Grade 4 Mathematics Big Ideas

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

[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 10 000, pictorially and symbolically. [C, CN, V]	➢ Read a given four-digit numeral without using the word *and*; e.g., 5321 is five thousand three hundred twenty-one, NOT five thousand three hundred AND twenty-one. ➢ Write a given numeral, using proper spacing without commas; e.g., 4567 or 4 567, 10 000. ➢ Write a given numeral 0–10 000 in words. ➢ Represent a given numeral, using a place value chart or diagrams. ➢ Express a given numeral in expanded notation; e.g., 321 = 300 + 20 + 1. ➢ Write the numeral represented by a given expanded notation. ➢ Explain the meaning of each digit in a given 4-digit numeral, including numerals with all digits the same; e.g., for the numeral 2222, the first digit represents two thousands, the second digit two hundreds, the third digit two tens and the fourth digit two ones.
2. Compare and order numbers to 10 000. [C, CN, V]	➢ Order a given set of numbers in ascending or descending order, and explain the order by making references to place value. ➢ Create and order three different 4-digit numerals. ➢ Identify the missing numbers in an ordered sequence or on a number line. ➢ Identify incorrectly placed numbers in an ordered sequence or on a number line.

3. Demonstrate an understanding of addition of numbers with answers to 10 000 and their corresponding subtractions (limited to 3- and 4-digit numerals) by: • using personal strategies for adding and subtracting • estimating sums and differences • solving problems involving addition and subtraction. [C, CN, ME, PS, R]	(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.) ➢ Explain how to keep track of digits that have the same place value when adding numbers, limited to 3- and 4-digit numerals. ➢ Explain how to keep track of digits that have the same place value when subtracting numbers, limited to 3- and 4-digit numerals. ➢ Describe a situation in which an estimate rather than an exact answer is sufficient. ➢ Estimate sums and differences, using different strategies; e.g., front-end estimation and compensation. ➢ Refine personal strategies to increase their efficiency. ➢ Solve problems that involve addition and subtraction of more than 2 numbers.
4. Apply the properties of 0 and 1 for multiplication and the property of 1 for division. [C, CN, R]	➢ Determine the answer to a given question involving the multiplication of a number by 1, and explain the answer. ➢ Determine the answer to a given question involving the multiplication of a number by 0, and explain the answer. ➢ Determine the answer to a given question involving the division of a number by 1, and explain the answer.

5. Describe and apply mental mathematics strategies, such as: • skip counting from a known fact • using doubling or halving • using doubling or halving and adding or subtracting one more group • using patterns in the 9s facts • using repeated doubling to determine basic multiplication facts to 9 × 9 and related division facts. [C, CN, ME, R] Understand and apply strategies for multiplication and related division facts to 9 × 9. Recall multiplication and related division facts to 7 × 7.	➢ Provide examples for applying mental mathematics strategies: • skip counting from a known fact; e.g., for 3 × 6, think 3 × 5 = 15 plus 3 = 18 • doubling; e.g., for 4 × 3, think 2 × 3 = 6 and 4 × 3 = 6 + 6 • doubling and adding one more group; e.g., for 3 × 7, think 2 × 7 = 14 and 14 + 7 = 21 • use ten facts 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 • halving; e.g., if 4 × 6 is equal to 24, then 2 × 6 is equal to 12 • relating division to multiplication; e.g., for 64 ÷ 8, think 8 × □ = 64 • repeated doubling; e.g., for 4 × 6, think 2 × 6 = 12 and 2 × 12 = 24. ➢ Demonstrate understanding and application of strategies for multiplication and related division facts to 9 × 9. ➢ Demonstrate recall/memorization of multiplication and related division facts to 7 × 7.
6. Demonstrate an understanding of multiplication (2- or 3-digit by 1-digit) to solve problems by: • using personal strategies for multiplication with and without concrete materials • using arrays to represent multiplication • connecting concrete representations to symbolic representations • estimating products • applying the distributive property. [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 a given multiplication problem, using the distributive property; e.g., 8 × 365 = (8 × 300) + (8 × 60) + (8 × 5). ➢ Use concrete materials, such as base ten blocks or their pictorial representations, to represent multiplication; and record the process symbolically. ➢ Create and solve a multiplication problem that is limited to 2- or 3-digits by 1-digit, and record the process. ➢ Refine personal strategies to increase their efficiency. ➢ Estimate a product, using a personal strategy; e.g., 2 × 243 is close to or a little more than 2 × 200, or close to or a little less than 2 × 250. ➢ Model and solve a given multiplication problem, using an array, and record the process. ➢ Solve a given multiplication problem, and record the process.

7. Demonstrate an understanding of division (1-digit divisor and up to 2-digit dividend) to solve problems by: • using personal strategies for dividing with and without concrete materials • estimating quotients • relating division to multiplication. [C, CN, ME, PS, R, V]	(It is not intended that remainders be expressed as decimals or fractions.) (Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.) ➢ Solve a given division problem without a remainder, using arrays or base ten materials, and connect this process to the symbolic representation. ➢ Solve a given division problem with a remainder, using arrays or base ten materials, and connect this process to the symbolic representation. ➢ Solve a given division problem, using a personal strategy, and record the process. ➢ Refine personal strategies to increase their efficiency. ➢ Create and solve a division problem involving a 1- or 2-digit dividend, and record the process. ➢ Estimate a quotient, using a personal strategy; e.g., 86 ÷ 4 is close to 80 ÷ 4 or close to 80 ÷ 5. ➢ Solve a given division problem by relating division to multiplication; e.g., for 100 ÷ 4, we know that 4 × 25 = 100, so 100 ÷ 4 = 25.
8. Demonstrate an understanding of fractions less than or equal to one by using concrete, pictorial and symbolic representations to: • name and record fractions for the parts of a whole or a set • compare and order fractions • model and explain that for different wholes, two identical fractions may not represent the same quantity • provide examples of where fractions are used. [C, CN, PS, R, V]	➢ Represent a given fraction, using a region, object or set. ➢ Identify a fraction from its given concrete representation. ➢ Name and record the shaded and non-shaded parts of a given set. ➢ Name and record the shaded and non-shaded parts of a given whole region, object or set. ➢ Represent a given fraction pictorially by shading parts of a given set. ➢ Represent a given fraction pictorially by shading parts of a given whole region, object or set. ➢ Explain how denominators can be used to compare two given unit fractions with a numerator of 1. ➢ Order a given set of fractions that have the same numerator, and explain the ordering. ➢ Order a given set of fractions that have the same denominator, and explain the ordering. ➢ Identify which of the benchmarks 0, $\frac{1}{2}$ or 1 is closer to a given fraction. ➢ Name fractions between two given benchmarks on a number line. ➢ Order a given set of fractions by placing them on a number line with given benchmarks. ➢ Provide examples of when two identical fractions may not represent the same quantity; e.g., half of a large apple is not equivalent to half of a small apple, half of ten Saskatoon berries is not equivalent to half of sixteen Saskatoon berries. ➢ Provide, from everyday contexts, an example of a fraction that represents part of a set and an example of a fraction that represents part of a whole.

9. Represent and describe decimals (tenths and hundredths), 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. ➢ Explain the meaning of each digit in a given decimal with all digits the same. ➢ Represent a given decimal, using money values (dimes and pennies). ➢ Record a given money value, using decimals. ➢ Provide examples of everyday contexts in which tenths and hundredths are used. ➢ Model, using manipulatives or pictures, that a given tenth can be expressed as a hundredth; e.g., 0.9 is equivalent to 0.90, or 9 dimes is equivalent to 90 pennies.
10. Relate decimals to fractions and fractions to decimals (to hundredths). [C, CN, R, V]	➢ Express, orally and in written form, a given fraction with a denominator of 10 or 100 as a decimal. ➢ Read decimals as fractions; e.g., 0.5 is zero and five tenths. ➢ Express, orally and in written form, a given decimal in fraction form. ➢ Express a given pictorial or concrete representation as a fraction or decimal; e.g., 15 shaded squares on a hundredth grid can be expressed as 0.15 or $\frac{15}{100}$. ➢ Express, orally and in written form, the decimal equivalent for a given fraction; e.g., $\frac{50}{100}$ can be expressed as 0.50.
11. Demonstrate an understanding of addition and subtraction of decimals (limited to hundredths) by: • using personal strategies to determine sums and differences • estimating sums and differences • using mental mathematics strategies to solve problems. [C, ME, PS, R, V]	➢ Predict sums and differences of decimals, using estimation strategies. ➢ Determine the sum or difference of two given decimal numbers, using a mental mathematics strategy, and explain the strategy. ➢ Refine personal strategies to increase their efficiency. ➢ Solve problems, including money problems, which involve addition and subtraction of decimals, limited to hundredths. ➢ Determine the approximate solution of a given problem not requiring an exact answer.

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. Identify and describe patterns found in tables and charts. [C, CN, PS, V] [ICT: C6–2.3]	➢ Identify and describe a variety of patterns in a multiplication chart. ➢ Determine the missing element(s) in a given table or chart. ➢ Identify the error(s) in a given table or chart. ➢ Describe the pattern found in a given table or chart.
2. Translate among different representations of a pattern, such as a table, a chart or concrete materials. [C, CN, V]	➢ Create a concrete representation of a given pattern displayed in a table or chart. ➢ Create a table or chart from a given concrete representation of a pattern.
3. Represent, describe and extend patterns and relationships, using charts and tables, to solve problems. [C, CN, PS, R, V] [ICT: C6–2.3]	➢ Translate the information in a given problem into a table or chart. ➢ Identify and extend the patterns in a table or chart to solve a given problem.
4. Identify and explain mathematical relationships, using charts and diagrams, to solve problems. [CN, PS, R, V] [ICT: C6–2.3]	➢ Complete a given Carroll diagram to solve a problem. ➢ Determine where new elements belong in a given Carroll diagram. ➢ Identify a sorting rule for a given Venn diagram. ➢ Describe the relationship shown in a given Venn diagram when the circles intersect, when one circle is contained in the other and when the circles are separate. ➢ Determine where new elements belong in a given Venn diagram. ➢ Solve a given problem by using a chart or diagram to identify mathematical relationships.

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.*
5. Express a given problem as an equation in which a symbol is used to represent an unknown number. [CN, PS, R]	➢ Explain the purpose of the symbol in a given addition, subtraction, multiplication or division equation with one unknown; e.g., 36 ÷ ☐ = 6. ➢ Express a given pictorial or concrete representation of an equation in symbolic form. ➢ 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 with one unknown.
6. Solve one-step equations involving a symbol to represent an unknown number. [C, CN, PS, R, V]	➢ Represent and solve a given one-step equation concretely, pictorially or symbolically. ➢ Solve a given one-step equation, using guess and test. ➢ Describe, orally, the meaning of a given one-step equation with one unknown. ➢ Solve a given equation when the unknown is on the left or right side of the equation. ➢ Represent and solve a given addition or subtraction problem involving a "part-part-whole" or comparison context, using a symbol to represent the unknown. ➢ Represent and solve a given multiplication or division problem involving equal grouping or partitioning (equal sharing), using a symbol to represent the unknown.

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. Read and record time, using digital and analog clocks, including 24-hour clocks. [C, CN, V]	➢ State the number of hours in a day. ➢ Express the time orally and numerically from a 12-hour analog clock. ➢ Express the time orally and numerically from a 24-hour analog clock. ➢ Express the time orally and numerically from a 12-hour digital clock. ➢ Express time orally and numerically from a 24-hour digital clock. ➢ Describe time orally as "minutes to" or "minutes after" the hour. ➢ Explain the meaning of a.m. and p.m., and provide an example of an activity that occurs during the a.m., and another that occurs during the p.m.
2. Read and record calendar dates in a variety of formats. [C, V]	➢ Write dates in a variety of formats; e.g., *yyyy/mm/dd*, *dd/mm/yyyy*, March 21, 2007, *dd/mm/yy*. ➢ Relate dates written in the format *yyyy/mm/dd* to dates on a calendar. ➢ Identify possible interpretations of a given date; e.g., 06/03/04.
3. Demonstrate an understanding of area of regular and irregular 2-D shapes by: • recognizing that area is measured in square units • selecting and justifying referents for the units cm^2 or m^2 • estimating area, using referents for cm^2 or m^2 • determining and recording area (cm^2 or m^2) • constructing different rectangles for a given area (cm^2 or m^2) in order to demonstrate that many different rectangles may have the same area. [C, CN, ME, PS, R, V]	➢ Describe area as the measure of surface recorded in square units. ➢ Identify and explain why the square is the most efficient unit for measuring area. ➢ Provide a referent for a square centimetre, and explain the choice. ➢ Provide a referent for a square metre, and explain the choice. ➢ Determine which standard square unit is represented by a given referent. ➢ Estimate the area of a given 2-D shape, using personal referents. ➢ Determine the area of a regular 2-D shape, and explain the strategy. ➢ Determine the area of an irregular 2-D shape, and explain the strategy. ➢ Construct a rectangle for a given area. ➢ Demonstrate that many rectangles are possible for a given area by drawing at least two different rectangles for the same given area.

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. Describe and construct right rectangular and right triangular prisms. [C, CN, R, V]	➢ Identify and name common attributes of right rectangular prisms from given sets of right rectangular prisms. ➢ Identify and name common attributes of right triangular prisms from given sets of right triangular prisms. ➢ Sort a given set of right rectangular and right triangular prisms, using the shape of the base. ➢ Construct and describe a model of a right rectangular and a right triangular prism, using materials such as pattern blocks or modelling clay. ➢ Construct right rectangular prisms from their nets. ➢ Construct right triangular prisms from their nets. ➢ Identify examples of right rectangular and right triangular prisms found 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.*
5. Demonstrate an understanding of congruency, concretely and pictorially. [CN, R, V]	➢ Determine if two given 2-D shapes are congruent, and explain the strategy used. ➢ Create a shape that is congruent to a given 2-D shape. ➢ Identify congruent 2-D shapes from a given set of shapes shown in different orientations. ➢ Identify corresponding vertices and sides of two given congruent shapes.
6. Demonstrate an understanding of line symmetry by: • identifying symmetrical 2-D shapes • creating symmetrical 2-D shapes • drawing one or more lines of symmetry in a 2-D shape. [C, CN, V]	➢ Identify the characteristics of given symmetrical and non-symmetrical 2-D shapes. ➢ Sort a given set of 2-D shapes as symmetrical and non-symmetrical. ➢ Complete a symmetrical 2-D shape, given half the shape and its line of symmetry. ➢ Identify lines of symmetry of a given set of 2-D shapes, and explain why each shape is symmetrical. ➢ Determine whether or not a given 2-D shape is symmetrical by using an image reflector or by folding and superimposing. ➢ Create a symmetrical shape with and without manipulatives. ➢ Provide examples of symmetrical shapes found in the environment, and identify the line(s) of symmetry. ➢ Sort a given set of 2-D shapes as those that have no lines of symmetry, one line of symmetry or more than one line of symmetry.

Strand: <u>Statistics and Probability (Data Analysis)</u>

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. Demonstrate an understanding of many-to-one correspondence. [C, R, T, V] [ICT: C6–2.2, C6–2.3]	➢ Compare graphs in which the same data has been displayed using one-to-one and many-to-one correspondences, and explain how they are the same and different. ➢ Explain why many-to-one correspondence is sometimes used rather than one-to-one correspondence. ➢ Find examples of graphs in print and electronic media, such as newspapers, magazines and the Internet, in which many-to-one correspondence is used; and describe the correspondence used.
2. Construct and interpret pictographs and bar graphs involving many-to-one correspondence to draw conclusions. [C, PS, R, V]	➢ Identify an interval and correspondence for displaying a given set of data in a graph, and justify the choice. ➢ Create and label (with categories, title and legend) a pictograph to display a given set of data, using many-to-one correspondence, and justify the choice of correspondence used. ➢ Create and label (with axes and title) a bar graph to display a given set of data, using many-to-one correspondence, and justify the choice of interval used. ➢ Answer a given question, using a given graph in which data is displayed using many-to-one correspondence.