

**MATH**  
**Learning Expectations for Grades 11 & 12**

CRLS Learning Expectations	Mass. Standard	Topic/Theme	Key Understandings	Assessments/Evidence
	12.N.1  12.N.2	Number Sense & Operations	<p>Students will:</p> <p>Define complex numbers (e.g., <math>a+bi</math>) and operations on them, in particular, addition, subtraction, multiplication, and division. Relate the system of complex numbers to the systems of real and rational numbers.</p> <p>Simplify numerical expressions with powers and roots, including fractional and negative exponents.</p>	
	12.P.1  12.P.2  12.P.3  12.P.4  12.P.5  12.P.6	Patterns, Relations, & Algebra	<p>Describe, complete, extend, analyze, generalize, and create a wide variety of patterns, including iterative and recursive patterns such as Pascal's Triangle.</p> <p>Identify arithmetic and geometric sequences and finite arithmetic and geometric series. Use the properties of such sequences and series to solve problems, including finding the general term and sum recursively and explicitly.</p> <p>Demonstrate an understanding of the binomial theorem and use it in the solution of problems.</p> <p>Demonstrate an understanding of the trigonometric, exponential, and logarithmic functions.</p> <p>Perform operations on functions, including composition. Find inverses of functions.</p> <p>Given algebraic, numeric and/or graphical representations, recognize functions as polynomial, rational, logarithmic, exponential, or trigonometric.</p>	

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	<p>12.P.7</p> <p>12.P.8</p> <p>12.P.9</p> <p>12.P.10</p> <p>12.P.11</p> <p>12.P.12</p>	<p>Patterns, Relations, &amp; Algebra</p>	<p>Students will:</p> <p>Find solutions to quadratic equations (with real coefficients and real or complex roots) and apply to the solutions of problems.</p> <p>Solve a variety of equations and inequalities using algebraic, graphical, and numerical methods, including the quadratic formula; use technology where appropriate. Include polynomial, exponential, logarithmic, and trigonometric functions; expressions involving absolute values; trigonometric relations; and simple rational expressions.</p> <p>Use matrices to solve systems of linear equations. Apply to the solution of everyday problems.</p> <p>Use symbolic, numeric, and graphical methods to solve systems of equations and/or inequalities involving algebraic, exponential, and logarithmic expressions. Also use technology where appropriate. Describe the relationships among the methods.</p> <p>Solve everyday problems that can be modeled using polynomial, rational, exponential, logarithmic, trigonometric, and step functions, absolute values, and square roots. Apply appropriate graphical, tabular, or symbolic methods to the solution. Include growth and decay; joint (e.g., <math>1=Part</math>, <math>y=k(w_1+w_2)</math>) and combined (<math>F=G(m_1m_2)/d^2</math>) variation, and periodic processes.</p> <p>Relate the slope of a tangent line at a specific point on a curve to the instantaneous rate of change. Identify maximum and minimum values of functions in simple situations. Apply these concepts to the solution of problems.</p>	

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	12.P.13	Patterns, Relations, & Algebra	<p>Students will:</p> <p>Describe the translations and scale changes of a given function <math>f(x)</math> resulting from substitutions for the various parameters <math>a</math>, <math>b</math>, <math>c</math>, and <math>d</math> in <math>y=af(b(x+c/b))+d</math>. In particular, describe the effect of such changes on polynomial, rational, exponential, logarithmic, and trigonometric functions.</p>	
	12.G.1  12.G.2  12.G.3  12.G.4  12.G.5	Geometry	<p>Define the sine, cosine, and tangent of an acute angle. Apply to the solution of problems.</p> <p>Derive and apply basic trigonometric identities (e.g., <math>\sin^2q+\cos^2q+1=\sec^2q</math>) and the laws of sines and cosines.</p> <p>Use the notion of vectors to solve problems. Describe addition of vectors and multiplication of a vector by a scalar, both symbolically and geometrically. Use vector methods to obtain geometric results.</p> <p>Relate geometric and algebraic representations of lines, simple curves, and conic sections.</p> <p>Apply properties of angles, parallel lines, arcs, radii, chords, tangents, and secants to solve problems.</p>	
	12M.1.  12M.2	Measurement	<p>Describe the relationship between degree and radian measures, and use radian measure in the solution of problems, in particular, problems involving angular velocity and acceleration.</p> <p>Use dimensional analysis for unit conversion and to confirm that expressions and equations make sense.</p>	

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	<p>12.D.1</p> <p>12.D.2</p> <p>12.D.3</p> <p>12.D.4</p> <p>12.D.5</p> <p>12.D.6</p> <p>12.D.7</p>	<p>Data Analysis, Statistics, &amp; Probability</p>	<p>Students will:</p> <p>Design surveys and apply random sampling techniques to avoid bias in the data collection.</p> <p>Select an appropriate graphical representation for a set of data and use appropriate statistics (e.g., quartile or percentile distribution) to communicate information about the data.</p> <p>Apply regression results and curve fitting to make predictions from data.</p> <p>Apply uniform, normal, and binomial distributions to the solutions of problems.</p> <p>Describe a set of frequency distribution data by spread (i.e., variance and standard deviation), skewness, symmetry, number of modes, or other characteristics. Use these concepts in everyday applications.</p> <p>Use combinatorics (e.g., “fundamental counting principle,” permutations, and combinations) to solve problems, in particular, to compute probabilities of compound events. Use technology as appropriate.</p> <p>Compare the results of simulations (e.g., random number tables, random functions, and area models) with predicted probabilities.</p>	