Mathematics 6

Outcomes

NOVA SCOTIA
NOUVELLE-ÉCOSSE

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Mathematics Grade 6

Prepared by the Department of Education and Early Childhood Development

This is the most recent version of the current curriculum materials as used by teachers in Nova Scotia.

Mathematics Grade 6 Outcomes

N01 Students will be expected to demonstrate an understanding of place value for numbers greater than one million and less than one-thousandth.

Performance Indicators:

N01.01 Explain how the pattern of the place-value system (e.g., the repetition of ones, tens, and hundreds) makes it possible to read and write numerals for numbers of any magnitude.
N01.02 Describe the pattern of adjacent place positions moving from right to left and from left to right.
N01.03 Represent a given numeral using a place-value chart.
N01.04 Explain the meaning of each digit in a given numeral.
N01.05 Read a given numeral in several ways.
N01.06 Record, in standard form, numbers expressed orally, concretely, pictorially, or symbolically as expressions, in decimal notation, and in expanded notation, using proper spacing without commas.
N01.07 Express a given numeral in expanded notation and/or in decimal notation.
N01.08 Represent a given number using expressions.
N01.09 Represent a given number in a variety of ways, and explain how they are equivalent.
N01.10 Read and write given numerals in words.
N01.11 Compare and order numbers in a variety of ways.
N01.12 Establish personal referents for large numbers.
N01.13 Provide examples of where large whole numbers and small decimal numbers are used.

N02 Students will be expected to solve problems involving whole numbers and decimal numbers.

Performance Indicators:

N02.01 Determine whether technology, mental mathematics, or paper-and-pencil calculation is appropriate to solve a given problem and explain why.
N02.02 Identify which operation is necessary to solve a given problem and solve it.
N02.03 Determine the reasonableness of an answer.
N02.04 Estimate the solution and solve a given problem using an appropriate method (technology, mental mathematics, or paper-and-pencil calculation).
N02.05 Create problems involving large numbers and decimal numbers.
N02.06 Use technology, mental mathematics, or paper-and-pencil calculation to solve problems involving the addition, subtraction, multiplication, and division of whole numbers.
N02.07 Use technology, mental mathematics, or paper-and-pencil calculation to solve problems involving the addition and subtraction of decimal numbers.

N03 Students will be expected to demonstrate an understanding of factors and multiples by

- determining multiples and factors of numbers less than 100
- identifying prime and composite numbers
- solving problems using multiples and factors

Performance Indicators:

N03.01 Identify multiples for a given number and explain the strategy used to identify them.
N03.02 Determine all the whole number factors of a given number using arrays.
N03.03 Identify the factors for a given number and explain the strategy used (e.g., concrete or visual representations, repeated division by prime numbers, or factor trees).
N03.04 Provide an example of a prime number, and explain why it is a prime number.
N03.05 Provide an example of a composite number, and explain why it is a composite number.
N03.06 Sort a given set of numbers as prime and composite.
N03.07 Solve a given problem involving factors or multiples.
N03.08 Explain why 0 and 1 are neither prime nor composite.

N04 Students will be expected to relate improper fractions to mixed numbers and mixed numbers to improper fractions.

Performance Indicators:

N04.01 Demonstrate, using models, that a given improper fraction represents a number greater than 1.
N04.02 Express improper fractions as mixed numbers.
N04.03 Express mixed numbers as improper fractions.
N04.04 Place a given set of fractions, including mixed numbers and improper fractions, on a number line, and explain strategies used to determine position.
N04.05 Represent a given improper fraction using concrete, pictorial, and symbolic forms.
N04.06 Represent a given mixed number using concrete, pictorial, and symbolic forms.

N05 Students will be expected to demonstrate an understanding of ratio, concretely, pictorially, and symbolically.

Performance Indicators:

N05.01 Represent a given ratio concretely and pictorially.
N05.02 Write a ratio from a given concrete or pictorial representation.
N05.03 Express a given ratio in multiple forms, such as "three to five," 3:5, 3 to 5, or $\frac{3}{5}$.
N05.04 Identify and describe ratios from real-life contexts and record them symbolically.
N05.05 Explain the part-whole and part-part ratios of a set (e.g., For a group of three girls and five boys, explain the ratios 3:5, 3:8, and 5:8.).
N05.06 Solve a given problem involving ratio.
N05.07 Verify that two ratios are or are not equivalent using concrete materials.

N06 Students will be expected to demonstrate an understanding of percent (limited to whole numbers) concretely, pictorially, and symbolically.

Performance Indicators:

N06.01 Explain that "percent" means "out of 100."
N06.02 Explain that percent is a ratio out of 100.
N06.03 Represent a given percent concretely and pictorially.
N06.04 Record the percent displayed in a given concrete or pictorial representation.
N06.05 Express a given percent as a fraction and a decimal.
N06.06 Identify and describe percent from real-life contexts, and record them symbolically.
N06.07 Solve a given percent problem involving benchmarks of 25%, 50%, 75%, and 100%.

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

Performance Indicators:

N07.01 Extend a given number line by adding numbers less than 0 and explain the pattern on each side of 0.
N07.02 Place given integers on a number line and explain how integers are ordered.
N07.03 Describe contexts in which integers are used (e.g., on a thermometer).
N07.04 Compare two integers; represent their relationship using the symbols <, >, and =; and verify using a number line.
N07.05 Order given integers in ascending or descending order.

N08 Students will be expected to demonstrate an understanding of multiplication and division of decimals (one-digit whole number multipliers and one-digit natural number divisors).

Performance Indicators:

N08.01 Model the multiplication and division of decimals using concrete and visual representations.
N08.02 Predict products and quotients of decimals using estimation strategies.
N08.03 Place the decimal point in a product using front-end estimation (e.g., For 15.205 × 4, think 15m × 4, so the product is greater than 60.).
N08.04 Place the decimal point in a quotient using front-end estimation (e.g., For $25.83 ÷ 4, think 24 ÷ 4, so the quotient is greater than $6.).
N08.05 Use estimation to correct errors of decimal point placement in a given product or quotient without using paper and pencil.
N08.06 Create and solve story problems that involve multiplication and division of decimals using multipliers from 0 to 9 and divisors from 1 to 9.
N08.07 Solve a given problem, using a personal strategy, and record the process symbolically.

N09 Students will be expected to explain and apply the order of operations, excluding exponents, with and without technology (limited to whole numbers).

Performance Indicators:

N09.01 Demonstrate and explain, with examples, why there is a need to have a standardized order of operations.
N09.02 Apply the order of operations to solve multi-step problems with or without technology (e.g., computer, calculator).

PR01 Students will be expected to demonstrate an understanding of the relationships within tables of values to solve problems.

Performance Indicators:

PR01.01 Generate values in one column of a table of values, given values in the other column, and a pattern rule.
PR01.02 State, using mathematical language, the relationship in a given table of values.
PR01.03 Create a concrete or pictorial representation of the relationship shown in a table of values.
PR01.04 Predict the value of an unknown term using the relationship in a table of values, and verify the prediction.
PR01.05 Formulate a rule to describe the relationship between two columns of numbers in a table of values.
PR01.06 Identify missing terms in a given table of values.
PR01.07 Identify errors in a given table of values.
PR01.08 Describe the pattern within each column of a given table of values.
PR01.09 Create a table of values to record and reveal a pattern to solve a given problem.

PR02 Students will be expected to represent and describe patterns and relationships, using graphs and tables.

Performance Indicators:

PR02.01 Translate a pattern to a table of values, and graph the table of values (limited to linear graphs with discrete elements).
PR02.02 Create a table of values from a given pattern or a given graph.
PR02.03 Describe, using everyday language, orally or in writing, the relationship shown on a graph.

PR03 Students will be expected to represent generalizations arising from number relationships using equations with letter variables.

Performance Indicators:

SCO PR03 Students will be expected to represent generalizations arising from number relationships using equations with letter variables. [C, CN, PS, R, V]

PR03.01 Write and explain the formula for finding the perimeter of any regular polygon.
PR03.02 Write and explain the formula for finding the area of any given rectangle.
PR03.03 Develop and justify equations using letter variables that illustrate the commutative property of addition and multiplication (e.g., $a + b = b + a$ or $a \times b = b \times a$).
PR03.04 Describe the relationship in a given table using a mathematical expression.
PR03.05 Represent a pattern rule using a simple mathematical expression, such as $4d$ or $2n + 1$.

PR04 Students will be expected to demonstrate and explain the meaning of preservation of equality concretely, pictorially, and symbolically.

Performance Indicators:

PR04.01 Model the preservation of equality for addition using concrete materials, such as a balance, or using pictorial representations, and orally explain the process.
PR04.02 Model the preservation of equality for subtraction using concrete materials, such as a balance, or using pictorial representations, and orally explain the process.
PR04.03 Model the preservation of equality for multiplication using concrete materials, such as a balance, or using pictorial representations, and orally explain the process.
PR04.04 Model the preservation of equality for division using concrete materials, such as a balance, or using pictorial representations, and orally explain the process.
PR04.05 Write equivalent forms of a given equation by applying the preservation of equality and verify using concrete materials (e.g., $3b = 12$ is the same as $3b + 5 = 12 + 5$ or $2r = 7$ is the same as $3(2r) = 3(7)$).

M01 Students will be expected to demonstrate an understanding of angles by

- identifying examples of angles in the environment
- classifying angles according to their measure
- estimating the measure of angles using 45°, 90°, and 180° as reference angles
- determining angle measures in degrees
- drawing and labelling angles when the measure is specified

Performance Indicators: all indicators

M01.01 Identify examples of angles found in the environment.
M01.02 Classify a given set of angles according to their measure (e.g., acute, right, obtuse, straight, reflex).
M01.03 Sketch 45°, 90°, and 180° angles without the use of a protractor, and describe the relationship among them.
M01.04 Estimate the measure of an angle using 45°, 90°, and 180° as reference angles.
M01.05 Measure, using a protractor, given angles in various orientations.
M01.06 Draw and label a specified angle in various orientations using a protractor.
M01.07 Describe the measure of an angle as the measure of rotation of one of its sides.
M01.08 Describe the measure of angles as the measure of an interior angle of a polygon.

M02 Students will be expected to demonstrate that the sum of interior angles is 180° in a triangle and 360° in a quadrilateral.

Performance Indicators:

M02.01 Explain, using models, that the sum of the interior angles of a triangle is the same for all triangles.
M02.02 Explain, using models, that the sum of the interior angles of a quadrilateral is the same for all quadrilaterals.

M03 Students will be expected to develop and apply a formula for determining the

- perimeter of polygons
- area of rectangles
- volume of right rectangular prisms

Performance Indicators:

M03.01 Explain, using models, how the perimeter of any polygon can be determined.
M03.02 Generalize a rule (formula) for determining the perimeter of polygons.
M03.03 Explain, using models, how the area of any rectangle can be determined.
M03.04 Generalize a rule (formula) for determining the area of rectangles.
M03.05 Explain, using models, how the volume of any rectangular prism can be determined.
M03.06 Generalize a rule (formula) for determining the volume of rectangular prisms.
M03.07 Solve a given problem involving the perimeter of polygons, the area of rectangles, and/or the volume of right rectangular prisms.

G01 Students will be expected to construct and compare triangles, including scalene, isosceles, equilateral, right, obtuse, or acute in different orientations.

Performance Indicators:

G01.01 Sort a given set of triangles according to the length of the sides.
G01.02 Sort a given set of triangles according to the measures of the interior angles.
G01.03 Identify the characteristics of a given set of triangles according to their sides and/or their interior angles.
G01.04 Sort a given set of triangles and explain the sorting rule.
G01.05 Draw a specified triangle.
G01.06 Replicate a given triangle in a different orientation and show that the two are congruent.

G03 Students will be expected to perform a combination of translation(s), rotation(s), and/or reflection(s) on a single 2-D shape, with and without technology, and draw and describe the image.

Performance Indicators:

G03.01 Demonstrate that a 2-D shape and its transformation image are congruent.
G03.02 Model a given set of successive translations, successive rotations, or successive reflections of a 2-D shape.
G03.03 Model a given combination of two different types of transformations of a 2-D shape.
G03.04 Draw and describe a 2-D shape and its image, given a combination of transformations.
G03.05 Describe the transformations performed on a 2-D shape to produce a given image.
G03.06 Model a given set of successive transformations (translation, rotation, or reflection) of a 2-D shape.
G03.07 Perform and record one or more transformations of a 2-D shape that will result in a given image.

G04 Students will be expected to perform a combination of successive transformations of 2-D shapes to create a design and identify and describe the transformations.

Performance Indicators:

G04.01 Analyze a given design created by transforming one or more 2-D shapes, and identify the original shape and the transformations used to create the design.
G04.02 Create a design using one or more 2-D shapes and describe the transformations used.
G04.03 Describe why a shape may or may not tessellate.
G04.04 Create a tessellation and describe how tessellations are used in the real world.

G05 Students will be expected to identify and plot points in the first quadrant of a Cartesian plane using whole number ordered pairs.

Performance Indicators:

G05.01 Label the axes of the first quadrant of a Cartesian plane and identify the origin.
G05.02 Plot a point in the first quadrant of a Cartesian plane given its ordered pair.
G05.03 Match points in the first quadrant of a Cartesian plane with their corresponding ordered pair.
G05.04 Plot points in the first quadrant of a Cartesian plane with intervals of 1, 2, 5, or 10 on its axes, given whole number ordered pairs.
G05.05 Draw shapes or designs in the first quadrant of a Cartesian plane, using given ordered pairs.
G05.06 Determine the distance between points along horizontal and vertical lines in the first quadrant of a Cartesian plane.
G05.07 Draw shapes or designs in the first quadrant of a Cartesian plane, and identify the points used to produce them.

G06 Students will be expected to perform and describe single transformations of a 2-D shape in the first quadrant of a Cartesian plane (limited to whole number vertices).

Performance Indicators:

G06.01 Identify the coordinates of the vertices of a given 2-D shape (limited to the first quadrant of a Cartesian plane).
G06.02 Perform a transformation on a given 2-D shape, and identify the coordinates of the vertices of the image (limited to the first quadrant).
G06.03 Describe the positional change of the vertices of a given 2-D shape to the corresponding vertices of its image as a result of a transformation (limited to first quadrant).

SP01 Students will be expected to create, label, and interpret line graphs to draw conclusions.

Performance Indicators:

SP01.01 Determine the common attributes (title, axes, and intervals) of line graphs by comparing a given set of line graphs.
SP01.02 Determine whether a given set of data can be represented by a line graph (continuous data) or a series of points (discrete data) and explain why.
SP01.03 Create a line graph from a given table of values or a set of data.
SP01.04 Interpret a given line graph to draw conclusions.

SP02 Students will be expected to select, justify, and use appropriate methods of collecting data, including questionnaires, experiments, databases, and electronic media.

Performance Indicators:

SP02.01 Select a method for collecting data to answer a given question, and justify the choice.
SP02.02 Design and administer a questionnaire for collecting data to answer a given question, and record the results.
SP02.03 Answer a given question by performing an experiment, recording the results, and drawing a conclusion.
SP02.04 Explain when it is appropriate to use a database as a source data.
SP02.05 Gather data for a given question by using electronic media, including selecting data from databases.

SP04 Students will be expected to demonstrate an understanding of probability by

- identifying all possible outcomes of a probability experiment
- differentiating between experimental and theoretical probability
- determining the theoretical probability of outcomes in a probability experiment
- determining the experimental probability of outcomes in a probability experiment
- comparing experimental results with the theoretical probability for an experiment

Performance Indicators:

SP04.01 List the possible outcomes of a probability experiment, such as
  - tossing a coin
  - rolling a die with a given number of sides
  - spinning a spinner with a given number of sectors

SP04.02 Determine the theoretical probability of an outcome occurring for a given probability experiment.
SP04.03 Predict the probability of a given outcome occurring for a given probability experiment by using theoretical probability.
SP04.04 Conduct a probability experiment, with or without technology, and compare the experimental results to the theoretical probability.
SP04.05 Explain that as the number of trials in a probability experiment increases, the experimental probability approaches the theoretical probability of a particular outcome.
SP04.06 Distinguish between theoretical probability and experimental probability, and explain the differences.