

Grade 8

[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.

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Strand:
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Specific Learning Outcomes
It is expected that students will:

Achievement Indicators

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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).

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Strand: Number (<i>continued</i>)		General Learning Outcome: Develop number sense.
Specific Learning Outcomes <i>It is expected that students will:</i>		Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
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.

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Strand:
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It is expected that students will:

Achievement Indicators

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- 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).

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Strand: Number (<i>continued</i>)		General Learning Outcome: Develop number sense.
Specific Learning Outcomes <i>It is expected that students will:</i>		Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
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.

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Strand: Patterns and Relations (Patterns)	General Learning Outcome: Use patterns to describe the world and solve problems.
Specific Learning Outcomes <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
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.

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Strand: Patterns and Relations (Variables and Equations)		General Learning Outcome: Represent algebraic expressions in multiple ways.
Specific Learning Outcomes <i>It is expected that students will:</i>		Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
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.

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Strand: Shape and Space (Measurement)		General Learning Outcome: Use direct or indirect measurement to solve problems.
Specific Learning Outcomes <i>It is expected that students will:</i>		Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
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.

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Strand: Shape and Space (Measurement) <i>(continued)</i>		General Learning Outcome: Use direct or indirect measurement to solve problems.
Specific Learning Outcomes <i>It is expected that students will:</i>		Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
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.

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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 <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
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.

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Strand: Shape and Space (Transformations)	General Learning Outcome: Describe and analyze position and motion of objects and shapes.
Specific Learning Outcomes <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
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.

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Strand: Statistics and Probability (Data Analysis)		General Learning Outcome: Collect, display, and analyze data to solve problems.
Specific Learning Outcomes <i>It is expected that students will:</i>		Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
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.

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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 <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>	
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.	