061/img-8601_orig.jpg*	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product Create a gallery walk showcasing different objects with their corresponding mass measurements.  Source:https://lfsloni.org/wp-content/uploads/2023/03/science-exhibition-scaled.jpg	

Useful Content Knowledge for the Teacher about the Outcome:

Mass is a parameter of measurement that computes how much matter is contained in a body.

Mass is the amount of matter in an object, and it stays the same anywhere the object is in the universe. It is measured in kilograms (kg) or grams (g).Weight, on the other hand, is the gravitational force acting on an object, and it varies depending on the strength of gravity. It is measured in newtons (N) or pounds (lb).

Additional Resources and Materials

Difference between mass and weight video:Difference between MASS and WEIGHT

Opportunities for Subject Integration:

Mathematics:

Students calculate the cost of items after weighing them (Topic: Money)

Language Arts:

Measure the mass of an item being described for descriptive writing.

Science:

Students measure the mass of objects before they test if it would sink or float.

Essential Learning Outcome M 2.2 : Applying Techniques, Tools and Formulae for Measuring - Use tools to measure attributes

Grade Level Expectations: M 2.2. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Identify the different standard measuring tools (ruler, meter rule, scale, measuring cup) **Skills** 2. Demonstrate the correct use of the measuring instruments. **Values** 3. Volunteer to demonstrate the use of various measuring instruments.	*Conversation* *Students talk to each other about the steps to take using different measuring instruments such ruler, meter rule, scale, measuring cup etc.* *Observation* *Students will carry out demonstrations of the use of the various measuring instruments to answer questions asked. A checklist can be used to record students understanding. All the instrument will be at students disposal. For example:* *Demonstrate how to measure the top of the desk using the correct instrument.* *Why did you choose the ruler over the metre rule?* *How do you know which instrument to choose?* *Did the students choose the correct tool to measure the attribute?*	Use Scenario to engage students in a guided discovery of measuring instruments/ tools. For example: A carpenter has to make benches and desks for a classroom. He has to make all of them the same size. What is necessary for him to carry out this task to make sure they are the same size? Students will discuss to bring out ideas such as measuring tools and precision. A further question can be why is precision necessary. Engage students in measuring activities. For example: Students will be given a piece of string, and they will all be asked to cut off 6 cm. They will compare each other's strings for similarities and differences in length. They can also exchange strings and measure on a ruler. They can now proceed to measure various objects using the ruler on meter rule in and outside of the classroom. This same strategy can be applied for mass using the scale and capacity using a measuring cup.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		They can also measure the capacity of popular sodas to check for accuracy. It is best to check those that would have 250ml, 500ml, and lL

Useful Content Knowledge for the Teacher about the Outcome: (Links to professional sources that *connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment*)

Instrument Used to measure

Length - ruler or metre rule measurement starts at zero on the ruler. Rulers without zero starts at the beginning of the ruler.

Mass - scale. Make sure that needle is pointed at zero to begin measuring. If there is a scale plate it should be on before checking to determine if it is at zero.

Capacity - measuring cup

Additional Resources and Materials

Rulers, metre rules, measuring cups of different capacity, scales, string, sodas, food item (peas, rice, sugar)

Opportunities for Subject Integration:

Language Art: Journal how to measure using the various instruments showing the processes involved.

Art: Use measurement to draw specific things

Science: measuring the growth of plants

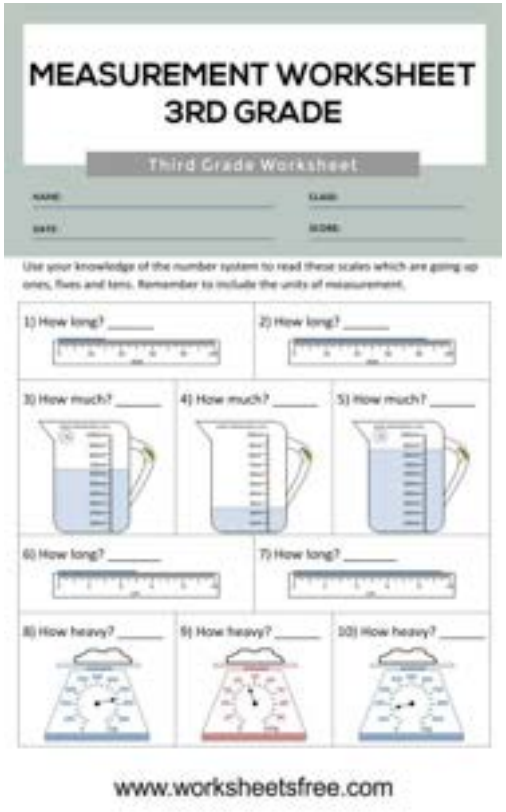
HFLE: measure students mass and height

Elements from Local Culture:

Social Studies: carnival costumes, local food and drinks, fishing

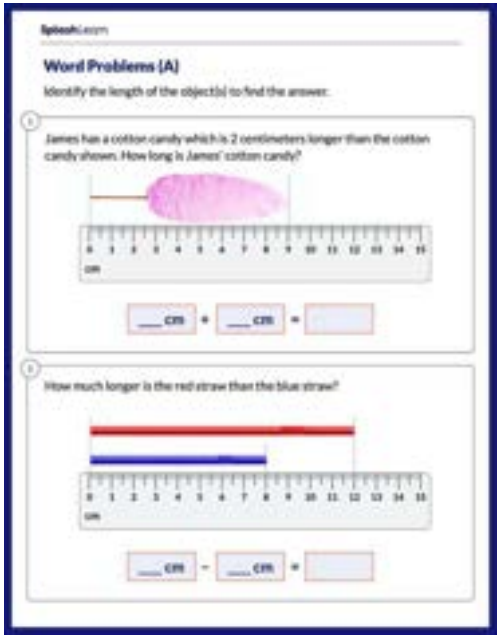
Resources for a learner who is struggling: *(Links to earlier learning activities for similar knowledge, links to resources for special education needs)*

https://youtu.be/Mw7JzJby8YxI



https://www.worksheetsfree.com/image/Measurement-Worksheet-3rd-Grade-3.jpg

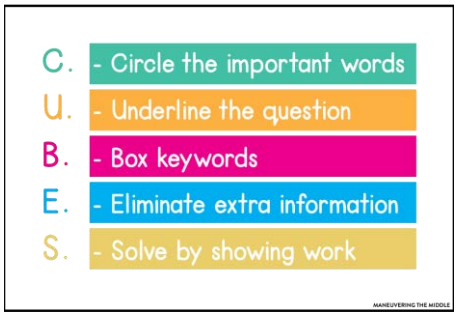
Resources for a learner who needs challenge: *(Links to learning activities and resources in later grades)*

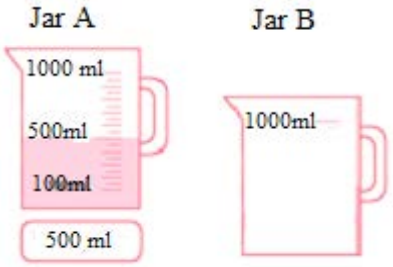
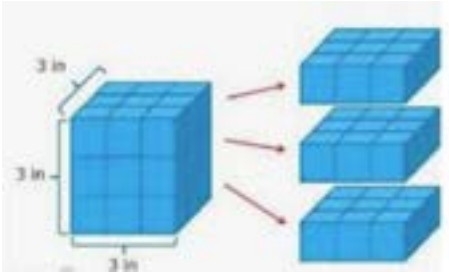


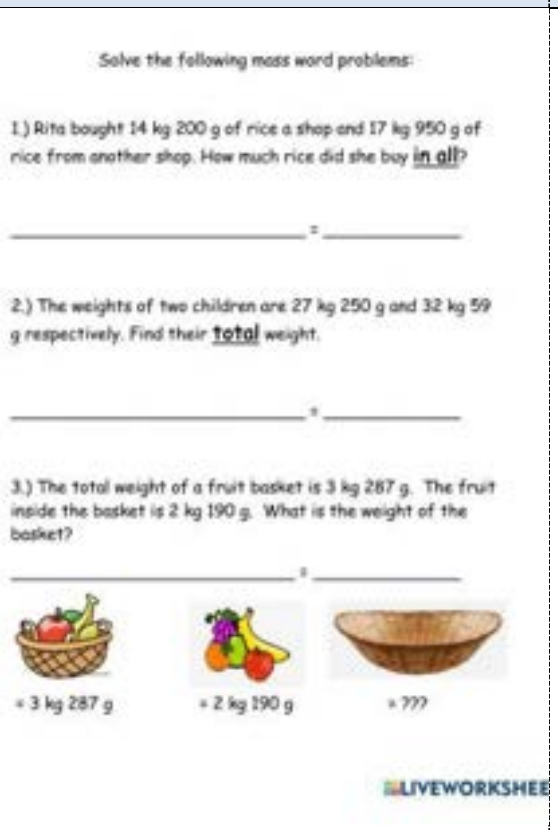
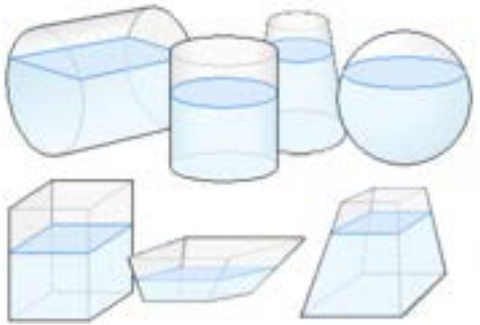
https://cdn.splashmath.com/cms_assets/s/math-worksheets/solve-word-problems-on-measurement.jpeg

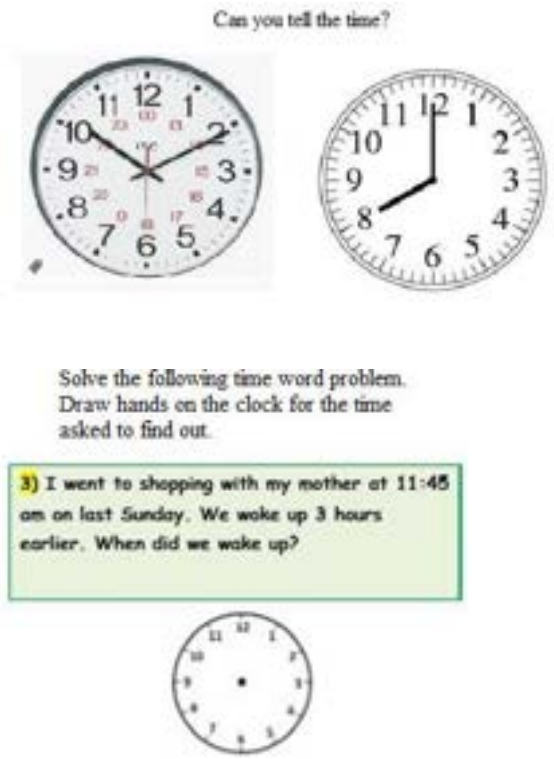
Essential Learning Outcomes: M 2.3 : Applying Techniques, Tools and Formulae for Measuring - Developing and applying formulae for measuring

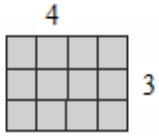
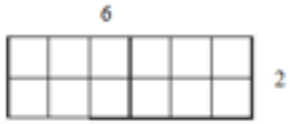
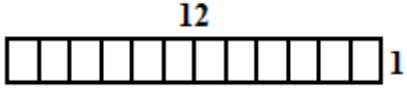
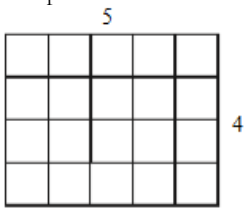
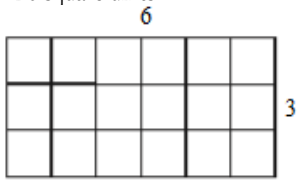
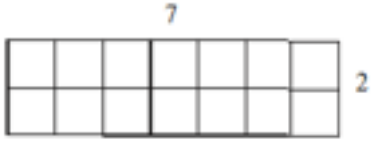
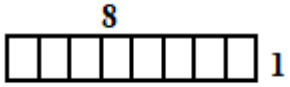
Grade Level Expectations: M 2.3. Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. 2. Create and apply strategies to determine measures of area using standard units. 3. Apply multiplication to situations involving measures of area (rectangles) and time;	***Conversation*** *Have students explain the procedure for solving given problems involving the calculation of mass/volume. They will also be asked to justify their answers,* *Sample questions:* 1. *A bag of potatoes weighs 20 kg. Calculate the mass of 4 bags of potatoes.* 2. *A basket of tomatoes weighs 55 kg. If there are 5 bags in the basket and each weighs the same, how much does each bag weigh?* How many times can the liquid in Jar A be used to fill Jar B? Have students estimate and justify their solutions. Listen as they discuss.	**Group work** - Provide opportunities for learners to work collaboratively and solve one-step word problems involving masses or volumes in the same units. **Using a mnemonic** Have students use the mnemonic to learn the steps for solving one-step problems. Provide word problems and guide students as they use the steps to find the solutions.  - - *Retrieved from: https://www.maneuveringthemiddle.com/problem-solving-strategies/* - Give learners the opportunity to use measuring scales, large and small containers, tape measures, etc to help them to create and solve problems

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Values **4.** Work collaboratively with peers to solve word problems involving any of the four operations.	 **Checklist** *Estimate how many times Jar A can fill Jar B.* *YES/NO* *Write down your initial estimate and the reasoning behind it* *YES/NO* ***Product*** *Students complete worksheets by using the most appropriate operation to solve one-step problems.* *Source: https://www.liveworksheets.com/w/en/math/1897332*	-  - *Retrieved from: https://www.pinterest.com/pin/338473728237914758/* -  Source: *https://learningpolicyinstitute.org/blog/finishing-unfinished-dream-road-educational-equity* - Allow them to use centicubes to build rectangular prisms for given volumes.  *Retrieved from: https://www.youtube.com/watch?v=7jw2MnMX5P4* - Give them the opportunity to use containers of different sizes then fill and record the volumes.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 **Peer assessment** Individual worksheets are exchanged as peers checked for correctness of work completed by peers. - Observe for accuracy as learners give answer to time shown or draw clock faces to show given time. Example:	 *Retrieved from: https://www.claredot.net/en/sec-Fluidics/volume-for-tanks-or-various-containers.php* - Allow learners to find the area of given shapes using standard units. - Provide them with checkered pages, hundred square grids, geo boards, etc. to have them estimate then count to find the area - Provide learners with the opportunities for them to show time and tell time using the 12 hours and 24 hours clock.  - - *Retrieved From: https://www.twinkl.co.uk/teaching-wiki/24-hour-clock*  Retrieved from : https://www.edu.gov.mb.ca/k12/cur/math/support_gr4/full_doc.pdf

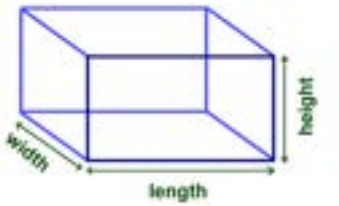
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		- Allow them to manipulate the clocks to show various times. They can work in small groups or pairs and take turns in asking questions Allow students to use the 12-hour and 24-hour clock in combination as well as separately for easy conversions. - Provide opportunities for learners to determine the area of given squares and rectangles. - Allow learners to gather information from given scenarios and let them determine the area.  *Retrieved from: https://helpingwithmath.com/worksheet/solving-word-problems-involving-perimeter-and-area-of-rectangle-worksheets/* Provide opportunities for learners to demonstrate and explain that a given area can correspond to multiple perimeters, and a given perimeter can correspond to multiple areas. Provide them with hundred grid squares, geoboards, and checkered paper, and have them draw shapes with a specified area or perimeter. Then, ask them to create one or two different shapes with the same

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product Use the given area below and draw two additional shapes with the same area but different perimeter.  Area = 3 rows of 4 square units Perimeter = __ units Solution:  Area = _ rows of _ square units = 12 square units Perimeter = (6 + 2 + _ + _) = 16 units  Area = 1 row of 12 square units = 12 square units Perimeter = ___units	area but different perimeters, or two additional shapes with the same perimeter but different areas. For example, using the perimeter of a given shape, have them draw two additional shapes with the same perimeter but different areas..  Perimeter = (5 + 4 + 5 + 4) = 18 units Area = 4 rows of 5 square units = 20 square units  Perimeter = (6 + 3 + 6 + 3) =18units Area = 3 rows of 6 square units = 18 square units  Perimeter = (7 + 2 + 7 + 2) = 18 units Area = 2 rows of 7 square units =14square units  Perimeter = (8 + 1 + 8 + 1) = 18 units Area = 1 row of 8 square units = 8 square units

Useful Content Knowledge for the Teacher about the Outcome:

Volume is the measurement of how much space a 3-dimensional object takes up.

The volume of a box can be found by using the formulae: L x W x H



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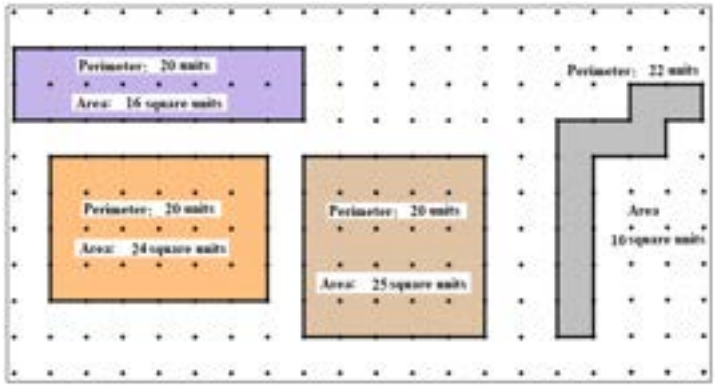
Useful Content Knowledge for the Teacher about the Outcome.

The volume of an object or substance is the amount of space it takes up. It is measured in cubic units (three-dimensional). Capacity is the amount a container can hold. Capacity is only used in relation to containers.

An irregular polygon has a smaller **area** for the **same perimeter** than a corresponding regular polygon. There are lots of polygons with **same area** but **different perimeters**. Polygons can have the same area and different perimeters or same perimeters with different areas.



Inclusive Resources and Materials.

Geo board and rubber bands
Grid paper
1 cm tiles
Clocks
Multi-link Cubes

Containers (assorted sizes)

- **Art and Craft:**
- Colouring shapes and tile patterns
- **Language:**
- Using adjectives to compare lengths, mass, areas
- Oral and written expressions
-
- **Science:**
- Developing measuring skills
- Measuring and comparing using measuring cylinders and beakers
- **HFLE:**
- Learning to appreciate colleagues when working in groups
- Listening to colleagues and appreciating their views
- Learning to listen critically and make valid comments

Children's Literature Suggestions

- Carle, Eric *The Grouchy Ladybug* (Comparing sizes)
- Leedy, Loreen *Measuring Penny* (Length, Mass, Time, Temperature)
- Wells, Robert E. *Is a Blue Whale the Biggest Thing There Is?* (Comparing sizes)

USEFUL VOCABULARY: MEASUREMENT

area balance distance capacity estimate length mas
measure non-standard scale square centimetre (cm^2) square decimetre (dm^2)

square metre (m^2) unit volume weight

Data Handling and Probability

Introduction to the Strand: As students advance the grade levels, they are exposed to additional skills on data gathering, representing, and recognizing patterns to inform predictions and decisions. These help students apply what they are learning by connecting to the real world. Students will be given opportunities to explore data sets that provide information on activities such as sports, school life, small business, weather, health, food, and population. The activities support student engagement, communication and collaboration, while at the same time, providing the conditions to recognize trends in society.

Essential Learning Outcomes D 1.1: Collecting, Organising and Displaying Data - Formulating questions that can be answered with data.

Grade Level Expectations: D1.1. Recognize bias in questions and take steps to reduce bias in formulating questions for survey

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Discuss biases that students may have or encounter in real life situations. 2. Identify biased/unbiased questions used in conducting surveys **Skills**	***Conversation*** Group work Students will discuss in group to determine what is bias or unbiased about the two questions. What do you think about the culture, in the best Windward Island, St. Vincent and the Grenadines? How do you feel about the different cultures in the four Windward Islands? Observation	***Introductory activity*** Provide learners with multiple examples of bias in questions. E.g. 1) Which is the most beautiful region in the OECS? 2) Who is best at parenting, mom or dad? 3) Which tastes better sweet potatoes or breadfruit? *Provide scenarios for students to be exposed to different perspectives. For example: Students will read the passage and select their choice for completion from the brackets.*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
3. Construct unbiased questions for the purpose of conducting surveys **Values** 4. Accept that people's choices can be different from theirs and still correct or good. 5. Hold their own opinion on choices they make.	Teacher listens as students discuss in pairs/groups how questions can be modified to ask unbiased questions. They will work together identify the bias then modify this question. How great is our chocolate cake sold at the tuck shop? Product Students will work cooperatively (pairs or groups) to change the following questions to make them unbiased. Do you agree that vegetables taste disgusting? Do you agree that our store is the best in town? **Identify these statements correctly as either bias or unbiased.** 1. How great is this party tonight? _____ 2. Don't you think this is the best teacher in the school? _____ 3. What do you think can be done to improve the service at the ice-cream shop? _____ 4. How awesome is this football team? _____ 5. What is your favourite vacation destination? _____	*Children who live in _____ (poor, crowded, residential) neighbourhoods have the opportunity to see _____* *(friends, police officers, parents) about the streets having a _____ (playful, hard, difficult) time. These children often are _____ (loved, abandoned, spoiled) by parents. One can usually see all these children receiving _____ (punishments, rewards) for their behaviour.* Whole Class Discussion Allow students to speak freely on why they chose a particular option from the bracket. They will notice how the meaning changes based on the option they chose. This will help to elicit the concept of bias from students. Students will provide a meaning for the concept bias **and try to determine if any bias would have shaped the answer that they provide.** Listen *as students discuss in pairs/groups the statement "Women can cook better than men" This can reinforce the meaning of bias. Students will understand that they are sharing their opinion on how they feel about the statement and your opinion has value just as another person's.* *Students will identify the bias* Allow students to share their opinions on the statement by supplying arguments to support their point of view. The term bias can be introduced to show how the statement is reflected. Provide students with a situation where they have to decide on asking other students questions about their favourite ice cream or sport. Provide opportunities for students to look at different types of questions both biased or unbiased. For example, the teacher will have two different questions such as: *Biased* How awesome do you think the chocolate ice-creame is that we produce?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Provide learners with the following questionnaire and ask them to identify the questions that are biased. 1. Age ( ) 6- 15 ( )16-25 ( ) 26-35 2. Religion ( ) Christianity ( ) Hinduism ( ) Islam 3. In what way do you think the school canteen can be improved? ( ) lower prices ( ) more variety of food ( ) opening earlier 4. What was your worst experience at the canteen? ( ) Waiting for a long period of time before being attended to. ( ) Receiving spoiled food Place learners in groups and have them reconstruct the questionnaire in order to reduce bias. Have learners justify the steps they will take to improve the data collection instrument.	*Unbiased* How would you rate the different ice-cream that we produce? What makes the first question a biased one? Students will try to determine which is a better question and why? Group work Have students discuss as a group to determine what is bias or unbiased about the two questions. How awesome is the new drink from the cafeteria? How do you feel about the new drink from the cafeteria?

Useful Content Knowledge for the Teacher about the Outcome:
A biased survey is one that encompasses errors caused by the design of the survey and its questions. It's important for you, the survey creator, to create survey questions that don't change the survey's outcome. Things to consider are the way questions are worded, the structure of the survey, and even its design, style and colors.
A biased survey can lead to survey response bias and higher than normal drop-out rates.

Firstly learners need to know what bias is, how it shows up in data handling. The teacher should progress to helping learners to know what steps can be taken to reduce bias so findings are as authentic as possible. (I.e., if I only ask cricketers what their favorite field sport is, of course they are going to say cricket!) Now, if I wanted to reduce bias then I would change my target group, probably ask random persons what their favourite field sport is.

A survey question is biased if it is phased or formatted in a way that skews people towards a certain answer. Survey question bias also occurs if your questions are hard to understand making it difficult for people to answer honestly.

The Leading Question

One of the biggest mistakes survey creators make is creating a question that leads respondents to give the "correct" answer. Leading questions negate your survey results, so you want to stay away from them at all costs.

Leading question: Should concerned cat owners vaccinate their pets? By using the word concerned, you put pet owners who don't vaccinate their pets on the defensive, thus creating bias. Instead, ask it this way: Do you think cats should be required to be vaccinated?

The Loaded Question?

With the loaded question, you basically force people into answering the question in a particular way. You keep them from explaining their own opinions. The loaded question has the potential to lead to survey drop-out and unclear results. Here is an example: Where do you like to swim? What if the respondents don't like to swim? Or if they can't swim? A better question might be, "what do you like to do at leisure time?"

The Unclear Question

If you want clear, concise answers. Then you need to pose clear, concise questions that avoid terms your respondents might not know.

Technical jargon and acronyms create bias because only some of the people in your audience know what you are talking about. It's important to make it as easy as possible for someone to answer your question. For example, you want to know how many of your survey respondents own a smart TV, yet you ask them if they have a CONNECTED TV. Just because you know the technical term doesn't mean everyone else does. You might ask: Do you have a smart TV?

In survey methodology terms, this is called **Sampling Bias**, which is introduced when some members of your intended population are less likely to be surveyed than others.

To avoid bias in formulating questions for survey, the following should be taken into consideration:

(1) Be careful while framing your survey questionnaire.
(2) Provide a simple, exhaustive set of answers options.
(3) Use precise, simple language.
(4) Structure you survey appropriately.
(5) Personalize the survey by keeping your target audience in mind.

Continuously track the metrics to be measured.

Inclusive Resources and Materials (texts, family & community knowledge and resources, web resources).

Questionnaires

Tables

Newspaper articles

Opportunities for Subject Integration:

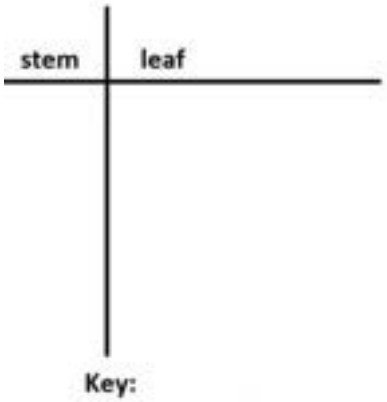
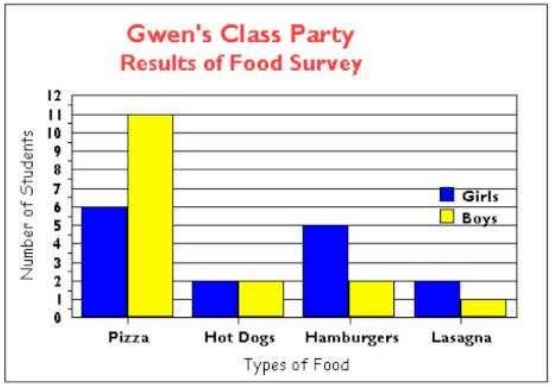
Social Studies - Individuality - how students relate socially to persons and things in their environment; their acceptance and rejection of things around them, forming opinions and critical thinking; choices

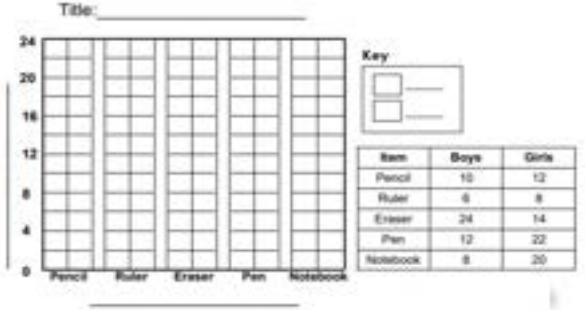
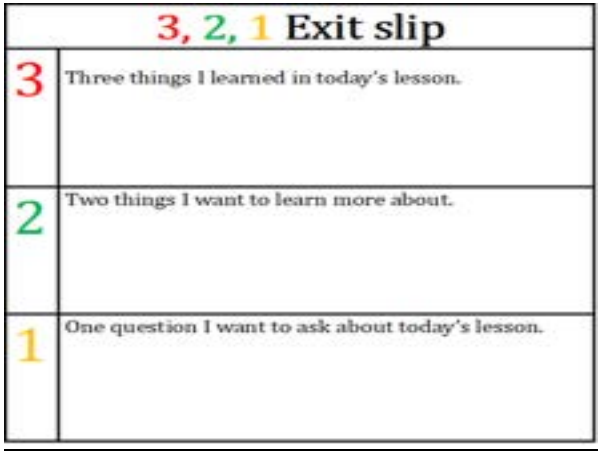
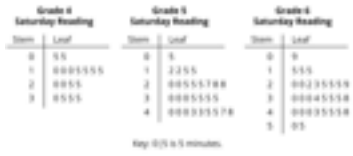
Language - communicate their thoughts and ideas effectively

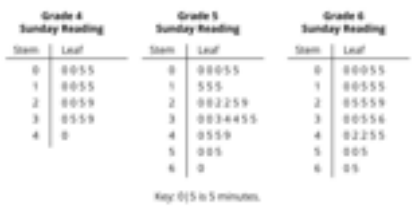
Essential Learning Outcome D1.2: Collecting, Organising and Displaying Data - Collecting, organising, displaying and communicating data.

Grade Level Expectations: D1.2. Represent real-world data using double-bar graphs to make comparisons. Collect data from different primary and secondary sources to answer questions of interest that involve comparing two or more sets of data and organise the data in frequency tables and stem-and-leaf plots.

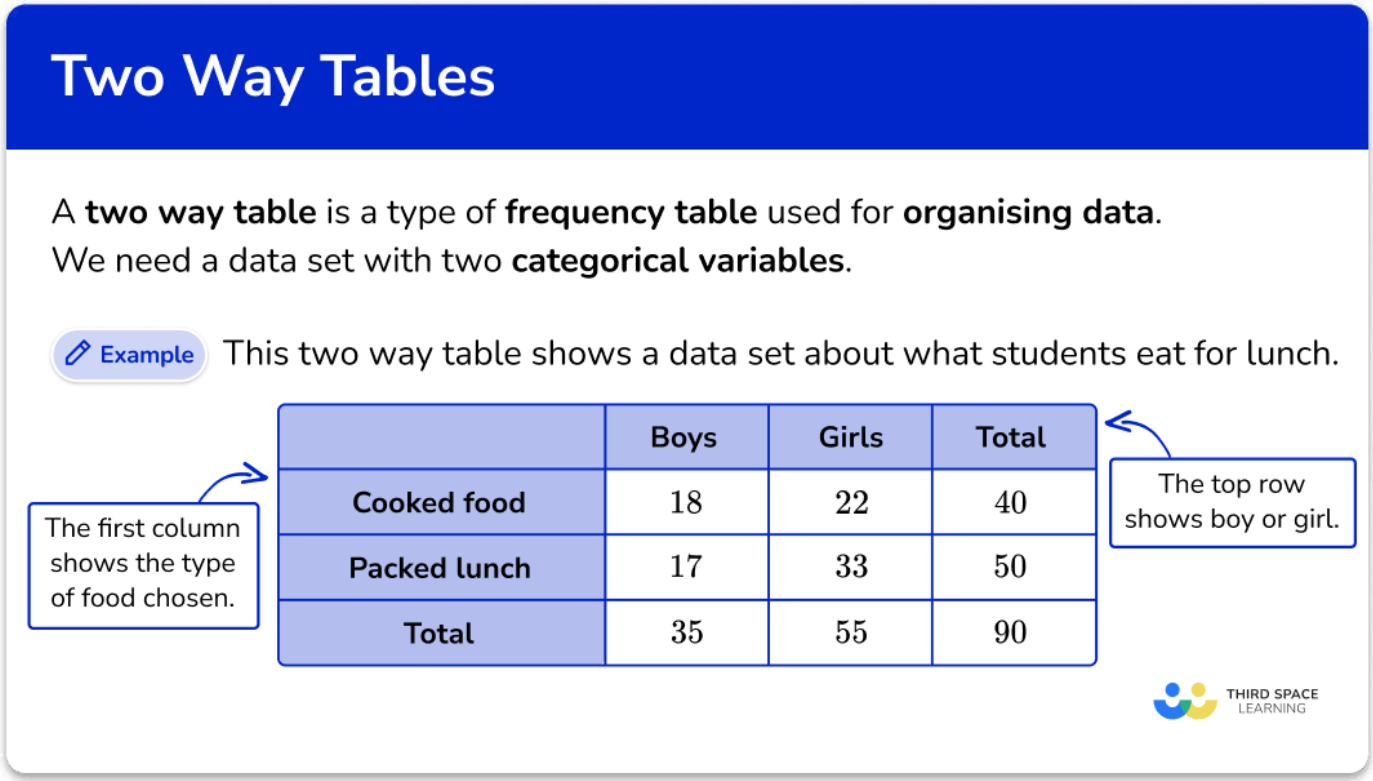
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Identify the elements of a double-bar graph 2. Represent data from two-way tables on bar graphs 3. Use a key to identify bars in bar graphs with multiple related bars, **Skills** 4. Collect real life data from different primary and secondary sources that involve comparing two or more sets of data. 5. Organise data collected in a frequency table 6. Organise data collected in a stem-and -leaf plot.	**Conversation**: Open-ended questions are posed to ascertain students' previous knowledge. Pupils are shown a picture /video of a single bar graph and a double-bar graph next to each other. Pupils differentiate between them As pupils share information any misconceptions are corrected. **Observation** Checklist is used to monitor students' performance on given tasks. Questions are asked and answered as pupils perform tasks. Tasks: Collecting and organising data in a two-way table and stem-and-leaf plot.	**Conversation** Allow Pupils to share what they know about data handling, collection and presenting of data. **Observation** Provided opportunities for learners to discover characteristics of a double bar graph. For example, students are shown a video of a double bar graph. They are guided to take notice of the different elements Unit 7, Lesson 3 - Constructing Double Bar Graphs

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
7. Compare data represented in a double-bar graph 8. Represent real-life data collected using a double-bar graph **Values** 9. Justify the importance of constructing a double-bar graph	Construct a double-bar graph after it has been modelled, All elements of the double-bar graph have been included e.g. title, key, labelling of axes. **Product** <u>Worksheet 1:</u> Pupils collect data: the number of soda sold in the tuckshop each day for 10 days. Data is then organised using a stem-and-leaf plot.  <u>Worksheet 2:</u> Grade 4 boys and girls voted on their favourite school items. Create a double bar graph using the table given.	 The above is a double bar graph created as a model using data collected from the class. The data are separated by gender. Group work Allow Pupils to work in groups of 3-4 to collect data on students' favourite television shows. Pupils separate responses according to gender. Data is recorded and presented in a frequency table. Allow students to work in groups to create a double bar graph with the information collected, They are guided accordingly. Independent practice Demonstrate on the chalk board how to create a stem and leaf plot and double bar graphs. Provide different videos for students to look at. Allow students to work independently on creating a

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 Exit Ticket (slip) 	stem-and-leaf plot and double-bar graph, with given data. Assistance is given where necessary, Provide opportunities for learners to create questions they still have about stem and leaf plots and double bars. Provide students with two sets of stem-and-leaf plots showing the number of minutes students in Grades 4, 5, and 6 read on Saturday and Sunday. Have them create a multiple-bar graph displaying the total minutes read on Saturday by each grade side by side and another for Sunday. Then, have them create a second multiple-bar graph showing the total minutes read on both days for each grade side by side. Discuss how these graphs present different aspects of the data. Additionally, have students collect and display data on the favorite subjects of students in Grades 4, 5, and 6. Have them use a frequency table and various graphs, including multiple-bar graphs, to represent the data. Such activities foster critical thinking as students decide how to best present the data in their graphs. Retrieved from: *https://www.dcp.edu.gov.on.ca/en/curriculum/elementary-mathematics/grades/g4-math/strand-d/d1* 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		

Useful Content Knowledge for the Teacher about the Outcome:



	Boys	Girls	Total
Cooked food	18	22	40
Packed lunch	17	33	50
Total	35	55	90

Stem and Leaf Plot

Stem and leaf plots organize numerical data based on the place value of the numbers.

To do this, you:

- Organize the data into **ascending order**, smallest to largest;
- Determine how the numbers are split into 2 parts by writing a **key** for the stem and leaf plot;
- Separate the numbers into 2 parts (one part for the stem and the other for the leaf);
- Write the values for the 'stem' into the stem and leaf plot;
- And write the values for the 'leaf' into the stem and leaf plot.

Stem	Leaf
0	1, 4
1	3, 6, 6, 7
2	0, 2, 5
3	6, 7, 7, 7, 8
4	0, 1, 3

Key: 2 | 0 means 20

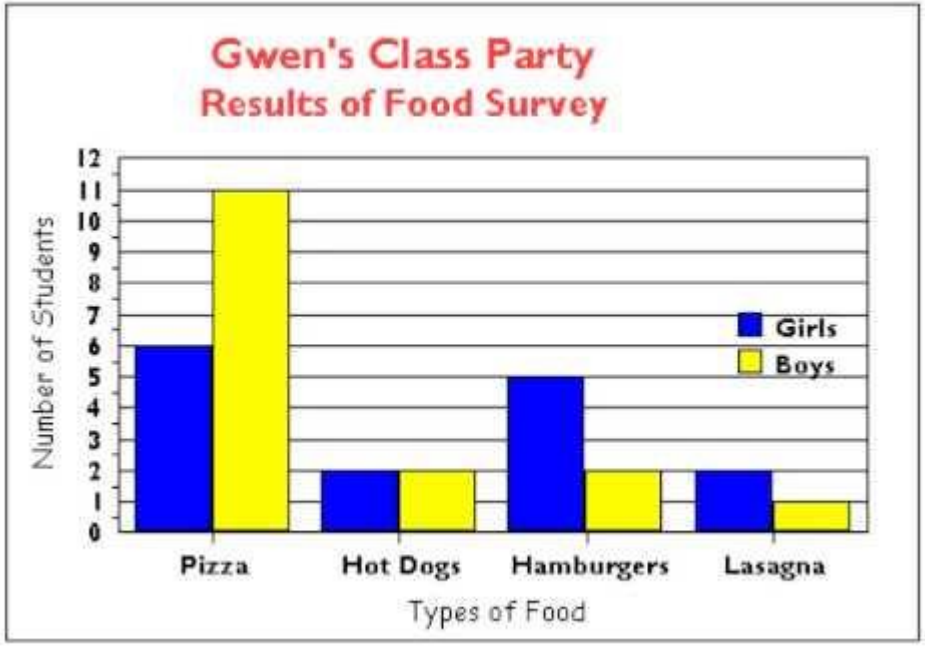
A stem and leaf plot must have a **key**.

THIRD SPACE LEARNING

Source: https://thirdspacelearning.com/us/math-resources/topic-guides/statistics-and-probability/stem-and-leaf-plot/

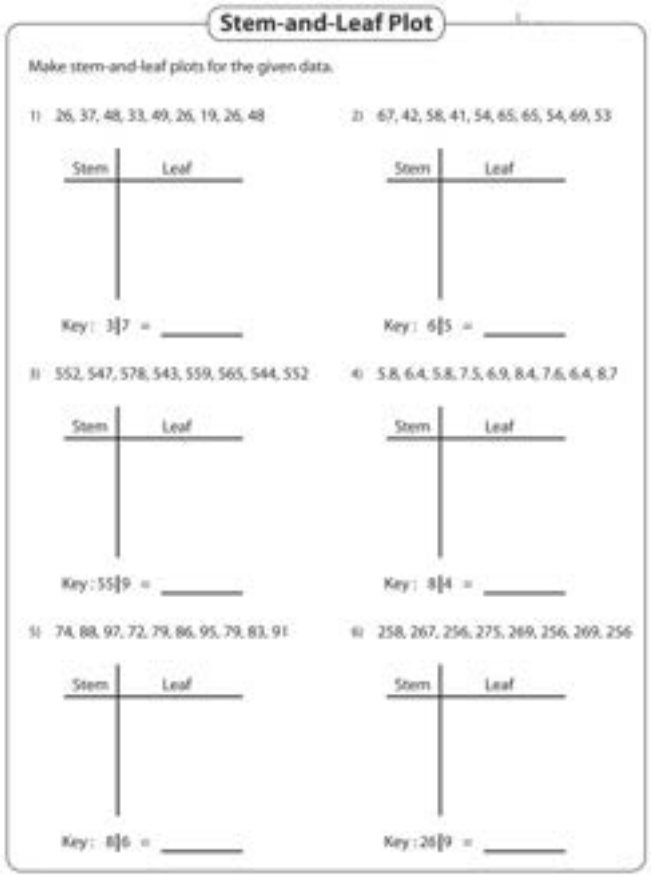
A **double-bar graph** represents data that uses two parallel bars of different heights. The bars can be arranged either vertically or horizontally. A double-bar graph can be used to compare two sets of data. The bars are often colour-coded to make it easier to compare data.

Source: https://www.javatpoint.com/double-bar-graph


Gwen's Class Party
Results of Food Survey
Number of Students
0
1
2
3
4
5
6
7
8
9
10
11
12
Girls
Boys
Pizza
Hot Dogs
Hamburgers
Lasagna
Types of Food

Additional Resources and Materials

Worksheets



Stem-and-Leaf Plot

Make stem-and-leaf plots for the given data.

1) 26, 37, 48, 33, 49, 26, 19, 26, 48

Stem	Leaf

Key: 3|7 = _____

2) 67, 42, 58, 41, 54, 65, 65, 54, 69, 53

Stem	Leaf

Key: 6|5 = _____

3) 552, 547, 578, 543, 559, 565, 544, 552

Stem	Leaf

Key: 55|9 = _____

4) 5.8, 6.4, 5.8, 7.5, 6.9, 8.4, 7.6, 6.4, 8.7

Stem	Leaf

Key: 8|4 = _____

5) 74, 88, 97, 72, 79, 86, 95, 79, 83, 91

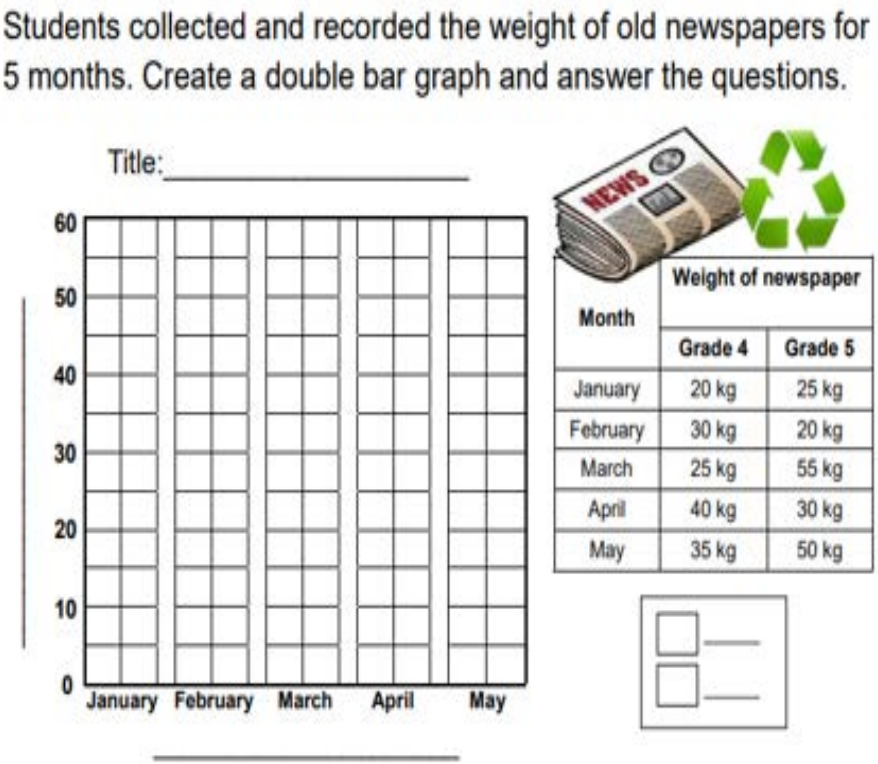
Stem	Leaf

Key: 8|6 = _____

6) 258, 267, 256, 275, 269, 256, 269, 256

Stem	Leaf

Key: 26|9 = _____



Students collected and recorded the weight of old newspapers for 5 months. Create a double bar graph and answer the questions.

Title: _____

Month	Weight of newspaper	
	Grade 4	Grade 5
January	20 kg	25 kg
February	30 kg	20 kg
March	25 kg	55 kg
April	40 kg	30 kg
May	35 kg	50 kg

https://www.k5learning.com/worksheets/math/data-graphing/grade-5-stem-and-leaf-plots-a.pdf
https://www.k5learning.com/worksheets/math/data-graphing/grade-5-double-bar-graphs-a.pdf
https://www.mathworksheets4kids.com/stem-leaf/stem-leaf-level1-1.pdf

Opportunities for Subject Integration:

Science: Collecting and presenting data about the weather, plant growth etc

Social Studies: Collecting and presenting data on Population, tourism etc

Language Arts: Books to teach graphing skills:

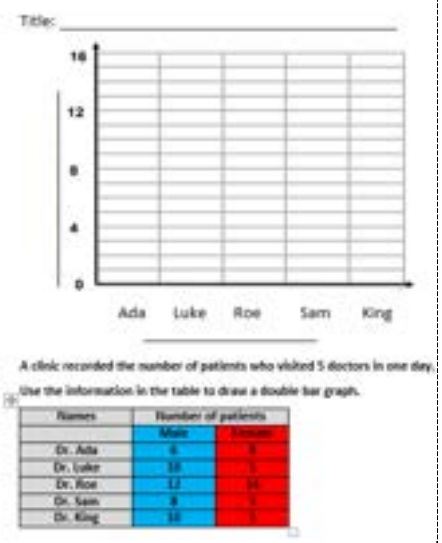
- The Great Graph Contest by Loreen Leedy
- Tally O'Malley by Stuart Murphy
- Lemonade for Sale by Stuart Murphy

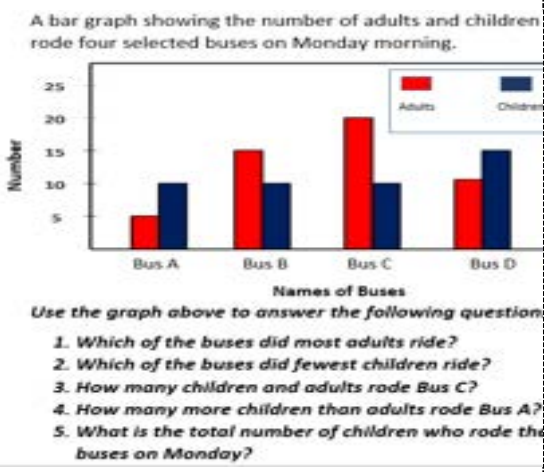
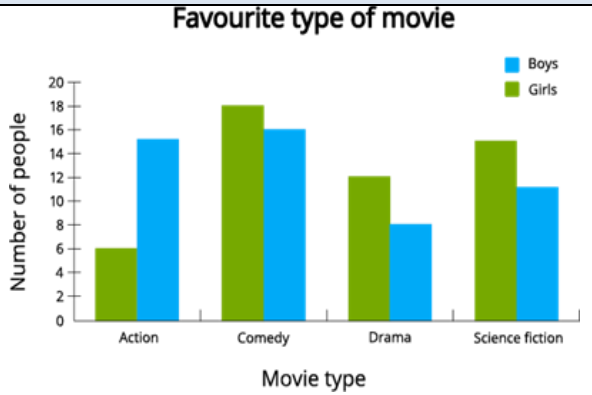
Essential Learning Outcomes D 2.1: Using Statistical Methods to Analyse Data - Describing data sets

Grade Level Expectations: D 2.1. Solve a given problem by constructing and interpreting a double bar graph; Summarize numerical data sets in relation to their context, such as by reporting the number of observations.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Specific Curriculum Outcomes Learners will be expected to: **Knowledge** 1. Construct a double bar graph to represent two sets of related data 2. Interpret data presented in a double bar graph **Skills** 3. Solve questions by constructing a double bar graph 4. Examine given numerical data sets to determine the number of observations **Values** 5. Show willingness to participate in whole-class and small group activities	**Inclusive Assessment Strategies:** ***Conversation*** *Students are asked to describe how to use given data sets to create a double bar graph. They will explain how to label the axes, and select the most suitable legend to represent the data on their graphs.* ***Observation*** *Observe students as they work cooperatively to use data to construct double bar graphs to represent data.*	**Inclusive Learning Strategies:** ***Video Presentation*** Allow students to through guided to learn to construct a double bar graph by presenting YouTube video clips to students on the topic of how to construct a double bar graph. During intervals, have a discussion with students to help them understand the steps involved. Unit 7, Lesson 3 - Constructing Double Bar Graphs Duration:5:02 minutes **Group work** Place students into small groups and present them with data sets showing two sets of related data in a table. They are asked to use the given data sets to construct a double bar graph. For example, students will be asked to create a double bar graph to compare the number of males and females in 3 selected grades. They will be encouraged to label the axes, title, and add a legend or scale to explain the categories being compared.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
involving learning about double bar graphs. 6. Provide assistance to their peers who may face difficulty understanding the content 7. Make convincing arguments and informed decisions based on data presented in double bar graphs, in various contexts drawn from real life.	***Observation Rubric for Group work.*** ***1. All answers are correct.*** ***2. The graph was well-presented.*** ***3. The presentation is neat and clean.*** ***4. Group members worked cooperatively*** ***5. Group members worked quietly and in an organized manner.*** ***10 pts** — **All indicators are evident.*** ***8 pts** — **1 indicator is not evident.*** ***6 pts** — **2 indicators are not evident.*** ***4 pts** — **3 indicators are not evident.*** ***2 pts** — **4 indicators are not evident.*** ***0 pts** — **5 indicators are not evident.*** ***Product*** *Have students complete worksheets to assess their understanding of constructing and interpreting double bar graphs.*	Sample activity: A table showing the number of males and females in three selected grades at Green Vale Academy. Class / Females / Males Grade 1 / 9 / 6 Grade 2 / 7 / 10 Grade 3 / 12 / 15 Task: Use the legend below to construct a double bar graph to represent the data shown in the table above. Females Males ***Independent practice*** Provide opportunities for students to work independently to complete worksheets or workbook exercises in which they use data presented in a double bar graph to answer related questions. **Game** Provide groups of students with markers, glue, poster paper and coloured squares. Present them with data sets and instruct them to use the materials to construct double bar graphs. The first group to complete the activity correctly within a given time will be rewarded.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• *Worksheet #1*  A clinic recorded the number of patients who visited 5 doctors in one day. Use the information in the table to draw a double bar graph. Names | Number of patients Male Dr. Ada 6 Dr. Luke 10 Dr. Roe 12 Dr. Sam 8 Dr. King 10	 *Source:https://playtolearnpreschool.us/paper-strip-process-art/* ***Conversation*** Present students with data sets . Engage them in discussing and comparing the number of observations presented. Ask probing questions such as: What is the total number of persons interviewed/observed? How many boys/girls were asked about their favourite types of movies?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Worksheet #2  ***Gallery Walk*** *Post samples of double bar graphs constructed by students around the classroom. Have students work in pairs to walk around , observe and answer questions about the data presented.*  *Source: http://howtodifferentiate.weebly.com/strategies/gallery-walk*	 *Source: https://www.yaclass.in/p/mathematics-cbse/class-7/data-handling-1485/bar-graph-8654/re-4f6323c0-3f16-4356-940c-6dd5d6d4cba4*

Useful Content Knowledge for the Teacher about the Outcome:

A double bar graph is also known as a double-bar chart. It is a type of graph that displays two sets of related data using rectangular-shaped bars. This type of graph is used to compare two sets of data side by side to show how they relate to each other. Like any other bar graph, the double bar graph has two axes (horizontal and vertical lines) as well as a title. Each axis should be labelled. Because two sets of data are presented on a double bar graph, it is important that it is accompanied by a key or legend to help learners understand what each bar represents. The bars that represent the data should be compared using two different colours or shades.

Source: https://www.math-only-math.com/double-bar-graph.html

Additional Resources and Materials

How to create a double bar graph: https://flexbooks.ck12.org/cbook/ck-12-middle-school-math-concepts-grade-6/section/2.12/primary/lesson/double-bar-graphs-msm6/

https://codinghero.ai/double-bar-graph/#Recommended_Reading

Understanding double bar graphs: www.nagwa.com/en/explainers/136102568654/

Opportunities for Subject Integration:

Social Studies - Using a double bar graph to represent the number of males and females comprising the population of selected communities in a country

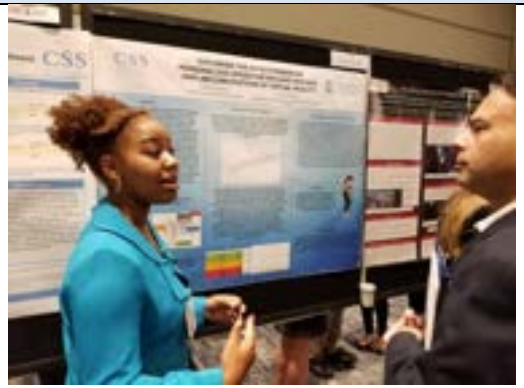
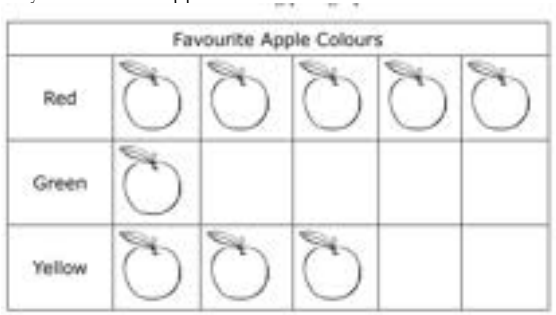
Language Arts - Reading and answering questions based on information presented in a double bar graph; explaining how to construct a double bar graph ; journaling what they learned about double bar graphs.

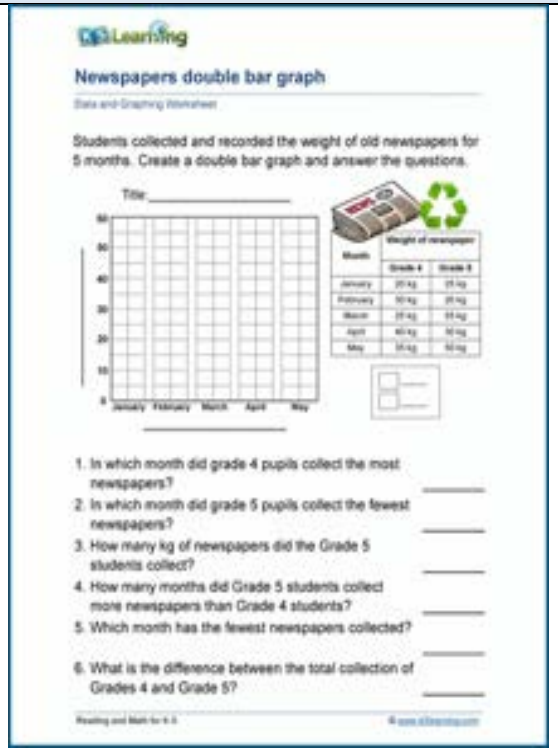
Art/Craft - Creating a model of a double bar graph to represent selected data sets.

Essential Learning Outcomes D 2.2: Using Statistical Methods to Analyse Data - Developing and applying methods to analyse data sets

Grade Level Expectations: *D2.2. Draw conclusions from a given double bar graph to answer questions; Compare graphs in which the same data has been displayed using one-to-one and many-to-one correspondences, and explain how they are the same and different.*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Specific Curriculum Outcomes Learners will be expected to: **Knowledge** 1. Solve word problems related to a double bar graph and provide written explanations for their answers. 2. Compare and contrast two double bar graphs by identifying similarities and differences in the data. **Skills** 3. Analyse a double bar graph and answer comprehension questions. 4. Create a double bar graph using given data and explain the conclusions that can be drawn from it. 5. Use a double bar graph to make predictions and justify reasons with evidence from the graph. 6. Use manipulatives (such as blocks or counters) to create two different	**Inclusive Assessment Strategies:** ***Observation*** *Students are observed as they complete worksheets.* *Students are observed as they present their posters and explanations on data.* ***Conversation*** *Students are graded based on their oral presentations.* ***Product*** *Think Pair Share* *Students design a poster that showcases data from a double bar graph and presents key findings.*	**Inclusive Learning Strategies:** ***Whole Class Activity*** Provide multiple opportunities for students to interpret graphs. For example, Students look at a video teaching them how to interpret a double bar graph, then answer questions orally based on what they saw in the video. 15.2 Interpreting Double Bar Graphs Students look at video teaching them about many to one correspondence in a bar graph. Reading Pictographs- many to one correspondence

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
graphs with the same data, one using one-to-one correspondence and the other using many-to-one correspondence. Take pictures of both graphs and explain the similarities and differences. **Values** 7. Design a poster that showcases the data from a double bar graph and present key findings. 8. Collaborate with a partner to interpret a double bar graph and create a skit or role play based on the information.	 *Source:https://www.sigmaxi.org/images/default-source/news-images/keyed-in/20181027_093533.jpg?sfvrsn=82c2bd58_0&MaxWidth=750&MaxHeight=&ScaleUp=false&Quality=High&Method=ResizeFitToAreaArguments&Signature=24AD8E5ACD3C270711326F5D61FA24C3* <u>*Individual Work*</u> *Students complete worksheets by answering questions, and comparing and contrasting double bar graphs.*	Key : = 5 apples  ***Group Activity*** Students work in pairs to interpret a double bar graph and ask their peers questions.  Source:https://www.readingrockets.org/sites/default/files/styles/share_image/public/2023-05/think-pair-share.jpg?itok=9-6sUkFi

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	 *Source:https://www.k5learning.com/worksheets/math/data-graphing/grade-5-double-bar-graphs-a.gif*	***Individual Activity*** Students use manipulatives to create graphs showing one to one correspondence and many to one correspondence.  Source:https://www.dysart.org/videos/uploads/RYAN.MCGINLEY_20114111124_MathManipulatives_A.jpg

Useful Content Knowledge for the Teacher about the Outcome:

- Graphs represent data visually.
- One-to-one correspondence: Each data point is represented by one element on the graph.
- Many-to-one correspondence: Multiple data points are represented by one element on the graph.
- Comparing graphs allows us to understand how different correspondences can affect the representation of data.

Additional Resources and Materials

Learn how to read and interpret bar graphs Bar Graphs for Kids (Grade 1 and Grade 2) - Learn How to Read and Interpret Bar Graphs.

Students play a bar graph game by answering questions from the graph: https://wordwall.net/resource/27163651

Opportunities for Subject Integration:

Science:

Compare the growth of two plants under two different circumstances.

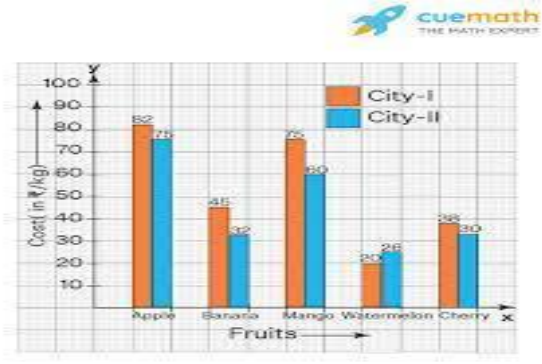
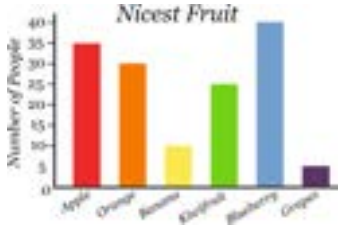
Social Studies:

Compare student performance by subject and grade level to identify trends

Essential Learning Outcome D 3.1: Evaluating Inferences and Making Prediction Based on Data - Making Inferences with data se

Grade Level Expectations: D 3.1. Read, explain patterns, and make predictions from data represented in pictographs, bar graphs, and double bar graphs.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Specific Curriculum Outcomes Learners will be expected to: **Knowledge** 1. Identify the patterns observed from data represented in a graph . **Skills** 2. Explain patterns observed from data presented in graphs 3. Predict an outcome based on the data represented on a graph.	**Inclusive Assessment Strategies:** **Observation**: Listen as students explain the pattern they observed. Listen for trend and if the discussion is logical and / rational **Conversation**:Having one and one conference with students to elicit how they arrive at their predictions. **Product** **Seat work** • Complete a graph based on their pattern and predictions.	**Inclusive Learning Strategies:** **Exploration** Provide opportunities for students to observe different graphs and identify patterns.(whether the graph increase, decreases or remains the same)

Values 4. Judge through the use of graphs to make predictions on given data.	• Students use given data to construct graphs from scratch and predict outcomes from the patterns they observed.	 Source: https://www.cuemath.com/ncert-solutions/study-the-double-bar-graph-given-below-and-answer-the-questions-that-follow-a-what-information-does-the-above-double-graph-depict-b-name-the-fruits-for-which-the-cost-of/  Source: https://www.mathsisfun.com/data/bar-graphs.html **Peer Discussion** Based on the observation, students will identify and discuss any significant change in pattern and then make predictions.

		Group Work Practice Students will complete a double bar graph by adding two bars based on the pattern and their prediction. **Individual Practice** **Scores on the practice Test and the Test** Draw a double bar graph using the data above.

Students	Practice Test	Test
Jeff	60	70
Peter	75	90
John	55	55
Mary	80	95

Useful Content Knowledge for the Teacher about the Outcomes

Graphs are diagrams used to visually illustrate or show relationships between variables. We use graphs to identify patterns (trends), they are also used to help in decision making.Graphs can be used to answer questions and interpret what took place. It can also compare the results of two sets of data. For example, a double bar graph to compare the maths results of boys compared to girls.

Additional Resources and Materials

Data from the school for the last 4 years on the number of new admission to the school males and females

Data from CDC for the last 5 years about the number of primary schools that participated in the Junior Calypso competition (primary and secondary schools). Here you can also collect data for calypso and soca.

Opportunities for Subject Integration:

Social S tudies: Population (school) number of 10 yrs old males and females.

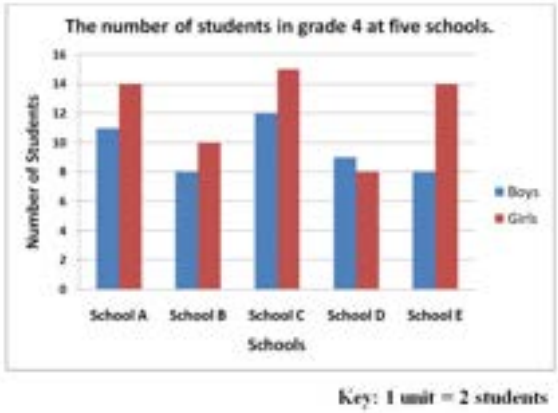
Science: temperature - graph the 10 o'clock temperature of the day for 4 days and predict the temperature at the same time for the next 3 days

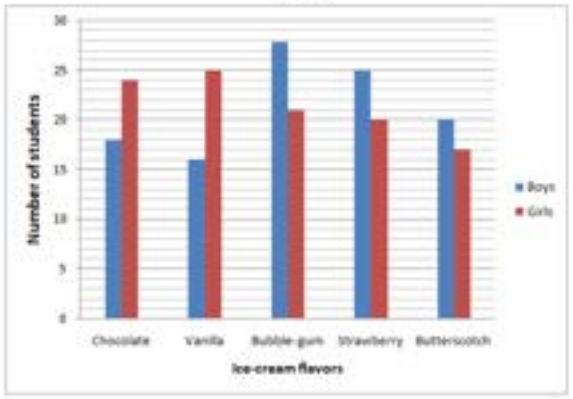
Language Arts: Write a paragraph to explain the pattern you discovered on a given graph and what predictions they will make about the graph.

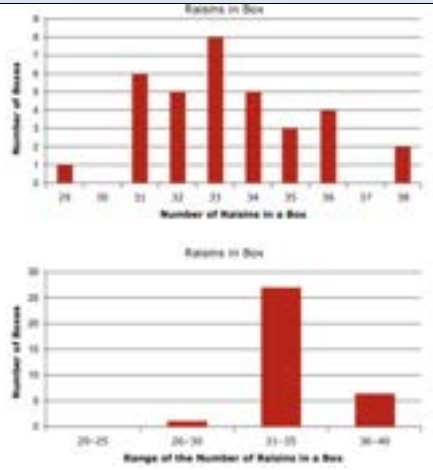
HFLE - Collect data on student participation in physical activity and healthy food choices to promote well-being.

Essential Learning Outcome D 3.2: Evaluating Inferences and Making Predictions Based on Data - Making and testing conjectures based on data sets

Grade Level Expectation: Answer a given question, using a double bar graph in which data is displayed using many-to-one correspondence.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Specific Curriculum Outcomes Learners will be expected to: **Knowledge** 1. Answer questions based on a given bar graph that depicts a many to one correspondence 2. Formulate unbiased questions that can be answered using a survey. **Skills** 3. Construct a double bar graph based on data collected using a many to one correspondence to answer a survey question. **Values** 4. Ask questions that can be answered using the bar graph presented.	**Inclusive Assessment Strategies:** *Conversation* Whole class discussion Learners share their questions orally with their classmates that can be asked using the data that was presented on a double bar graph to them during discussion. The Class responds to questions by giving answers. *Product* Worksheet are distributed to learners to be completed	**Inclusive Learning Strategies:** Give learners the opportunity to answer questions through whole class discussion based on a given double bar graph. For example:  Key: 1 unit = 2 students Questions that can be asked by the teacher are presented below. Look at the bar chart: 1. What are two/three things that you can know by looking at the data? 2. How does the key help us with the data on the bar graph?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
5. Report their findings to class to justify their use of many to one correspondence 6. Display their bar graph on a	**A bar graph showing the ice-cream flavor liked by students in particular school.**  1. What is the least liked flavor of ice-cream? _____ 2. What is the most popular flavor of ice-cream? _____ 3. How many more boys liked bubble gum ice-cream than vanilla? _____ 4. How many students liked chocolate and strawberry altogether? _____ 5. Who do you think that this information would be useful for? Why? _____ 6. State two questions that come to mind when you look at the data? _____ Students bar graphs are checked using a checklist. The axes are correctly labelled. The numbers are labelled correctly on the lines.	3. How many girls are in grade 4 at school B? 4. How many more boys are in school A than in school C? 5. Who do you think this information on the graph will be useful for? (This next question can be used for group work) 6. What other questions that can be answered by the data on the bar graph? (this question can be used for group work) Display a large data set 35 students liked chocolate ice-cream 30 students liked vanilla ice-cream 60 students liked bubble gum ice-cream 25 liked strawberry ice-cream Learners are presented with a set of data and are asked to construct a double bar graph displaying a many to one correspondence. Compare graphs that use different intervals or correspondences and explain the reasoning behind the chosen interval or correspondence. Analyze graphs that display the same data using both one-to-one and many-to-one correspondences, and describe the similarities and differences. Discuss the reasons why many-to-one correspondence is sometimes preferred over one-to-one correspondence. Using the graphs below. .

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product: Brainstorm with the class different categories of food they could sell (crackers, beverages, granola bars, etc.). Give each group a category and have them research the nutritional facts of food within the category. Each group must decide on 4 specific food items that are healthy to sell. Groups must present their information to the whole class. The presentation must include the following: Q a pictograph or bar graph that represents many-to-one correspondence Q an analysis of the data from the food labels Q a statement about why the snacks will be a good choice to sell to the students at the school Look for the following: Graphs were completed correctly. Data were represented correctly. Data were summarized correctly. Students were able to compare quantities in the graph. Conclusions were valid	 *Retrieved from: https://www.edu.gov.mb.ca/k12/cur/math/support_gr4/statistics.pdf* Identify examples of graphs using many-to-one correspondence in print and electronic media, such as newspapers, magazines, and the Internet, and describe the type of correspondence used Group work Ask questions in groups or pairs Provide learners with the opportunity to work in small groups or in pairs to ask questions that can be answered based on the double bar graph presented.

Useful Content Knowledge for the Teacher about the Outcome: A double bar graph is a bar graph that is used to display two sets of data in a comparative manner using two bars beside each other.

Inclusive Resources and Materials from Regional Specialists

Digital Tools and Interactive Resources

1. **Interactive Graphing Tools**:
   - **Create A Graph** (NCES Kids' Zone): A user-friendly tool for creating various types of graphs, including double bar graphs. Students can enter data and see immediate visual representations.
   - **ChartGo**: An online graphing tool where students can input data and generate double bar graphs.
2. **Educational Software and Apps**:
   - **Google Sheets or Microsoft Excel**: These programs allow students to input data and create double bar graphs. They provide options for customizing graphs and interpreting data.
   - **Khan Academy**: Offers interactive exercises and videos on creating and interpreting double bar graphs.
   - **Graphing Apps**: Apps like "Graphing for Kids" on tablets or smartphones provide interactive ways for students to create and analyze double bar graphs.

Hands-On Activities and Manipulatives

5. **Graphing Kits**:
   - **Double Bar Graph Templates**: Printable templates where students can manually enter data and color bars.
   - **Classroom Graphing Sets**: Kits that include tools for creating graphs on large chart paper or whiteboards.
6. **Manipulatives**:
   - **Colored Blocks or Cubes**: Use these to represent data physically before transferring it to a graph.
   - **Graph Paper**: Provide large graph paper for students to draw and color their double bar graphs.

Classroom Activities and Projects

7. **Project-Based Learning**:
   - **Class Surveys**: Have students conduct a survey within the class on a topic of interest (e.g., favorite fruits, preferred hobbies) and use the data to create double bar graphs.
   - **Science Experiments**: Integrate graphing with science projects where students can graph data from experiments (e.g., plant growth under different conditions).
8. **Math Centers**:
   - Set up a math center where students can rotate through different graphing activities, including digital tools, hands-on manipulatives, and worksheet stations.

Opportunities for Subject Integration:

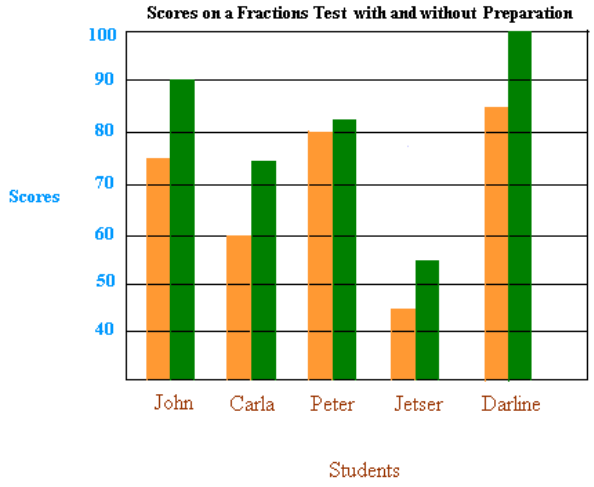
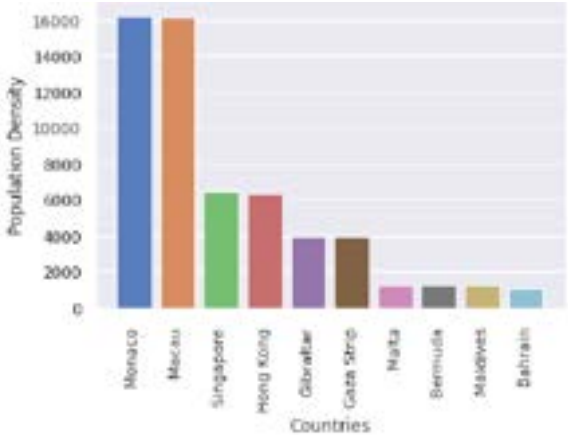
Social S tudies - Collect data about population and display the data using a double bar graph.

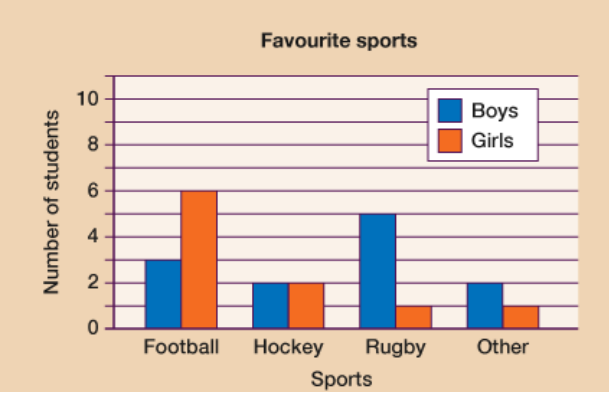
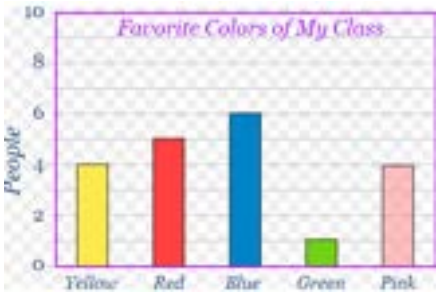
Science - Collect data about the heights of students in a class and display using a double bar graph

Language Arts - Listen to a story about the usefulness and importance of graphs. One possible story can be '*Tiger Math: Learning to graph from a Baby Tiger by Ann Whitehead Nagda and Cindy Bickell*'.

Essential Learning Outcome D 3.3: Evaluating Inferences and Making Predictions Based on Data - Evaluating data descriptions and reports

Grade Level Expectations: D3.3. Find examples of graphs in print and electronic media, such as newspapers, magazines, and the Internet, in which many-to-one correspondence is used; and describe the correspondence used.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Describe the correspondence(one-to-one or many-to-one)used to present information in graphs. 2. Differentiate the components of a graph using legend or key **Values** 3. Appreciate the usefulness of data to make reasonable predictions about future outcomes	*Group work* *Students are divided into 4 groups and assigned a bar graph. employment.* *Examples:*  	**Whole class activity** Teacher displays a population density graph in thousands  The teacher asks students to observe the graph and describe the components and the contents: the heading, the labels etc Questions a. Which countries have the least population density?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Retrieved from https://www.basic-mathematics.com/double-bar-graphs.html  *Retrieved from https://www.open.edu/openlearn/mod/oucontent/view.php?id=90853&section=3* *Ask students questions based on their graph* ***Conversation*** ***Observation*** *Students are observed as they interact and share information during class discussions. Present pairs of students with a data set (eg.* trends in the genre of movies created over the years). *Observe students as they evaluate the data presented in the graph and communicate their predictions of future occurrences. .*	b. Determine the frequency table for information presented in the graph. c. Describe the type of correspondence used in this data set. **Peer Collaboration**  Retrieved fromhttps://www.mathsisfun.com/data/survey-results.html Provide activities for students to describe two single bar charts and merge the two single bar charts to a double bar chart.

Essential Learning Outcome D 4.1: Understanding and Applying Concepts of Probability - Predicting and describing the likelihood of events

Grade Level Expectations: D4.1. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Knowledge** 1. Define the terms predicting, likelihood, unlikelihood, certain, impossible and equally likely **Skills** 1. Describe events through the use of different probability	***Conversation*** ***Students discuss the different colours they observe and make predictions about the likelihood of landing on specific colours.***  	***Introductory*** Provide students with a dice. Allow one student to roll the dice and the other students will predict which number will be rolled. They will talk about what could have happened when the dice is rolled. Teacher will guide students so they can conclude that there was a chance or likelihood that any of the numbers could have been rolled. The term probability is reinforced. ***Exploration*** Give multiple examples for students to use the terms impossible, unlikely, equally likely, likely and certain are reinforced. For example, using the dice students will determine the probability of each of the following. The likelihood of getting a four is _____ The chance of getting a seven is _____ The chance of the dice landing on a number is _____

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	https://dj0b18phdhzpx.cloudfront.net/ckeditor_assets/pictures/1195016/original_598193.JPG ***Observation*** *Both the teacher and students will observe the probability of the following based on the spinning of the wheel.* *The probability of landing on a pink* _____ *The probability of landing on a red.* _____ *The probability of not landing on a blue* _____ *The probability of landing on a blue, green, yellow or red* _____ ***Product*** ***Complete each of these using the correct using the different type of probability.*** ***The day after Thursday is Friday*** _____ ***A coin landing on the third side*** _____ ***Time moving backwards*** _____ ***Rain falling during the month of September in the Caribbean*** _____	The chance of getting a number from 1 to 6 _____ (different answers) The number line can be used to reinforce the various probability terms used above. _____ 0 ½ 1 Unlikely uncertain likely certain

Useful Content Knowledge for the Teacher about the Outcome:

Probability expresses the likelihood of an event occurring. The probability of an event can be described as the relationship of favourable outcomes to the number of possible outcomes.

Additional Resources and Materials:

https://www.turtlediary.com/worksheets/fourth-grade/probability.html

Interactive Whiteboards: Use for visual demonstrations and interactive probability activities.

Educational Apps and Software: Utilize apps that offer probability games and simulations, such as "Mathletics" or "Probability Spin".

Worksheets and Printables: Provide worksheets with probability exercises and word problems.

Opportunities for Subject Integration:

Science

Weather Predictions

Activity: Discuss weather forecasts and the probability of different weather events occurring.

Example: Analyze weather predictions and assign probabilities to events like rain, snow, or sunny weather.

Integration: Create a classroom weather station where students record daily weather predictions and compare them to actual weather, discussing the probabilities.

Animal Behavior

Activity: Study the behavior patterns of animals and the likelihood of certain behaviors.

Example: Observe birds and record the frequency of different behaviors (e.g., flying, eating, singing).

Integration: Assign probabilities to each behavior based on the observations and discuss why some behaviors are more likely than others.

Social Studies

Historical Events

Activity: Explore the likelihood of historical events and discuss the factors that influenced their occurrence.

Example: Assign probabilities to different outcomes in historical scenarios, such as the success of an exploration mission.

Integration: Discuss how certain events were likely or unlikely based on the context and factors at the time.

Geography and Natural Disasters

Activity: Study the probability of natural disasters occurring in different regions.

Example: Map out areas prone to earthquakes, hurricanes, or floods and assign probabilities to these events.

Integration: Discuss why some regions have higher probabilities of certain natural disasters and the impact on human settlements.

Language Arts

Story Predictions

Activity: Predict outcomes in stories and assign probabilities to different events.

Example: Before reading a chapter, have students predict what might happen next and discuss the likelihood of various outcomes.

Integration: Use probability vocabulary to discuss predictions (e.g., "It's very likely that the character will find the treasure").

Reading Comprehension

Activity: Analyze characters' decisions and the likelihood of different outcomes.

Example: After reading a story, discuss how likely different endings were based on the events and character actions.

Integration: Assign probabilities to alternative endings and justify the reasoning based on the story context.

Art

Color Probability

Activity: Discuss the probability of selecting different colors from a set.

Example: If a jar contains 10 red, 5 blue, and 3 yellow beads, what is the probability of picking each color?

Integration: Use the concept of probability in art projects where students randomly select colors to create patterns or designs.

Creative Projects

Activity: Integrate probability into project planning.

Example: Plan a project where students draw cards to determine the elements they must include (e.g., different shapes or colors) and discuss the probability of drawing each card.

Integration: Analyze the likelihood of different project outcomes based on the elements included.

Physical Education

Sports and Games

Activity: Calculate the probability of different outcomes in sports activities.

Example: Determine the likelihood of making a basket in basketball or scoring a goal in soccer.

Integration: Use probability to discuss strategies and predict game outcomes based on players' performance.

Fitness Challenges

Activity: Assign probabilities to various physical challenges.

Example: Predict the likelihood of completing a certain number of push-ups or running a specific distance.

Integration: Track and compare probabilities with actual performance to discuss fitness goals and achievements.

Music

Music Choices

Activity: Discuss the probability of selecting different types of music or instruments.

Example: If a student has 5 songs from different genres, what is the probability of choosing a specific genre?

Integration: Create playlists or randomize music selections and analyze the probability of different outcomes.

Composing Music

Activity: Use probability to compose music by randomly selecting notes or instruments.

Example: Assign probabilities to different notes or instruments and create compositions based on random selections.

Integration: Discuss how probability affects the variety and creativity in music composition.

Technology

Coding and Simulations

Activity: Use coding to create simulations that involve probability.

Example: Program a simple simulation where students can change the probability of events and observe the outcomes.

Integration: Discuss how changing probabilities affects the results and the importance of probability in simulations and real-life scenarios.

Data Analysis

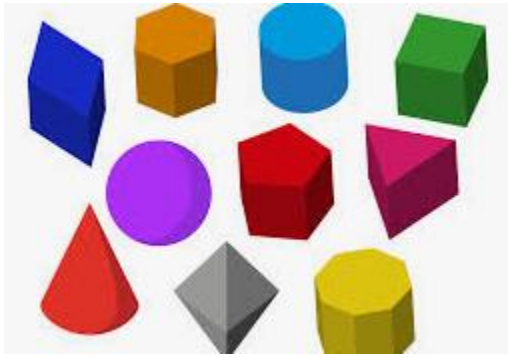
Activity: Analyze data sets and determine the probability of certain trends.

Example: Use spreadsheets to track data and calculate the probability of different events based on the data.

Integration: Discuss how data analysis can help predict future events and make informed decisions.

Essential Learning Outcome: D 4.2 Understanding and Applying Concepts of Probability - Calculating Probabilities

Grade Level Expectations: Conduct a given probability experiment a number of times, record the outcomes, and explain the results; Calculate using fractions and decimals on a probability continuum (0= impossible - 1=certain)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners will be expected to: **Skills** 1. Find probability through experiment 2. express probabilities of events using fraction	***Conversation*** ***Conversation***  *Retrieved from https://www.thoughtco.com/standard-deck-of-cards-3126599* *Using a pack of cards, students are given the different suits in groups(four groups, 13 cards in each suit).* *Teacher listens as students predict the possibility of getting numbered cards and court cards.*	 ***Retrieved fromhttps://letstalkscience.ca/educational-resources/hands-on-activities/can-you-debug-these-3d-shapes*** Give students miniature objects of shapes such as cylinder, cube, cuboid and sphere. Objects can be of same or different number based on shapes. Students will count the number of each type of object and determine the total of all the objects. Students will establish the probability using different shapes through calculations. For example, the probability of getting a green shape is 1/10.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Provide students with the opportunity to select cards at random and record their results in a suitable table. *Allow students to compare the results for theoretical and the experimental probability* ***Observation*** *The teacher will observe students as they discuss in groups or pairs possible items they can produce. Given the numbers 1 - 15 students will calculate different probabilities based on their previous knowledge. They will justify how they get the answers and if they are certain on them being correct.* *E.g.* *What is the probability of getting an even number?* _____ *What is the probability of getting a prime number* _____ *Probability of getting a number less than 10* _____ *The probability of getting a number between 5 and 15* _____ *Probability of getting a multiple of 2* _____	E.g. If there are 24 pieces in total with the same number of pieces for each shape the probability of a cuboid being drawn will be 6/24 or ¼. Experimental Probability Experimental probability is the actual result of an experiment, which may be different from the theoretical probability. Example: you conduct an experiment where you flip a coin 100 times. The theoretical probability is 50% heads, 50% tails. The actual outcome of your experiment may be 47 heads, 53 tails. Coin Probability Experiment Provide each group of students with a coins/a die and ask them to toss it and record the results  | Coin toss	1st	2nd	3rd	4th	5th	6th
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Results							 Put H or T to complete the table Ask students probability questions based on the results. For example, what is the probability of getting a head after six tosses? Allow students to compare results for experimental and theoretical probability

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Product *Months of the Year* *Write the probability of the following occurring in numeral form* *What is the probability of a month beginning with J?*_____ *What is the probability of a month having 31 days?*_____ *The chance of getting month with 28 days is* _____ *What is the probability of selecting the month of March?* _____ *The chance of a month after August beginning with the letter F* _____	

Useful Content Knowledge for the Teacher about the Outcome:

Knowledge of the different types of numbers: prime, odd, even, factors, multiples

Knowledge of names 3D shapes : cube cuboid, cylinder, sphere, cone

Inclusive Resources and Materials from Regional Specialists

Interactive Whiteboards: Use for visual demonstrations of probability experiments and recording outcomes.

Educational Apps and Software: Utilize apps like "Probability Tools" to conduct virtual experiments and calculate probabilities.

Worksheets and Printables: Provide worksheets for recording outcomes and calculating fractions and decimals in probability experiments.

Additional Resources and Materials

Miniature 3D shapes, deck of cards, months of the year, number chart

Opportunities for Subject Integration:

Science

Scientific Experiments

Activity: Conduct probability experiments related to natural phenomena.

Example: Measure the probability of different weather conditions over a week.

Integration: Record daily weather (sunny, cloudy, rainy) and calculate the fraction and decimal probabilities of each condition occurring.

Biology and Animal Behavior

Activity: Study the probability of certain animal behaviors.

Example: Observe how often a pet (e.g., a classroom hamster) performs different actions (eating, sleeping, playing) over a set period.

Integration: Record the outcomes, convert them to fractions and decimals, and explain the results.

Social Studies

Historical Events

Activity: Discuss the likelihood of historical events occurring based on recorded data.

Example: Conduct a mock voting experiment to understand historical election outcomes.

Integration: Record the results, calculate the fraction and decimal probabilities of different outcomes, and explain why certain results were more likely.

Language Arts

Reading Predictions

Activity: Make predictions about story outcomes and their probabilities.

Example: Before reading a chapter, students predict possible events and assign probabilities to each.

Integration: Record predictions, discuss outcomes after reading, and convert probabilities into fractions and decimals.

Creative Writing

Activity: Write stories that involve probability experiments.

Example: Create a story where characters conduct an experiment, such as predicting the weather or the outcome of a race.

Integration: Include recorded outcomes and probability calculations in the story.

Art

Art Projects

Activity: Integrate probability into art activities.

Example: Use a spinner with different colors to determine the colors used in a project.

Integration: Record the frequency of each color being chosen, calculate the fractions and decimals, and explain the results.

Pattern Creation

Activity: Create patterns based on probability experiments.

Example: Roll dice to determine the number of shapes or colors used in an art piece.

Integration: Record the outcomes, convert them to fractions and decimals, and explain the probability of different patterns occurring.

Physical Education

Sports and Games

Activity: Conduct experiments to determine the probability of different outcomes in sports.

Example: Record the success rates of free throws in basketball.

Integration: Convert the results into fractions and decimals and explain the probability continuum from impossible to certain.

Fitness Challenges

Activity: Calculate the probability of completing various fitness challenges.

Example: Predict the likelihood of running a specific distance within a time frame.

Integration: Record attempts, calculate the fractions and decimals of successful outcomes, and explain the results.

Music

Music Practice

Activity: Conduct probability experiments related to music practice.

Example: Record the frequency of correctly played notes during practice sessions.

Integration: Convert the data into fractions and decimals, and explain the likelihood of playing the piece correctly.

Random Music Composition

Activity: Use probability to compose music.

Example: Assign probabilities to different notes or rhythms and conduct an experiment to compose a piece based on the outcomes.

Integration: Record the outcomes, convert to fractions and decimals, and explain the composition process.

Technology

Coding and Simulations

Activity: Use coding to simulate probability experiments.

Example: Program a simple game that involves probability (e.g., rolling dice, flipping coins).

Integration: Record the simulated outcomes, calculate fractions and decimals, and explain the results.

Data Analysis

Activity: Analyze real-world data sets to understand probability.

Example: Use spreadsheets to record and analyze data from experiments.

Integration: Convert the data into fractions and decimals, and explain the probabilities.