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

Strand: Number	**General Learning Outcome:** Develop number sense.
Specific Learning 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.N.1. Demonstrate an understanding of perfect squares and square roots, concretely, pictorially, and symbolically (limited to whole numbers). [C, CN, R, V]	■ Represent a perfect square as a square region using materials, such as grid paper or square shapes. ■ Determine the factors of a perfect square, and explain why one of the factors is the square root and the others are not. ■ Determine whether or not a number is a perfect square using materials and strategies such as square shapes, grid paper, or prime factorization, and explain the reasoning. ■ Determine the square root of a perfect square, and record it symbolically. ■ Determine the square of a number.
8.N.2. Determine the approximate square root of numbers that are not perfect squares (limited to whole numbers). [C, CN, ME, R, T]	■ Estimate the square root of a number that is not a perfect square using the roots of perfect squares as benchmarks. ■ Approximate the square root of a number that is not a perfect square using technology (e.g., calculator, computer). ■ Explain why the square root of a number shown on a calculator may be an approximation. ■ Identify a number with a square root that is between two given numbers.

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

Strand: Number *(continued)*	General Learning Outcome: Develop number sense.
Specific Learning 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.N.3. | Demonstrate an understanding of percents greater than or equal to 0%.
[CN, PS, R, V] | Provide a context where a percent may be more than 100% or between 0% and 1%. Represent a fractional percent using grid paper. Represent a percent greater than 100% using grid paper. Determine the percent represented by a shaded region on a grid, and record it in decimal, fractional, or percent form. Express a percent in decimal or fractional form. Express a decimal in percent or fractional form. Express a fraction in decimal or percent form. Solve a problem involving percents. Solve a problem involving combined percents (e.g., addition of percents, such as GST + PST). Solve a problem that involves finding the percent of a percent (e.g., A population increased by 10% one year and then increased by 15% the next year. Explain why there was not a 25% increase in population over the two years). |

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

Strand: Number *(continued)*	General Learning Outcome: Develop number sense.
Specific Learning 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.N.4.	Demonstrate an understanding of ratio and rate. [C, CN, V]	■ Express a two-term ratio from a context in the forms 3:5 or 3 to 5. ■ Express a three-term ratio from a context in the forms 4:7:3 or 4 to 7 to 3. ■ Express a part-to-part ratio as a part to whole ratio (e.g., Given the ratio of frozen juice to water is 1 can to 4 cans, this can be written as 1/4 or 1:4 or 1 to 4, [part-to-part ratio]. Related part-to-whole ratios are $\frac{1}{5}$ or 1:5 or 1 to 5, which is the ratio of juice to solution, or $\frac{4}{5}$, or 4:5 or 4 to 5, which is the ratio of water to solution). ■ Identify and describe ratios and rates from real-life examples, and record them symbolically. ■ Express a rate using words or symbols (e.g., 20 L per 100 km or 20 L/100 km). ■ Express a ratio as a percent, and explain why a rate cannot be represented as a percent.

8.N.5.	Solve problems that involve rates, ratios, and proportional reasoning. [C, CN, PS, R]	■ Explain the meaning of $\frac{a}{b}$ within a context.
		 ■ Provide a context in which $\frac{a}{b}$ represents a
		    ■ fraction
		    ■ rate
		    ■ ratio
		    ■ quotient
		    ■ probability
		 ■ Solve a problem involving rate, ratio, or percent.

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

Strand: Number *(continued)*	General Learning Outcome: Develop number sense.
Specific Learning 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.N.6. Demonstrate an understanding of multiplying and dividing positive fractions and mixed numbers, concretely, pictorially, and symbolically. [C, CN, ME, PS]	■ Identify the operation(s) required to solve a problem involving positive fractions. ■ Provide a context involving the multiplying of two positive fractions. ■ Provide a context involving the dividing of two positive fractions. ■ Express a positive mixed number as an improper fraction and a positive improper fraction as a mixed number. ■ Model multiplication of a positive fraction by a whole number, concretely or pictorially, and record the process. ■ Model multiplication of a positive fraction by a positive fraction, concretely or pictorially, and record the process. ■ Model division of a positive fraction by a whole number, concretely or pictorially, and record the process. ■ Generalize and apply rules for multiplying and dividing positive fractions, including mixed numbers. ■ Solve a problem involving positive fractions, taking into consideration order of operations (limited to problems with positive solutions).

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

Strand: Number *(continued)*	**General Learning Outcome:** Develop number sense.
Specific Learning 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.N.7. Demonstrate an understanding of multiplication and division of integers, concretely, pictorially, and symbolically. [C, CN, PS, R, V]	■ Identify the operation(s) required to solve a problem involving integers. ■ Provide a context that requires multiplying two integers. ■ Provide a context that requires dividing two integers. ■ Model the process of multiplying two integers using concrete materials or pictorial representations, and record the process. ■ Model the process of dividing an integer by an integer using concrete materials or pictorial representations, and record the process. ■ Generalize and apply a rule for determining the sign of the product or quotient of integers. ■ Solve a problem involving integers, taking into consideration order of operations.
8.N.8. Solve problems involving positive rational numbers. [C, CN, ME, PS, R, T, V]	■ Identify the operation(s) required to solve a problem involving positive rational numbers. ■ Determine the reasonableness of an answer to a problem involving positive rational numbers. ■ Estimate the solution and solve a problem involving positive rational numbers. ■ Identify and correct errors in the solution to a problem involving positive rational numbers.

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

Strand: Patterns and Relations (Patterns)	General Learning Outcome: Use patterns to describe the world and solve problems.
Specific Learning 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.PR.1. Graph and analyze two-variable linear relations. [C, ME, PS, R, T, V]	■ Determine the missing value in an ordered pair for an equation of a linear relation. ■ Create a table of values for the equation of a linear relation. ■ Construct a graph from the equation of a linear relation (limited to discrete data). ■ Describe the relationship between the variables of a graph.

Grade 8

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

Strand: Patterns and Relations (Variables and Equations)	General Learning Outcome: Represent algebraic expressions in multiple ways.
Specific Learning 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.PR.2. Model and solve problems using linear equations of the form:

- $ax = b$
- $\frac{x}{a} = b, a \neq 0$
- $ax + b = c$
- $\frac{x}{a} + b = c, a \neq 0$
- $a(x + b) = c$

concretely, pictorially, and symbolically, where *a*, *b*, and *c*, are integers.
[C, CN, PS, V]

- Model a problem with a linear equation, and solve the equation using concrete models.
- Verify the solution to a linear equation using a variety of methods, including concrete materials, diagrams, and substitution.
- Draw a visual representation of the steps used to solve a linear equation, and record each step symbolically.
- Solve a linear equation symbolically.
- Identify and correct errors in an incorrect solution of a linear equation.
- Solve a linear equation by applying the distributive property [e.g., $2(x + 3) = 5$; $2x + 6 = 5$; …].
- Solve a problem using a linear equation, and record the process.

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

Strand: Shape and Space (Measurement)	**General Learning Outcome:** Use direct or indirect measurement to solve problems.
Specific Learning 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.SS.1. Develop and apply the Pythagorean theorem to solve problems. [CN, PS, R, T, V]	■ Model and explain the Pythagorean theorem concretely, pictorially, or by using technology. ■ Explain, using examples, that the Pythagorean theorem applies only to right triangles. ■ Determine whether or not a triangle is a right triangle by applying the Pythagorean theorem. ■ Solve a problem that involves determining the measure of the third side of a right triangle, given the measures of the other two sides. ■ Solve a problem that involves Pythagorean triples (e.g., 3, 4, 5 or 5, 12, 13).
8.SS.2. Draw and construct nets for 3-D objects. [C, CN, PS, V]	■ Match a net to the 3-D object it represents. ■ Construct a 3-D object from a net. ■ Draw nets for a right circular cylinder, right rectangular prism, and right triangular prism, and verify by constructing the 3-D objects from the nets. ■ Predict 3-D objects that can be created from a net and verify the prediction.
8.SS.3. Determine the surface area of ■ right rectangular prisms ■ right triangular prisms ■ right cylinders to solve problems. [C, CN, PS, R, V]	■ Explain, using examples, the relationship between the area of 2-D shapes and the surface area of a 3-D object. ■ Identify all the faces of a prism, including right rectangular and right triangular prisms. ■ Describe and apply strategies for determining the surface area of a right rectangular or right triangular prism. ■ Describe and apply strategies for determining the surface area of a right cylinder. ■ Solve a problem involving surface area.

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

Strand: Shape and Space (Measurement) *(continued)*	**General Learning Outcome:** Use direct or indirect measurement to solve problems.

Specific Learning 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.SS.4. Develop and apply formulas for determining the volume of right prisms and right cylinders. [C, CN, PS, R, V]	■ Determine the volume of a right prism, given the area of the base. ■ Generalize and apply a rule for determining the volume of right cylinders. ■ Explain the relationship between the area of the base of a right 3-D object and the formula for the volume of the object. ■ Demonstrate that the orientation of a 3-D object does not affect its volume. ■ Apply a formula to solve a problem involving the volume of a right cylinder or a right prism.

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

Strand: Shape and Space (3-D Objects and 2-D Shapes)	**General Learning Outcome:** Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.
Specific Learning 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.SS.5. Draw and interpret top, front, and side views of 3-D objects composed of right rectangular prisms. [C, CN, R, T, V]	■ Draw and label the top, front, and side views for a 3-D object on isometric dot paper. ■ Compare different views of a 3-D object to the object. ■ Predict the top, front, and side views that will result from a described rotation (limited to multiples of 90°) and verify predictions. ■ Draw and label the top, front, and side views that result from a rotation (limited to multiples of 90°). ■ Build a 3-D block object, given the top, front, and side views, with or without the use of technology. ■ Sketch and label the top, front, and side views of a 3-D object in the environment, with or without the use of technology.

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

Strand: Shape and Space (Transformations)	**General Learning Outcome:** Describe and analyze position and motion of objects and shapes.
Specific Learning 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.SS.6. Demonstrate an understanding of tessellation by ■ explaining the properties of shapes that make tessellating possible ■ creating tessellations ■ identifying tessellations in the environment [C, CN, PS, T, V]	■ Identify in a set of regular polygons those shapes and combinations of shapes that will tessellate, and use angle measurements to justify choices. ■ Identify in a set of irregular polygons those shapes and combinations of shapes that will tessellate, and use angle measurements to justify choices. ■ Identify a translation, reflection, or rotation in a tessellation. ■ Identify a combination of transformations in a tessellation. ■ Create a tessellation using one or more 2-D shapes, and describe the tessellation in terms of transformations and conservation of area. ■ Create a new tessellating shape (polygon or non-polygon) by transforming a portion of a tessellating polygon, and describe the resulting tessellation in terms of transformations and conservation of area. ■ Identify and describe tessellations in the environment.

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

Strand: Statistics and Probability (Data Analysis)	General Learning Outcome: Collect, display, and analyze data to solve problems.
Specific Learning 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.SP.1. Critique ways in which data are presented. [C, R, T, V]	▪ Compare the information that is provided for the same data set by a set of graphs, such as circle graphs, line graphs, bar graphs, double bar graphs, or pictographs, to determine the strengths and limitations of each graph. ▪ Identify the advantages and disadvantages of different graphs, such as circle graphs, line graphs, bar graphs, double bar graphs, or pictographs, in representing a specific set of data. ▪ Justify the choice of a graphical representation for a situation and its corresponding data set. ▪ Explain how a formatting choice, such as the size of the intervals, the width of bars, or the visual representation, may lead to misinterpretation of the data. ▪ Identify conclusions that are inconsistent with a data set or graph, and explain the misinterpretation.

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

Strand: Statistics and Probability (Chance and Uncertainty)	**General Learning Outcome:** Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.
Specific Learning 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.SP.2. Solve problems involving the probability of independent events. [C, CN, PS, T]	■ Determine the probability of two independent events and verify the probability using a different strategy. ■ Generalize and apply a rule for determining the probability of independent events. ■ Solve a problem that involves determining the probability of independent events.