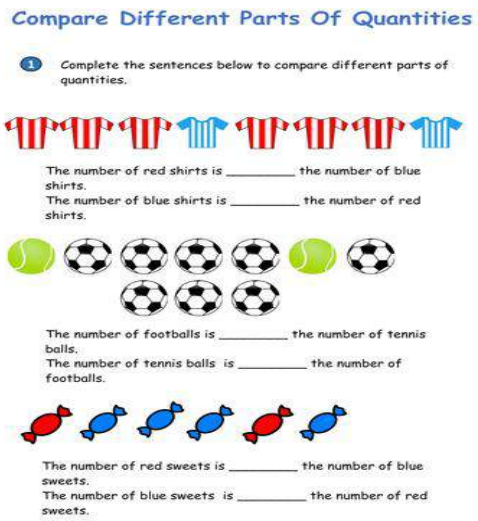
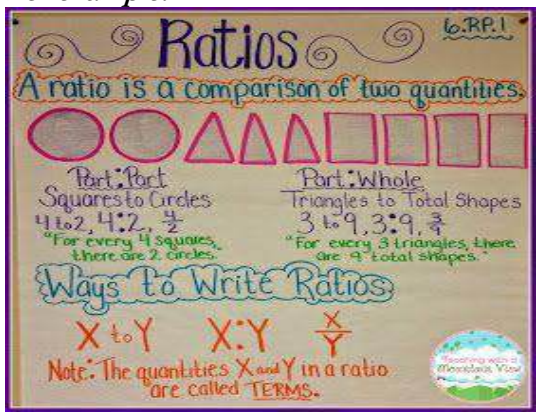
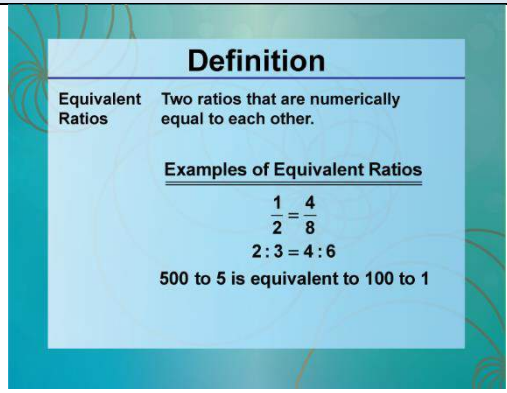
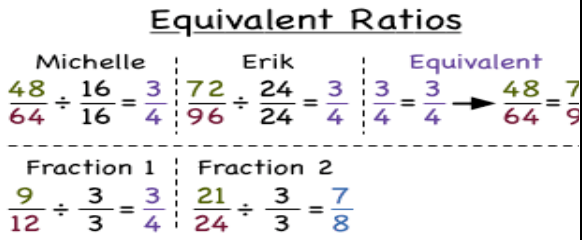
Essential Learning Outcome O3.1: Proportional Reasoning – Representing and Working with Rates and Ratios
Grade Level Expectations Use ratio and rate reasoning to solve real-world and mathematical problems

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

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

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

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

Additional Resources and Materials

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

Additional Useful Content Knowledge for the Teacher

Ratios compare quantities and show the relationship between them.

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

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

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

Opportunities for Subject Integration

Language Arts:

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

Science:

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

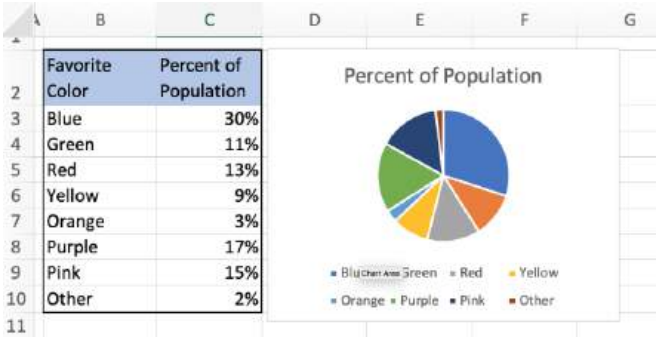
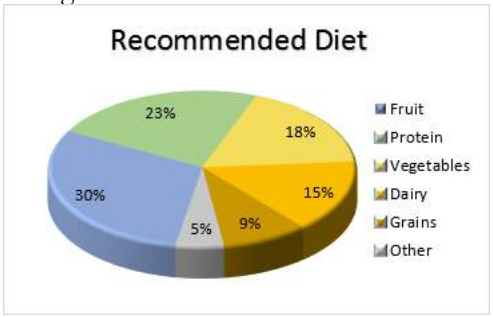
Social Studies:

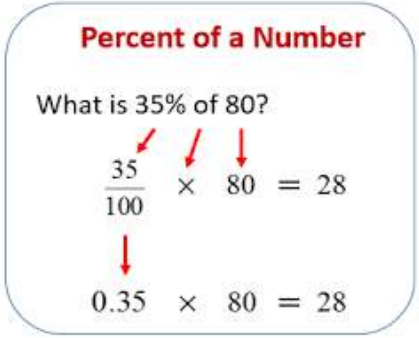
- Cooperative learning among learners in completing group projects.
- Promoting social interaction among learners as they learn.
- Sharing of ideas, strategies when solving real life problems

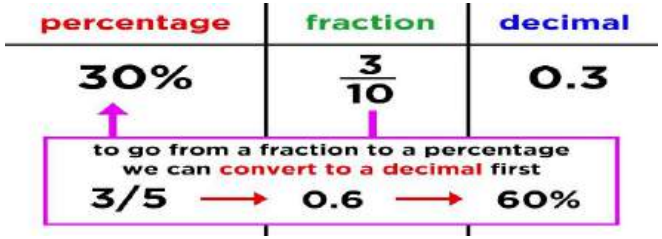
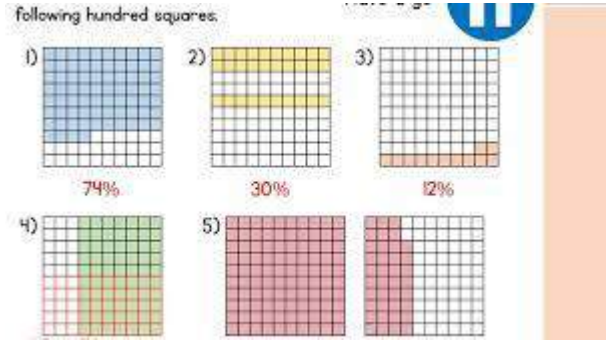
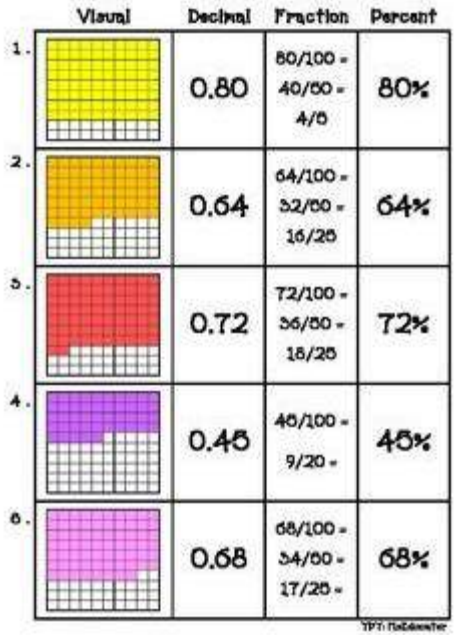
Essential Learning Outcome O3.2: Use a variety of representations and models of percentages to solve real-world mathematical problems.

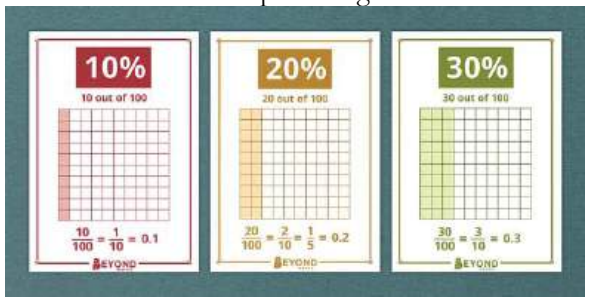
Grade Level Expectations:

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

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

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

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

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

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

Additional Resources and Materials

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

Additional Useful Content Knowledge for the Teacher:

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

Opportunities for Subject Integration:

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

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

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

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

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

Patterns and Relationships

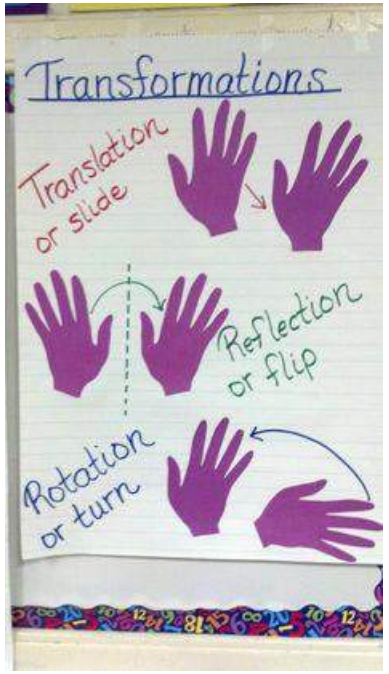
Introduction to the Strand:
Patterns are central to mathematics; children have intuitive ideas about patterns. As children become more confident in making patterns and seeing connections, they can talk out loud about what they have noticed. Children will start to identify the mathematical relationships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

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

Grade Level Expectations:

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

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

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

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

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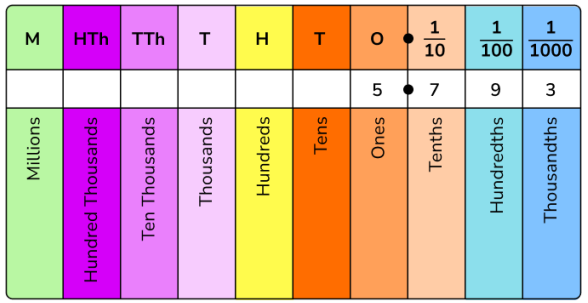
	Pair up with a classmate and discuss your answers to the questions. Make sure to explain your reasoning behind your responses and listen to your partner's explanations as well. Step 3: Share (Whole Group Discussion) Share your answers with the class. Be prepared to explain your thought process and reasoning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

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

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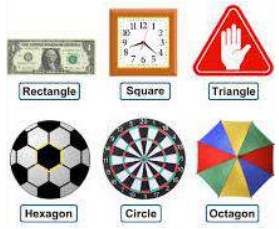
	Station 2 **One LittleTwo, Little Three Little Polygons** 1. Research and list different types of polygons Within and outside the classroom and school environment. 2. Identify the properties of each type of polygon. 3. Discuss the relationships between sides and angles in polygons. 4. Explore the concept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

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

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

Additional Resources and Materials

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

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

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

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

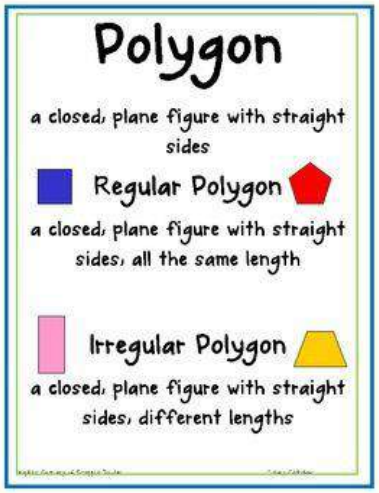
Transformation Slides
https://docs.google.com/presentation/d/1pXMFNiStvy7qW4EuYMvrOr33YOUAGQwGHnMyNsH_lRs/edit#slide=id.g20df9b5ade3_0_18

Place value worksheet

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

Additional Useful Content Knowledge for the Teacher

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



Regular and Irregular Polygons

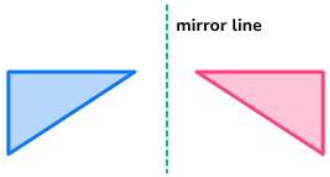
Name	Regular	Irregular	Number of Sides
Triangle			3
Quadrilateral			4
Pentagon			5
Hexagon			6
Octagon			8

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

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

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

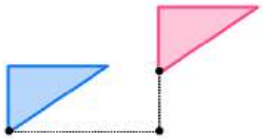
E.g.



The shapes are congruent.

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

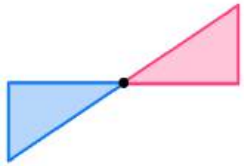
E.g.



The shapes are congruent.

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

E.g.



The shapes are congruent.

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

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

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr>
<td>5. Explain the relationship between whole numbers and decimal tenths.

Skills

6. Demonstrate the use of patterns to simplify the process of adding and subtracting decimal numbers.

7. Apply patterns in decimal addition/subtraction to solve word problems.

8. Identify and explain the patterns in relationships among whole numbers and decimal tenths.

Values

9. Generate a plan for using patterns to solve addition/subtraction problems with decimal numbers.</td>
<td>day. How much money will Sarah have saved in total after 7 days?

Steps to Solve the Problem:

1. Identify the pattern in Sarah's savings.
2. Calculate the amount saved each day.
3. Sum the amounts saved over the 7 days.

Rubric

<table>
<tr><th>Criteria</th><th>4 Point</th><th>6 Points</th><th>10 Points</th></tr>
<tr><td>Problem Accuracy</td><td>The problem is somewhat accurate</td><td>The problem is mostly accurate</td><td>Problem is accurate</td></tr>
<tr><td>Identification of Pattern</td><td>Pattern somewhat identified</td><td>Pattern mostly identified</td><td>Pattern identified</td></tr>
<tr><td>Explanation of Pattern</td><td>The explanation is unclear or incomplete</td><td>The explanation is somewhat clear</td><td>The explanation is clear and detailed</td></tr>
</table>

Sticky Note Discussion- Have learners answer the following questions on a sticky note. They will post their answers on the wall for their classmates to view. They will then have a class discussion to see how well the understood the concept.

1. I am a set of numbers that follows a sequence. When you add me to a whole number, the result is always a decimal tenth. What am I?

2. I am a pattern that repeats every 0.1. What am I?</td>
<td>The "Result" column shows the outcome of each operation.

1: Adding a Constant Decimal Pattern: Adding 0.5

<table>
<tr><th>Step</th><th>Expression</th><th>Result</th></tr>
<tr><td>1</td><td>0.5 + 0.5</td><td>1.0</td></tr>
<tr><td>2</td><td>1.0 + 0.5</td><td>1.5</td></tr>
<tr><td>3</td><td>1.5 + 0.5</td><td>2.0</td></tr>
<tr><td>4</td><td>2.0 + 0.5</td><td>2.5</td></tr>
</table>

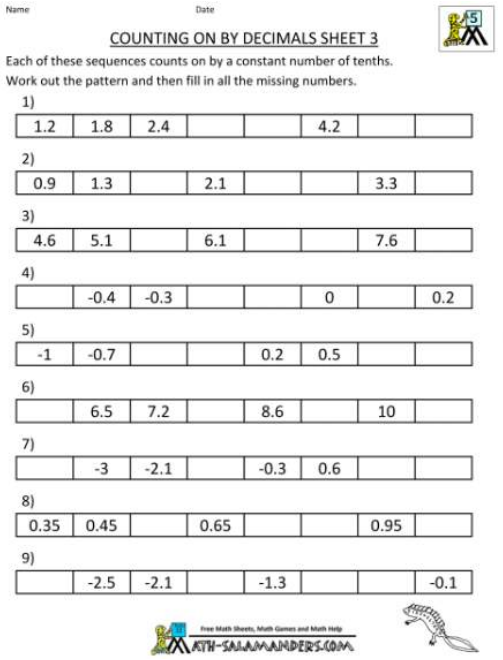
#2: Subtracting a Constant Decimal Pattern: Subtracting 0.2

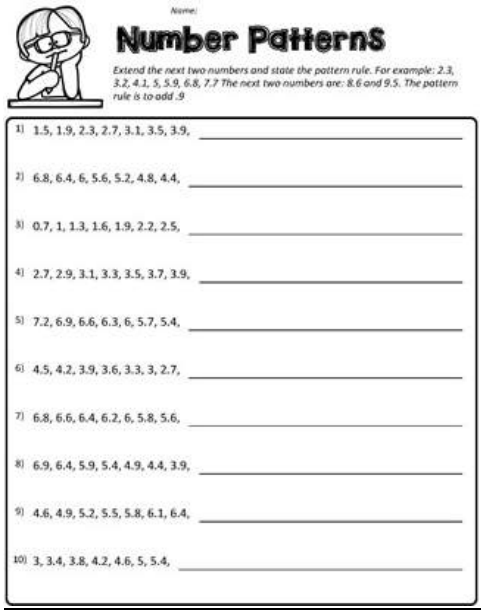
<table>
<tr><th>Step</th><th>Expression</th><th>Result</th></tr>
<tr><td>1</td><td>1.0 - 0.2</td><td>0.8</td></tr>
<tr><td>2</td><td>0.8 - 0.2</td><td>0.6</td></tr>
<tr><td>3</td><td>0.6 - 0.2</td><td>0.4</td></tr>
<tr><td>4</td><td>0.4 - 0.2</td><td>0.2</td></tr>
</table>

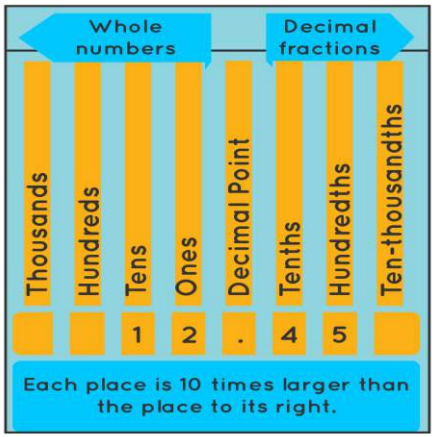
Develop a set of cards with decimal addition and subtraction problems on one set and their solutions or pattern descriptions on another. Learners match problems with their corresponding solutions or pattern descriptions, reinforcing their ability to recall and apply patterns.

Use number lines marked with decimal increments (e.g., 0.1, 0.2, etc.). Learners perform addition and</td>
</tr>
</table>

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

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

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

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

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

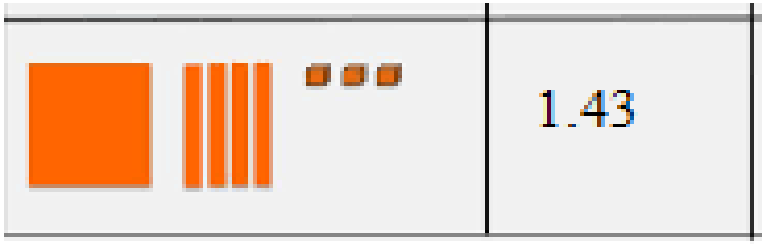
Additional Resources and Materials

Geo board and rubber bands

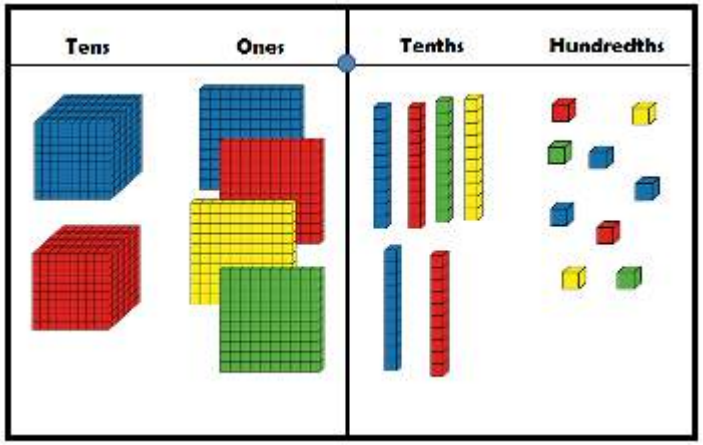
Building blocks/ Tiles

Additional Useful Content Knowledge for the Teacher

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



Above the number 1.43 is modeled using base ten blocks.



Above the number 24.69 is modeled using base ten blocks.

Opportunities for Subject Integration

Language Arts

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

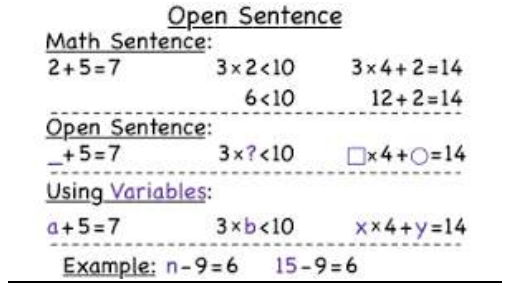
Summarizing- Learners can make journal entries by summarizing what they learned about patterns in adding and subtracting decimals.

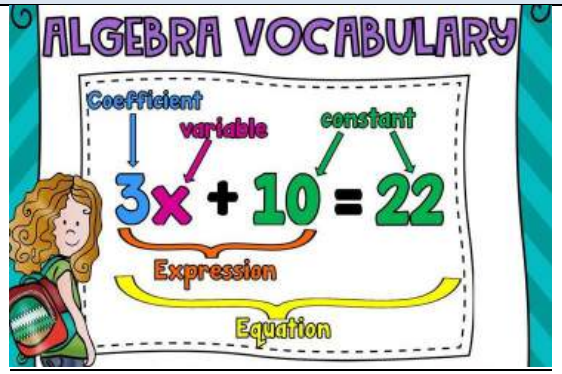
Expository Writing - Learners will explain how to solve a problem that involves finding patterns in adding and subtracting decimals.

Science

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

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

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

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

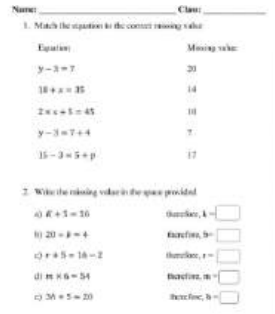
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Project Rubric

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

Worksheet

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



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

Games

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

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

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

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

Additional Resources and Materials

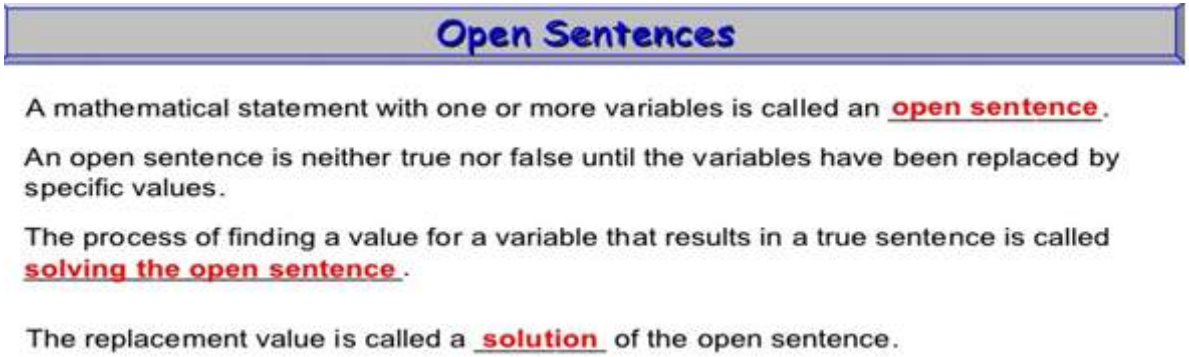
Interactive Notebooks

Equation Puzzles
Equation Cards
Algebra Tiles
Balance Scales

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

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

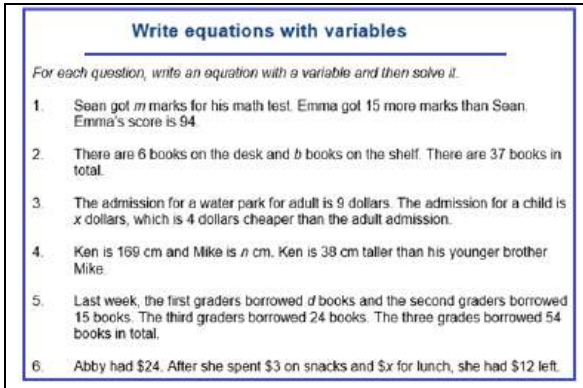
Additional Useful Content Knowledge for the Teacher



Vocabulary

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

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

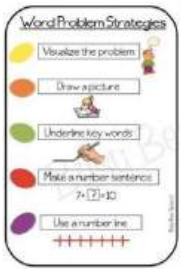


Write equations with variables

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

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

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



Opportunities for Subject Integration

Music

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

Technology

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

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

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

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

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

Grade Level Expectation:

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

Specific Curriculum Outcomes

Learners are expected to:

Knowledge

1. Compare and contrast different volumes and capacities using direct measurement, and the appropriate tools and units to determine equality and inequality
2. Show equivalence in amounts of money using strategies such as counting and exchanging coins and notes.
3. Compare/measure size of angles to determine if two angles are equal or unequal.
4. Evaluate/compare results in two expressions involving multiplication and division to determine equality or inequality (50÷5 is greater than 30÷5, and 12×3=6×6).

Inclusive Assessment Strategies

Observational Assessment:

Description: Teachers observe learners as they engage in measurement activities at each station.

Implementation:

- Use a checklist or rubric to note learners' use of measurement tools, accuracy in reading measurements, and ability to estimate and compare volumes.
- Pay attention to learners' problem-solving approaches and interactions with peers.
- Provide on-the-spot feedback and support as needed.

Sample Checklist

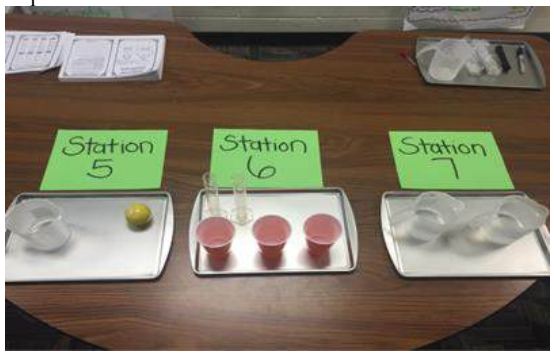
Learner Name: _____

Criterion	Yes	No	Comments
Uses Measurement Tools Correctly			
Accurately Reads Measurements			
Effectively Estimates Volumes			

Inclusive Learning Strategies

Hands-On Activities:

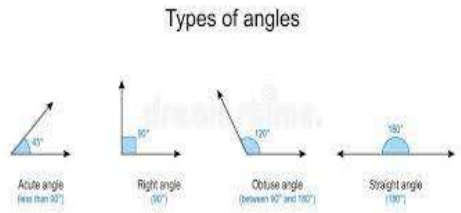
Measurement Stations: Set up different stations with various containers and liquids. Provide measuring tools (like graduated cylinders, measuring cups, beakers) and instruct learners to measure and record the volumes and capacities.



https://mrswests3rdgrade.weebly.com/classroom-blog/volume-volume-more-volume

Water Play: Use water or sand for practical measurement activities. Invite learners to pour, measure, and compare volumes of substances in the different containers. Record findings and

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills 5. Simplify fractions by dividing or generating equivalent fractions by multiplying to show equivalence. 6. Using common denominators or visual models, compare fractions to show inequalities. 7. Illustrate when two expressions involving addition and subtraction of decimals are equivalent	**Compares Volumes Accurately** | | | | **Reflects on Estimations and Measurements** | | | | ***Self-Assessment:*** **Description:** Learners assess their own understanding and performance. **Implementation:** • Provide learners with a self-assessment checklist to evaluate their own work at each station. • Include questions that prompt learners to reflect on their accuracy, use of tools, and estimation skills. • Encourage learners to set personal goals for improvement based on their self-assessment. **<u>Self-Assessment Checklist</u>** **Learner Name:** **Date:** **Activity:**	discuss patterns, such as which tools provide the most precise measurements. ***Real-World Connections*** **Description:** Connect learning to real-life situations. **Implementation:** • Organize field trips to local stores where learners can practice counting and exchanging money. • Invite guest speakers, such as bank tellers or store managers, to talk about money handling. • Create projects where learners manage a small budget for a classroom event or fundraiser. Provide a variety of containers with different shapes and sizes (e.g., jars, bottles, boxes). Instructions: Learners use a standard measuring cup or
	Use of Measurement Tools **I used the measurement tools correctly.** o ☐ Always o ☐ Sometimes o ☐ Rarely **Accuracy in Reading Measurements** **I read the measurements accurately.** o ☐ Always o ☐ Sometimes o ☐ Rarely **Estimating Volumes** **I made accurate estimates of volumes.** o ☐ Always	graduated cylinder to measure the capacity of each container. Sort containers into groups based on their capacities (e.g., small, medium, large). Compare and contrast the capacity of containers in each group, discussing why some containers hold more or less. Discuss the differences and similarities in liquid capacities and explore patterns, such as how larger containers hold more liquid. Use containers with volumes that follow a pattern (e.g., 50 mL, 100 mL, 150 mL, 200 mL). Instructions:

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

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Differentiated Instruction Rubric

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

Performance Tasks

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

Implementation:

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

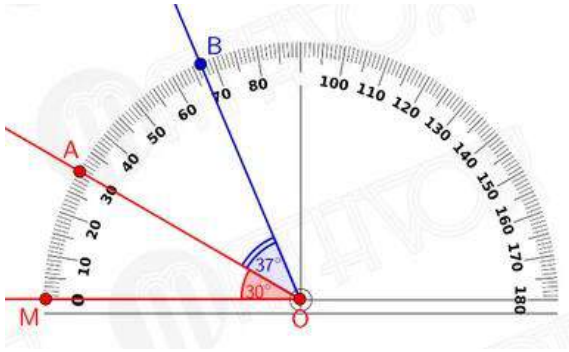
Station 1: Plot Area Comparison

Sample Activity - Angle Comparison Challenge

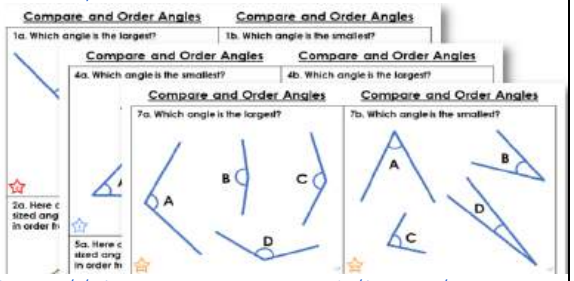
Instructions:

Basic Level:

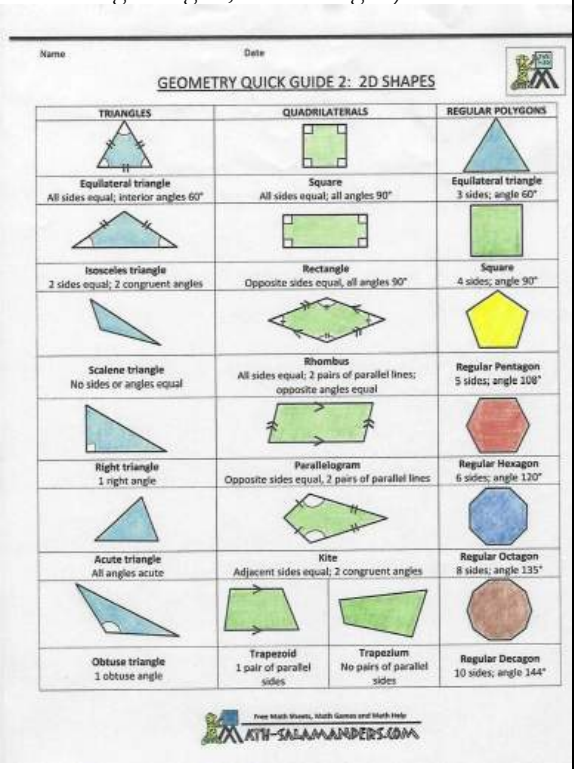
- Provide pairs of angles and ask learners to use a protractor to measure and compare them.
- Identify whether each pair of angles is equal, greater than, or less than each other.

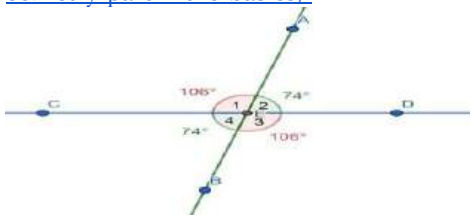
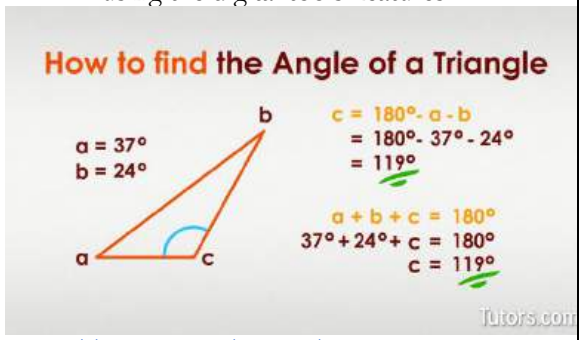


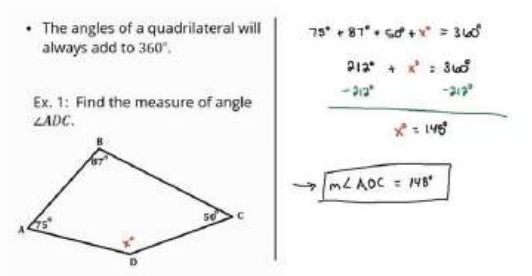
https://mathvox.com/geometry/basic-concepts-and-figures-of-plane-geometry/chapter-2-angles-types-of-angles-and-their-properties/the-comparison-of-angles-2nd-method/

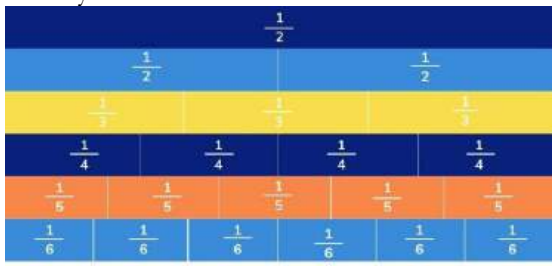


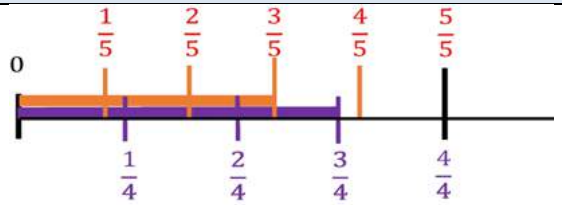
https://classroomsecrets.co.uk/lesson/year-4-compare-and-order-angles-lesson/

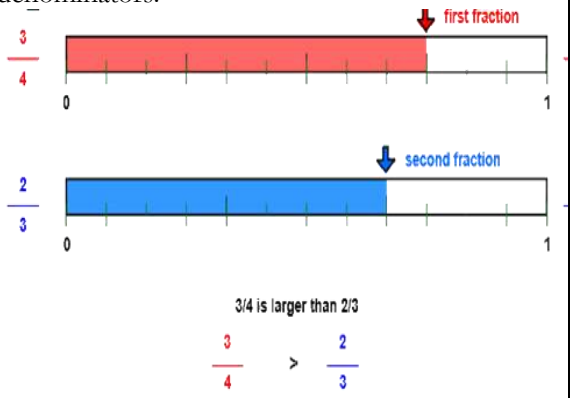
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	1. **Plot A:** Length = 10 metres Width = 8 metres Area of Plot A: 10×8=80 square metres 2. **Plot B:** Length = 15 metres Width = 6 metres Area of Plot B: 15×6=90 square metres **Station 2: Snack Pack Comparison**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

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

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

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

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

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

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

Additional Useful Content Knowledge for the Teacher

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

Measurement: Volume and Capacity

Volume:

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

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

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

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

Capacity:

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

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

Currency

Basic Arithmetic with Currency:

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

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

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

Angles

Types of Angles:

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

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

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

Angle Construction:

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

Angle Comparison: Techniques for comparing angles visually and numerically.

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

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

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

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

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

Additional Useful Content Knowledge for the Teacher

Solving Algebra Equations with Addition and Subtraction

The Equation

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

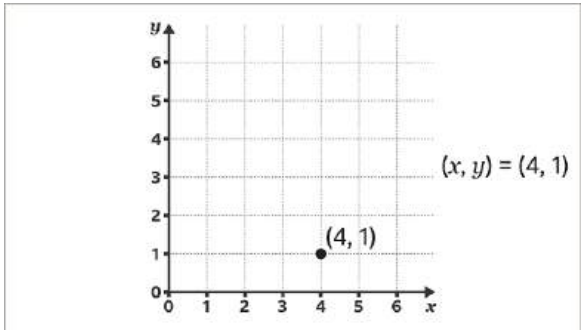
Variables

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

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

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

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

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

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

Additional Useful Content Knowledge for the Teacher

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

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

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

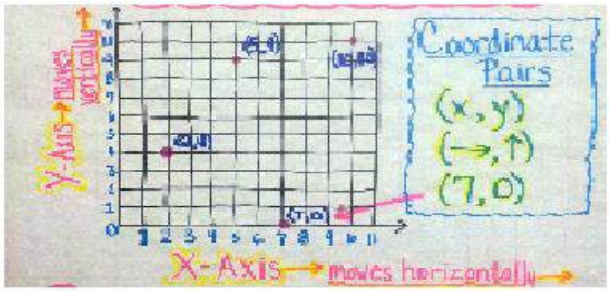
The first number in an ordered pair tells how far across left or right to go on the X line.

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

A line is drawn to connect the points.

Coordinate system

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



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

Inclusive Resources and Materials

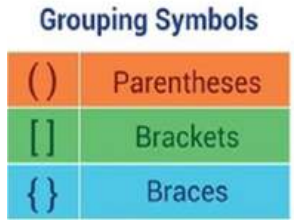
String, rope

Geoboards and rubber bands

Graph paper

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

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

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

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

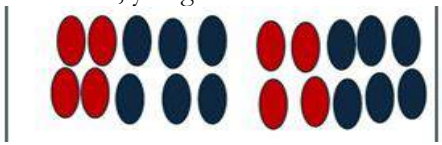
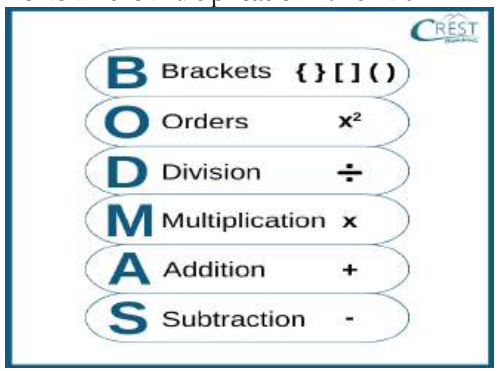
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		symbols helps maintain the correct order of operations. Writing Expressions: Translating verbal descriptions into expressions highlights how grouping symbols structure mathematical relationships. Applying Order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

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

Grade Level Expectations:

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

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

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

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

Additional Resources and Materials

Interactive Tools:

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

2. Interpreting Numerical Expressions Without Evaluating Them

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

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

Additional Useful Content Knowledge for the Teacher

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

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

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

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

Term	1	2	3	4
Term Value	1	4	7	10

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

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

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

Inclusive Resources and Materials

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

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

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

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

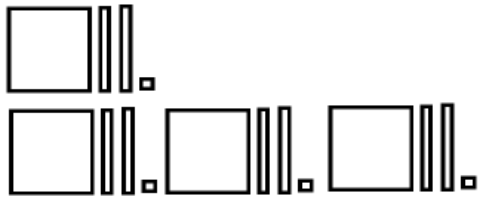
Listen to learners as they make comparisons.

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

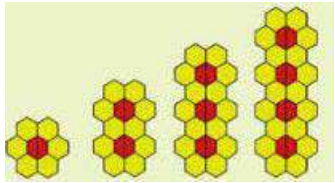
<table>
<tr><td>Year</td><td>Number of persons</td></tr>
<tr><td>2013</td><td>120</td></tr>
<tr><td>2014</td><td>240</td></tr>
<tr><td>2015</td><td>480</td></tr>
</table>

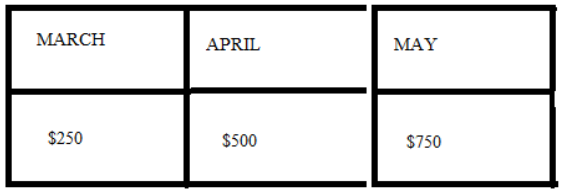
If the pattern continued, what was the attendance in 2017?

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



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

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

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

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

Additional Useful Content Knowledge for the Teacher:

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

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

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

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

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

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

53 + 62 _____ 54 + 61 (compensation)

138 + 267 _____ 140 + 265(compensation)

673 – 428 _____ 675 –430 (constant difference)

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

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

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

Inclusive Resources and Materials

Hundred Chart

Counters: rocks, corks, beans, etc.

Geoboards and rubber bands

Blocks

Graph paper

Base Ten Blocks

Opportunities for Subject Integration

Art and Craft:

Drawing and colouring shapes

Creating shapes of plants and animals

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

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

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

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

LanguageArts:

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

Reading stories about place values, patterns and relationships

Composing stories and poems of shapes and solids

Making concept maps using 2D shapes

Writing reports for models and projects created

Social Studies:

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

Creating patterns to show cultural affiliations

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

Settlement patterns, road grids.

Science:

Relating shaped to the earth, moon and moon phases

Planetary movements

HFLE:

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

Accepting challenges when making presentations

Adopting problem solving strategies

Developing rational argument and reasoning

Healthy Habits (patterns of behaviour

Geometric Thinking

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

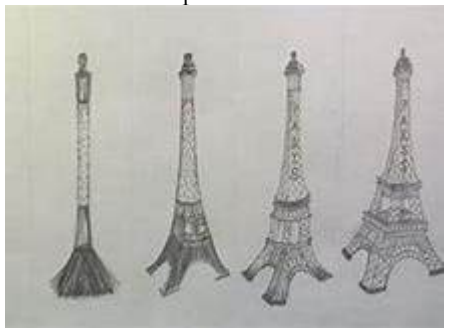
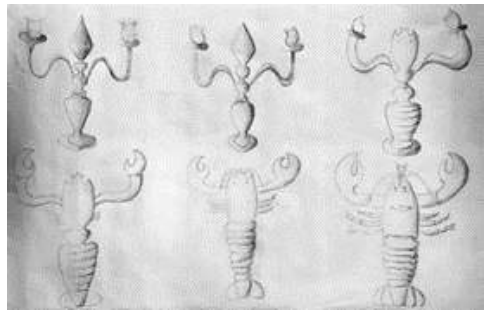
Essential Learning Outcome G1.1: Explore and Analyse Geometric Shapes and Relationships - Developing a spatial sense

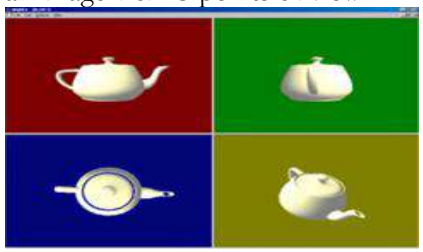
Grade Level Expectations:

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

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

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

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

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

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

Additional Resources and Materials

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

Additional Useful Content Knowledge for the Teacher

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

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

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

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

Top Tips for Teaching 2D Shapes

Opportunities for Subject Integration

Mathematics & Language Arts:

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

Mathematics & Art:

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

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

Mathematics & Science:

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

Mathematics & Technology:

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

Mathematics & Agricultural Science

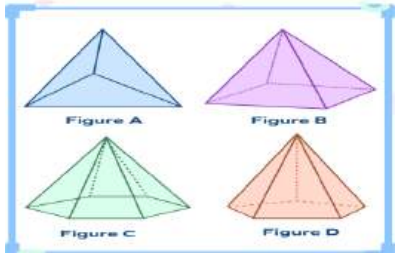
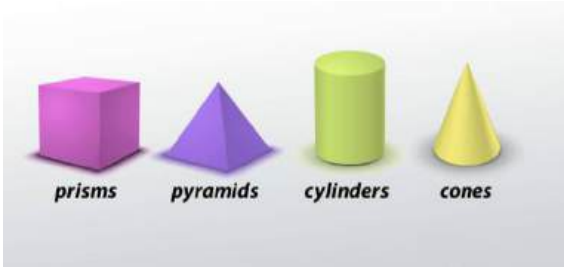
- classifying leaves based on their shape.
- building seed boded and also raised garden beds
- building animal shelters

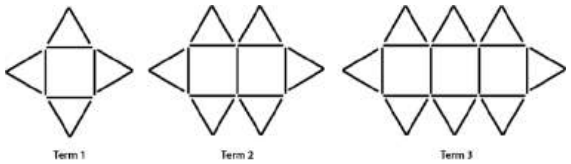
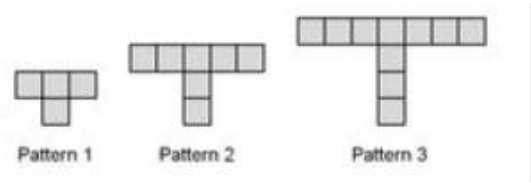
Mathematics & Sport: In different sports, disciplines require a sense of direction and angle to aim the ball to score a perfect goal. From being alert on the field to recognizing their angles, geometry plays a vital role in daily life.

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

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

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

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

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

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

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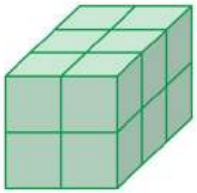
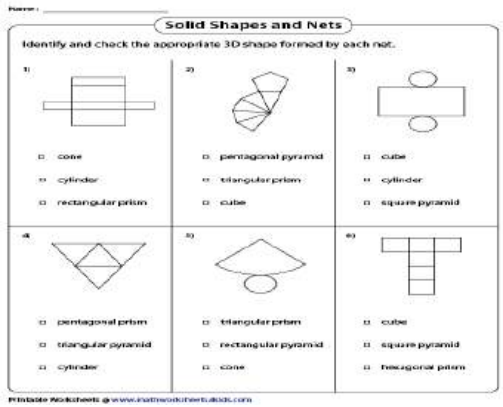
	Learners are able to correctly construct the nets of given shapes yes somewhat no Learners can identify the shapes used to create the nets yes somewhat no **<u>Product</u> - to make unique isometric creations** Learners will be given images of isometric shapes and be asked to create the shape using cutouts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

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

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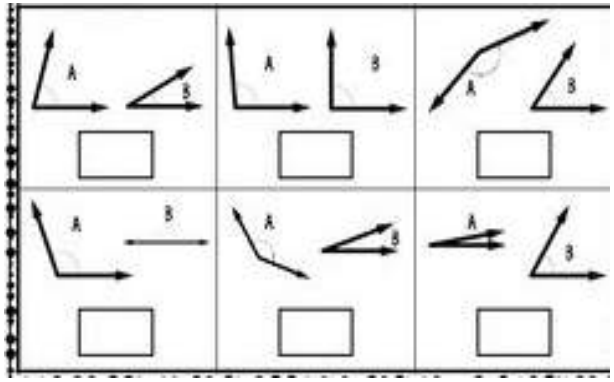
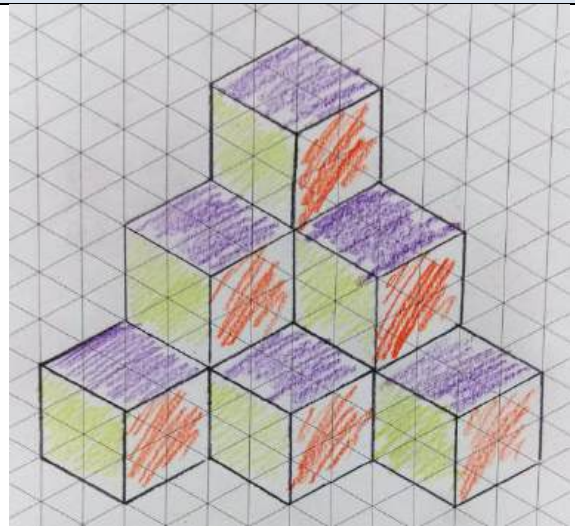
	<u>Product</u> (Drawing angles) - to test learners' ability to sketch sample angles. Learners will be asked to use rulers to assist them to sketch given angles and be asked to label them as being as acute, right or obtuse **<u>Exit Ticket</u>** Learners will be shown pictures of two angles and be asked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

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

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

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

Additional Resources and Materials

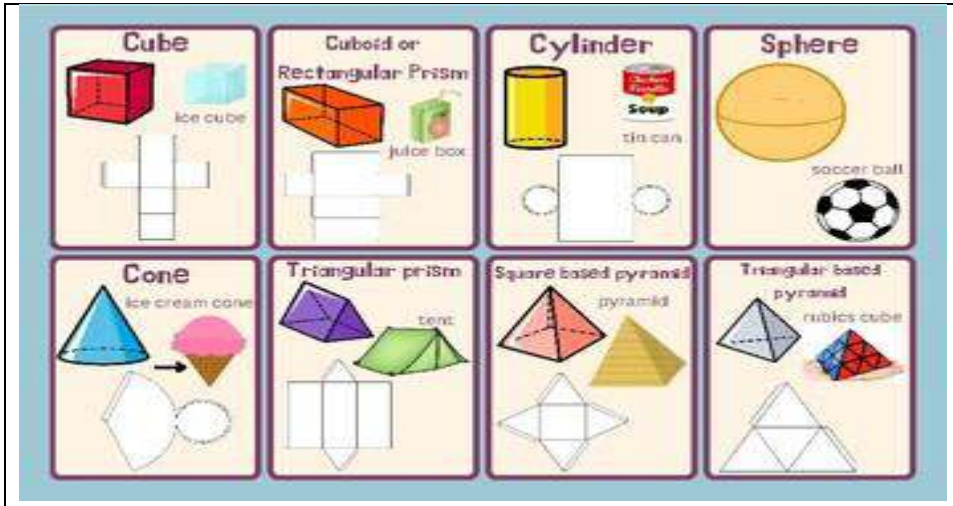
https://teach.files.bbci.co.uk/skillswise/ma343dsh-l1-w-everyday-shapes.pdf
https://teach.files.bbci.co.uk/skillswise/ma33angl-e2-w-drawing-angles.pdf
https://www.turtlediary.com/game/nets-of-3d-shapes.html
https://www.mathgames.com/skill/6.23-nets-of-3-dimensional-figures

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

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

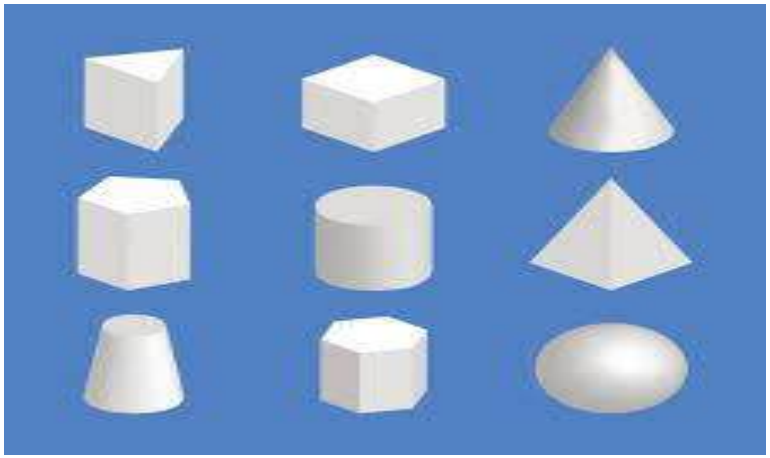
Additional Useful Content Knowledge for the Teacher

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

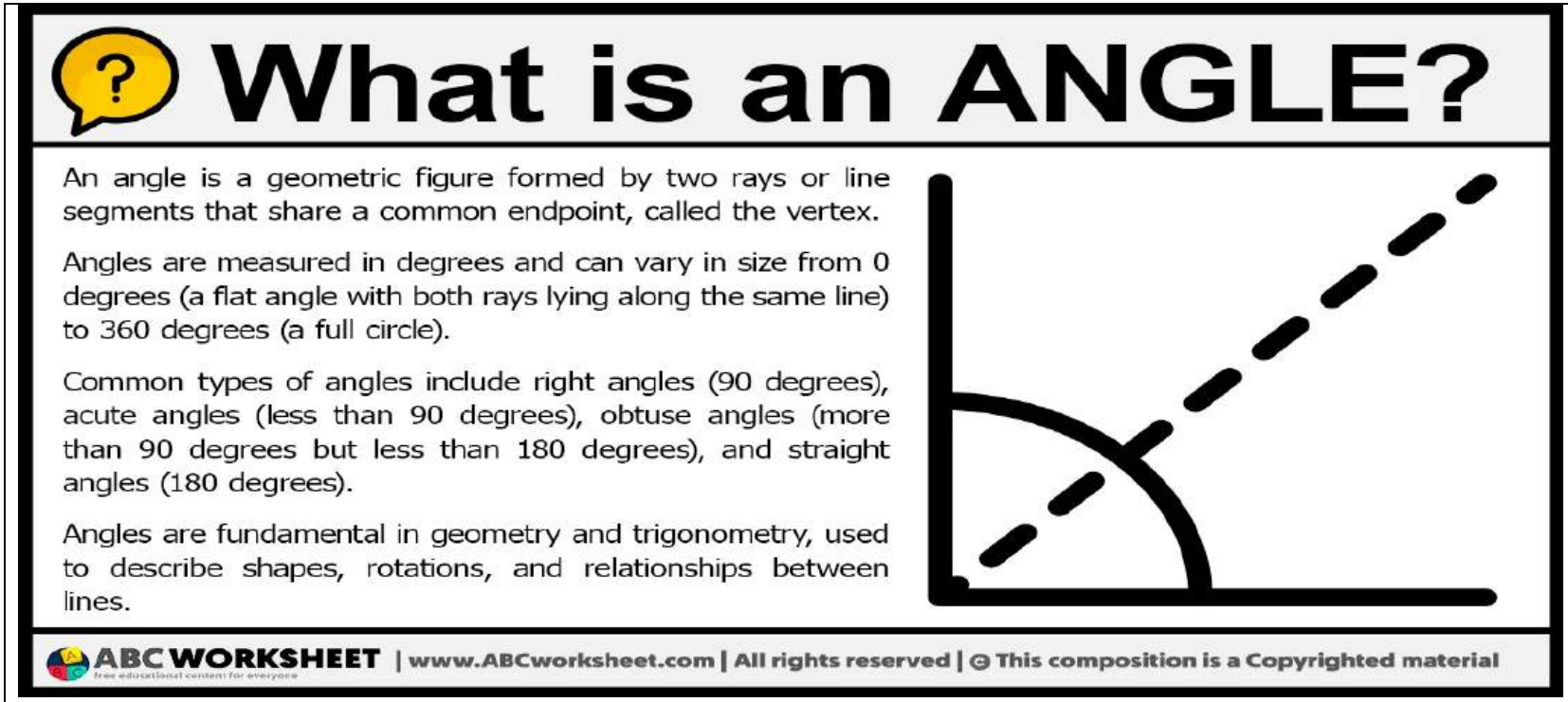


Retrieved from https://ecdn.teacherspayteachers.com/thumbitem/3D-Shapes-and-Nets-Anchor-Chart-11143836-1708778565/original-11143836-1.jpg

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



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



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

Opportunities for Subject Integration:

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

Art:

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

Science:

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

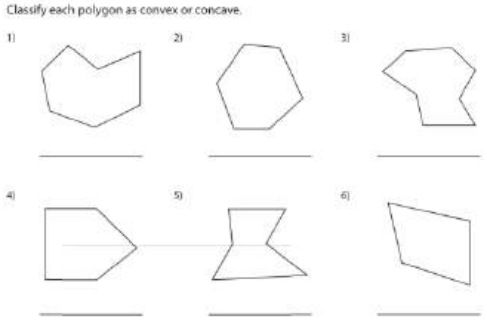
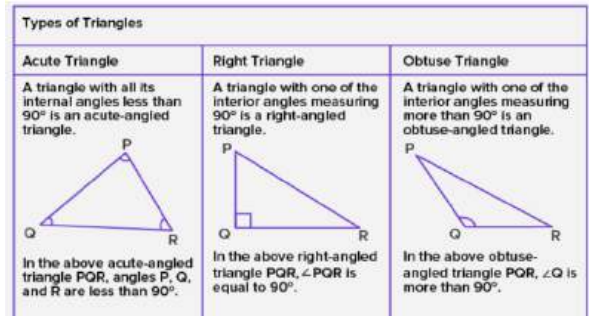
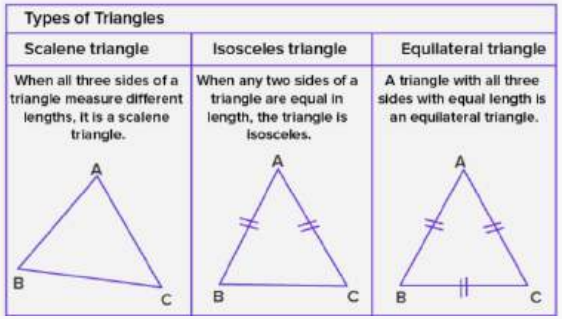
Essential Learning Outcome G.2.1 : Recognizing, Naming and Describing Shapes - Analysing and describing shapes

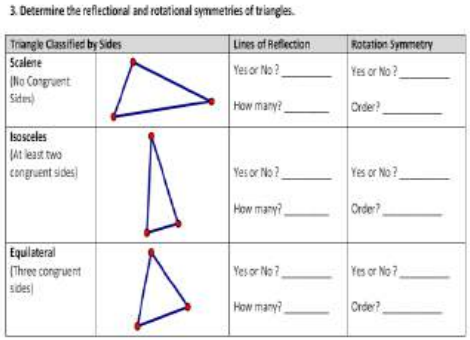
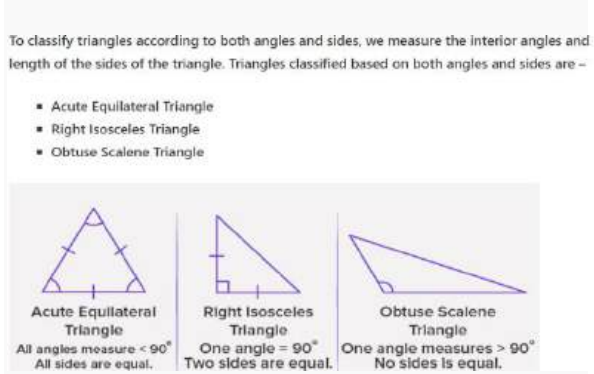
Grade Level Expectations:

Recognise and describe characteristics and attributes of triangles according to sides, angles, and symmetries (acute, obtuse, right, scalene, isosceles, equilateral)
Recognise polygons both regular and irregular, including non-convex) according to sides, angles, parallel sides, diagonals, lines of reflective symmetry, order of rotational symmetry, perpendicular lines, bisectors of line segments and angles, and perpendicular bisectors of segments.
Recognise and describe attributes and characteristics of prisms, pyramids, cylinders and cones according to faces, edges, vertices, curved surfaces, parallel and congruent bases and congruent faces

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

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

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

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

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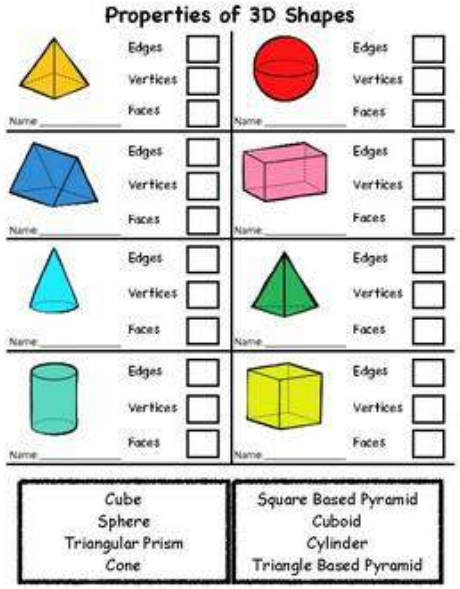
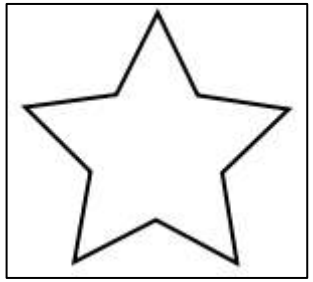
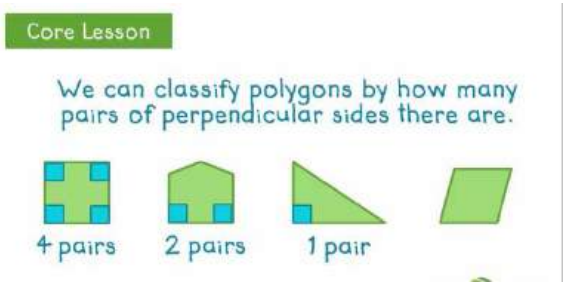
	<u>Product/Discussion</u> - to demonstrate ability or recognise perpendicularity In pairs learners will identify 1 example in the classroom which depicts perpendicularity. For e.g. the square face of tiles and /or carpet squares has 2 perpendicular lines and 4 perpendicular angles. **<u>Checklist</u>**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

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

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

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

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

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

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

Additional Resources and Materials

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

Cutouts, matchsticks, popsicle sticks, rulers

Additional Content Knowledge for the Teacher

What is Reflective symmetry?

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

What is Rotational symmetry?

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

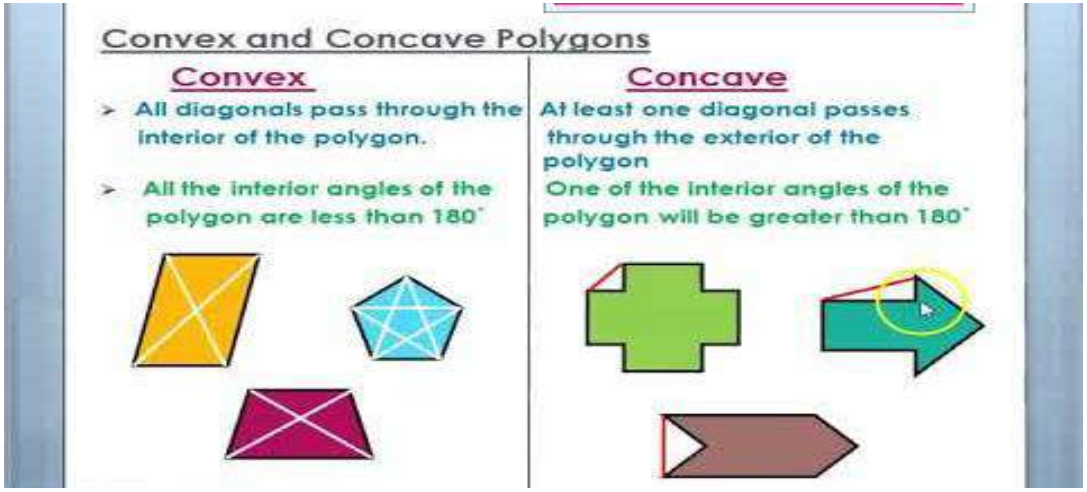
Perpendicular lines are two lines that meet or intersect at right angles (90 degrees)

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

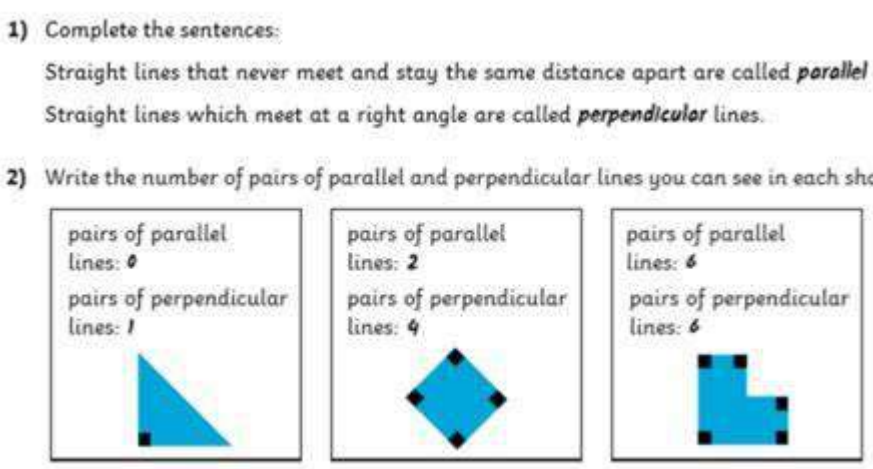
A pyramid in geometry is a three-dimensional shape with the following characteristics:

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

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



Retrieved from https://i.ytimg.com/vi/NEyh9POuUxk/hqdefault.jpg



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

Opportunities for Subject Integration:

Within Other Areas of Mathematics:

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

Art:

Incorporate geometric shapes into design and artistic projects.

Science:

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

Language Arts:

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

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

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

Social Studies:

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

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

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

Historical Architecture Project:

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

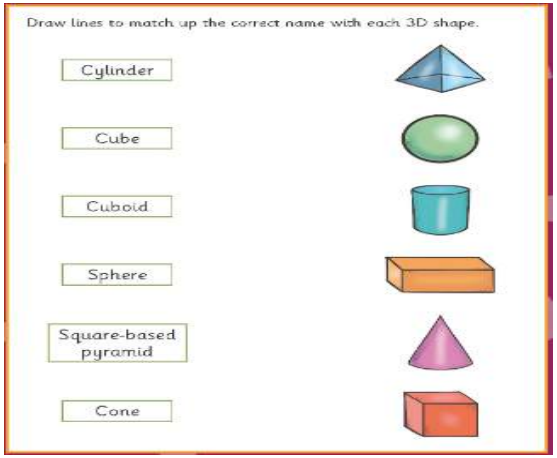
Cultural Artifacts Report:

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

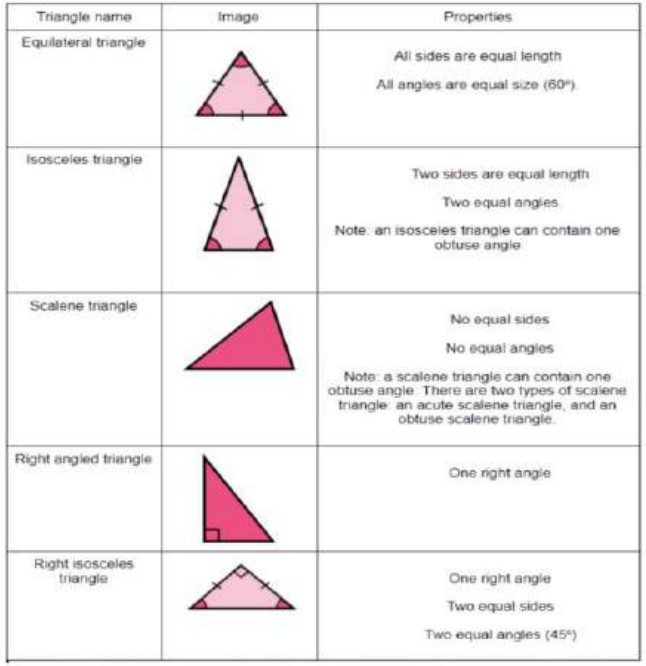
Map Creation Assignment:

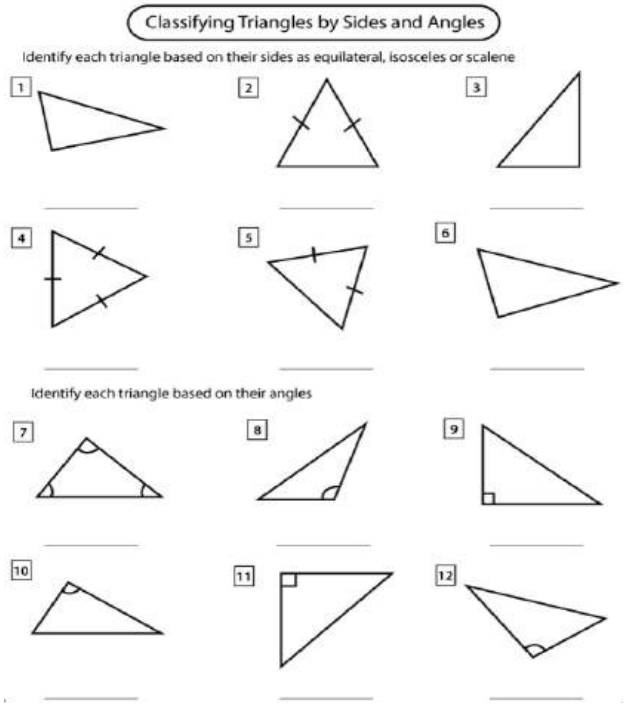
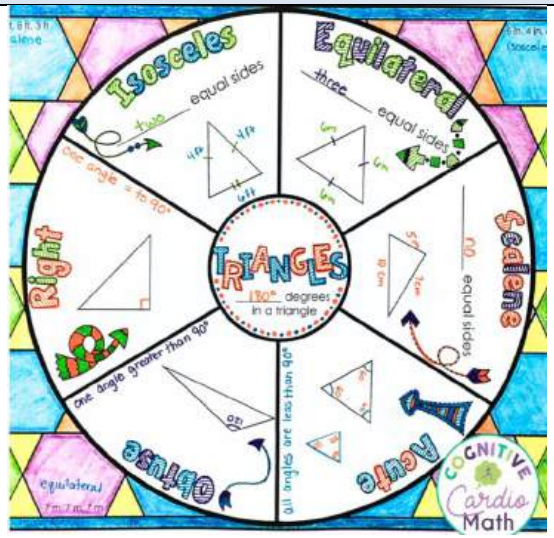
Prompt: "Design a fictional map of a newly discovered land. Use different geometric shapes to represent landmarks and natural features, and explain your choices."

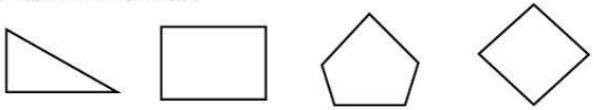
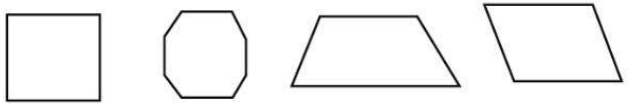
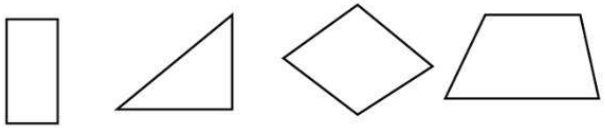
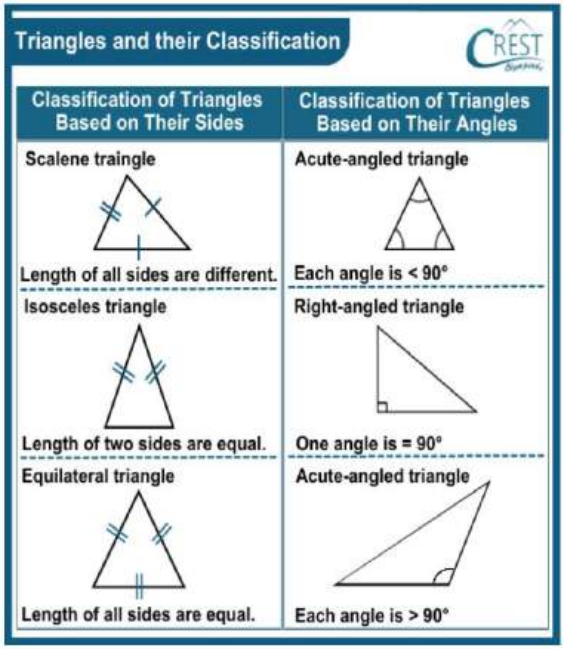
Essential Learning Outcome G2.2: Recognizing, Naming and Describing Shapes - Naming 2D & 3D shapes
Grade Level Expectations: Recognise, name and classify: - 3D shapes based on their properties. - triangles by their side lengths and angle measures. - polygons based on their properties. - types of angles.

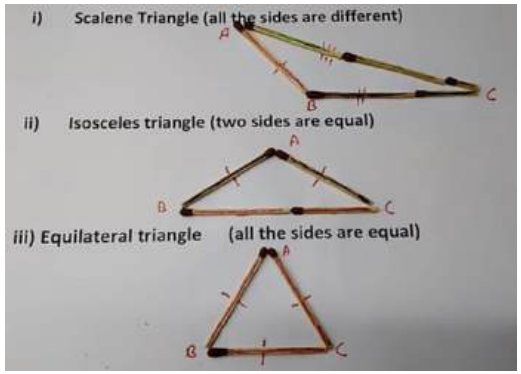
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to*:* **Knowledge** 1. Recognise prisms, pyramids, cylinders, and cones based on their bases, edges, vertices, curved surfaces, parallel and congruent bases, and congruent faces. 2. Name prisms,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

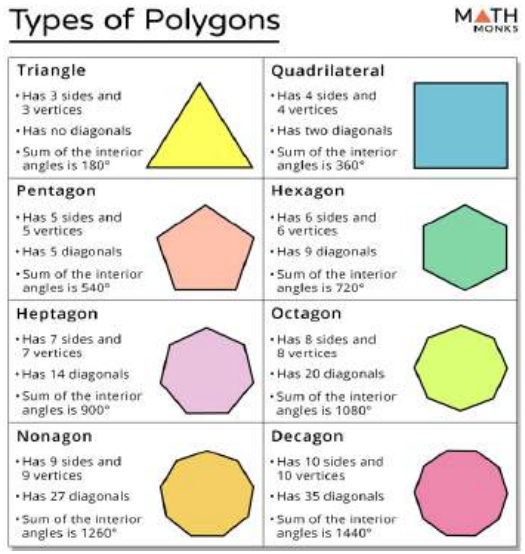
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
5. Recognise triangles by their side lengths as isosceles, scalene, and equilateral. 6. Name triangles by their side lengths as isosceles, scalene, and equilateral. 7. Recognise triangles by their angle measures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

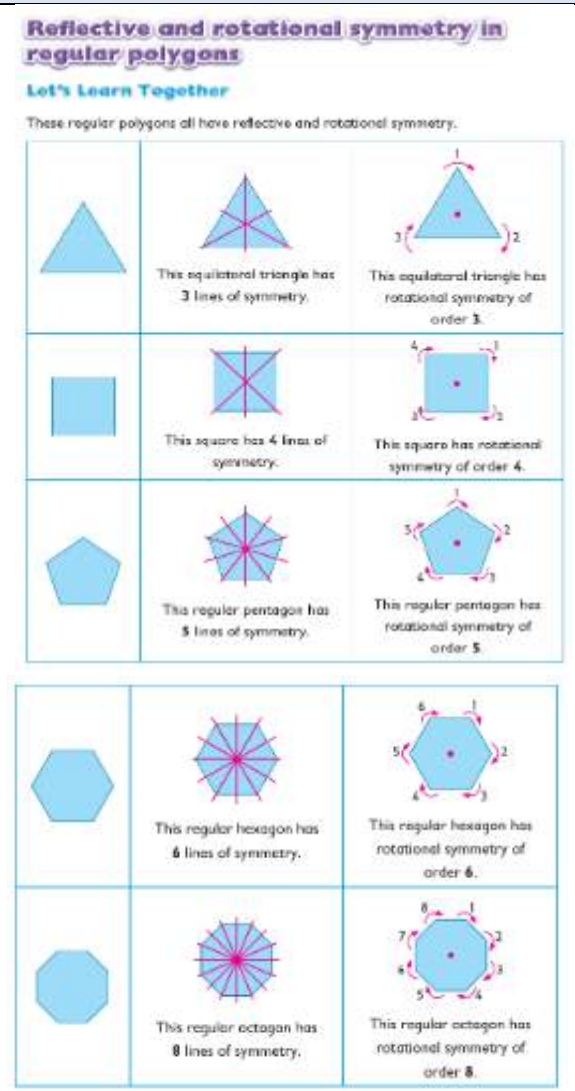
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
vertices, curved surfaces, parallel and congruent bases, and congruent faces. 12. Classify triangles by their side lengths as isosceles, scalene, and equilateral. 13. Classify triangles by their angle measures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

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

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

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

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

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

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

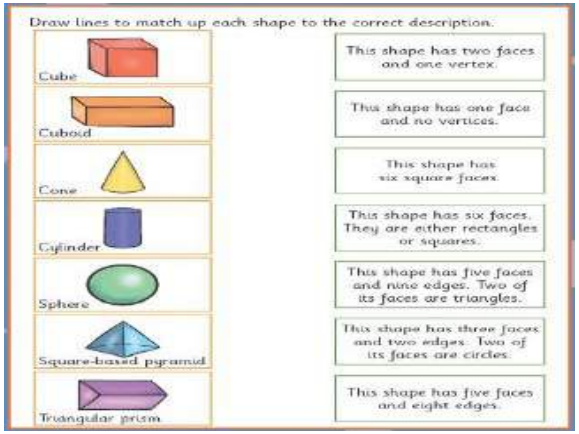
Additional Resources and Materials

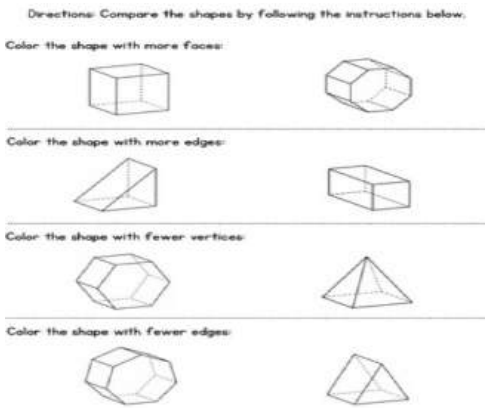
Manila paper, match sticks, popsicle sticks, markers, 3D manipulatives

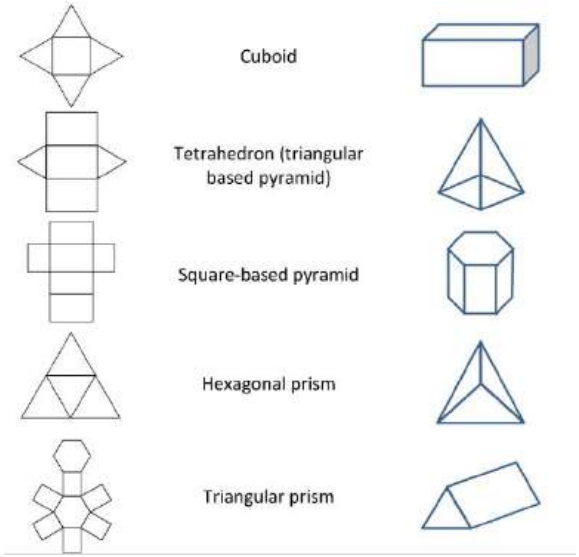
Additional Content Knowledge for the Teacher:

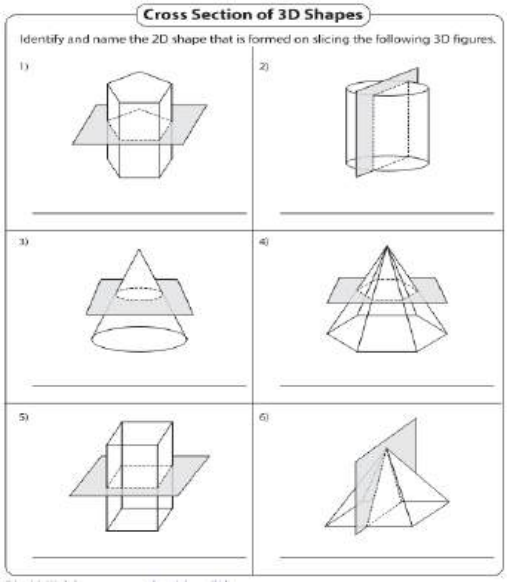
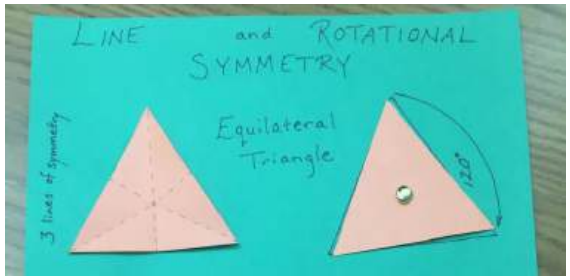
Reflectional symmetry means that an object will look exactly the same if it's reflected across a line of symmetry. Rotational symmetry means that an object will look exactly the same if it's rotated the right amount.
Retrieved from https://www.expii.com/t/symmetry-of-an-object-1059#:~:text=Reflectional%20symmetry%20means%20that%20an,it's%20rotated%20the%20right%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

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

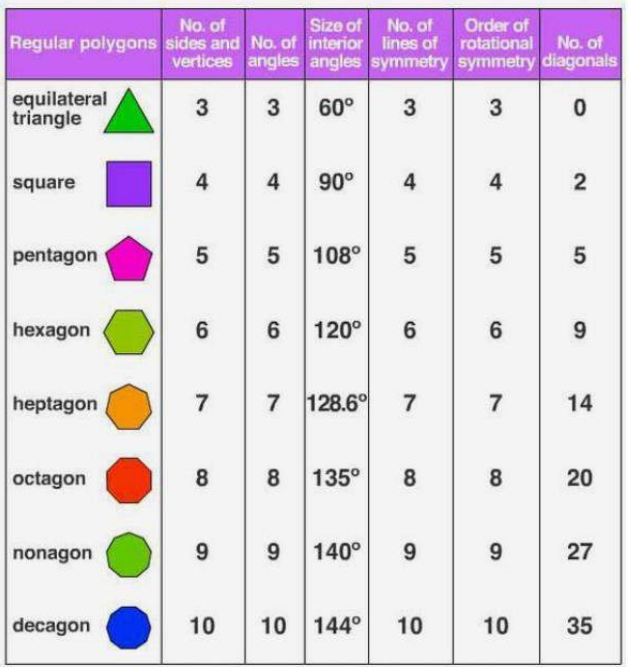
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Recognise the attributes of prisms, pyramids, cylinders, and cones. 2. Describe the attributes of prisms, pyramids, cylinders, and cones 3. Recognise the attributes of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

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

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

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

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

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

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

Additional Resources and Materials

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

Additional Content Knowledge for the Teacher

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

Opportunities for Subject Integration

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

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

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

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

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

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

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

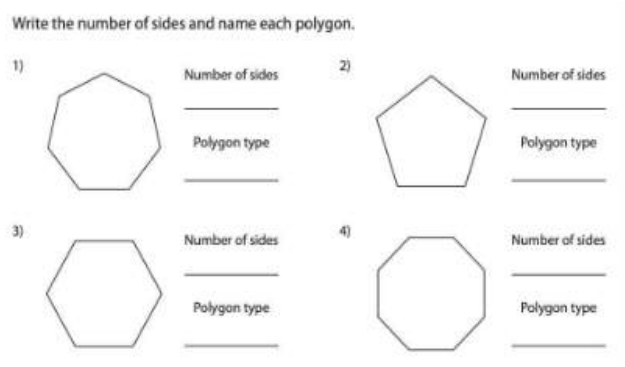
Mathematics & Technology: Predict which nets will form prisms or pyramids using technology like 3D modeling software to experiment with shape construction and transformations.

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

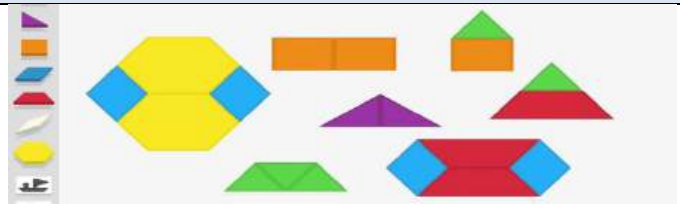
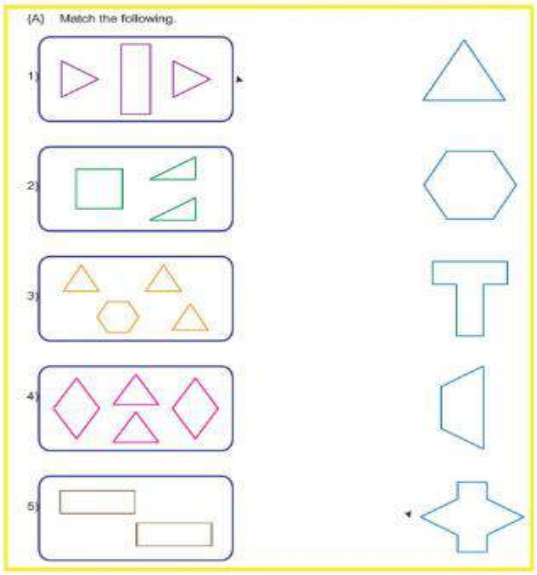
Mathematics & Language Arts: Classify polygons and compare properties, encouraging learners to use precise mathematical language to describe and explain their reasoning in written or oral presentations.

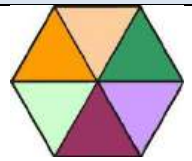
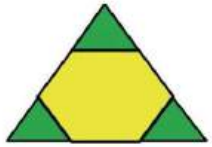
Essential Learning Outcome G 3.1: Composing, Decomposing and Transforming Shapes - Combining Shapes
Grade Level Expectations: Construct composite objects (various prisms, pyramids, cylinders and cones) from other shapes Construct composite shapes (various polygons including triangles) from other polygons.

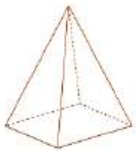
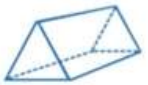
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** 1. Recognise polygons and non-polygons 2. Name polygons 3. Identify prisms, pyramids, cylinders and cones with further accuracy 4. Describe composite shapes and objects,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

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

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

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

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

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

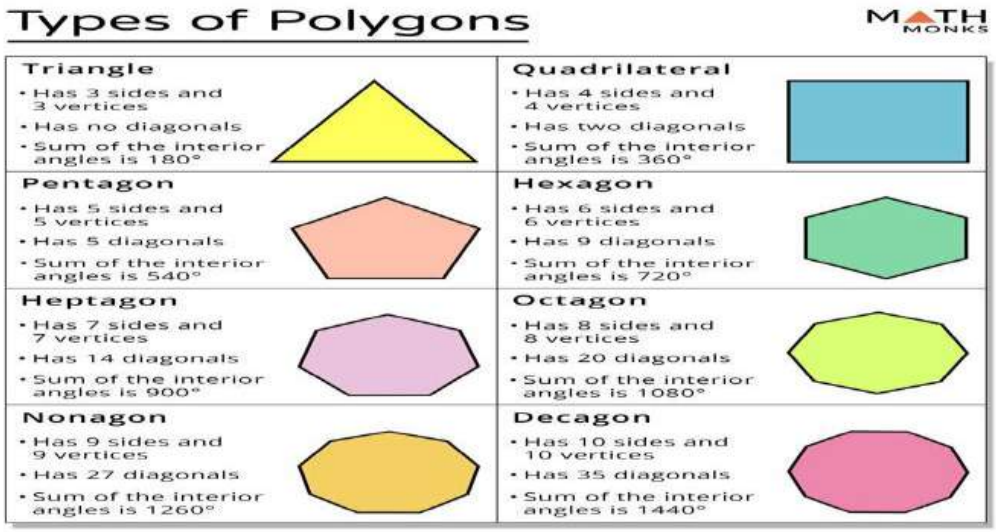
Additional Resources and Materials

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

Additional Content Knowledge for the Teacher

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

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



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

Opportunities for Subject Integration:

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

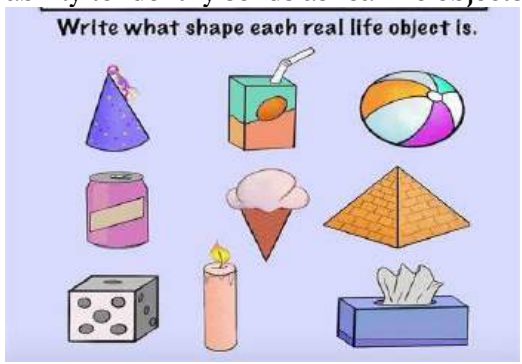
Geometry & Measurement: Decompose complex shapes to calculate surface areas and volumes.

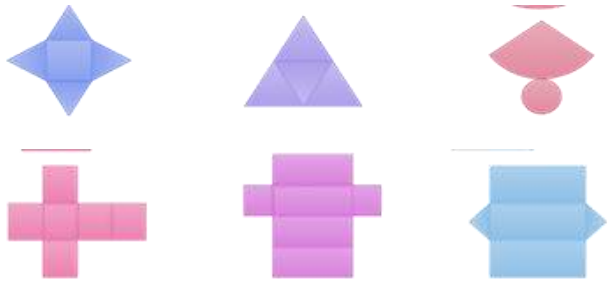
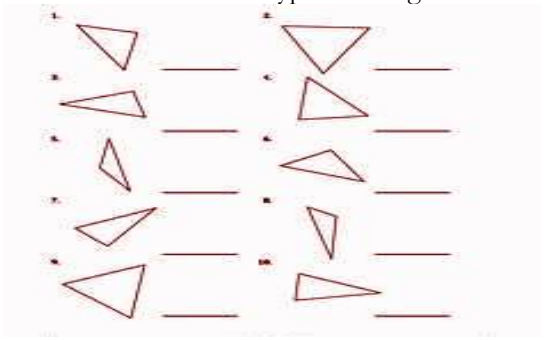
Geometry & Spatial Reasoning: Use transformations to understand shape composition and decomposition.

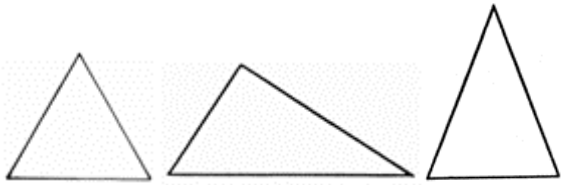
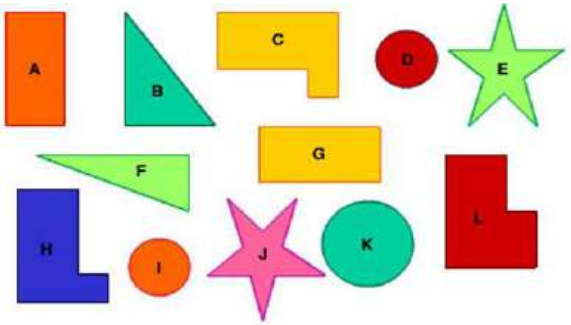
Geometry & Problem-Solving: Apply shape composition and decomposition to real-world design and optimization problems.

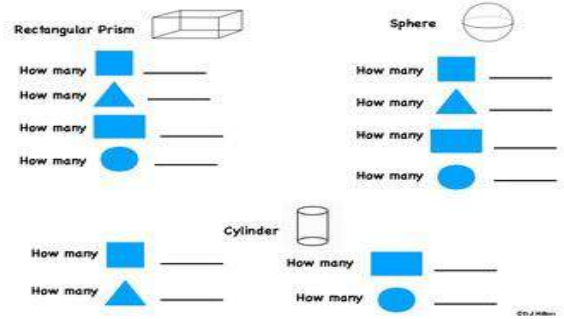
Geometry & Technology: Use digital tools to manipulate shapes and explore their properties.

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

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

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

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

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

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

Additional Resources and Materials

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

Additional Content Knowledge for the Teacher:

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

Congruent: identical in form when superimposed.

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

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

Opportunities for Subject Integration:

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

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

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

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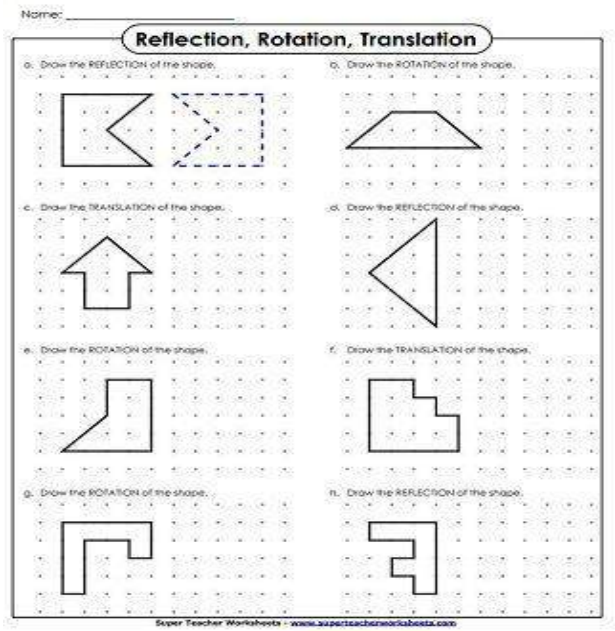
5. Draw shapes to show reflection, translation and rotation and justify. 6. Locate x and y axis on a graph 7. a. Plot coordinates on the graph b. write ordered pairs from coordinate graph 8. Use a coordinate system to represent transformation in a coordinate plane. 9. Use geoboards and tangrams to represent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

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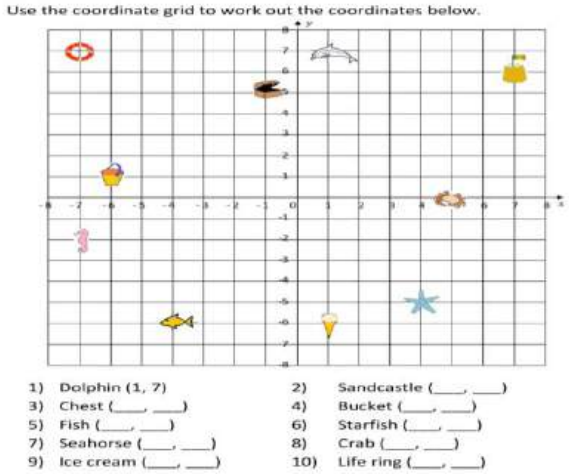
	<u>Checklist</u> Learner can state 1 or more observation yes/no **<u>Product /Peer Assessment</u> - to test accuracy in plotting point on the cartesian plane** Write the coordinates of each picture on the line below. Peers will exchange worksheet for assessment  Retrieved from https://i.pinimg.com/originals/06/5a/0e/065a0e2bc5f2895830a179a06942f0a1.jpg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

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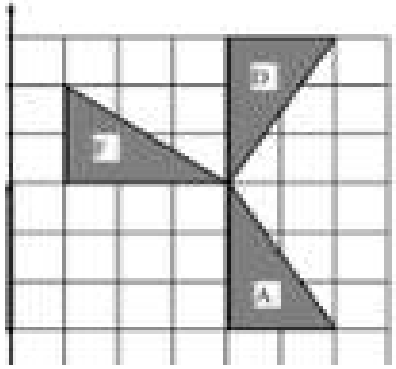
	Product/- to test learners' ability to accurately plot coordinates Have learners plot the points A, B C of a triangle on graph paper (object). Learners will plot the points of the image of the triangle when reflected, translated and rotated (shaded differently). Learners will then determine by labeling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

Additional Resources and Materials

GeoGebra Software
Wolfram software
Graph paper, squared paper

Additional Content Knowledge for the Teacher:

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

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

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

Opportunities for Subject Integration:

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

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