Pre-Calculus 12 Curriculum Comparison (1996 and 2008 curriculums)

Analysis of Curriculum Changes 1996 to 2008

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Summary of Changes to Grade 12 Mathematics

WNCP (1996) vs. Pre-Calculus 12 (2008)

1996 45 outcomes. Of these, 23 have been deleted or significantly changed.
2008 24 outcomes. Of these, 6 are either significantly changed or are new.
Out of 59 outcomes in total for 1996 and 2008, there have been changes in 29 of them. This is a 49% change altogether.

Deleted Topics

- Geometric sequences and series **Moved to Pre-Calculus 11**
- Graphs of secant, cosecant, and cotangent
- Reciprocal functions **Moved to Pre-Calculus 11** (linear & quadratic only)
- Absolute value functions **Moved to Pre-Calculus 11** (linear & quadratic only)
- Conics
- Statistics (standard deviation, *z*-scores, normal distribution)
- Sample space, independent/dependent events, mutually exclusive and complementary events
- Pathway problems
- Conditional probability
- Binomial distribution

New Topics

- Graphing and analyzing polynomial functions **Moved from Pre-Calculus 11**
- Graphing and analyzing rational functions **Moved from Pre-Calculus 11**
- Operations on functions and compositions of functions **Moved from Pre-Calculus 11**
- Inverses of relations **Moved from Pre-Calculus 11**

Pre-Calculus 12: 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 12* course.
• Bolded items have been added to the *Pre-Calculus 12* course.

WNCP (1996)	WNCP (2008)
Strand: Patterns and Relations (Patterns) **General Outcome:** **Generate and analyze exponential patterns.**	
• **Derive and apply expressions to represent general terms and sums for geometric growth and to solve problems. [CN, R, T]** • **Connect geometric sequences to exponential functions over the natural numbers. [E, R, V]** • **Estimate values of expressions for infinite geometric processes. [PS, R, T]**	***MOVED FROM PRE-CALCULUS 12 to PRE-CALCULUS 11***

WNCP (1996)	WNCP (2008)
Strand: Patterns and Relations (Variables & Equations)	**Strand: Trigonometry**
General Outcomes:	**General Outcomes:**
Solve exponential, logarithmic and trigonometric equations and identities.	Develop trigonometric reasoning.
• Solve exponential equations having bases that are powers of one another. [E, R] • Solve and verify exponential and logarithmic equations **and identities**. [R]	**See Relations & Functions next page**

• Distinguish between degree and radian measure, and solve problems, using both. [CN, E]
• Determine the exact and the approximate values of trigonometric ratios for any multiples of 0°, 30°, 45°, 60° and 90° and 0, $\frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}$ [CN, E]
• Solve first and second degree trigonometric equations over a domain of length 2π:
  ○ algebraically
  ○ graphically. [PS, T]
• Determine the general solutions to trigonometric equations where the domain is the set of real numbers. [PS, T]
• **Verify** trigonometric identities:
  ○ **numerically for any particular case**
  ○ algebraically for general cases
  ○ graphically. [PS, R, T, V]
• Use sum, difference and double angle identities for sine and cosine to **verify** and simplify trigonometric expressions. [R, T]
	• Demonstrate an understanding of angles in standard position, expressed in degrees and radians. [CN, ME, R, V]
	• Develop and apply the equation of the unit circle. [CN, R, V]
	• Solve problems, using the six trigonometric ratios for angles expressed in radians and degrees. [ME, PS, R, T, V]
	• Graph and analyze the trigonometric functions sine, cosine and tangent to solve problems. [CN, PS, T, V]
	• Solve, algebraically and graphically, first and second degree trigonometric equations with the domain expressed in degrees and radians. [CN, PS, R, T, V]
	• **Prove** trigonometric identities, using:
	  ○ reciprocal identities
	  ○ quotient identities
	  ○ Pythagorean identities
	  ○ sum or difference identities (restricted to sine, cosine and tangent)
	  ○ double-angle identities (**restricted to sine, cosine and tangent**). [R, T, V]

WNCP (1996)	WNCP (2008)
Strand: Patterns and Relations (Relations & Functions)	**Strand:** Relations and Functions
General Outcomes:	**General Outcome:**
Represent and analyze exponential and logarithmic functions, using technology as appropriate. Represent and analyze trigonometric functions, using technology as appropriate.	Develop algebraic and graphical reasoning through the study of relations

WNCP (1996)	WNCP (2008)

• Graph and analyze an exponential (PR64) function, using technology. [R, T, V]
• Model, graph and apply exponential functions to solve problems. [PS, T, V]
• Change functions from exponential form to logarithmic form and vice versa. [CN]
• Use logarithms to model practical problems. [CN, PS, V]
• Explain the relationship between the laws of logarithms and the laws of exponents. [C, T]
• Graph and analyze logarithmic functions with and without technology. [R, T, V]
• Describe the three primary trigonometric functions as circular functions with reference to the unit circle and an angle in standard position. [PS, R, V]
• Draw **(using technology)**, sketch and analyze the graphs of sine, cosine and tangent functions, for:
  ○ amplitude, if defined
  ○ period
  ○ domain and range
  ○ asymptotes, if any
  ○ behaviour under transformations. [CN, T, V]
• **Draw (using technology) and analyze the graphs of secant, cosecant and cotangent functions, for:**
  ○ **period**
  ○ **domain and range**
  ○ **asymptotes**
  ○ **behaviour under transformations**. [CN, T, V]
• Use trigonometric functions to model and solve problems. [PS, R, V]
Strand: Shape and Space (Transformations)
	• Demonstrate an understanding of logarithms. [CN, ME, R]
	• Demonstrate an understanding of the product, quotient and power laws of logarithms. [C, CN, R, T]
	• Graph and analyze exponential and logarithmic functions. [C, CN, T, V]
	• Solve problems that involve exponential and logarithmic equations. [C, CN, PS, R]
	• **Demonstrate an understanding of factoring polynomials of degree greater than 2 (limited to polynomials of degree ≤ 5 with integral coefficients).** [C, CN, ME]
	• **Graph and analyze polynomial functions (limited to polynomial functions of degree ≤ 5).** [C, CN, T, V]
	• Graph and analyze radical functions (limited to functions involving one radical). [CN, R, T, V]
	• **Graph and analyze rational functions (limited to numerators and denominators that are monomials, binomials or trinomials).** [CN, R, T, V]

General Outcomes: Perform, analyze and create transformations of functions and relations that are described by equations or graphs.	

WNCP (1996)	WNCP (2008)

• Describe how various translations of functions affect graphs and their related equations:
  ○ $y = f(x \square h)$
  ○ $y \square k = f(x)$. [C, T, V]
• Describe how various stretches of functions (compressions and expansions) affect graphs and their related equations:
  ○ $y = af(x)$
  ○ $y = f(kx)$. [C, T, V]
• Describe how reflections of functions in both axes and in the line $y = x$ affect graphs and their related equations:
  ○ $y = f(\square x)$
  ○ $y = \square f(x)$
  ○ $y = f^{\square 1}(x)$. [C, T, V]
• **Using the graph and/or the equation of $f(x)$, describe and sketch $\frac{1}{f(x)}$.** [C, T, V]
• **Using the graph and/or the equation of $f(x)$, describe and sketch $\lvert f(x)\rvert$.** [C, T, V]
• Describe and perform single transformations and combinations of transformations on functions and relations. [C, T, V]
	• **Demonstrate an understanding of operations on, and compositions of, functions.** [CN, R, T, V]
	• Demonstrate an understanding of the effects of horizontal and vertical translations on the graphs of functions and their related equations. [C, CN, R, V]
	• Demonstrate an understanding of the effects of horizontal and vertical stretches on the graphs of functions and their related equations. [C, CN, R, V]
	• Apply translations and stretches to the graphs and equations of functions. [C, CN, R, V]
	• Demonstrate an understanding of the effects of reflections on the graphs of functions and their related equations, including reflections through the:
	  ○ x-axis
	  ○ y-axis
	  ○ line $y = x$. [C, CN, R, V]
	• **Demonstrate an understanding of inverses of relations.** [C, CN, R, V]

WNCP (1996)	WNCP (2008)
Strand: Shape and Space (3-D Objects and 2-D Shapes) **General Outcome:** **Classify conic sections, using their shapes and equations**	
• **Classify conic sections according to shape. [C, R, V]** • **Classify conic sections according to a given equation in general or standard (completed square) form (vertical or horizontal axis of symmetry only). [CN, T, V]** • **Convert a given equation of a conic section from general to standard form and vice versa. [R, T]**	***DELETED FROM PRE-CALCULUS 12***

WNCP (1996)	WNCP (2008)
Strand: Statistics and Probability (Chance & Uncertainty)	**Strand:** Permutations, Combinations and Binomial Theorem
General Outcomes:	**General Outcome:**
Use normal and binomial probability distributions to solve problems involving uncertainty. Solve problems based on the counting of sets, using techniques such as the fundamental counting principle, permutations and combinations.	Develop algebraic and numeric reasoning that involves combinatorics.

WNCP (1996)	WNCP (2008)
• **Find the population standard deviation of a data set or a probability distribution, using technology. [CN, E, T, V]** • **Use *z*-scores and *z*-score tables to solve problems. [PS, R, T, V]** • **Use the normal distribution and the normal approximation to the binomial distribution to solve problems involving confidence intervals for large samples. [CN, E, PS]** • **Solve pathway problems, interpreting and applying any constraints. [PS, R]** • Use the fundamental counting principle to determine the number of different ways to perform multistep operations. [PS, R] • Determine the number of permutations of *n* different objects taken *r* at a time, and use this to solve problems. [PS, R, V] • Determine the number of combinations of *n* different objects taken *r* at a time, and use this to solve problems. [PS, R, V] • **Determine the number of pathways in a given compound pathway problem. [CN, PS, V]** • Solve problems, using the binomial theorem where *N* belongs to the set of natural numbers. [CN, E, V] • **Construct a sample space for two or three events. [PS, R, V]** • **Classify events as independent or dependent. [C]** • **Solve problems, using the probabilities of mutually exclusive and complementary events. [CN, PS, R]** • **Determine the conditional probability of two events (Bayes' law). [E, PS, R]** • Solve probability problems involving permutations, combinations **and conditional probability**. [E, PS, R] • **Solve probability problems, using the binomial distribution as applied to small samples. [PS, R, T]**	• Apply the fundamental counting principle to solve problems. [C, PS, R, V] • Determine the number of permutations of *n* elements taken *r* at a time to solve problems. [C, PS, R, V] • Determine the number of combinations of *n* different elements taken *r* at a time to solve problems. [C, PS, R, V] • Expand powers of a binomial in a variety of ways, including using the binomial theorem (restricted to exponents that are natural numbers). [CN, R, V]