MATHEMATICS

Algebra 3-4 (Algebra 2)

Grades 9-12		
1. Students solve equations and inequalities involving absolute value.	2. Students solve systems of linear equations and inequalities (in two or three variables) simultaneously, by substitution, graphically, or with matrices.	3. Students are adept at operations on polynomials, including long division.
4. Students factor polynomials representing the difference of squares, perfect square trinomials, and the sum and differences of two cubes.	5. Students demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically. In particular, they can plot complex numbers as points on the plane.	6. Students add, subtract, multiply and divide complex numbers. .
7. Students add, subtract, multiply, divide, reduce, and evaluate rational expressions with monomial and polynomial denominators, and simplify complicated fractions including fractions with negative exponents in the denominator.	8. Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system.	9. Students demonstrate and explain the effect changing a coefficient has of the graph of quadratic functions. That is, students can determine how the graph of a parabola changes as a, b, and c vary in the equation $y = a(x-b)^2 + c$.
10. Students graph quadratic functions and determine the maxima, minima, and zeros of the function.	11. Students prove simple laws of logarithms. 11.1 Students understand the inverse relationship between exponents and logarithms, and use this relationship to solve problems involving logarithms and exponents. 11.2 Students judge the validity of an argument based on whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step.	12. Students know the laws of exponents, understand exponential functions, and use these functions in problems involving exponential growth and decay.

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13. Students use the definition of logarithms and the product formula for logs to translate between logarithms in any base.	**14. Students understand and use the properties of logarithms to simplify logarithmic numeric expressions and identify their approximate values**.	**15. Students determine if a specific algebraic statement involving rational expressions, radical expressions, logarithmic or exponential functions, is sometimes true, always true, or never true.**
16. Students demonstrate and explain how the geometry of the graph of a conic section (e.g., asymptotes, foci, eccentricity) depends upon the coefficients of the quadratic equation representing it.	**17. Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$, students can use the method of completing the square to put the equation into standard form, and can recognize whether its graph is a circle, ellipse, parabola, or hyperbola. Students can then graph the equation.**	**18. Students use fundamental counting principles to compute combinations and permutations.**
19. Students use combinations and permutations to compute probabilities.	**20. Students know the Binomial Theorem and use it to expand binomial expressions which are raised to positive integer powers.**	**21. Students apply the method of mathematical induction to prove general statements about the positive integers.**
22. Students find the general term and the sums of arithmetic series and both finite and infinite geometric series.	**23. Students derive the summation formulas for arithmetic series and both finite and infinite geometric series.**	**24. Students solve problems involving functional concepts such as composition, inverse, and arithmetic operations on functions.**
25. Students use properties from number systems to justify steps in combining and simplifying functions.	**SM.26. Students can apply the Rational Root Theorem and Descartes' Law of Sines**.	**MA.3. Students can give proofs of various formulas using the technique of mathematical induction.**

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MA.4. Students know the statement of and can apply the Fundamental Theorem of Algebra.	**T.1. Students understand the notion of angle, and how to measure it, both in degrees and radians. They can convert between degrees and radians.**	**T.2. Students know the definition of sine and cosine and y and x coordinates of points on the unit circle, and are familiar with the graphs of the sine and cosine functions.**
T.3. Students know the identity $\cos^2(x) + \sin^2(x) = 1$. T.3.1 Students prove that this identity is equivalent of the Pythagorean theorem (i.e., students can prove this identity using the Pythagorean theorem, and conversely they can prove the Pythagorean theorem as a consequence of this identity. T.3.2 Students prove other trigonometric identities, and simplify others using the identity $\cos^2(x) + \sin^2(x) = 1$ (e.g., students use this identity to prove that $\sec^2(x) = \tan^2(x) + 1$).	**T.9. Students compute, by hand, the values of the trigonometric functions and the inverse trigonometric functions at various standard points.**	**T.12. Students use trigonometry to determine unknown sides or angles in right triangles.**
P.1. Students know the definition of the notion of independent events, and can use the addition, multiplication, and complementation rules to solve for the probabilities of particular events in finite sample spaces.	**P.2 . Students know the definition of conditional probability , and use it to solve for probabilities in finite sample spaces.**	**P.3. Students demonstrate understanding of the notion of discrete variables by using them to solve for the probabilities of outcomes, such as the probability of the occurrence of five heads in fourteen coin tosses.**
P.4. Students are familiar with the standard distributions (normal, binomial, and exponential), and can use them to solve for events in problems where the distribution	**P.5. Students determine the mean and standard deviation of a normally distributed random variable.**	**P.6. Students know the definitions of the mean, median, and mode of distribution of real valued data, and can compute them in particular situations.**

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belongs to these families.		
P.7. Students compute the variance and standard deviation of a distribution of data.	**P.8. Students organize and describe distributions of data using a number of different methods, including frequency tables, histograms, standard line and bar graphs, stem and leaf displays, scatter plots, and box and whisker plots.**	**P.9. Students find the line of the best fit to a given distribution of data using least squares regression.**
LA.4. Students perform addition on matrices.	**LA.5. Students perform matrix multiplication.**	**LA.10. Students compute the determinants of 2 by 2 and 3 by 3 matrices, and use them to solve systems of equations with Cramer's rule.**