Math 10 Specific Curriculum Outcomes (SCOs) and Performance Indicators

Specific curriculum outcomes are statements that identify specific concepts and related skills underpinned by the understanding and knowledge attained by students as expected for a given grade. 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.

MEASUREMENT (M)

M01 Students will be expected to solve problems that involve linear measurement, using SI and imperial units of measure, estimation strategies, and measurement strategies.

Performance Indicators
M01.01 Provide referents for linear measurements, including millimetre, centimetre, metre, kilometre, inch, foot, yard, and mile, and explain the choices.
M01.02 Compare SI and imperial units, using referents.
M01.03 Estimate a linear measure, using a referent, and explain the process used.
M01.04 Justify the choice of units used for determining a measurement in a problem-solving context.
M01.05 Solve problems that involve linear measure, using instruments such as rulers, calipers, or tape measures.
M01.06 Describe and explain a personal strategy used to determine a linear measurement (e.g., circumference of a bottle, length of a curve, and perimeter of the base of an irregular 3-D object).

M02 Students will be expected to apply proportional reasoning to problems that involve conversions between SI and imperial units of measure.

Performance Indicators
M02.01 Explain how proportional reasoning can be used to convert a measurement within or between
SI and imperial systems.
M02.02 Solve a problem that involves the conversion of units within or between SI and imperial systems.
M02.03 Verify, using unit analysis, a conversion within or between SI and imperial systems, and explain the conversion.
M02.04 Justify, using mental mathematics, the reasonableness of a solution to a conversion problem.

M03 Students will be expected to solve problems, using SI and imperial units, that involve the surface area and volume of 3-D objects, including right cones, right cylinders, right prisms, right pyramids, and spheres.

Performance Indicators
M03.01 Sketch a diagram to represent a problem that involves surface area or volume.
M03.02 Determine the surface area of a right cone, right cylinder, right prism, right pyramid, or sphere, using an object or its labelled diagram.
M03.03 Determine the volume of a right cone, right cylinder, right prism, right pyramid, or sphere, using an object or its labelled diagram.
M03.04 Determine an unknown dimension of a right cone, right cylinder, right prism, right pyramid, or sphere, given the object's surface area or volume and the remaining dimensions.
M03.05 Solve a problem that involves surface area or volume, given a diagram of a composite 3-D object.
M03.06 Describe the relationship between the volumes of right cones and right cylinders with the same base and height, and right pyramids and right prisms with the same base and height.

M04 Students will be expected to develop and apply the primary trigonometric ratios (sine, cosine, tangent) to solve problems that involve right triangles.

Performance Indicators
M04.01 Explain the relationships between similar right triangles and the definitions of the primary trigonometric ratios.
M04.02 Identify the hypotenuse of a right triangle and the opposite and adjacent sides for a given acute angle in the triangle.
M04.03 Solve right triangles, with or without technology.
M04.04 Solve a problem that involves one or more right triangles by applying the primary trigonometric ratios or the Pythagorean theorem.
M04.05 Solve a problem that involves indirect and direct measurement, using the trigonometric ratios, the Pythagorean theorem, and measurement instruments such as a clinometer or metre stick.

ALGEBRA AND NUMBER (AN)

AN01 Students will be expected to demonstrate an understanding of factors of whole numbers by determining the prime factors, greatest common factor, least common multiple, square root, and cube root.

Performance Indicators
AN01.01 Determine the prime factors of a whole number.
AN01.02 Explain why the numbers 0 and 1 have no prime factors.
AN01.03 Determine, using a variety of strategies, the greatest common factor or least common multiple of a set of whole numbers, and explain the process.
AN01.04 Determine, concretely, whether a given whole number is a perfect square, a perfect cube, or neither.
AN01.05 Determine, using a variety of strategies, the square root of a perfect square, and explain the process.
AN01.06 Determine, using a variety of strategies, the cube root of a perfect cube, and explain the process.
AN01.07 Solve problems that involve prime factors, greatest common factors, least common multiples, square roots, or cube roots.

AN02 Students will be expected to demonstrate an understanding of irrational numbers by representing, identifying, simplifying, and ordering irrational numbers.

Performance Indicators

AN02.01 Sort a set of numbers into rational and irrational numbers.

AN02.02 Determine an approximate value of a given irrational number.

AN02.03 Approximate the locations of irrational numbers on a number line, using a variety of strategies, and explain the reasoning.

AN02.04 Order a set of irrational numbers on a number line.

AN02.05 Express a radical as a mixed radical in simplest form (limited to numerical radicands).

AN02.06 Express a mixed radical as an entire radical (limited to numerical radicands).

AN02.07 Explain, using examples, the meaning of the index of a radical.

AN02.08 Represent, using a graphic organizer, the relationship among the subsets of the real numbers (natural, whole, integer, rational, irrational).

AN03 Students will be expected to demonstrate an understanding of powers with integral and rational exponents.

Performance Indicators

AN03.01 Explain, using patterns, why $a^{-n} = \dfrac{1}{a^n}$, $a \neq 0$.

AN03.02 Explain, using patterns, why $a^{\frac{1}{n}} = \sqrt[n]{a}$, $n > 0$.

AN03.03 Apply the following exponent laws to expressions with rational and variable bases and integral and rational exponents, and explain the reasoning.

- $(a^m)(a^n) = a^{m+n}$
- $a^m \div a^n = a^{m-n}$, $a \neq 0$.
- $(am)^n = a^{mn}$
- $(ab)^m = a^m b^m$
- $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$, $b \neq 0$

AN03.04 Express powers with rational exponents as radicals and vice versa, when m and n are natural numbers, and x is a rational number.

$$x^{\frac{m}{n}} = \left(x^{\frac{1}{n}}\right)^m = \sqrt[n]{x}\,^m \quad \text{and} \quad x^{\frac{m}{n}} = x^m\,^{\frac{1}{n}} = \sqrt[n]{x^m}$$

AN03.05 Solve a problem that involves exponent laws or radicals.

AN03.06 Identify and correct errors in a simplification of an expression that involves powers.

AN04 Students will be expected to demonstrate an understanding of the multiplication of polynomial expressions (limited to monomials, binomials, and trinomials), concretely, pictorially, and symbolically.

Performance Indicators

AN04.01 Model the multiplication of two given binomials, concretely or pictorially, and record the process symbolically.

AN04.02 Relate the multiplication of two binomial expressions to an area model.

AN04.03 Explain, using examples, the relationship between the multiplication of binomials and the multiplication of two-digit numbers.
AN04.04 Verify a polynomial product by substituting numbers for the variables.
AN04.05 Multiply two polynomials symbolically, and combine like terms in the product.
AN04.06 Generalize and explain a strategy for multiplication of polynomials.
AN04.07 Identify and explain errors in a solution for a polynomial multiplication.

AN05 Students will be expected to demonstrate an understanding of common factors and trinomial factoring, concretely, pictorially, and symbolically.

Performance Indicators
AN05.01 Determine the common factors in the terms of a polynomial, and express the polynomial in factored form.
AN05.02 Model the factoring of a trinomial, concretely or pictorially, and record the process symbolically.
AN05.03 Factor a polynomial that is a difference of squares, and explain why it is a special case of trinomial factoring where $b = 0$.
AN05.04 Identify and explain errors in a polynomial factorization.
AN05.05 Factor a polynomial, and verify by multiplying the factors.
AN05.06 Explain, using examples, the relationship between multiplication and factoring of polynomials.
AN05.07 Generalize and explain strategies used to factor a trinomial.
AN05.08 Express a polynomial as a product of its factors.

RELATIONS AND FUNCTIONS (RF)
RF01 Students will be expected to interpret and explain the relationships among data, graphs, and situations.

Performance Indicators
RF01.01 Graph, with or without technology, a set of data, and determine the restrictions on the domain and range.
RF01.02 Explain why data points should or should not be connected on the graph for a situation.
RF01.03 Describe a possible situation for a given graph.
RF01.04 Sketch a possible graph for a given situation.
RF01.05 Determine, and express in a variety of ways, the domain and range of a graph, a set of ordered pairs, or a table of values.

RF02 Students will be expected to demonstrate an understanding of relations and functions.

Performance Indicators
RF02.01 Explain, using examples, why some relations are not functions, but all functions, are relations.
RF02.02 Determine if a set of ordered pairs represents a function.
RF02.03 Sort a set of graphs as functions or non-functions.
RF02.04 Generalize and explain rules for determining whether graphs and sets of ordered pairs represent functions.

RF03 Students will be expected to demonstrate an understanding of slope with respect to rise and run, line segments and lines, rate of change, parallel lines, and perpendicular lines.

Performance Indicators
RF03.01 Determine the slope of a line segment by measuring or calculating the rise and run.
RF03.02 Classify lines in a given set as having positive or negative slopes.
RF03.03 Explain the meaning of the slope of a horizontal or vertical line.
RF03.04 Explain why the slope of a line can be determined by using any two points on that line.
RF03.05 Explain, using examples, slope as a rate of change.
RF03.06 Draw a line, given its slope and a point on the line.
RF03.07 Determine another point on a line, given the slope and a point on the line.
RF03.08 Generalize and apply a rule for determining whether two lines are parallel or perpendicular.
RF03.09 Solve a contextual problem involving slope.

RF04 Students will be expected to describe and represent linear relations, using words, ordered pairs, tables of values, graphs, and equations.

Performance Indicators
RF04.01 Identify independent and dependent variables in a given context.
RF04.02 Determine whether a situation represents a linear relation, and explain why or why not.
RF04.03 Determine whether a graph represents a linear relation, and explain why or why not.
RF04.04 Determine whether a table of values or a set of ordered pairs represents a linear relation, and explain why or why not.
RF04.05 Draw a graph from a set of ordered pairs within a given situation, and determine whether the relationship between the variables is linear.
RF04.06 Determine whether an equation represents a linear relation, and explain why or why not.
RF04.07 Match corresponding representations of linear relations.

RF05 Students will be expected to determine the characteristics of the graphs of linear relations, including the intercepts, slope, domain, and range.

Performance Indicators
RF05.01 Determine the intercepts of the graph of a linear relation, and state the intercepts as values or ordered pairs.
RF05.02 Determine the slope of the graph of a linear relation.
RF05.03 Determine the domain and range of the graph of a linear relation.
RF05.04 Sketch a linear relation that has one intercept, two intercepts, or an infinite number of intercepts.
RF05.05 Identify the graph that corresponds to a given slope and y-intercept.
RF05.06 Identify the slope and y-intercept that correspond to a given graph.
RF05.07 Solve a contextual problem that involves intercepts, slope, domain, or range of a linear relation.

RF06 Students will be expected to relate linear relations to their graphs, expressed in
· slope-intercept form ($y = mx + b$)
· general form ($Ax + By + C = 0$)
· slope-point form ($y - y1) = m(x - x1)$)

Performance Indicators
RF06.01 Express a linear relation in different forms, and compare the graphs.
RF06.02 Rewrite a linear relation in either slope-intercept or general form.

RF06.03 Generalize and explain strategies for graphing a linear relation in slope-intercept, general, or slope-point form.
RF06.04 Graph, with and without technology, a linear relation given in slope-intercept, general, or slope-point form, and explain the strategy used to create the graph.
RF06.05 Identify equivalent linear relations from a set of linear relations.
RF06.06 Match a set of linear relations to their graphs.
RF07 Students will be expected to determine the equation of a linear relation to solve problems, given a graph, a point and the slope, two points, and a point and the equation of a parallel or perpendicular line.

Performance Indicators
RF07.01 Determine the slope and y-intercept of a given linear relation from its graph, and write the equation in the form $y = mx + b$.
RF07.02 Write the equation of a linear relation, given its slope and the coordinates of a point on the line, and explain the reasoning.
RF07.03 Write the equation of a linear relation, given the coordinates of two points on the line, and explain the reasoning.
RF07.04 Write the equation of a linear relation, given the coordinates of a point on the line and the equation of a parallel or perpendicular line, and explain the reasoning.
RF07.05 Graph linear data generated from a context, and write the equation of the resulting line.
RF07.06 Determine the equation of the line of best fit from a scatterplot using technology and determine the correlation.
RF07.07 Solve a problem, using the equation of a linear relation.

RF08 Students will be expected to solve problems that involve the distance between two points and the midpoint of a line segment.

Performance Indicators
RF08.01 Determine the distance between two points on a Cartesian plane using a variety of strategies.
RF08.02 Determine the midpoint of a line segment, given the endpoints of the segment, using a variety of strategies.
RF08.03 Determine and endpoint of a line segment, given the other endpoint and the midpoint, using a variety of strategies.
RF08.04 Solve a contextual problem involving the distance between two points or midpoint of a line segment.

RF09 Students will be expected to represent a linear function, using function notation.

Performance Indicators
RF09.01 Express the equation of a linear function in two variables, using function notation.
RF09.02 Express an equation given in function notation as a linear function in two variables.
RF09.03 Determine the related range value, given a domain value for a linear function.
RF09.04 Determine the related domain value, given a range value for a linear function.
RF09.05 Sketch the graph of a linear function expressed in function notation.

RF10 Students will be expected to solve problems that involve systems of linear equations in two variables, graphically and algebraically.

Performance Indicators

RF10.01 Model a situation, using a system of linear equations.
RF10.02 Relate a system of linear equations to the context of a problem.
RF10.03 Determine and verify the solution of a system of linear equations graphically, with and without technology.
RF10.04 Explain the meaning of the point of intersection of a system of linear equations.
RF10.05 Determine and verify the solution of a system of linear equations algebraically.
RF10.06 Explain, using examples, why a system of equations may have no solution, one solution, or an infinite number of solutions.
RF10.07 Explain a strategy to solve a system of linear equations.
RF10.08 Solve a problem that involves a system of linear equations.

FINANCIAL MATHEMATICS (FM)

FM01 Students will be expected to solve problems that involve unit pricing and currency exchange, using proportional reasoning.

Performance Indicators
FM01.01 Compare the unit price of two or more given items.
FM01.02 Solve problems that involve determining the best buy, and explain the choice in terms of the cost as well as other factors, such as quality and quantity.
FM01.03 Compare, using examples, different sales promotion techniques.
FM01.04 Determine the percent increase or decrease for a given original and new price.
FM01.05 Solve, using proportional reasoning, a contextual problem that involves currency exchange.
FM01.06 Explain the difference between the selling rate and purchasing rate for currency exchange.
FM01.07 Explain how to estimate the cost of items in Canadian currency while in a foreign country, and explain why this may be important.
FM01.08 Convert between Canadian currency and foreign currencies, using formulas, charts, or tables.

FM02 Students will be expected to demonstrate an understanding of income to calculate gross pay and net pay, including wages, salary, contracts, commissions, and piecework.

Performance Indicators
FM02.01 Describe, using examples, various methods of earning income.
FM02.02 Identify and list jobs that commonly use different methods of earning income (e.g., hourly wage, wage and tips, salary, commission, contract, bonus, shift premiums).
FM02.03 Determine in decimal form, from a time schedule, the total time worked in hours and minutes, including time and a half and/or double time.
FM02.04 Determine gross pay from given or calculated hours worked when given
· the base hourly wage, with and without tips
· the base hourly wage, plus overtime (time and a half, double time)
FM02.05 Determine gross pay for earnings acquired by
· base wage, plus commission
· single commission rate
FM02.06 Explain why gross pay and net pay are not the same.
FM02.07 Determine the Canadian Pension Plan (CPP), Employment Insurance (EI), and income tax deductions for a given gross pay.
FM02.08 Determine net pay when given deductions (e.g., health plans, uniforms, union dues, charitable donations, payroll tax).

FM02.09 Investigate, with technology, "what if …" questions related to changes in income (e.g., What if there is a change in the rate of pay?)

FM03 Students will be expected to investigate personal budgets.

Performance Indicators
FM03.01 Identify income and expenses that should be included in a personal budget.
FM03.02 Explain considerations that must be made when developing a budget (e.g., prioritizing, and recurring and unexpected expenses).
FM03.03 Create a personal budget based on given income and expense data.
FM03.04 Collect income and expense data, and create a budget.
FM03.05 Modify a budget to achieve a set of personal goals.
FM03.06 Investigate and analyze, with or without technology, "what if …" questions related to personal budgets.

FM04 Students will be expected to explore and give a presentation on an area of interest that involves financial mathematics.

Performance Indicators
FM04.01 Collect primary or secondary data (statistical or informational) related to the topic.
FM04.02 Organize and present a project.
FM04.03 Create and solve a contextual problem that is related to the project.
FM04.04 Make informed decisions and plans related to the project.
FM04.05 Compare advantages and disadvantages as part of the project.