Grade 5 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. Represent and describe whole numbers to 1 000 000. [C, CN, V, T] [ICT: C6–2.2]	➢ Write a given numeral, using proper spacing without commas; e.g., 934 567. ➢ Describe the pattern of adjacent place positions moving from right to left. ➢ Describe the meaning of each digit in a given numeral. ➢ Provide examples of large numbers used in print or electronic media. ➢ Express a given numeral in expanded notation; e.g., 45 321 = (4 × 10 000) + (5 × 1000) + (3 × 100) + (2 × 10) + (1 × 1) or 40 000 + 5000 + 300 + 20 + 1. ➢ Write the numeral represented by a given expanded notation.

2. Use estimation strategies, such as: • front-end rounding • compensation • compatible numbers in problem-solving contexts. [C, CN, ME, PS, R, V]	➢ Provide a context for when estimation is used to: • make predictions • check the reasonableness of an answer • determine approximate answers. ➢ Describe contexts in which overestimating is important. ➢ Determine the approximate solution to a given problem not requiring an exact answer. ➢ Estimate a sum or product, using compatible numbers. ➢ Estimate the solution to a given problem, using compensation, and explain the reason for compensation. ➢ Select and use an estimation strategy for a given problem. ➢ Apply front-end rounding to estimate: • sums; e.g., 253 + 615 is more than 200 + 600 = 800 • differences; e.g., 974 – 250 is close to 900 – 200 = 700 • products; e.g., the product of 23 × 24 is greater than 20 × 20 (400) and less than 25 × 25 (625) • quotients; e.g., the quotient of 831 ÷ 4 is greater than 800 ÷ 4 (200).
3. Apply mental mathematics strategies and number properties, such as: • skip counting from a known fact • using doubling or halving • using patterns in the 9s facts • using repeated doubling or halving in order to understand and recall basic multiplication facts (multiplication tables) to 81 and related division facts. [C, CN, ME, R, V] Understand, recall and apply multiplication and related division facts to 9 × 9.	➢ Describe the mental mathematics strategy used to determine a given basic fact, such as: • skip count up by one or two groups from a known fact; e.g., if 5 × 7 = 35, then 6 × 7 is equal to 35 + 7 and 7 × 7 is equal to 35 + 7 + 7 • skip count down by one or two groups from a known fact; e.g., if 8 × 8 = 64, then 7 × 8 is equal to 64 – 8 and 6 × 8 is equal to 64 – 8 – 8 • doubling; e.g., for 8 × 3 think 4 × 3 = 12, and 8 × 3 = 12 + 12 • patterns when multiplying by 9; e.g., for 9 × 6, think 10 × 6 = 60, and 60 – 6 = 54; for 7 × 9, think 7 × 10 = 70, and 70 – 7 = 63 • repeated doubling; e.g., if 2 × 6 is equal to 12, then 4 × 6 is equal to 24 and 8 × 6 is equal to 48 • repeated halving; e.g., for 60 ÷ 4, think 60 ÷ 2 = 30 and 30 ÷ 2 = 15. ➢ Explain why multiplying by zero produces a product of zero (zero property of multiplication). ➢ Explain why division by zero is not possible or is undefined; e.g., 8 ÷ 0. ➢ Determine, with confidence, answers to multiplication facts to 81and related division facts. ➢ Demonstrate understanding, recall/memorization and application of multiplication and related division facts to 9 × 9.

4. Apply mental mathematics strategies for multiplication, such as: • annexing then adding zero • halving and doubling • using the distributive property. [C, CN, ME, R, V]	➢ Determine the products when one factor is a multiple of 10, 100 or 1000 by annexing and adding zero; e.g., for 3 × 200 think 3 × 2 and then add two zeros. ➢ Apply halving and doubling when determining a given product; e.g., 32 × 5 is the same as 16 × 10. ➢ Apply the distributive property to determine a given product that involves multiplying factors that are close to multiples of 10; e.g., 98 × 7 = (100 × 7) – (2 × 7).
5. Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems. [C, CN, PS, V]	(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.) ➢ Illustrate partial products in expanded notation for both factors; e.g., for 36 × 42, determine the partial products for (30 + 6) × (40 + 2). ➢ Represent both 2-digit factors in expanded notation to illustrate the distributive property; e.g., to determine the partial products of 36 × 42, (30 + 6) × (40 + 2) = 30 × 40 + 30 × 2 + 6 × 40 + 6 × 2 = 1200 + 60 + 240 + 12 = 1512. ➢ Model the steps for multiplying 2-digit factors, using an array and base ten blocks, and record the process symbolically. ➢ Describe a solution procedure for determining the product of two given 2-digit factors, using a pictorial representation such as an area model. ➢ Solve a given multiplication problem in context, using personal strategies, and record the process. ➢ Refine personal strategies to increase their efficiency. ➢ Create and solve a multiplication problem, and record the process.

6. Demonstrate, with and without concrete materials, an understanding of division (3-digit by 1-digit), and interpret remainders to solve problems. [C, CN, ME, PS, R, V]	(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.) ➢ Model the division process as equal sharing, using base ten blocks, and record it symbolically. ➢ Explain that the interpretation of a remainder depends on the context: • ignore the remainder; e.g., making teams of 4 from 22 people • round up the quotient; e.g., the number of five passenger cars required to transport 13 people • express remainders as fractions; e.g., five apples shared by two people • express remainders as decimals; e.g., measurement and money. ➢ Solve a given division problem in context, using personal strategies, and record the process. ➢ Refine personal strategies to increase their efficiency. ➢ Create and solve a division problem, and record the process.
7. Demonstrate an understanding of fractions by using concrete, pictorial and symbolic representations to: • create sets of equivalent fractions • compare fractions with like and unlike denominators. [C, CN, PS, R, V]	➢ Create a set of equivalent fractions; and explain, using concrete materials, why there are many equivalent fractions for any given fraction. ➢ Model and explain that equivalent fractions represent the same quantity. ➢ Determine if two given fractions are equivalent, using concrete materials or pictorial representations. ➢ Formulate and verify a rule for developing a set of equivalent fractions. ➢ Identify equivalent fractions for a given fraction. ➢ Compare two given fractions with unlike denominators by creating equivalent fractions. ➢ Position a given set of fractions with like and unlike denominators on a number line, and explain strategies used to determine the order.
8. Describe and represent decimals (tenths, hundredths, thousandths), concretely, pictorially and symbolically. [C, CN, R, V]	➢ Write the decimal for a given concrete or pictorial representation of part of a set, part of a region or part of a unit of measure. ➢ Represent a given decimal, using concrete materials or a pictorial representation. ➢ Represent an equivalent tenth, hundredth or thousandth for a given decimal, using a grid. ➢ Express a given tenth as an equivalent hundredth and thousandth. ➢ Express a given hundredth as an equivalent thousandth. ➢ Describe the value of each digit in a given decimal.
9. Relate decimals to fractions and fractions to decimals (to thousandths). [CN, R, V]	➢ Write a given decimal in fraction form. ➢ Write a given fraction with a denominator of 10, 100 or 1000 as a decimal. ➢ Express a given pictorial or concrete representation as a fraction or decimal; e.g., 250 shaded squares on a thousandth grid can be expressed as 0.250 or $\frac{250}{1000}$.

10. Compare and order decimals (to thousandths) by using: • benchmarks • place value • equivalent decimals. [C, CN, R, V]	➢ Order a given set of decimals by placing them on a number line that contains the benchmarks 0.0, 0.5 and 1.0. ➢ Order a given set of decimals including only tenths, using place value. ➢ Order a given set of decimals including only hundredths, using place value. ➢ Order a given set of decimals including only thousandths, using place value. ➢ Explain what is the same and what is different about 0.2, 0.20 and 0.200. ➢ Order a given set of decimals including tenths, hundredths and thousandths, using equivalent decimals; e.g., 0.92, 0.7, 0.9, 0.876, 0.925 in order is: 0.700, 0.876, 0.900, 0.920, 0.925.
11. Demonstrate an understanding of addition and subtraction of decimals (limited to thousandths). [C, CN, PS, R, V]	➢ Place the decimal point in a sum or difference, using front-end estimation; e.g., for 6.3 + 0.25 + 306.158, think 6 + 306, so the sum is greater than 312. ➢ Correct errors of decimal point placements in sums and differences without using paper and pencil. ➢ Explain why keeping track of place value positions is important when adding and subtracting decimals. ➢ Predict sums and differences of decimals, using estimation strategies. ➢ Solve a given problem that involves addition and subtraction of decimals, limited to thousandths.

Strand: Patterns and Relations (Patterns)

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. Determine the pattern rule to make predictions about subsequent elements. [C, CN, PS, R, V]	➢ Extend a given pattern with and without concrete materials, and explain how each element differs from the preceding one. ➢ Describe, orally or in writing, a given pattern, using mathematical language such as *one more*, *one less*, *five more*. ➢ Write a mathematical expression to represent a given pattern, such as $r + 1$, $r - 1$, $r + 5$. ➢ Describe the relationship in a given table or chart, using a mathematical expression. ➢ Determine and explain why a given number is or is not the next element in a pattern. ➢ Predict subsequent elements in a given pattern. ➢ Solve a given problem by using a pattern rule to determine subsequent elements. ➢ Represent a given pattern visually to verify predictions.

Strand: Patterns and Relations (Variables and Equations)

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.*
2. Express a given problem as an equation in which a letter variable is used to represent an unknown number (limited to whole numbers). [C, CN, PS, R]	➢ Explain the purpose of the letter variable in a given addition, subtraction, multiplication or division equation with one unknown; e.g., $36 \div n = 6$. ➢ Express a given pictorial or concrete representation of an equation in symbolic form. ➢ Identify the unknown in a problem, and represent the problem with an equation. ➢ Create a problem for a given equation with one unknown.

3. Solve problems involving single-variable, one-step equations with whole number coefficients and whole number solutions. [C, CN, PS, R]	➢ Express a given problem as an equation where the unknown is represented by a letter variable. ➢ Solve a given single-variable equation with the unknown in any of the terms; e.g., $n + 2 = 5$, $4 + a = 7$, $6 = r - 2$, $10 = 2c$. ➢ Identify the unknown in a problem; represent the problem with an equation; and solve the problem concretely, pictorially or symbolically. ➢ Create a problem for a given equation.

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. Identify 90º angles. [ME, V]	➢ Provide examples of 90º angles in the environment. ➢ Sketch 90º angles without the use of a protractor. ➢ Label a 90º angle, using a symbol.
2. Design and construct different rectangles, given either perimeter or area, or both (whole numbers), and make generalizations. [C, CN, PS, R, V]	➢ Construct or draw two or more rectangles for a given perimeter in a problem-solving context. ➢ Construct or draw two or more rectangles for a given area in a problem-solving context. ➢ Determine the shape that will result in the greatest area for any given perimeter. ➢ Determine the shape that will result in the least area for any given perimeter. ➢ Provide a real-life context for when it is important to consider the relationship between area and perimeter.

3. Demonstrate an understanding of measuring length (mm) by: • selecting and justifying referents for the unit mm • modelling and describing the relationship between mm and cm units, and between mm and m units. [C, CN, ME, PS, R, V]	➢ Provide a referent for one millimetre, and explain the choice. ➢ Provide a referent for one centimetre, and explain the choice. ➢ Provide a referent for one metre, and explain the choice. ➢ Show that 10 millimetres is equivalent to 1 centimetre, using concrete materials; e.g., a ruler. ➢ Show that 1000 millimetres is equivalent to 1 metre, using concrete materials; e.g., a metre stick. ➢ Provide examples of when millimetres are used as the unit of measure.
4. Demonstrate an understanding of volume by: • selecting and justifying referents for cm^3 or m^3 units • estimating volume, using referents for cm^3 or m^3 • measuring and recording volume (cm^3 or m^3) • constructing right rectangular prisms for a given volume. [C, CN, ME, PS, R, V]	➢ Identify the cube as the most efficient unit for measuring volume, and explain why. ➢ Provide a referent for a cubic centimetre, and explain the choice. ➢ Provide a referent for a cubic metre, and explain the choice. ➢ Determine which standard cubic unit is represented by a given referent. ➢ Estimate the volume of a given 3-D object, using personal referents. ➢ Determine the volume of a given 3-D object, using manipulatives, and explain the strategy. ➢ Construct a right rectangular prism for a given volume. ➢ Construct more than one right rectangular prism for the same given volume.
5. Demonstrate an understanding of capacity by: • describing the relationship between mL and L • selecting and justifying referents for mL or L units • estimating capacity, using referents for mL or L • measuring and recording capacity (mL or L). [C, CN, ME, PS, R, V]	➢ Demonstrate that 1000 millilitres is equivalent to 1 litre by filling a 1 litre container using a combination of smaller containers. ➢ Provide a referent for a litre, and explain the choice. ➢ Provide a referent for a millilitre, and explain the choice. ➢ Determine the capacity unit of a given referent. ➢ Estimate the capacity of a given container, using personal referents. ➢ Determine the capacity of a given container, using materials that take the shape of the inside of the container (e.g., a liquid, rice, sand, beads), and explain the strategy.

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.*
6. Describe and provide examples of edges and faces of 3-D objects, and sides of 2-D shapes that are: • parallel • intersecting • perpendicular • vertical • horizontal. [C, CN, R, T, V] [ICT: C6–2.2, P5–2.3]	➢ Identify parallel, intersecting, perpendicular, vertical and horizontal edges and faces on 3-D objects. ➢ Identify parallel, intersecting, perpendicular, vertical and horizontal sides on 2-D shapes. ➢ Provide examples from the environment that show parallel, intersecting, perpendicular, vertical and horizontal line segments. ➢ Find examples of edges, faces and sides that are parallel, intersecting, perpendicular, vertical and horizontal in print and electronic media, such as newspapers, magazines and the Internet. ➢ Draw 2-D shapes that have sides that are parallel, intersecting, perpendicular, vertical or horizontal. ➢ Draw 3-D objects that have edges and faces that are parallel, intersecting, perpendicular, vertical or horizontal. ➢ Describe the faces and edges of a given 3-D object, using terms such as parallel, intersecting, perpendicular, vertical or horizontal. ➢ Describe the sides of a given 2-D shape, using terms such as parallel, intersecting, perpendicular, vertical or horizontal.
7. Identify and sort quadrilaterals, including: • rectangles • squares • trapezoids • parallelograms • rhombuses according to their attributes. [C, R, V]	➢ Identify and describe the characteristics of a pre-sorted set of quadrilaterals. ➢ Sort a given set of quadrilaterals, and explain the sorting rule. ➢ Sort a given set of quadrilaterals according to the lengths of the sides. ➢ Sort a given set of quadrilaterals according to whether or not opposite sides are parallel.

Strand: <u>Shape and Space (Transformations)</u>

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.*
8. Identify and describe a single transformation, including a translation, rotation and reflection of 2-D shapes. [C, T, V] [ICT: C6–2.1]	➢ Provide an example of a translation, rotation and reflection. ➢ Identify a given single transformation as a translation, rotation or reflection. ➢ Describe a given rotation about a vertex by the direction of the turn (clockwise or counterclockwise). ➢ Describe a given reflection by identifying the line of reflection and the distance of the image from the line of reflection. ➢ Describe a given translation by identifying the direction and magnitude of the movement.
9. Perform, concretely, a single transformation (translation, rotation or reflection) of a 2-D shape, and draw the image. [C, CN, T, V] [ICT: C6–2.1]	➢ Translate a given 2-D shape horizontally, vertically or diagonally, and draw the resultant image. ➢ Rotate a given 2-D shape about a vertex, and describe the direction of rotation (clockwise or counterclockwise) and the fraction of the turn (limited to ¼, ½, ¾ or full turn). ➢ Reflect a given 2-D shape across a line of reflection, and draw the resultant image. ➢ Draw a 2-D shape, translate the shape, and record the translation by describing the direction and magnitude of the movement. ➢ Draw a 2-D shape, rotate the shape about a vertex, and describe the direction of the turn (clockwise or counterclockwise) and the fraction of the turn (limited to ¼, ½, ¾ or full turn). ➢ Draw a 2-D shape, reflect the shape, and identify the line of reflection and the distance of the image from the line of reflection. ➢ Predict the result of a single transformation of a 2-D shape, and verify the prediction.

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. Differentiate between first-hand and second-hand data. [C, R, T, V] [ICT: C1–2.2, P5–2.3]	➢ Explain the difference between first-hand and second-hand data. ➢ Formulate a question that can best be answered using first-hand data, and explain why. ➢ Formulate a question that can best be answered using second-hand data, and explain why. ➢ Find examples of second-hand data in print and electronic media, such as newspapers, magazines and the Internet.
2. Construct and interpret double bar graphs to draw conclusions. [C, PS, R, T, V] [ICT: C6–2.2, P5–2.3]	➢ Determine the attributes (title, axes, intervals and legend) of double bar graphs by comparing a given set of double bar graphs. ➢ Represent a given set of data by creating a double bar graph, label the title and axes, and create a legend without the use of technology. ➢ Draw conclusions from a given double bar graph to answer questions. ➢ Provide examples of double bar graphs used in a variety of print and electronic media, such as newspapers, magazines and the Internet. ➢ Solve a given problem by constructing and interpreting a double bar 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.*
3. Describe the likelihood of a single outcome occurring, using words such as: • impossible • possible • certain. [C, CN, PS, R]	➢ Provide examples of events from personal contexts that are impossible, possible or certain. ➢ Classify the likelihood of a single outcome occurring in a probability experiment as impossible, possible or certain. ➢ Design and conduct a probability experiment in which the likelihood of a single outcome occurring is impossible, possible or certain. ➢ Conduct a given probability experiment a number of times, record the outcomes, and explain the results.
4. Compare the likelihood of two possible outcomes occurring, using words such as: • less likely • equally likely • more likely. [C, CN, PS, R]	➢ Identify outcomes from a given probability experiment that are less likely, equally likely or more likely to occur than other outcomes. ➢ Design and conduct a probability experiment in which one outcome is less likely to occur than the other outcome. ➢ Design and conduct a probability experiment in which one outcome is equally likely to occur as the other outcome. ➢ Design and conduct a probability experiment in which one outcome is more likely to occur than the other outcome.