

# Mathematics 8

*Curriculum Outcomes*

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## Title

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**Mathematics 8**  
**Curriculum Outcomes Framework**



# Mathematics 8

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

<b>Number (N)</b>	
<b>General Curriculum Outcome:</b> Students will be expected to develop number sense.	
<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b>
<p><b>N01</b> Students will be expected to demonstrate an understanding of perfect squares and square roots, concretely, pictorially, and symbolically (limited to whole numbers). [C, CN, R, V]</p>	<p>Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.</p> <p>N01.01 Represent a given perfect square as a square region, using materials such as grid paper or square shapes.</p> <p>N01.02 Determine the factors of a given perfect square, and explain why one of the factors is the square root and the others are not.</p> <p>N01.03 Determine whether or not a given number is a perfect square, using materials and strategies such as square shapes, grid paper or prime factorization, and explain the reasoning.</p> <p>N01.04 Determine the square root of a given perfect square, and record it symbolically.</p> <p>N01.05 Determine the square of a given number.</p>
<p><b>N02</b> Students will be expected to determine the approximate square root of numbers that are not perfect squares (limited to whole numbers). [C, CN, ME, R, T]</p>	<p>N02.01 Estimate the square root of a given number that is not a perfect square, using materials such as square shapes and graph paper and strategies such as using the roots of perfect squares as benchmarks.</p> <p>N02.02 Approximate the square root of a given number that is not a perfect square using technology (e.g., a calculator or a computer).</p> <p>N02.03 Explain why the square root of a number shown on a calculator may be an approximation.</p> <p>N02.04 Identify a number with a square root that is between two given numbers.</p>

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<b>Number (N)</b>	
<b>General Curriculum Outcome:</b> Students will be expected to develop number sense.	
<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b> Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.
<p><b>N03</b> Students will be expected to demonstrate an understanding of and solve problems involving percents greater than or equal to 0%.</p> <p>[CN, ME, PS, R, V]</p>	<p>N03.01 Provide contexts where a percent may be between 0% and 1%, between 1% and 100%, and more than 100%.</p> <p>N03.02 Represent a given fractional percent using concrete materials and pictorial representations.</p> <p>N03.03 Represent a given percent greater than 100% using concrete materials and pictorial representations.</p> <p>N03.04 Determine the percent represented by a given shaded region on a grid, and record it in decimal, fraction, and percent form.</p> <p>N03.05 Express a given percent in decimal or fraction form.</p> <p>N03.06 Express a given decimal in percent or fraction form.</p> <p>N03.07 Express a given fraction in decimal or percent form.</p> <p>N03.08 Solve a given problem involving percents mentally, with pencil and paper, or with technology, as appropriate.</p> <p>N03.09 Solve a given problem that involves finding the percent of a percent.</p>

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<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b> Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.
<b>N04</b> Students will be expected to demonstrate an understanding of ratio and rate. [C, CN, V]	<p>N04.01 Explain the multiplicative relationship found within a ratio.</p> <p>N04.02 Represent a two-term ratio from a given context concretely and pictorially and record using the forms 3:5 or 3 to 5.</p> <p>N04.03 Express a three-term ratio from a given context in the forms 4:7:3 or 4 to 7 to 3.</p> <p>N04.04 Express a part-to-part ratio as a part-to-whole fraction.</p> <p>N04.05 Identify and describe ratios and rates (including unit rates) from real-life examples and record them symbolically.</p> <p>N04.06 Express a given rate using words or symbols.</p> <p>N04.07 Express a given ratio as a percent, and explain why a rate cannot be represented as a percent.</p>

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<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b>
<p><b>N05</b> Students will be expected to solve problems that involve rates, ratios, and proportional reasoning. [C, CN, ME, PS, R]</p>	<p>Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.</p> <p>N05.01 Explain the meaning of <math>\frac{a}{b}</math> within a given context.</p> <p>N05.02 Provide a context in which <math>\frac{a}{b}</math> represents a fraction, a rate, a ratio, a quotient, and a probability.</p> <p>N05.03 Use pictures, models, or manipulatives to make sense of a proportional situation.</p> <p>N05.04 Differentiate between proportional and non-proportional contexts.</p> <p>N05.05 Use multiplicative relationships to compare quantities and to predict the value of one quantity based on the values of another.</p> <p>N05.06 Use multiple methods to solve proportional tasks and understand that these methods are related to each other.</p> <p>N05.07 Use estimation to determine the reasonableness of an answer.</p> <p>N05.08 Solve a proportion using mental mathematics, pencil and paper, or technology, as appropriate.</p> <p>N05.09 Solve a given problem involving rate, ratio, or percent using mental mathematics, pencil and paper, or technology, as appropriate.</p> <p>N05.10 Create problems that are examples of proportional reasoning.</p>



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<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b>
<p><b>N06</b> Students will be expected to demonstrate an understanding of multiplying and dividing positive fractions and mixed numbers, concretely, pictorially, and symbolically. [C, CN, ME, PS]</p>	<p>Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.</p> <p>N06.01 Identify the operation required to solve a given problem involving positive fractions.</p> <p>N06.02 Provide a context that requires the multiplying of two given positive fractions.</p> <p>N06.03 Provide a context that requires the dividing of two given positive fractions.</p> <p>N06.04 Estimate the product of two given positive proper fractions to determine if the product will be closer to 0, <math>\frac{1}{2}</math>, or 1.</p> <p>N06.05 Estimate the quotient of two given positive fractions, and compare the estimate to whole number benchmarks.</p> <p>N06.06 Express a given positive mixed number as an improper fraction and a given positive improper fraction as a mixed number.</p> <p>N06.07 Model multiplication of a positive fraction by a whole number concretely and/or pictorially and record the process.</p> <p>N06.08 Model multiplication of a positive fraction by a positive fraction concretely and/or pictorially, using an area model, and record the process.</p> <p>N06.09 Model division of a positive proper fraction by a whole number concretely and/or pictorially and record the process.</p> <p>N06.10 Model division of a whole number by a positive proper fraction concretely and/or pictorially, using an area model, and record the process.</p> <p>N06.11 Model division of a positive proper fraction by a positive proper fraction pictorially and record the process.</p>

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<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b>
<b>N06</b> (Continued)	<p>Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.</p> <p>N06.12 Generalize and apply rules for multiplying and dividing positive fractions, including mixed numbers.</p> <p>N06.13 Symbolically solve a given problem involving positive fractions, taking into consideration order of operations (limited to problems with positive solutions and that exclude exponents).</p>
<b>N07</b> Students will be expected to demonstrate an understanding of multiplication and division of integers, concretely, pictorially, and symbolically. [C, CN, PS, R, V]	<p>N07.01 Identify the operation required to solve a given problem involving integers.</p> <p>N07.02 Provide a context that requires multiplying two integers.</p> <p>N07.03 Provide a context that requires dividing two integers.</p> <p>N07.04 Model the process of multiplying two integers, using concrete materials or pictorial representations, and record the process.</p> <p>N07.05 Model the process of dividing an integer by an integer, using concrete materials and/or pictorial representations, and record the process.</p> <p>N07.06 Generalize and apply a rule for determining the sign of the product and quotient of integers.</p> <p>N07.07 Solve a given problem involving the division of integers (two-digit by one-digit) without the use of technology.</p> <p>N07.08 Solve a given problem involving the division of integers (two-digit by two-digit) mentally or with the use of technology, where appropriate.</p> <p>N07.09 Symbolically solve a given problem involving integers, taking into consideration order of operations when necessary.</p>

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<b>Patterns and Relations (PR)</b>	
<b>General Curriculum Outcomes:</b>	
Students will be expected to use patterns to describe the world and to solve problems. Students will be expected to represent algebraic expressions in multiple ways.	
<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b>
<p><b>PR01</b> Students will be expected to graph and analyze two-variable linear relations. [C, ME, PS, R, T, V]</p>	<p>Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.</p> <p>PR01.01 Determine the missing value in an ordered pair for a given equation.</p> <p>PR01.02 Create a table of values by substituting values for a variable in the equation of a given linear relation.</p> <p>PR01.03 Construct a graph from the equation of a given linear relation (limited to discrete data).</p> <p>PR01.04 Describe the relationship between the variables of a given graph.</p>
<p><b>PR02</b> Students will be expected to model and solve problems, concretely, pictorially, and symbolically, where <math>a</math>, <math>b</math>, and <math>c</math> are integers, using linear equations of the form</p> <ul style="list-style-type: none"> <li>▪ <math>ax = b</math></li> <li>▪ <math>\frac{x}{a} = b, a \neq 0</math></li> <li>▪ <math>ax + b = c</math></li> <li>▪ <math>\frac{x}{a} + b = c, a \neq 0</math></li> <li>▪ <math>a(x + b) = c</math></li> </ul> <p>[C, CN, PS, V]</p>	<p>PR02.01 Model a given problem with a linear equation, and solve the equation using concrete models.</p> <p>PR02.02 Verify the solution to a given linear equation, using a variety of methods, including concrete materials, diagrams, and substitution.</p> <p>PR02.03 Draw a visual representation of the steps used to solve a given linear equation, and record each step symbolically.</p> <p>PR02.04 Solve a given linear equation symbolically.</p> <p>PR02.05 Identify and correct an error in a given incorrect solution of a linear equation.</p> <p>PR02.06 Apply the distributive property to solve a given linear equation.</p> <p>PR02.07 Solve a given problem, using a linear equation, and record the process.</p>

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<b>Measurement (M)</b>	
<b>General Curriculum Outcome:</b> Students will be expected to use direct or indirect measurement to solve problems.	
<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b> Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.
<b>M01</b> Students will be expected to develop and apply the Pythagorean theorem to solve problems. [CN, PS, R, T, V]	M01.01 Model and explain the Pythagorean theorem concretely, pictorially, or using technology. M01.02 Explain, using examples, that the Pythagorean theorem applies only to right triangles. M01.03 Determine whether or not a given triangle is a right triangle by applying the Pythagorean theorem. M01.04 Determine the measure of the third side of a right triangle, given the measures of the other two sides, to solve a given problem. M01.05 Solve a given problem that involves Pythagorean triples.
<b>M02</b> Students will be expected to draw and construct nets for 3-D objects. [C, CN, PS, V]	M02.01 Match a given net to the 3-D object it represents. M02.02 Construct a 3-D object from a given net. M02.03 Draw nets for a given right cylinder, right rectangular prism, and right triangular prism, and verify by constructing the 3-D objects from the nets. M02.04 Predict 3-D objects that can be created from a given net, and verify the prediction.
<b>M03</b> Students will be expected to determine the surface area of right rectangular prisms, right triangular prisms, and right cylinders to solve problems. [C, CN, PS, R, V]	M03.01 Explain, using examples, the relationship between the area of 2-D shapes and the surface area of a given 3-D object. M03.02 Identify all the faces of a given prism, including right rectangular and right triangular prisms. M03.03 Identify all the faces of a given right cylinder. M03.04 Describe and apply strategies for determining the surface area of a given right rectangular or right triangular prism. M03.05 Describe and apply strategies for determining the surface area of a given right cylinder. M03.06 Solve a given problem involving surface area.

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<b>Measurement (M)</b>	
<b>General Curriculum Outcome:</b> Students will be expected to use direct or indirect measurement to solve problems.	
<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b> Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.
<p><b>M04</b> Students will be expected to develop and apply formulas for determining the volume of right rectangular prisms, right triangular prisms, and right cylinders. [C, CN, PS, R, V]</p>	<p>M04.01 Determine the volume of a given right prism, given the area of the base.</p> <p>M04.02 Generalize and apply a rule for determining the volume of right cylinders.</p> <p>M04.03 Explain the connection between the area of the base of a given right 3-D object and the formula for the volume of the object.</p> <p>M04.04 Demonstrate that the orientation of a given 3-D object does not affect its volume.</p> <p>M04.05 Apply a formula to solve a given problem involving the volume of a right cylinder or a right prism.</p>

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## Geometry (G)

### General Curriculum Outcomes:

Students will be expected to describe the characteristics of 3-D objects and 2-D shapes and analyze the relationships among them.  
Students will be expected to describe and analyze position and motion of objects and shapes.

<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b>
<p><b>G01</b> Students will be expected to draw and interpret top, front, and side views of 3-D objects composed of right rectangular prisms. [C, CN, R, T, V]</p>	<p>Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.</p> <p>G01.01 Draw and label the top, front, and side views for a given 3-D object on isometric dot paper.</p> <p>G01.02 Compare different views of a given 3-D object to the object.</p> <p>G01.03 Predict the top, front, and side views that will result from a described rotation (limited to multiples of 90°), and verify predictions.</p> <p>G01.04 Draw and label the top, front, and side views that result from a given rotation (limited to multiples of 90°).</p> <p>G01.05 Build a 3-D block object given the top, front, and side views, with or without the use of technology.</p> <p>G01.06 Sketch and label the top, front, and side views of a 3-D object in the environment, with or without the use of technology.</p>

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## Geometry (G)

### General Curriculum Outcomes:

Students will be expected to describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.  
 Students will be expected to describe and analyze position and motion of objects and shapes.

<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b>
<p><b>G02</b> Students will be expected to demonstrate an understanding of the congruence of polygons under a transformation.            [CN, R, V]</p>	<p>Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.</p> <p>G02.01 Determine the coordinates of the vertices of an image following a given combination of transformations of the original figure.</p> <p>G02.02 Draw the original figure and determine the coordinates of its vertices, given the coordinates of the image's vertices and a description of the transformation (translation, rotation, reflection).</p>

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## Statistics and Probability (SP)

### General Curriculum Outcomes:

Students will be expected to collect, display, and analyze data to solve problems.

Students will be expected to use experimental or theoretical probabilities to represent and solve problems involving uncertainty.

<b>Specific Curriculum Outcomes</b>	<b>Performance Indicators</b>
<p><b>SP01</b> Students will be expected to critique ways in which data is presented. [C, R, T, V]</p>	<p>Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcomes.</p> <p>SP01.01 Compare information provided for the same data set by a given set of graphs, including circle graphs, line graphs, bar graphs, and pictographs, to determine the strengths and limitations of each graph.</p> <p>SP01.02 Identify the advantages and disadvantages of different graphs, including circle graphs, line graphs, bar graphs, and pictographs, in representing a given set of data.</p> <p>SP01.03 Justify the choice of a graphical representation for a given situation and its corresponding data set.</p> <p>SP01.04 Explain how the format of a given graph, such as the size of the intervals, the width of the bars, and the visual representation, may lead to misinterpretation of the data.</p> <p>SP01.05 Explain how a given formatting choice could misrepresent the data.</p> <p>SP01.06 Identify conclusions that are inconsistent with a given data set or graph, and explain the misinterpretation.</p>
<p><b>SP02</b> Students will be expected to solve problems involving the probability of independent events. [C, CN, PS, T]</p>	<p>SP02.01 Determine the probability of two given independent events, and verify the probability using a different strategy.</p> <p>SP02.02 Generalize and apply a rule for determining the probability of independent events.</p> <p>SP02.03 Solve a given problem that involves determining the probability of independent events.</p>