Pre-Calculus 11 Curriculum Comparison (1996 and 2008 curriculums)

Analysis of Curriculum Changes 1996 to 2008

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Summary of Changes to Grade 11 Mathematics
WNCP Pure 11 (1996) vs. Pre-Calculus 11 (2008)

1996: 32 outcomes. Of these, 24 have been deleted or significantly changed.
2008: 20 outcomes. Of these, 15 are either significantly changed or are new.
Out of 52 outcomes in total for 1996 and 2008, there have been changes in 39 outcomes. This is a 75% change altogether.

Deleted Topics
• Financial/consumer math
• Reasoning/logic/proof
• Remainder Theorem and Factor Theorem **Moved to Pre-Calculus 12**
• Systems of linear equations in two variables **Moved to Foundations of Mathematics and Pre-Calculus 10**
• Systems of linear equations in three variables
• Operation on functions and compositions of functions **Moved to Pre-Calculus 12**
• Non-linear equations (solving algebraically or graphically)
• Graph and analyze polynomial and rational functions **Moved to Pre-Calculus 12**
• Circle geometry **Moved to Grade 9**

New Topics
Note: Italicized items have been deleted from the *Pre-Calculus 12* course.
• Arithmetic sequences and series **Moved from Foundations of Mathematics and Pre-Calculus 10**
• Geometric sequences and series **Moved from Pre-Calculus 12 (1996)**
• **General Outcome:** *Generate and analyze exponential patterns.*
–Derive and apply expressions to represent general terms and sums for geometric growth and to solve problems.
–Connect geometric sequences to exponential functions over the natural numbers.
–Estimate values of expressions for infinite geometric processes. [PS, R, T]
• Geometric growth/number patterns **Moved from Foundations of Mathematics and Pre-Calculus 10**
• Rational expressions (equivalent forms, nonpermissible values, and operations) and equations **Moved from Foundations of Mathematics and Pre-Calculus 10**
• Cosine and Sine Laws **Moved from Foundations of Mathematics and Pre-Calculus 10**
• Linear-quadratic and quadratic-quadratic systems
• Reciprocal functions (linear and quadratic only) **Moved from Pre-Calculus 12 (1996)**
• Absolute value functions **Moved from Pre-Calculus 12 (1996)**
• **General Outcome:** *Perform, analyze and create transformations of functions and relations that are described by equations or graphs.*
–Using the graph and/or the equation of f(x), describe and sketch $\frac{1}{f(x)}$.
–Using the graph and/or the equation of f(x), describe and sketch |f(x)|.
• Sine and cosine for angles from 90° to 180° **Moved from Pre-Calculus 10**
• Sine and cosine laws **Moved from Foundations of Mathematics and Pre-Calculus 10**

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Pre-Calculus 11: A Comparison of WNCP Outcomes for 1996 and 2008

NOTE: In the following chart,
• Items in italics have been deleted from or moved from the *Pre-Calculus 11* course.
• Bolded items have been added to the *Pre-Calculus 11* course.

WNCP (1996)	WNCP (2008)
Strand: Number (Number Operations) **General Outcome:** *Solve consumer problems, using arithmetic operations.*	
Solve consumer problems, including: *• wages earned in various situations* *• property taxation* *• exchange rates* *• unit prices.[CN, E, PS, R, T]* *Reconcile financial statements including:* *• cheque books with bank statements* *• cash register tallies with daily receipts.* *[CN, PS, T]* *Solve budget problems, using graphs tables to communicate solutions. [C, PS, T, V]* *• Plot and describe data of exponential form, to using appropriate scales. [C, T, V]* *Solve investment and credit problems involving simple and compound interest.* *[CN, PS, T]*	

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WNCP (1996)	WNCP (2008)
Strand: Patterns and Relations (Patterns) **General Outcome:** *Apply the principles of mathematical reasoning to solve problems and to justify solutions.*	
Differentiate between inductive and deductive reasoning. [CN, R] *Explain and apply connecting words, such as "and", "or" and "not", to solve problems. [C, PS, R, V]* *Use examples and counterexamples to analyze conjectures. [CN, R]* *Distinguish between an "if–then" proposition, its converse and its contrapositive. [CN, R]* *Prove assertions in a variety of settings, using direct and indirect reasoning. [R]*	

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WNCP (1996)	WNCP (2008)
Strand: Patterns and Relations (Variables and Equations) **General Outcome:** Represent and analyze situations that involve expressions, equations and inequalities.	
Graph linear inequalities, in two variables. [PS, V] *Solve systems of linear equations, in two variables:* *• algebraically (elimination and substitution)* *• graphically.[CN, PS, T, V]* *Solve nonlinear equations, using a graphing tool. [CN, T, V]* *Solve nonlinear equations:* *• by factoring* *• graphically. [CN, T, V]* *Use the Remainder Theorem to evaluate polynomial expressions and the Factor Theorem to determine factors of polynomials. [E, PS, T]* *Determine the solution to a system of nonlinear equations, using technology as appropriate. [PS, T, V]* *Solve systems of linear equations, in three variables:* *• algebraically* *• with technology. [CN, PS, T, V]*	

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WNCP (1996)	WNCP (2008)
Strand: Patterns and Relations (Relations and Functions) **General Outcome:** Represent and analyze quadratic, *polynomial and rational* functions, using technology as appropriate.	**Strand:** Relations and Functions **General Outcome:** Develop algebraic and graphical reasoning through the study of relations.
Determine the following characteristics of the graph of a quadratic function: • vertex • domain and range • axis of symmetry • intercepts. [C, PS, T, V] *Perform operations on functions and compositions of functions. [CN, E, PS]* *Determine the inverse of a function. [CN, R, V]* Connect algebraic and graphical transformations of quadratic functions, using completing the square as required. [CN, T, V] Model real-world situations, using quadratic functions. [CN, PS] Solve quadratic equations, and relate the solutions to the zeros of a corresponding quadratic function, using: • factoring • the quadratic formula • graphing. [CN, E, T, V] *Determine the character of the real and non-real roots of a quadratic equation, using:* *• the discriminant in the quadratic formula* *• graphing. [C, R, T, V]*	**Factor polynomial expressions of the form:** • $ax^2 + bx + c,\ a \neq 0$ • $a^2x^2 - b^2y^2,\ a \neq 0, b \neq 0$ • $a\left(f(x)\right)^2 + b\left(f(x)\right) + c,\ a \neq 0$ • $a^2\left(f(x)\right)^2 - b^2\left(g(y)\right)^2,\ a \neq 0, b \neq 0$ **where *a*, *b* and *c* are rational numbers. [CN, ME, R]** **Graph and analyze absolute value functions (limited to linear and quadratic functions) to solve problems.** [C, PS, R, T, V] Analyze quadratic functions of the form $y = a(x - p)^2 + q$ and determine the: • vertex • domain and range **• direction of opening** • axis of symmetry • *x*- and *y*-intercepts. [CN, R, T, V] Analyze quadratic functions of the form $y = ax^2\ bx +$ c to identify characteristics of the corresponding graph, including: • vertex • domain and range **• direction of opening** • axis of symmetry • *x*- and *y*-intercepts and to solve problems. [CN, PS, R, T, V] Solve problems that involve quadratic equations. [C, CN, PS, R, T, V] **Solve, algebraically and graphically, problems that involve systems of linear-quadratic and quadratic-quadratic equations in two variables. [CN, PS, R, T, V]** Solve problems that involve linear **and**

WNCP (1996)	WNCP (2008)
Describe, graph and analyze polynomial and rational functions, using technology. [C, R, T, V] Formulate and apply strategies to solve absolute value equations, radical equations, rational equations and inequalities. [CN, R, V]	**quadratic** inequalities in two variables. [C, PS, T, V] **Solve problems that involve quadratic inequalities in one variable. [CN, PS, V]** **Analyze arithmetic sequences and series to solve problems. [CN, PS, R, T]** **Analyze geometric sequences and series to solve problems. [PS, R, T]** **Graph and analyze reciprocal functions (limited to the reciprocal of linear and quadratic functions). [CN, R, T, V]** **Strand:** Algebra and Number **General Outcome:** Develop algebraic reasoning and number sense.
	Demonstrate an understanding of the absolute value of real numbers. [R, V] Solve problems that involve operations on radicals and radical expressions with numerical and variable radicands. [CN, ME, PS, R, T] Solve problems that involve radical equations **(limited to square roots)**. [C, PS, R] Determine equivalent forms of rational expressions **(limited to numerators and denominators that are monomials, binomials or trinomials)**. [C, ME, R] Perform operations on rational expressions **(limited to numerators and denominators that are monomials, binomials or trinomials).** [CN, ME, R] Solve problems that involve rational equations **(limited to numerators and denominators that are monomials, binomials or trinomials).** [C,PS, R]

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Strand: Shape and Space (Measurement) **General Outcome:** Solve problems involving triangles, including those found in *3-D and* 2-D applications.	**Strand:** Trigonometry **General Outcome:** Develop trigonometric reasoning.
Solve problems involving ambiguous case triangles in *3-D and* 2-D. [CN, PS, R, T]	**Demonstrate an understanding of angles in standard position [0° to 360°]. [R, V]** **Solve problems, using the three primary trigonometric ratios for angles from 0˚ to 360˚ in standard position.** **[C, ME, PS, R, T, V]** Solve problems, **using the cosine law and sine law**, including the ambiguous case. [C, CN, PS, R, T]

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WNCP (1996)	WNCP (2008)
Strand: Shape and Space (3-D Objects and 2-D Shapes) **General Outcomes:** *Solve coordinate geometry problems involving lines and line segments, and justify the solutions.* *Develop and apply the geometric properties of circles and polygons to solve problems.*	
Solve problems involving distances between points and lines. [CN, PS, R] *Verify and prove assertions in plane geometry, using coordinate geometry. [C, R, V]* *Use technology and measurement to confirm and apply the following properties to particular cases:* • *the perpendicular bisector of a chord contains the centre of the circle* • *the measure of the central angle is equal to twice the measure of the inscribed angle subtended by the same arc (for the case when the centre of the circle is in the interior of the inscribed angle)* • *the inscribed angles subtended by the same arc are congruent* • *the angle inscribed in a semicircle is a right angle* • *the opposite angles of a cyclic quadrilateral are supplementary* • *a tangent to a circle is perpendicular to the radius at the point of tangency* • *the tangent segments to a circle from any external point are congruent the angle between a tangent and a chord is equal to the inscribed angle on the opposite side of the chord* • *the sum of the interior angles of an n-sided polygon is (2n – 4) right angles.*	

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WNCP (1996)	WNCP (2008)
Prove the following general properties, using established concepts and theorems: • *the perpendicular bisector of a chord contains the centre of the circle* • *the measure of the central angle is equal to twice the measure of the inscribed angle subtended by the same arc (for the case when the centre of the circle is in the interior of the inscribed angle)* • *the inscribed angles subtended by the same arc are congruent* • *the angle inscribed in a semicircle is a right angle* • *the opposite angles of a cyclic quadrilateral are supplementary* • *a tangent to a circle is perpendicular to the radius at the point of tangency* • *the tangent segments to a circle from any external point are congruent* • *the angle between a tangent and a chord is equal to the inscribed angle on the opposite side of the chord* • *the sum of the interior angles of an n-sided polygon is (2n − 4) right angles.* *Solve problems, using a variety of circle properties, and justify the solution strategy used.*