Mathematics 11

Outcomes

NOVA SCOTIA
NOUVELLE-ÉCOSSE

2015

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Mathematics 11

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 11

General Curriculum Outcomes

Students will be expected to
- develop spatial sense and proportional reasoning
- develop spatial sense
- develop logical reasoning
- develop statistical reasoning
- develop algebraic and graphical reasoning through the study of relations

Specific Curriculum Outcomes

Performance indicators are samples of how students may demonstrate their performance of the goals of a specific curriculum outcome. The range of samples provided is meant to reflect the scope of the SCO. In the SCOs, the word **including** indicates that any ensuing items *must* be addressed to fully achieve the learning outcome. The phrase **such as** indicates that the ensuing items are provided for clarification only and are *not* requirements that must be addressed to fully achieve the learning outcome. The word **and** used in an outcome indicates that both ideas must be addressed to achieve the learning outcome, although not necessarily at the same time or in the same question.

Process Standards Key

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

Measurement (M) (15–20 hours)

M01 Students will be expected to solve problems that involve the application of rates.

Performance Indicators

M01.01 Interpret rates in a given context, such as the arts, commerce, the environment, medicine, or recreation.
M01.02 Solve a rate problem that requires the isolation of a variable.
M01.03 Determine and compare rates and unit rates.
M01.04 Make and justify a decision using rates.
M01.05 Represent a given rate pictorially.
M01.06 Draw a graph to represent a rate.
M01.07 Explain, using examples, the relationship between the slope of a graph and a rate.
M01.08 Describe a context for a given rate or unit rate.
M01.09 Identify and explain factors that influence a rate in a given context.
M01.10 Solve a contextual problem that involves rates or unit rates.

M02 Students will be expected to solve problems that involve scale diagrams, using proportional reasoning.

Performance Indicators

M02.01 Explain, using examples, how scale diagrams are used to model a 2-D shape or a 3-D object.
M02.02 Determine, using proportional reasoning, the scale factor, given one dimension of a 2-D shape or a 3-D object and its representation.
M02.03 Determine, using proportional reasoning, an unknown dimension of a 2-D shape or a 3-D object, given a scale diagram or a model.
M02.04 Draw, with or without technology, a scale diagram of a given 2-D shape according to a specified scale factor (enlargement or reduction).
M02.05 Solve a contextual problem that involves scale diagrams.

M03 Students will be expected to demonstrate an understanding of the relationships among scale factors, areas, surface areas, and volumes of similar 2-D shapes and 3-D objects.

Performance Indicators

M03.01 Determine the area of a 2-D shape, given the scale diagram, and justify the reasonableness of the result.
M03.02 Determine the surface area and volume of a 3-D object, given the scale diagram, and justify the reasonableness of the result.
M03.03 Explain, using examples, the effect of a change in the scale factor on the area of a 2-D shape.
M03.04 Explain, using examples, the effect of a change in the scale factor on the surface area of a 3-D object.
M03.05 Explain, using examples, the effect of a change in the scale factor on the volume of a 3-D object.
M03.06 Explain, using examples, the relationships among scale factor, area of a 2-D shape, surface area of a 3-D object and volume of a 3-D object.
M03.07 Solve a spatial problem that requires the manipulation of formulas.
M03.08 Solve a contextual problem that involves the relationships among scale factors, areas, and volumes.

Geometry (G) (20–25 hours)

G01 Students will be expected to derive proofs that involve the properties of angles and triangles.

Performance Indicators

G01.01 Generalize, using inductive reasoning, the relationships between pairs of angles formed by transversals and parallel lines, with or without technology.
G01.02 Prove, using deductive reasoning, properties of angles formed by transversals and parallel lines, including the sum of the angles in a triangle.
G01.03 Generalize, using inductive reasoning, a rule for the relationship between the sum of the interior angles and the number of sides (n) in a polygon, with or without technology.
G01.04 Identify and correct errors in a given proof of a property involving angles.
G01.05 Verify, with examples, that if lines are not parallel the angle properties do not apply.
G01.06 Verify, through investigation, the minimum conditions that make a triangle unique.

G02 Students will be expected to solve problems that involve the properties of angles and triangles.

Performance Indicators

G02.01 Determine the measures of angles in a diagram that involves parallel lines, angles, and triangles and justify the reasoning.
G02.02 Identify and correct errors in a given solution to a problem that involves the measures of angles.
G02.03 Solve a contextual problem that involves angles or triangles.
G02.04 Construct parallel lines, using only a compass and straight edge or a protractor and straight edge, and explain the strategy used.
G02.05 Determine if lines are parallel, given the measure of an angle at each intersection formed by the lines and a transversal.

G03 Students will be expected to solve problems that involve the cosine law and the sine law, including the ambiguous case.

Performance Indicators

G03.01 Draw a diagram to represent a problem that involves the cosine law and/or sine law.
G03.02 Explain the steps in a given proof of the sine law and of the cosine law.
G03.03 Solve a problem involving the cosine law that requires the manipulation of a formula.
G03.04 Explain, concretely, pictorially or symbolically, whether zero, one or two triangles exist, given two sides and a non-included angle.
G03.05 Solve a problem involving the sine law that requires the manipulation of a formula.
G03.06 Solve a contextual problem that involves the cosine law and/or the sine law.

Logical Reasoning (LR) (10 hours)

LR01 Students will be expected to analyze and prove conjectures, using inductive and deductive reasoning, to solve problems.

Performance Indicators

LR01.01 Make conjectures by observing patterns and identifying properties, and justify the reasoning.
LR01.02 Explain why inductive reasoning may lead to a false conjecture.
LR01.03 Compare, using examples, inductive and deductive reasoning.
LR01.04 Provide and explain a counterexample to disprove a given conjecture.
LR01.05 Prove algebraic and number relationships, such as divisibility rules, number properties, mental mathematics strategies, or algebraic number puzzles.
LR01.06 Prove a conjecture, using deductive reasoning (not limited to two column proofs).
LR01.07 Determine if an argument is valid and justify the reasoning.
LR01.08 Identify errors in a given proof.
LR01.09 Solve a contextual problem involving inductive or deductive reasoning.

LR02 Students will be expected to analyze puzzles and games that involve spatial reasoning, using problem-solving strategies.

Performance Indicators

LR02.01 Determine, explain and verify a strategy to solve a puzzle or to win a game; for example,
- guess and check
- look for a pattern
- make a systematic list
- draw or model
- eliminate possibilities
- simplify the original problem
- work backward
- develop alternative approaches

LR02.02 Identify and correct errors in a solution to a puzzle or in a strategy for winning a game.

LR02.03 Create a variation on a puzzle or a game, and describe a strategy for solving the puzzle or winning the game.

Statistics (S) (20–25 hours)

S01 Students will be expected to demonstrate an understanding of normal distribution, including standard deviation and *z*-scores.

Performance Indicators

S01.01 Explain, using examples, the meaning of standard deviation.

S01.02 Calculate, using technology, the population standard deviation of a data set.

S01.03 Explain, using examples, the properties of a normal curve, including the mean, median, mode, standard deviation, symmetry, and area under the curve.

S01.04 Determine if a data set approximates a normal distribution and explain the reasoning.

S01.05 Compare the properties of two or more normally distributed data sets.

S01.06 Explain, using examples that represent multiple perspectives, the application of standard deviation for making decisions in situations such as warranties, insurance, or opinion polls.

S01.07 Solve a contextual problem that involves the interpretation of standard deviation.

S01.08 Determine, with or without technology, and explain the *z*-score for a given value in a normally distributed data set.

S01.09 Solve a contextual problem that involves normal distribution.

S02 Students will be expected to interpret statistical data, using confidence intervals, confidence levels, and margin of error.

Performance Indicators

(It is intended that the focus of this outcome be on interpretation of data rather than on statistical calculations.)

S02.01 Explain, using examples, how confidence levels, margin of error, and confidence intervals may vary depending on the size of the random sample.

S02.02 Explain, using examples, the significance of a confidence interval, margin of error, or confidence level.

S02.03 Make inferences about a population from sample data, using given confidence intervals, and explain the reasoning.

S02.04 Provide examples from print or electronic media in which confidence intervals and confidence levels are used to support a particular position.

S02.05 Interpret and explain confidence intervals and margin of error, using examples found in print or electronic media.
S02.06 Support a position by analyzing statistical data presented in the media.

S03 Students will be expected to critically analyze society's use of inferential statistics.

Performance Indicators
S03.01 Investigate examples of the use of inferential statistics in society.
S03.02 Assess the accuracy, reliability, and relevance of statistical claims by
- identifying examples of bias and points of view
- identifying and describing the data collection methods
- determining if the data is relevant

S03.03 Identify, discuss, and present multiple sides of the issues with supporting data.

Relations and Functions (RF) (30–35 hours)

RF01 Students will be expected to model and solve problems that involve systems of linear inequalities in two variables.

Performance Indicators
RF01.01 Model a problem, using a system of linear inequalities in two variables.
RF01.02 Graph the boundary line between two half planes for each inequality in a system of linear inequalities, and justify the choice of solid or broken lines.
RF01.03 Determine and explain the solution region that satisfies a linear inequality, using a test point when given a boundary line.
RF01.04 Determine, graphically, the solution region for a system of linear inequalities, and verify the solution.
RF01.05 Explain, using examples, the significance of the shaded region in the graphical solution of a system of linear inequalities.
RF01.06 Solve an optimization problem, using linear programming.

RF02 Students will be expected to demonstrate an understanding of the characteristics of quadratic functions, including vertex, intercepts, domain and range, and axis of symmetry.

Performance Indicators
(It is intended that completion of the square not be required.)
RF02.01 Determine, with or without technology, the intercepts of the graph of a quadratic function.
RF02.02 Determine, by factoring, the roots of a quadratic equation, and verify by substitution.
RF02.03 Determine, using the quadratic formula, the roots of a quadratic equation.
RF02.04 Explain the relationships among the roots of an equation, the zeros of the corresponding function, and the x-intercepts of the graph of the function.
RF02.05 Explain, using examples, why the graph of a quadratic function may have zero, one, or two *x*-intercepts.
RF02.06 Express a quadratic equation in factored form, using the zeros of a corresponding function or the *x*-intercepts of its graph.
RF02.07 Determine, with or without technology, the coordinates of the vertex of the graph of a quadratic function.
RF02.08 Determine the equation of the axis of symmetry of the graph of a quadratic function, given *x*-intercepts of the graph.

RF02.09 Determine the coordinates of the vertex of the graph of a quadratic function, given the equation of the function and the axis of symmetry, and determine if the *y*-coordinate of the vertex is a maximum or a minimum.

RF02.10 Determine the domain and range of a quadratic function.

RF02.11 Sketch the graph of a quadratic function.

RF02.12 Solve a contextual problem that involves the characteristics of a quadratic function.