

Mathematics 8

Outcomes

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Mathematics Grade 8

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Mathematics Grade 8 Outcomes

N01 Students will be expected to demonstrate an understanding of perfect squares and square roots, concretely, pictorially, and symbolically (limited to whole numbers).

Performance Indicators:

- N01.01 Represent a given perfect square as a square region, using materials such as grid paper or square shapes.
- 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.
- 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.
- N01.04 Determine the square root of a given perfect square, and record it symbolically.
- N01.05 Determine the square of a given number.

N02 Students will be expected to determine the approximate square root of numbers that are not perfect squares (limited to whole numbers).

Performance Indicators:

- 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.
- 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).
- N02.03 Explain why the square root of a number shown on a calculator may be an approximation.
- N02.04 Identify a number with a square root that is between two given numbers.

N03 Students will be expected to demonstrate an understanding of and solve problems involving percents greater than or equal to 0%.

Performance Indicators:

- N03.01 Provide contexts where a percent may be between 0% and 1%, between 1% and 100%, and more than 100%.
- N03.02 Represent a given fractional percent using concrete materials and pictorial representations.
- N03.03 Represent a given percent greater than 100% using concrete materials and pictorial representations.
- N03.04 Determine the percent represented by a given shaded region on a grid, and record it in decimal, fraction, and percent form.
- N03.05 Express a given percent in decimal or fraction form.
- N03.06 Express a given decimal in percent or fraction form.
- N03.07 Express a given fraction in decimal or percent form.
- N03.08 Solve a given problem involving percents mentally, with pencil and paper, or with technology, as appropriate.
- N03.09 Solve a given problem that involves finding the percent of a percent.

N04 Students will be expected to demonstrate an understanding of ratio and rate.

Performance Indicators:

- N04.01 Explain the multiplicative relationship found within a ratio.
- 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.
- N04.03 Express a three-term ratio from a given context in the forms 4:7:3 or 4 to 7 to 3.
- N04.04 Express a part-to-part ratio as a part-to-whole fraction.
- N04.05 Identify and describe ratios and rates (including unit rates) from real-life examples and record them symbolically.
- N04.06 Express a given rate using words or symbols.
- N04.07 Express a given ratio as a percent, and explain why a rate cannot be represented as a percent.

N05 Students will be expected to solve problems that involve rates, ratios, and proportional reasoning.

Performance Indicators:

- N05.01 Explain the meaning of $\frac{a}{b}$ within a given context.
- N05.02 Provide a context in which $\frac{a}{b}$ represents a fraction, a rate, a ratio, a quotient, and a probability.
- N05.03 Use pictures, models, or manipulatives to make sense of a proportional situation.
- N05.04 Differentiate between proportional and non-proportional contexts.
- N05.05 Use multiplicative relationships to compare quantities and to predict the value of one quantity based on the values of another.
- N05.06 Use multiple methods to solve proportional tasks and understand that these methods are related to each other.
- N05.07 Use estimation to determine the reasonableness of an answer.
- N05.08 Solve a proportion using mental mathematics, pencil and paper, or technology, as appropriate.
- N05.09 Solve a given problem involving rate, ratio, or percent using mental mathematics, pencil and paper, or technology, as appropriate.
- N05.10 Create problems that are examples of proportional reasoning.

N06 Students will be expected to demonstrate an understanding of multiplying and dividing positive fractions and mixed numbers, concretely, pictorially, and symbolically.

Performance Indicators:

- N06.01 Identify the operation required to solve a given problem involving positive fractions.
- N06.02 Provide a context that requires the multiplying of two given positive fractions.
- N06.03 Provide a context that requires the dividing of two given positive fractions.
- N06.04 Estimate the product of two given positive proper fractions to determine if the product will be closer to 0, $\frac{1}{2}$, or 1.
- N06.05 Estimate the quotient of two given positive fractions, and compare the estimate to whole number benchmarks.
- N06.06 Express a given positive mixed number as an improper fraction and a given positive improper fraction as a mixed number.
- N06.07 Model multiplication of a positive fraction by a whole number concretely and/or pictorially and record the process.
- N06.08 Model multiplication of a positive fraction by a positive fraction concretely and/or pictorially, using an area model, and record the process.
- N06.09 Model division of a positive proper fraction by a whole number concretely and/or pictorially and record the process.
- 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.
- N06.11 Model division of a positive proper fraction by a positive proper fraction pictorially and record the process.
- N06.12 Generalize and apply rules for multiplying and dividing positive fractions, including mixed numbers.
- 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).

N07 Students will be expected to demonstrate an understanding of multiplication and division of integers, concretely, pictorially, and symbolically.

Performance Indicators:

- N07.01 Identify the operation required to solve a given problem involving integers.
- N07.02 Provide a context that requires multiplying two integers.
- N07.03 Provide a context that requires dividing two integers.
- N07.04 Model the process of multiplying two integers, using concrete materials or pictorial representations, and record the process.
- N07.05 Model the process of dividing an integer by an integer, using concrete materials and/or pictorial representations, and record the process.
- N07.06 Generalize and apply a rule for determining the sign of the product and quotient of integers.
- N07.07 Solve a given problem involving the division of integers (two-digit by one-digit) without the use of technology.
- 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.
- N07.09 Symbolically solve a given problem involving integers, taking into consideration order of operations when necessary.

PR01 Students will be expected to graph and analyze two-variable linear relations.

Performance Indicators:

PR01.01 Determine the missing value in an ordered pair for a given equation.

PR01.02 Create a table of values by substituting values for a variable in the equation of a given linear relation.

PR01.03 Construct a graph from the equation of a given linear relation (limited to discrete data).

PR01.04 Describe the relationship between the variables of a given graph.

PR02 Students will be expected to model and solve problems, concretely, pictorially, and symbolically, where a , b , and c are integers, using linear equations of the form $ax = b$; $x/a = b$, $a \neq 0$; $ax + b = c$; $x/a + b = c$, $a \neq 0$; $a(x + b) = c$

Performance Indicators:

PR02.01 Model a given problem with a linear equation, and solve the equation using concrete models.

PR02.02 Verify the solution to a given linear equation, using a variety of methods, including concrete materials, diagrams, and substitution.

PR02.03 Draw a visual representation of the steps used to solve a given linear equation, and record each step symbolically.

PR02.04 Solve a given linear equation symbolically.

PR02.05 Identify and correct an error in a given incorrect solution of a linear equation.

PR02.06 Apply the distributive property to solve a given linear equation.

PR02.07 Solve a given problem, using a linear equation, and record the process.

M01 Students will be expected to develop and apply the Pythagorean theorem to solve problems.

Performance Indicators:

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.

M02 Students will be expected to draw and construct nets for 3-D objects.

Performance Indicators:

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.

M03 Students will be expected to determine the surface area of right rectangular prisms, right triangular prisms, and right cylinders to solve problems.

Performance Indicators:

- 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.

M04 Students will be expected to develop and apply formulas for determining the volume of right rectangular prisms, right triangular prisms, and right cylinders.

Performance Indicators:

- M04.01 Determine the volume of a given right prism, given the area of the base.
- M04.02 Generalize and apply a rule for determining the volume of right cylinders.
- 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.
- M04.04 Demonstrate that the orientation of a given 3-D object does not affect its volume.
- M04.05 Apply a formula to solve a given problem involving the volume of a right cylinder or a right prism.

G01 Students will be expected to draw and interpret top, front, and side views of 3-D objects composed of right rectangular prisms.

Performance Indicators:

- G01.01 Draw and label the top, front, and side views for a given 3-D object on isometric dot paper.
- G01.02 Compare different views of a given 3-D object to the object.
- G01.03 Predict the top, front, and side views that will result from a described rotation (limited to multiples of 90°), and verify predictions.
- G01.04 Draw and label the top, front, and side views that result from a given rotation (limited to multiples of 90°).
- G01.05 Build a 3-D block object given the top, front, and side views, with or without the use of technology.
- 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.

SP01 Students will be expected to critique ways in which data is presented.

Performance Indicators:

- 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.
- 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.
- SP01.03 Justify the choice of a graphical representation for a given situation and its corresponding data set.
- 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.
- SP01.05 Explain how a given formatting choice could misrepresent the data.
- SP01.06 Identify conclusions that are inconsistent with a given data set or graph, and explain the misinterpretation.