Grade 6 Mathematics Big Ideas

Big Ideas – Priority 1 **Supporting Ideas – Priority 2** **Number Facts**

Processes

[C] Communication **[PS]** Problem Solving
[CN] Connections **[R]** Reasoning
[ME] Mental Mathematics **[T]** Technology and Estimation **[V]** Visualization

Strand: Number

General Outcome: Develop number sense.

Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*
1. Demonstrate an understanding of place value, including numbers that are: • greater than one million • less than one thousandth. [C, CN, R, T]	➢ Explain how the pattern of the place value system, i.e., the repetition of ones, tens and hundreds within each period, makes it possible to read and write numerals for numbers of any magnitude. ➢ Provide examples of where large and small numbers are used; e.g., media, science, medicine, technology.
2. Solve problems involving whole numbers and decimal numbers. [ME, PS, T] [ICT: C6–2.4]	➢ Identify which operation is necessary to solve a given problem, and solve it. ➢ Determine the reasonableness of an answer. ➢ Estimate the solution to, and solve, a given problem. ➢ Determine whether the use of technology is appropriate to solve a given problem, and explain why. ➢ Use technology when appropriate to solve a given problem.

3. Demonstrate an understanding of factors and multiples by: • determining multiples and factors of numbers less than 100 • identifying prime and composite numbers • solving problems using multiples and factors. [CN, PS, R, V]	➢ Identify multiples for a given number, and explain the strategy used to identify them. ➢ Determine all the whole number factors of a given number, using arrays. ➢ Identify the factors for a given number, and explain the strategy used; e.g., concrete or visual representations, repeated division by prime numbers, factor trees. ➢ Provide an example of a prime number, and explain why it is a prime number. ➢ Provide an example of a composite number, and explain why it is a composite number. ➢ Sort a given set of numbers as prime and composite. ➢ Solve a given problem involving factors or multiples. ➢ Explain why 0 and 1 are neither prime nor composite.
4. Relate improper fractions to mixed numbers and mixed numbers to improper fractions. [CN, ME, R, V]	➢ Demonstrate, using models, that a given improper fraction represents a number greater than 1. ➢ Express improper fractions as mixed numbers. ➢ Express mixed numbers as improper fractions. ➢ Place a given set of fractions, including mixed numbers and improper fractions, on a number line, and explain strategies used to determine position. ➢ Translate a given improper fraction between concrete, pictorial and symbolic forms. ➢ Translate a given mixed number between concrete, pictorial and symbolic forms.
5. Demonstrate an understanding of ratio, concretely, pictorially and symbolically. [C, CN, PS, R, V]	➢ Provide a concrete or pictorial representation for a given ratio. ➢ Write a ratio from a given concrete or pictorial representation. ➢ Express a given ratio in multiple forms, such as 3:5, $\frac{3}{5}$ or 3 to 5. ➢ Identify and describe ratios from real-life contexts, and record them symbolically. ➢ Explain the part/whole and part/part ratios of a set; e.g., for a group of 3 girls and 5 boys, explain the ratios 3:5, 3:8 and 5:8. ➢ Solve a given problem involving ratio.

6. Demonstrate an understanding of percent (limited to whole numbers), concretely, pictorially and symbolically. [C, CN, PS, R, V]	➢ Explain that "percent" means "out of 100." ➢ Explain that percent is a ratio out of 100. ➢ Use concrete materials and pictorial representations to illustrate a given percent. ➢ Record the percent displayed in a given concrete or pictorial representation. ➢ Express a given percent as a fraction and a decimal. ➢ Identify and describe percents from real-life contexts, and record them symbolically. ➢ Solve a given problem involving percents.
7. Demonstrate an understanding of integers, concretely, pictorially and symbolically. [C, CN, R, V]	➢ Extend a given number line by adding numbers less than zero, and explain the pattern on each side of zero. ➢ Place given integers on a number line, and explain how integers are ordered. ➢ Describe contexts in which integers are used; e.g., on a thermometer. ➢ Compare two integers; represent their relationship using the symbols <, > and =; and verify the relationship, using a number line. ➢ Order given integers in ascending or descending order.
8. Demonstrate an understanding of multiplication and division of decimals (1-digit whole number multipliers and 1-digit natural number divisors). [C, CN, ME, PS, R, V]	➢ Place the decimal point in a product, using front-end estimation; e.g., for 15.205 m × 4, think 15 m × 4, so the product is greater than 60 m. ➢ Place the decimal point in a quotient, using front-end estimation; e.g., for $26.83 ÷ 4, think $24 ÷ 4, so the quotient is greater than $6. ➢ Correct errors of decimal point placement in a given product or quotient without using paper and pencil. ➢ Predict products and quotients of decimals, using estimation strategies. ➢ Solve a given problem that involves multiplication and division of decimals using multipliers from 0 to 9 and divisors from 1 to 9.
9. Explain and apply the order of operations, excluding exponents, with and without technology (limited to whole numbers). [C, CN, ME, PS, T] [ICT: C6–2.4, C6–2.7]	➢ Explain, using examples, why there is a need to have a standardized order of operations. ➢ Apply the order of operations to solve multistep problems with and without technology; e.g., a computer, a calculator. Number facts to 12 x 12 in a variety of ways.

Strand: <u>Patterns and Relations (Patterns</u>)

General Outcome: Use patterns to describe the world and to solve problems.

Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*
1. Represent and describe patterns and relationships, using graphs and tables. [C, CN, ME, PS, R, V] [ICT: C6–2.3]	➢ Translate a pattern to a table of values, and graph the table of values (limited to linear graphs with discrete elements). ➢ Create a table of values from a given pattern or a given graph. ➢ Describe, using everyday language, orally or in writing, the relationship shown on a graph.
2. Demonstrate an understanding of the relationships within tables of values to solve problems. [C, CN, PS, R] [ICT: C6–2.3]	➢ Generate values in one column of a table of values, given values in the other column and a pattern rule. ➢ State, using mathematical language, the relationship in a given table of values. ➢ Create a concrete or pictorial representation of the relationship shown in a table of values. ➢ Predict the value of an unknown term, using the relationship in a table of values, and verify the prediction. ➢ Formulate a rule to describe the relationship between two columns of numbers in a table of values. ➢ Identify missing elements in a given table of values. ➢ Identify errors in a given table of values. ➢ Describe the pattern within each column of a given table of values. ➢ Create a table of values to record and reveal a pattern to solve a given problem.

Strand: <u>Patterns and Relations (Variables and Equations)</u>

General Outcome: Represent algebraic expressions in multiple ways.

Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*
3. Represent generalizations arising from number relationships, using equations with letter variables. [C, CN, PS, R, V]	➢ Write and explain the formula for finding the perimeter of any given rectangle. ➢ Write and explain the formula for finding the area of any given rectangle. ➢ Develop and justify equations using letter variables that illustrate the commutative property of addition and multiplication; e.g., $a + b = b + a$ or $a \times b = b \times a$. ➢ Describe the relationship in a given table, using a mathematical expression. ➢ Represent a pattern rule, using a simple mathematical expression such as $4d$ or $2n + 1$.
4. Express a given problem as an equation in which a letter variable is used to represent an unknown number. [C, CN, PS, R]	➢ Identify the unknown in a problem where the unknown could have more than one value, and represent the problem with an equation. ➢ Create a problem for a given equation with one unknown. ➢ Identify the unknown in a problem; represent the problem with an equation; and solve the problem concretely, pictorially or symbolically.
5. Demonstrate and explain the meaning of preservation of equality, concretely and pictorially. [C, CN, PS, R, V]	➢ Model the preservation of equality for addition, using concrete materials (e.g., a balance, pictorial representations), and explain and record the process. ➢ Model the preservation of equality for subtraction, using concrete materials (e.g., a balance, pictorial representations), and explain and record the process. ➢ Model the preservation of equality for multiplication, using concrete materials (e.g., a balance, pictorial representations), and explain and record the process. ➢ Model the preservation of equality for division, using concrete materials (e.g., a balance, pictorial representations), and explain and record the process.

Strand: Shape and Space (Measurement)

General Outcome: Use direct and indirect measurement to solve problems.

Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*
1. Demonstrate an understanding of angles by: • identifying examples of angles in the environment • classifying angles according to their measure • estimating the measure of angles, using 45°, 90° and 180° as reference angles • determining angle measures in degrees • drawing and labelling angles when the measure is specified. [C, CN, ME, V]	➢ Provide examples of angles found in the environment. ➢ Classify a given set of angles according to their measure; e.g., acute, right, obtuse, straight, reflex. ➢ Sketch 45°, 90° and 180° angles without the use of a protractor, and describe the relationship among them. ➢ Estimate the measure of an angle, using 45°, 90° and 180° as reference angles. ➢ Measure, using a protractor, given angles in various orientations. ➢ Draw and label a specified angle in various orientations, using a protractor.
2. Demonstrate that the sum of interior angles is: • 180° in a triangle • 360° in a quadrilateral. [C, R]	➢ Explain, using models, that the sum of the interior angles of a triangle is the same for all triangles. ➢ Explain, using models, that the sum of the interior angles of a quadrilateral is the same for all quadrilaterals.
3. Develop and apply a formula for determining the: • perimeter of polygons • area of rectangles • volume of right rectangular prisms. [C, CN, PS, R, V]	➢ Explain, using models, how the perimeter of any polygon can be determined. ➢ Generalize a rule (formula) for determining the perimeter of polygons, including rectangles and squares. ➢ Explain, using models, how the area of any rectangle can be determined. ➢ Generalize a rule (formula) for determining the area of rectangles. ➢ Explain, using models, how the volume of any right rectangular prism can be determined. ➢ Generalize a rule (formula) for determining the volume of right rectangular prisms. ➢ Solve a given problem involving the perimeter of polygons, the area of rectangles and/or the volume of right rectangular prisms.

Strand: Shape and Space (3-D Objects and 2-D Shapes)

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*
4. Construct and compare triangles, including: • scalene • isosceles • equilateral • right • obtuse • acute in different orientations. [C, PS, R, V]	➢ Identify the characteristics of a given set of triangles according to their sides and/or their interior angles. ➢ Sort a given set of triangles, and explain the sorting rule. ➢ Identify a specified triangle from a given set of triangles; e.g., isosceles. ➢ Draw a specified triangle; e.g., scalene. ➢ Replicate a given triangle in a different orientation, and show that the two are congruent.
5. Describe and compare the sides and angles of regular and irregular polygons. [C, PS, R, V]	➢ Sort a given set of 2-D shapes into polygons and non-polygons, and explain the sorting rule. ➢ Demonstrate congruence (sides to sides and angles to angles) in a regular polygon by superimposing. ➢ Demonstrate congruence (sides to sides and angles to angles) in a regular polygon by measuring. ➢ Demonstrate that the sides of a given regular polygon are of the same length and that the angles of a regular polygon are of the same measure. ➢ Sort a given set of polygons as regular or irregular, and justify the sorting. ➢ Identify and describe regular and irregular polygons in the environment.

Strand: Shape and Space (Transformations)

General Outcome: Describe and analyze position and motion of objects and shapes.

Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*
6. Perform a combination of translations, rotations and/or reflections on a single 2-D shape, with and without technology, and draw and describe the image. [C, CN, PS, T, V]	➢ Demonstrate that a 2-D shape and its transformation image are congruent. ➢ Model a given set of successive translations, successive rotations or successive reflections of a 2-D shape. ➢ Model a given combination of two different types of transformations of a 2-D shape. ➢ Draw and describe a 2-D shape and its image, given a combination of transformations. ➢ Describe the transformations performed on a 2-D shape to produce a given image. ➢ Model a given set of successive transformations (translations, rotations and/or reflections) of a 2-D shape. ➢ Perform and record one or more transformations of a 2-D shape that will result in a given image.
7. Perform a combination of successive transformations of 2-D shapes to create a design, and identify and describe the transformations. [C, CN, T, V]	➢ Analyze a given design created by transforming one or more 2-D shapes, and identify the original shape(s) and the transformations used to create the design. ➢ Create a design using one or more 2-D shapes, and describe the transformations used.

8. Identify and plot points in the first quadrant of a Cartesian plane, using whole number ordered pairs. [C, CN, V]	➢ Label the axes of the first quadrant of a Cartesian plane, and identify the origin. ➢ Plot a point in the first quadrant of a Cartesian plane, given its ordered pair. ➢ Match points in the first quadrant of a Cartesian plane with their corresponding ordered pair. ➢ Plot points in the first quadrant of a Cartesian plane with intervals of 1, 2, 5 or 10 on its axes, given whole number ordered pairs. ➢ Draw shapes or designs, given ordered pairs, in the first quadrant of a Cartesian plane. ➢ Determine the distance between points along horizontal and vertical lines in the first quadrant of a Cartesian plane. ➢ Draw shapes or designs in the first quadrant of a Cartesian plane, and identify the points used to produce them.
9. Perform and describe single transformations of a 2-D shape in the first quadrant of a Cartesian plane (limited to whole number vertices). [C, CN, PS, T, V] [ICT: C6–2.1]	➢ Identify the coordinates of the vertices of a given 2-D shape (limited to the first quadrant of a Cartesian plane). ➢ Perform a transformation on a given 2-D shape, and identify the coordinates of the vertices of the image (limited to the first quadrant). ➢ Describe the positional change of the vertices of a given 2-D shape to the corresponding vertices of its image as a result of a transformation (limited to the first quadrant).

Strand: Statistics and Probability (Data Analysis)

General Outcome: Collect, display and analyze data to solve problems.

Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*
1. Create, label and interpret line graphs to draw conclusions. [C, CN, PS, R, V]	➢ Determine the common attributes (title, axes and intervals) of line graphs by comparing a given set of line graphs. ➢ Determine whether a given set of data can be represented by a line graph (continuous data) or a series of points (discrete data), and explain why. ➢ Create a line graph from a given table of values or a given set of data. ➢ Interpret a given line graph to draw conclusions.

2. Select, justify and use appropriate methods of collecting data, including: • questionnaires • experiments • databases • electronic media. [C, CN, PS, R, T] [ICT: C4–2.2, C6–2.2, C7–2.1, P2–2.1, P2–2.2]	➢ Select a method for collecting data to answer a given question, and justify the choice. ➢ Design and administer a questionnaire for collecting data to answer a given question, and record the results. ➢ Answer a given question by performing an experiment, recording the results and drawing a conclusion. ➢ Explain when it is appropriate to use a database as a source of data. ➢ Gather data for a given question by using electronic media, including selecting data from databases.
3. Graph collected data, and analyze the graph to solve problems. [C, CN, PS, R, T] [ICT: C6–2.5, C7–2.1, P2–2.1, P2–2.2]	➢ Determine an appropriate type of graph for displaying a set of collected data, and justify the choice of graph. ➢ Solve a given problem by graphing data and interpreting the resulting graph.

Strand: Statistics and Probability (Chance and Uncertainty)

General Outcome: Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.

Specific Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*
4. Demonstrate an understanding of probability by: • identifying all possible outcomes of a probability experiment • differentiating between experimental and theoretical probability • determining the theoretical probability of outcomes in a probability experiment • determining the experimental probability of outcomes in a probability experiment • comparing experimental results with the theoretical probability for an experiment. [C, ME, PS, T] [ICT: C6–2.1, C6–2.4]	➢ List the possible outcomes of a probability experiment, such as: • tossing a coin • rolling a die with a given number of sides • spinning a spinner with a given number of sectors. ➢ Determine the theoretical probability of an outcome occurring for a given probability experiment. ➢ Predict the probability of a given outcome occurring for a given probability experiment by using theoretical probability. ➢ Conduct a probability experiment, with or without technology, and compare the experimental results with the theoretical probability. ➢ Explain that as the number of trials in a probability experiment increases, the experimental probability approaches theoretical probability of a particular outcome. ➢ Distinguish between theoretical probability and experimental probability, and explain the differences.