Pre-Calculus 12

Foundational Outcomes

NOVA SCOTIA
NOUVELLE-ÉCOSSE

2021

Outcomes Framework Pre-Calculus 12 (2021-22)

The **Foundational Outcomes** identified in this document represent outcomes determined to be relevant for future learning in mathematics. Decisions about foundational outcomes were made in consultation with teachers, provincial mathematics team, Board and Regional Centre staff. In response to feedback, some changes have been made to the 2020-21 foundational outcomes to ensure continuity of learning within and across grade levels. The foundational outcomes are meant to guide teachers in making decisions about creating learning experiences that will prepare and engage their learners in a responsive way. However, a teacher's professional judgment remains the most important guide to effectively responding to the needs of their learners.

Colour coding has been used to identify outcomes and indicators as foundational (**green**), optional (**orange**) or non-foundational (**red**) for the 2021-2022 school year.

T03 Solve problems, using the six trigonometric ratios for angles expressed in radians and degrees.

Performance Indicators: all indicators

T04 Graph and analyze the trigonometric functions sine, cosine and tangent to solve problems.

Performance Indicators: all indicators

T05 Solve, algebraically and graphically, first and second degree trigonometric equations with the domain expressed in degrees and radians.

Performance Indicators: all indicators

T06 Prove trigonometric identities, using:
• reciprocal identities
• quotient identities
• Pythagorean identities
• sum or difference identities
• double-angle identities

- T06.01 Explain the difference between a trigonometric identity and a trigonometric equation.
- T06.02 Verify a trigonometric identity numerically for a given value in either degrees or radians.
- T06.03 Explain why verifying that the two sides of a trigonometric identity are equal for given values is insufficient to conclude that the identity is valid.
- T06.04 Determine, graphically, the potential validity of a trigonometric identity, using technology.
- T06.05 Determine the non-permissible values of a trigonometric identity.
- T06.06 Prove, algebraically, that a trigonometric identity is valid.
- **T06.07** Determine, using the sum, difference, and double-angle identities, the exact value of a trigonometric ratio.

RF01 Demonstrate an understanding of operations on, and compositions of, functions.

Performance Indicators:

- **RF01.01** Sketch the graph of a function that is the sum, difference, product, or quotient of two functions, given their graphs.
- **RF01.02** Write the equation of a function that is the sum, difference, product, or quotient of two or more functions, given their equations.
- **RF01.03** Determine the domain and range of a function that is the sum, difference, product, or quotient of two functions.
- **RF01.04** Write a function $h(x)$ as the sum, difference, product, or quotient of two or more functions.
- RF01.05 Determine the value of the composition of functions when evaluated at a point, including $f[f(a)], f[g(a)],$ and $g[f(a)]$.
- RF01.06 Determine, given the equations of two functions $f(x)$ and $g(x)$, the equation of the composite function $f[f(x)], f[g(x)],$ and $g[f(x)],$ and explain any restrictions.
- RF01.07 Sketch, given the equations of two functions $f(x)$ and $g(x)$, the graph of the composite function $f[f(x)], f[g(x)],$ and $g[f(x)]$.
- RF01.08 Write a function $h(x)$ as the composition of two or more functions.
- **RF01.09** Write a function $h(x)$ by combining two or more functions through operations on, and compositions of, functions

RF02 Demonstrate an understanding of the effects of horizontal and vertical translations on the graphs of functions and their related equations.

Performance Indicators: all indicators

RF03 Demonstrate an understanding of the effects of horizontal and vertical stretches on the graphs of functions and their related equations.

Performance Indicators: all indicators

RF04 Apply translations and stretches to the graphs and equations of functions.

Performance Indicators: all indicators

RF05 Demonstrate an understanding of the effects of reflections on the graphs of functions and their related equations, including reflections in the: x-axis, y-axis, and the line y=x .

Performance Indicators: all indicators

RF06 Demonstrate an understanding of inverses of relations.

Performance Indicators: all indicators

RF07 Demonstrate an understanding of logarithms.

Performance Indicators: all indicators

RF08 Demonstrate an understanding of the product, quotient and power laws of logarithms.

Performance Indicators: all indicators

RF09 Graph and analyze exponential and logarithmic functions.

Performance Indicators: all indicators

RF10 Solve problems that involve exponential and logarithmic equations.

Performance Indicators:
- **RF10.01** Determine the solution of an exponential equation in which the bases are powers of one another.
- RF10.02 Determine the solution of an exponential equation in which the bases are not powers of one another, using a variety of strategies.
- RF10.03 Determine the solution of a logarithmic equation, and verify the solution.
- RF10.04 Explain why a value obtained in solving a logarithmic equation may be extraneous.
- **RF10.05** Solve a problem that involves exponential growth or decay.
- **RF10.06** Solve a problem that involves the application of exponential equations to loans, mortgages, and investments.
- **RF10.07** Solve a problem that involves logarithmic scales, such as the Richter scale and the pH scale.
- RF10.08 Solve a problem by modelling a situation with an exponential or a logarithmic equation.

RF11 Demonstrate an understanding of factoring polynomials of degree greater than 2 (limited to polynomials of degree ≤ 5 with integral coefficients).

Performance Indicators: all indicators

RF12 Graph and analyze polynomial functions (limited to polynomial functions of degree ≤ 5).

Performance Indicators: all indicators

RF13 Graph and analyze radical functions (limited to functions involving one radical)

Performance Indicators: all indicators

RF14 Graph and analyze rational functions (limited to numerators and denominators that are monomials, binomials or trinomials).

Performance Indicators: all indicators

PC01 Apply the fundamental counting principle to solve problems.

Performance Indicators: all indicators

PC02 Determine the number of permutations of elements taken at a time to solve problems.

Performance Indicators: all indicators

PC03 Determine the number of combinations of different elements taken at a time to solve problems.

Performance Indicators: all indicators

PC04 Expand powers of a binomial in a variety of ways, including using the binomial theorem (restricted to exponents that are natural numbers).

Performance Indicators: all indicators