Unit Plan: Math Connections – Numbers, Patterns, and Shapes.

Grade Level: 6

Unit Duration: 7 Weeks

Unit Overview: This unit engages students in discovering the connections between numbers, algebra, and geometry through real-world problems and mathematical reasoning. This unit aims to develop students' understanding of key concepts such as factors and multiples, square and cube numbers, algebraic expressions, and properties of 2D shapes including circles. Students will build fluency in using mathematical language and notation to represent unknowns, relationships, and problem-solving strategies. The unit emphasizes critical and creative thinking through Cambridge's Thinking and Working Mathematically skills. By applying these skills, students explore mathematical patterns, construct and refine expressions, and identify relationships in geometric figures. The goal is for students to be able to analyse and solve practical problems by applying conceptual knowledge.

Expected outcomes include:

- Confidently identifying factors, multiples, HCF, and LCM of numbers
- Understanding and applying square and cube roots
- Representing situations algebraically and transitioning between word and symbolic forms
- Recognizing and analysing properties of polygons and circles
- Demonstrating mathematical reasoning in collaborative and individual tasks

Big Idea: Mathematical structures and patterns help us understand the world around us and support innovative problem-solving.

Prior Knowledge: Before beginning this unit, students are expected to:

- Understand basic arithmetic operations (addition, subtraction, multiplication, and division)
- Be familiar with place value and comparing whole numbers
- Recognize and work with simple factors and multiples
- Identify and classify basic 2D shapes (e.g., triangles, squares, rectangles)
- Have introductory exposure to mathematical symbols and simple expressions
- Be able to read and interpret simple mathematical instructions

Key Vocabulary

Factor, Multiple, Prime number, Composite number, Highest Common Factor (HCF), Lowest Common Multiple (LCM), Divisibility, Square number, Square root, Cube number, Cube root.

Variable, Constant, Algebraic expression, Formula, Open interval.

Polygon, Regular polygon, Congruent, Side, Angle, Symmetry, Radius, Diameter, Circumference, Chord, Tangent.

Summative Assessment Tasks

Mathematical Investigation - Students investigate a real-world scenario involving factors and multiples.

Problem-solving tasks - Students solve algebraic expressions derived from real-life situations and justify their reasoning.

Geometric Explorations - Students classify polygons, analyse congruency, and identify relationships between circle properties and algebraic concepts.

End of unit assessment

Formative Assessments & Thinking and Working Mathematically (TWM) Activities

Week	Inquiry questions	Cambridge Learning Objectives	Learning Activities/Experiences	Resources
Week 1: Factors, Multiples, and Divisibility	• What is the difference between a factor and a multiple? • How do you find the Highest Common Factor (HCF) of two numbers? • How do you determine the Lowest Common Multiple (LCM) of two numbers? • How do HCF and LCM help us understand the relationships between numbers? • How does understanding factors and multiples help us in solving real-world problems? • Are HCF and LCM always useful in real-world applications, or are there cases where they do not matter?	**7Ni.04** Understand lowest common multiple and highest common factor (numbers less than 100). **7Ni.05** Use tests of divisibility to find factors of numbers greater than 100.	**TWM Activities:** • *Specialising:* Students choose specific numbers and test their divisibility by different rules. They identify factor pairs and apply their knowledge to find HCF and LCM for specific cases. • *Generalising:* After working with multiple examples of factorization and multiples, students recognize patterns in how HCF and LCM relate to number properties. • *Conjecturing:* Students form mathematical hypotheses, such as predicting whether a number is prime based on divisibility rules. • *Convincing:* Students justify their solutions by explaining factorization steps and divisibility tests.	Number cards and dice (for factor, multiple, and divisibility games) **Digital tools:** Khan Academy Quizlet Kahoot! or Quizziz

	• Is it more important to understand how to find HCF and LCM or when to apply them in real life?		**Formative Tasks:** 1) **Divisibility Rule Investigation:** Students test numbers greater than 100 using divisibility rules and explain why certain numbers are divisible by specific factors. 2) **Find the Factors:** Students list factors of given numbers and identify common factors between two numbers. 3) **Factor Pairs Matching:** Provide students with numbers and ask them to match them to their correct factor pairs. 4) **HCF Challenge:** Students find the HCF of number pairs using both factor listing and prime factorization. 5) **LCM Calculation Race:** Students work in groups to calculate the LCM of different number pairs and compare the methods (listing and prime factorization). 6) **Venn Diagram Task:** Students use Venn diagrams to compare the factors of two numbers and visually determine the HCF and LCM. 7) **Error Spotting:** Provide incorrect solutions for HCF or LCM problems; students must identify and correct the mistakes. 8) **Real-World Applications:** Students apply the highest common factor (HCF) and least common multiple (LCM) to solve practical problems such as scheduling events and designing product packaging.	

			9) **Card Sorting Activity:** Students sort numbers based on their factors, multiples, and common divisibility characteristics. 10) **Exit Ticket:** Students write a real-life scenario where LCM or HCF would be useful and explain their reasoning.	
Week 2: Squares and Cube numbers	• What is the difference between squaring and finding a square root? • What is the difference between cubing and finding a cube root? • How do you determine if a number is a perfect square or a perfect cube? • What is the mathematical notation for squares, cubes, square roots, and cube roots? • How are square numbers and cube numbers related to area and volume? • Why do square roots and cube roots undo the process of squaring and cubing? • In what ways are square roots and cube roots important in scientific and engineering calculations?	**7Ni.06** Understand the relationship between squares and corresponding square roots, cubes and corresponding cube roots.	**TWM Activities:** • *Generalising*: Students observe patterns in square numbers and cube numbers, leading to an understanding of square and cube roots. • *Characterising*: Students describe properties of numbers, such as what makes a number a square number or a cube number. • *Classifying:* Students classify numbers based on their properties, such as prime, composite, square, or cube numbers. **Formative Tasks:** 1. **Matching Activity:** Students match square numbers with their corresponding square roots and cube numbers with their cube roots. 2. **Number Patterns Exploration:** Students examine and describe patterns in square and cube numbers to identify relationships. 3. **Real-World Problem Solving:** Students apply their understanding of squares and cubes by solving real-world problems. For example, calculating areas of square tiles or volume of cube-shaped objects. 4. **Error Analysis:** Students identify and correct mistakes incorrect calculations of square roots or cube roots.	Square and cube blocks (for modelling square and cube numbers) **Digital tools:** Khan Academy Quizlet Kahoot! or Quizziz

			5. **Visual Representation Task:** Students create a visual model. For example, arrays or cube diagrams, to represent square and cube numbers. 6. **Card Sort Activity:** Given a set of numbers, students sort them into categories - perfect squares, perfect cubes, both, or neither. 7. **True or False Statements:** Provide students with statements about square and cube numbers and ask them to justify their answers. 8. **Exit Ticket:** At the end of class, students write one real-world application of square and cube roots. **9. Peer Teaching:** Students work in pairs to explain the concept of square and cube roots to each other using examples and models.	
Week 3: Writing algebraic expressions	• What is a variable? • What is a constant? • How are letters used to represent unknown numbers in algebra? • How can you translate a word problem into an algebraic expression? • Is algebra necessary for everyday life, or is it only useful in specific professions? • Can all mathematical situations be effectively represented using algebra?	**7Ae.01** Understand that letters can be used to represent unknown numbers, variables or constants. **7Ae.04** Understand that a situation can be represented either in words or as an algebraic expression, and move between the two representations	**TWM Activities:** • *Conjecturing*: Students form algebraic expressions from word problems. • *Generalising*: Students identify common structures in expressions. **Formative Tasks:** 1. **Identifying Variables:** Students highlight and identify variables in given algebraic expressions and equations. 2. **Matching Activity:** Students match algebraic expressions with their corresponding word descriptions.	Algebra tiles (to visualize expressions and variables) **Digital tools:** Khan Academy Quizlet Kahoot! or Quizziz

	• Is it easier to solve a problem when it is written in words or as an algebraic expression?		3. **Creating Word Problems:** Students write real-world word problems that they can represent with algebraic expressions. 4. **Expression Sorting:** Given a list of expressions and formulas, students classify them based on whether they represent a single operation or a multi-step situation. 5. **Fill in the Blanks:** Students complete missing parts of algebraic expressions and justify their choices. 6. **Translating Between Representations:** Students take a given real-world scenario and write it in words, symbols, and an algebraic expression. 7. **Error Analysis:** Provide incorrect algebraic translations of word problems and have students identify and correct mistakes. 8. **Algebra Scavenger Hunt:** Students find examples in everyday life where they can use algebraic representations such as in pricing discounts and speed-distance-time relationships. 9. **Exit Ticket:** Students explain in one sentence why letters are used to represent unknown values in algebra. 10. **Peer Teaching:** Students create a mini-lesson for a partner, explaining how to translate a word problem into an algebraic expression.	
Week 4: Creating formula and	• What is a formula, and how is it different from an algebraic expression?	**7Ae.05** Understand that a situation can be represented either in	**TWM Activities** • *Convincing:* Students justifying algebraic solutions.	**Digital tools:** Khan Academy Quizlet

algebraic inequalities	• What is an open interval, and how is it represented using algebraic notation? • How can letters be used to express an open interval in mathematical reasoning? • How do we convert word statements into algebraic formulas? • Why is it important to move between word statements and algebraic formulas? • Are formulas always the best way to represent a real-world situation, or are there cases where words are more effective? • Should students focus more on memorizing formulas or understanding how to derive them? • Can every real-world scenario be accurately represented using algebraic formulas?	words or as a formula (single operation), and move between the two representations 7**Ae.07** Understand that letters can represent an open interval (one term)	• *Conjecturing:* In algebra, they predict the effect of changing a variable in an expression. **Formative Tasks** 1. **Formula Translation Exercise:** Students are given word problems and must write the corresponding formulas using a single operation. 2. **Fill in the Blanks:** Provide formulas with missing variables or numbers, and let students complete them correctly. 3. **Real-World Applications:** Present scenarios in which students must create formulas, for example calculating discounts, speed, and area. 4. **Open Interval Exploration:** Students investigate open intervals on a number line and express them using algebraic notation. 5. **Matching Game:** Students match given formulas to real-world situations described in words. 6. **Sorting Activity:** Students sort different mathematical representations into categories: words, expressions, formulas, and equations. 7. **Writing Challenge:** Students create their formulas to represent real-life situations. 8. **Exit Ticket:** Students explain how moving between word statements and formulas helps simplify problem-solving. 9. **Peer Teaching:** Students teach each other how to convert verbal descriptions into algebraic formulas.	Kahoot! or Quizziz

			10. **Error Analysis:** Provide common mistakes in translating word problems into formulas, and students must identify and correct them.	
Week 5: Properties of 2D shapes and congruence	• What are the properties of regular polygons? • How do you identify and classify regular polygons? • What is symmetry, and how is it related to regular polygons? • How can you determine whether two shapes are congruent? • What are corresponding sides and angles in congruent shapes? • How does the number of sides in a polygon affect its angles and symmetry? • Why are congruent shapes important in mathematics and real-world applications? • What strategies can be used to prove that two shapes are congruent? • In what ways do regular polygons appear in nature, architecture, and design? • Is symmetry necessary for a shape to be considered 'beautiful' or 'balanced'? • Are congruent shapes always identical in appearance?	**7Gg.01** Identify, describe and sketch regular polygons, including reference to sides, angles and symmetrical properties. **7Gg.02** Understand that if two 2D shapes are congruent, corresponding sides and angles are equal.	**TWM Activities** • *Characterising*: Students identify key properties of polygons. and circles and their defining characteristics. • *Classifying:* Students classify polygons by the number of sides and symmetry properties. • *Specialising:* Students verify whether given shapes are congruent by checking corresponding sides and angles. • *Conjecturing:* Students explore geometric relationships (e.g., If two shapes have equal corresponding sides, are they always congruent?). **Formative Tasks** 1. **Polygon Sorting Activity** – Provide students with a set of 2D shapes and ask them to sort them into regular and irregular polygons. Have them justify their classifications. 2. **Polygon Scavenger Hunt** – Ask students to find examples of regular polygons in their environment (classroom, school, or images) and describe their properties in a short reflection. 3. **Guided Drawing and Labeling** – Have students draw different regular polygons with rulers and protractors, then label sides, angles, and lines of symmetry.	Cut-out shapes and manipulatives (for classifying polygons and exploring congruency) **Digital tools:** Khan Academy Quizlet Kahoot! or Quizziz

			4. **Polygon Investigation with GeoGebra (or Paper Folding)** – Students use GeoGebra or fold paper to explore lines of symmetry and angle measurements in regular polygons. 5. **Card Sort: Name, Properties, and Sketch** – Provide students with three sets of cards: (1) polygon names, (2) sketches, and (3) properties. Students match the correct name, sketch, and properties for each polygon. 6. **Polygon riddle creation** – Students write descriptions of different regular polygons (e.g., "I have all equal sides and four right angles. What am I?") and swap with a partner to solve. 7. **Find the Mistake** – Give students a diagram of polygons with incorrectly labelled angles, sides, or symmetry lines, and ask them to identify and correct the errors. 8. **Exit Ticket – Describe a Polygon** – At the end of the lesson, ask students to describe a regular polygon of their choice in a few sentences, including properties like side lengths, angles, and symmetry. 9. **Matching congruent shapes** – Provide students with a set of shape pairs, some congruent and some not. Have them identify the congruent pairs and explain their reasoning. 10. **Congruence Cut-Outs** – Give students cut-out shapes and ask them to match congruent pairs by superimposing them or folding them over one another.	

			11. **Error Analysis Task** – Provide a student "work sample" where someone incorrectly identifies non-congruent shapes as congruent. Ask students to critique and explain the mistake. 12. **Congruence Sorting Activity** – Give students a mix of shape pairs and have them sort them into "Congruent" and "Not Congruent," explaining their reasoning. 13. **Identify Corresponding Parts** – Give students two congruent shapes with missing labels and ask them to correctly identify corresponding angles and sides. 14. **Find the Congruent Shape in a Pattern** – Provide a tiling or tessellation pattern and ask students to identify pairs of congruent shapes within it. 15. **Congruence Challenge (Real-World Connection)** – Ask students to find examples of congruent shapes in real life (e.g., floor tiles, window panes, road signs) and explain why they are congruent. 16. **Mini-Investigation with rulers and protractors** – Have students measure and compare the sides and angles of two given shapes to determine whether they are congruent. 17. **Exit Ticket – Define and Explain** – Ask students to write a one-sentence definition of congruence and provide a small sketch as an example.	

Week 6: Circle properties	• What are the main parts of a circle? • How are the radius, diameter, and circumference related? • How does knowing the parts of a circle help us solve real-world problems? • Why is the ratio of a circle's circumference to its diameter always the same? • Is the concept of π (pi) one of the most important discoveries in mathematics?	**7Gg.03** Know the parts of a Circle	**TWM Activities** • *Classifying*: Students sort and compare different circle properties. • *Characterising*: Students identify key properties of circles. **Formative Tasks** 1. **Label the Circle** – Provide students with a blank diagram of a circle and ask them to label key parts (radius, diameter, circumference, chord, arc, sector, etc.). 2. **Circle Parts Cut-and-Paste** – Give students a list of definitions and have them match them to the correct terms by pasting them onto a blank circle diagram. 3. **Find the Mistake** – Provide a diagram where some parts are incorrectly labelled. Students must identify and correct the mistakes. 6. **Circle Scavenger Hunt** – Ask students to find real-world examples of circles and identify different parts (e.g., bicycle wheels, coins, plates). 7. **Construct and Compare** – Have students draw different-sized circles and compare the relationships between the radius, diameter, and circumference. 8. **Guess the Part** – Describe a circle part without naming it (e.g., "This is twice the radius" → Answer: Diameter), and have students guess the correct term.	Circle models (with labeled radius, diameter, chord, tangent) **Digital tools:** Khan Academy Quizlet Kahoot! or Quizziz

			10. **Kahoot or Quizizz Game** – Create an interactive quiz where students identify and describe circle parts. 11. **GeoGebra Exploration** – Let students use GeoGebra or other geometry software to explore and manipulate circle properties dynamically. 12. **Drag-and-Drop Activity (Digital Find the Missing Measure** – Give students one measurement (e.g., radius = 5 cm) and ask them to find the diameter or another related part. 13. **Circle Puzzle** – Provide a partially labeled circle diagram and have students deduce the missing terms or values. 14. **Exit Ticket – Explain in Your Own Words** – Ask students to write a brief explanation of one circle part and why it is important. 15. **Real-Life Application Task** – Ask students to explain how understanding circles is useful in daily life (e.g., designing wheels, round tables, or clocks).	
Week 7: Review and Summative Tasks		Review of the Numbers, Algebra, and Geometry concepts in the unit. Summative tasks	**TWM Activities** • *Improving*: Students refine problem-solving strategies. After solving problems, students reflect on their methods and consider if there is a more efficient strategy.	Colored markers and chart paper (for student-led posters and group tasks)

				Digital tools for visualization and interactive problem-solving.