

MATH <i>Connections</i> Book	MC 1A				MC 1B				MC 2A			MC2B			MC3A				MC3B			
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14. Describe the relationship between slope and the graph of a direct variation and inverse variation.										○	○												
15. Describe how a change in the value of a constant in a linear or quadratic equation affects the related graphs.			○	○		○																	

Data Analysis and Probability Standard

Data Collection

1. Classify data as univariate (single variable) or bivariate (two variables) and as quantitative (measurement) or qualitative (categorical) data.	○			○																			
2. Create a scatterplot for a set of bivariate data, sketch the line of best fit, and interpret the slope of the line of best fit.				○	○								X										

Statistical Methods

3. Analyze and interpret frequency distributions based on spread, symmetry, skewness, clusters and outliers.	○																						
4. Describe and compare various types of studies (survey, observation, experiment), and identify possible misuses of statistical data.	○																	○					
5. Describe characteristics and limitations of sampling methods, and analyze the effects of random versus biased sampling; e.g., determine and justify whether the sample is likely to be representative of the population.								○										○					
6. Make inferences about relationships in bivariate data, and recognize the difference between evidence of relationship (correlation) and causation.				○	○																		

Probability

7. Use counting techniques and the Fundamental Counting Principle to determine the total number of possible outcomes for mathematical situations.					X		○	○										○					
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8. Describe, create and analyze a sample space and use it to calculate probability.								O										O				
9. Identify situations involving independent and dependent events, and explain differences between, and common misconceptions about, probabilities associated with those events.								X										O				
10. Use theoretical and experimental probability, including simulations or random numbers, to estimate probabilities and to solve problems dealing with uncertainty; e.g., compound events, independent events, simple dependent events.								O														
Grade Ten																						
Number, Number Sense and Operations Standard																						
Number and Number Systems																						
1. Connect physical, verbal and symbolic representations of irrational numbers; e.g., construct $\sqrt{2}$ as a hypotenuse or on a number line.									X	O								O				O
Meaning of Operations																						
2. Explain the meaning of the n th root.								O										O				
Computation and Estimation																						
3. Use factorial notation and computations to represent and solve problem situations involving arrangements.																		O				
4. Approximate the n th root of a given number greater than zero between consecutive integers when n is an integer; e.g., the 4 th root of 50 is between 2 and 3.								O														
Measurement Standard																						
Use Measurement Techniques and Tools																						
1. Explain how a small error in measurement may lead to a large error in calculated results.																						X
2. Calculate relative error.																						

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3. Explain the difference between absolute error and relative error in measurement.																						
4. Give examples of how the same absolute error can be problematic in one situation but not in another; e.g., compare “accurate to the nearest foot” when measuring the height of a person versus when measuring the height of a mountain.																						
5. Determine the measures of central and inscribed angles and their associated major and minor arcs.																						

Geometry and Spatial Sense Standard

Characteristics and Properties

1. Formally define and explain key aspects of geometric figures, including:																						
a. prove the Pythagorean Theorem;																						
b. prove theorems involving triangle similarity and congruence;																						
c. prove theorems involving properties of lines, angles, triangles and quadrilaterals;																						
d. test a conjecture using basic constructions made with a compass and straightedge or technology.																						
4. Construct right triangles, equilateral triangles, parallelograms, trapezoids, rectangles, rhombuses, squares and kites, using compass and straightedge or dynamic geometry software.																						
5. Construct congruent figures and similar figures using tools, such as compass, straightedge, and protractor or dynamic geometry software.																						

Transformation and Symmetry

6. Identify the reflection and rotation symmetries of two- and three-dimensional figures.																						
7. Perform reflections and rotations using																						

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compass and straightedge constructions and dynamic geometry software.																						
8. Derive coordinate rules for translations, reflections and rotations of geometric figures in the coordinate plane.			O																			
9. Show and describe the results of combinations of translations, reflections and rotations (compositions); e.g., perform compositions and specify the result of a composition as the outcome of a single motion, when applicable.																						
Visualization and Geometric Models																						
10. Solve problems involving chords, radii and arcs within the same circle.													O									
Patterns, Functions and Algebra Standard																						
Use Patterns, Relations and Functions																						
1. Define function formally and with $f(x)$ notation.							O													O		
2. Describe and compare characteristics of the following families of functions: square root, cubic, absolute value and basic trigonometric functions; e.g., general shape, possible number of roots, domain and range.							X													O		
Use Algebraic Representations																						
3. Solve equations and formulas for a specified variable; e.g., express the base of a triangle in terms of the area and height.					O	O							O							O	O	
4. Use algebraic representations and functions to describe and generalize geometric properties and relationships.			O										O									
5. Solve simple linear and nonlinear equations and inequalities having square roots as coefficients and solutions.										O	O	O		O								
6. Solve equations and inequalities having rational expressions as coefficients and solutions.											O											

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7. Solve systems of linear inequalities.					O									O								
8. Graph the quadratic relationship that defines circles.												O										
9. Recognize and explain that the slopes of parallel lines are equal and the slopes of perpendicular lines are negative reciprocals.			X								O											
10. Solve real-world problems that can be modeled using linear, quadratic, exponential or square root functions.				O	O				O							O					O	
11. Solve real-world problems that can be modeled, using systems of linear equations and inequalities.					O									O								
Analyze Change																						
12. Describe the relationship between slope of a line through the origin and the tangent function of the angle created by the line and the positive x -axis.			O								O											
Data Analysis and Probability Standard																						
Data Collection																						
1. Describe measures of center and the range verbally, graphically and algebraically.	O																					
2. Represent and analyze bivariate data using appropriate graphical displays (scatterplots, parallel box-and-whisker plots, histograms with more than one set of data, tables, charts, spreadsheets) with and without technology.		O		O	O																	
3. Display bivariate data where at least one variable is categorical.	O																					
4. Identify outliers on a data display; e.g., use interquartile range to identify outliers on a box-and-whisker plot.	O																					
Statistical Methods																						
5. Provide examples and explain how a statistic may or may not be an attribute of the entire								O										O				

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population; e.g., intentional or unintentional bias may be present.																						
6. Interpret the relationship between two variables using multiple graphical displays and statistical measures; e.g., scatterplots, parallel box-and-whisker plots, and measures of center and spread.	○																					

Probability

7. Model problems dealing with uncertainty with area models (geometric probability).								○										○				
8. Differentiate and explain the relationship between the probability of an event and the odds of an event, and compute one given the other.																						

Grade Eleven
Number, Number Sense and Operations Standard

Number and Number Systems

1. Determine what properties hold for matrix addition and matrix multiplication; e.g., use examples to show addition is commutative and when multiplication is not commutative.																						
2. Determine what properties hold for vector addition and multiplication, and for scalar multiplication.																						
3. Represent complex numbers on the complex plane.																						

Meaning of Operations

4. Use matrices to represent given information in a problem situation.																						
5. Model, using the coordinate plane, vector addition and scalar multiplication.																						

Computation and Estimation

6. Compute sums, differences and products of																						
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matrices using paper and pencil calculations for simple cases, and technology for more complicated cases.																						
7. Compute sums, differences, products and quotients of complex numbers.																						
8. Use fractional and negative exponents as optional ways of representing and finding solutions for problem situations; e.g., $27^{2/3} = (27^{1/3})^2 = 9$.																						
9. Use vector addition and scalar multiplication to solve problems.																						
Measurement Standard																						
Measurement Units																						
1. Determine the number of significant digits in a measurement.	X									X												
2. Use radian and degree angle measures to solve problems and perform conversions as needed.																						
Use Measurement Techniques and Tools																						
3. Derive a formula for the surface area of a cone as a function of its slant height and the circumference of its base.																						
4. Calculate distances, areas, surface areas and volumes of composite three-dimensional objects to a specified number of significant digits.																						
5. Solve real-world problems involving area, surface area, volume, and density to a specified degree of precision.																						
Geometry and Spatial Sense Standard																						
Spatial Relationships																						
1. Use polar coordinates to specify locations on a plane.																						

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Transformations and Symmetry																					
2. Represent translations using vectors.																					
3. Describe multiplication of a vector and a scalar graphically and algebraically, and apply to problem situations.																					
4. Use trigonometric relationships to determine lengths and angle measures; i.e., Law of Sines and Law of Cosines.																					
Visualization and Geometric Models																					
5. Identify, sketch and classify the cross- sections of three-dimensional objects.																					
Patterns, Functions and Algebra Standard																					
Use Patterns, Relations and Functions																					
1. Identify and describe problem situations involving an iterative process that can be represented as a recursive function; e.g., compound interest.		X				X	O														O
2. Translate a recursive function into a closed form expression or formula for the <i>n</i> th term to solve a problem situation involving an iterative process; e.g., find the value of an annuity after seven years.		X				X	O														O
3. Describe and compare the characteristics of the following families of functions: quadratics with complex roots, polynomials of any degree, logarithms, and rational functions; e.g., general shape, number of roots, domain and range, asymptotic behavior.																					
4. Identify the maximum and minimum points of polynomial, rational and trigonometric functions graphically and with technology.																					
Use Algebraic Representations																					
5. Identify families of functions with graphs that																					

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have rotation symmetry or reflection symmetry about the y -axis, x -axis or $y = x$.																						
6. Represent the inverse of a function symbolically and graphically as a reflection about $y = x$.																						
7. Model and solve problems with matrices and vectors.																						
8. Solve equations involving radical expressions and complex roots.																						
9. Solve 3 by 3 systems of linear equations by elimination and using technology, and interpret graphically what the solution means (a point, line, plane, or no solution).																						
Analyze Change																						
10. Describe the characteristics of the graphs of conic sections.																						
11. Describe how a change in the value of a constant in an exponential, logarithmic or radical equation affects the graph of the equation.																						
Data Analysis and Probability Standard																						
Data Collection																						
1. Design a statistical experiment, survey or study for a problem; collect data for the problem; and interpret the data with appropriate graphical displays, descriptive statistics, concepts of variability, causation, correlation and standard deviation.																						
2. Describe the role of randomization in a well-designed study, especially as compared to a convenience sample, and the generalization of results from each.																						
Statistical Methods																						
3. Describe how a linear transformation of univariate data affects range, mean, mode and																						

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Patterns, Functions and Algebra Standard																							
Use Patterns, Relations and Functions																							
1. Analyze the behavior of arithmetic and geometric sequences and series as the number of terms increases.																							
2. Translate between the numeric and symbolic form of a sequence or series.																							
3. Describe and compare the characteristics of transcendental and periodic functions; e.g., general shape, number of roots, domain and range, asymptotic behavior, extrema, local and global behavior.																							
4. Represent the inverse of a transcendental function symbolically.																							
Use Algebraic Representations																							
5. Set up and solve systems of equations using matrices and graphs, with and without technology.																							
6. Make arguments about mathematical properties using mathematical induction.																							
7. Make mathematical arguments using the concepts of limit.																							
8. Compare estimates of the area under a curve over a bounded interval by partitioning the region with rectangles; e.g., make successive estimates using progressively smaller rectangles.																							
9. Translate freely between polar and Cartesian coordinate systems.																							
Analyze Change																							
10. Use the concept of limit to find instantaneous rate of change for a point on a graph as the slope of a tangent at a point.																							
Data Analysis and Probability Standard																							
Data Collection																							

