ACCRS/QUALITY CORE CORRELATION DOCUMENT: ALGEBRA II

2010 ACOS ALGEBRA I I	QUALITYCORE COURSE STANDARD	COMMENTS
Perform arithmetic operations with complex numbers.		
1. **[N-CN1]** Know there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi with a and b real.	C.1.a. Identify complex numbers and write their conjugates.	**Students will be required to find quotients of complex numbers on QualityCore assessment.**
2. **[N-CN2]** Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	C.1.b. Add, subtract, and multiply complex numbers.	
3. **(+) [N-CN3]** Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.	C.1.a. Identify complex numbers and write their conjugates.	
Use complex numbers in polynomial identities and equations. *(Polynomials with real coefficients.)*		
4. **[N-CN7]** Solve quadratic equations with real coefficients that have complex solutions.	E.1.c. Solve quadratic equations with complex number solutions.	
5. **(+) [N-CN8]** Extend polynomial identities to the complex numbers.		**Example: $x^2 + 4 = (x + 2i)(x-2i)$**
6. **[N-CN9]** Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	F.2.c. Recognize the connection among zeros of a polynomial function, x-intercepts, factors of polynomials, and solutions of polynomial equations. E.1.b Use the discriminant to determine the number and type of roots for a given quadratic equation.	**Use the discriminant to analyze the zeros.**
Perform operations on matrices and use matrices in applications.		
7. **(+) [N-VM6]** Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network. *(Use technology to approximate roots.)*	I.1.f. Use technology to perform operations on matrices, find determinants, and find inverses	
8. **(+) [N-VM7]** Multiply matrices by scalars to produce new matrices, e.g, as when all of the payoffs in a game are doubled.	I.1.a. Add, subtract, and multiply matrices I.1.b. Use addition, subtraction, and multiplication of matrices to solve real-world problems I.1.f. Use technology to perform operations on matrices, find determinants, and find inverses	
9. **(+) [N-VM8)** Add, subtract, and multiply matrices of appropriate dimensions.	I.1.a. Add, subtract, and multiply matrices I.1.f. Use technology to perform operations on matrices, find determinants, and find inverses	

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10. **(+) [N-VM9]** Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.	I.1.a. Add, subtract, and multiply matrices I.1.b. Use addition, subtraction, and multiplication of matrices to solve real-world problems I.1.f. Use technology to perform operations on matrices, find determinants, and find inverses	
11. **(+) [N-VM10]** Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero is and only if the matrix has a multiplicative inverse.	I.1.c. Calculate the determinant of a 2 x2 and 3x3 matrix I.1.e. Solve systems of equations by using inverses of matrices and determinants I.1.d. Find the inverse of a 2x2 matrix	
Interpret the structure of expressions. ***(Polynomial and rational.)***		
12. **[A-SSE1]** Interpret expressions that represent a quantity in terms of its context.* 12a. **[A-SSE1a]** Interpret parts of an expression, such as terms, factors, and coefficients. 12b. **[A-SSE1b]** Interpret complicated expressions by viewing one or more of their parts as a single entity.	G.1.a. Solve mathematical and real-world rational equation problems (e.g., work or rate problems)	**Expressions are investigated in Algebra I. Focus should be on using the expressions to solve equations and apply.**
13. **[A-SSE2]** Use the structure of an expression to identify ways to rewrite it.	F.1.b Evaluate and simplify polynomial expressions and equations. G.1.c Use properties of roots and rational exponents to evaluate and simplify expressions	
Write expressions in equivalent forms to solve problems.		
14. **[A-SSE4]** Derive the formula for the sum of an infinite geometric series (when the common ratio is not 1), and use the formula to solve problems.*		
Perform arithmetic operations on polynomials. ***(Beyond quadratic.)***		
15. **[A-APR1**] Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	A.1.b. Multiply monomials and binomials. F.1.a. Evaluate and simplify polynomial expressions and equations.	**Adding and subtracting are covered in Algebra I.**

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Understand the relationship between zeros and factors of polynomials.		
16. **[A-APR2]** Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).	F.1.a. Evaluate and simplify polynomial expressions and equations.	
	F.1.b Evaluate and simplify polynomial expressions and equations.	
	F.2.c. Recognize the connection among zeros of a polynomial function, x-intercepts, factors of polynomials, and solutions of polynomial equations.	
17. **[A-APR3]** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	F.1.b Factor polynomials using a variety of methods (e.g., factor theorem, synthetic division, long division, sums and differences of cubes, grouping).	**Teach Rational Root Theorem**
	F.2.a. Determine the number and type of rational zeros for a polynomial function.	
	F.2.b Find all rational zeros of a polynomial function.	
	E.1.a Solve quadratic equations and inequalities using various techniques, including completing the square and using the quadratic formula.	
	F.2.d. Use technology to graph a polynomial function and approximate the zeros, minimum, and maximum; determine domain and range of the polynomial function	
Use polynomial identities to solve problems.		
18. **[A-APR4]** Prove polynomial identities and use them to describe numerical relationships.		**For example: special cases such as factoring of cubics; difference of squares, etc.**
Rewrite rational expressions. *(Linear and quadratic denominators.)*		
19. **[A-APR6]** Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.	F.1.b Evaluate and simplify polynomial expressions and equations.	
Create equations that describe numbers or relationships. *(Equations using all available types of expressions, including simple root functions.)*		
20. **[A-CED1]** Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.**	D.2.b Solve linear programming problems by finding maximum and minimum values of a function over a region defined by linear inequalities.	**Include completing the square, with and without technology**
	E.1.a Solve quadratic equations and inequalities using various techniques, including completing the square and using the quadratic formula.	
	E.1.d. Solve quadratic systems graphically and algebraically with and without technology.	
	E.2.a. Determine the domain and range of a quadratic function; graph the function with and without technology.	
	G.1.a. Solve mathematical and real-world rational equation problems (e.g., work or rate problems).	

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21. **[A-CED2]** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*	D.2.a Graph a system of linear inequalities in two variables with and without technology to find the solution set to the system. D.2.b Solve linear programming problems by finding maximum and minimum values of a function over a region defined by linear inequalities. D.1.c. Solve algebraically a system containing three variables. E.1.d. Solve quadratic systems graphically and algebraically with and without technology. E.2.a. Determine the domain and range of a quadratic function; graph the function with and without technology. E.2.c. Graph a system of quadratic inequalities with and without technology to find the solution set to the system.	**With and without technology**
22. **[A-CED3]** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.*	D.2.a Graph a system of linear inequalities in two variables with and without technology to find the solution set to the system. D.2.b Solve linear programming problems by finding maximum and minimum values of a function over a region defined by linear inequalities. E.2.c. Graph a system of quadratic inequalities with and without technology to find the solution set to the system.	**With and without technology**
23. **[A-CED4]** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.		
Understand solving equations as a process of reasoning, and explain the reasoning. *(Simple rational and radical.)*		
24. **[A-REI2]** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	G.1.b. Simplify radicals that have various indices. G.1.c. Use properties of roots and rational exponents to evaluate and simplify expressions G.1.d. Add, subtract, and divide expressions containing radicals G.1.e. Rationalize denominators containing radicals and find the simplest common denominator G.1.f. Evaluate expressions and solve equations containing nth roots or rational exponents G.1.g. Evaluate and solve radical equations given a formula for a real-world situations	**Include simplifying rational exponents.**

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Solve equations and inequalities in one variable.		
25. **[A-REI4b]** Recognize when the quadratic formula gives complex solutions, and write them as a ± bi for real numbers *a* and *b*.		
Solve systems of equations.		
26**. (+) [A-REI9]** Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 x 3 or greater).	I.1.e. Solve systems of equations by using inverses of matrices and determinants	**Include solving systems of equations with three variables algebraically**
Represent and solve equations and inequalities graphically. *(Combine polynomial, rational, radical, absolute value, and exponential functions.)*		
27. **[A-REI11]** Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*	D.1.a. Solve linear inequalities containing absolute value D.1.b Solve compound inequalities containing "and" and "or" and graph the solution set	**Solve linear inequalities using absolute value.** **Solve compound inequalities.**
Understand the graphs and equations of conic sections. (Emphasize understanding graphs and equations of circles and parabolas.)		
28. **[AL]** Create graphs of conic sections, including parabolas, hyperbolas, ellipses, circles, and degenerate conics, from second-degree equations. 28a. **[AL]** Formulate equations of conic sections from their determining characteristics.	E.3.a. Identify conic sections (e.g., parabola, circle, ellipse, hyperbola) from their equations in standard form. E.3.b. Graph circles and parabolas and their translations from given equations or characteristics with and without technology E.3.c. Determine characteristics of circles and parabolas from their equations and graphs E.3.d.Identify and write equations for circles and parabolas from given characteristics and graphs	
Interpret functions that arise in application in terms of the context. *(Emphasize selection of appropriate models.)*		
29. **[F-IF5]** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.*	E.2.a. Determine the domain and range of a quadratic function; graph the function with and without technology. E.2.b. Use transformations (e.g., translation, reflection) to draw the graph of a relation and determine a relations that fits a graph.	

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Analyze functions using different representations. ***(Focus on using key features to guide selection of appropriate type of model function.)***		
30. **[F-IF7]** Graph functions expressed symbolically, and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* 30a. **[F-IF7b]** Graph square root, cube root, and piece-wise defined functions, including step functions and absolute value functions. 30b. **[F-IF7c]** Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. 30c. **[F-IF7e]** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	F.2.d. Use technology to graph a polynomial function and approximate the zeros, minimum, and maximum; determine domain and range of the polynomial function. G.2.a. Graph exponential and logarithmic functions with and without technology	
31. **[F-IF8]** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	E.3.a. Identify conic sections (e.g., parabola, circle, ellipse, hyperbola) from their equations in standard form. E.3.b. Graph circles and parabolas and their translations from given equations or characteristics with and without technology E.3.c. Determine characteristics of circles and parabolas from their equations and graphs E.3.d. Identify and write equations for circles and parabolas from given characteristics and graphs	**For example: Changing from standard form to vertex form**
32. **[F-IF9]** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).		
Build a function that models a relationship between two quantities. ***(Include all types of functions studied.)***		
33. **[F-BF1]** Write a function that describes a relationship between two quantities.* 33a. **[F-BF1b]** Combine standard function types using arithmetic operations.	C.1.d Perform operations on functions, including function composition, and determine domain and range for each of the given functions.	**Include composition and determining domain and range.**
Build new functions from existing functions. ***(Include simple radical, rational, and exponential functions; emphasize common effect of each transformation across function types.)***		

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34. **[F-BF3]** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	E.2.b. Use transformations (e.g., translation, reflection) to draw the graph of a relation and determine a relations that fits a graph.	
35. **[F-BF4]** Find inverse functions. 35a. **[F-BF4a]** Solve an equation of the form f(x) = c for a simple function f that has an inverse, and write an expression for the inverse.		**f(x) = c does not imply the constant function**
Construct and compare linear, quadratic, and exponential models and solve problems. ***(Logarithms as solutions for exponentials.)***		
36. **[F-LE4a]** For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.*	G.2.b. Convert exponential equations to logarithmic form and logarithmic equations to exponential form.	**Include graphing exponential and logarithmic functions with and without technology**
Use probability to evaluate outcomes of decisions. ***(Include more complex situations.)***		
37. (+) **[S-MD6]** Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator). 38. (+) **[S-MD7]** Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	H.1.a Use the fundamental counting principle to count the number of ways an event can happen H.1.b Use counting techniques, like combinations and permutations, to solve problems (e.g., to calculate probabilities) H.1.c. Find the probability of mutually exclusive and nonmutually exclusive events H.1.d. Find the probability of independent and dependent events H.1.e. Use unions, intersections, and complements to find probabilities H.1.f. Solve problems involving conditional probability	
Understand independence and conditional probability and use them to interpret data. (Link to data from simulations or experiments.)		
39. **[S-CP1]** Describe events as subsets of a sample space (the set of outcomes), using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").	H.1.a. Use the fundamental counting principle to count the number of ways an event can happen H.1.b. Use counting techniques, like combinations and permutations, to solve problems (e.g., to calculate probabilities) H.1.c. Find the probability of mutually exclusive and nonmutually exclusive events H.1.e. Use unions, intersections, and complements to find probabilities	

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40. **[S-CP3]** Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.*	H.1.f Solve problems involving conditional probability	
41. **[S-CP4]** Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *	H.1.d. Find the probability of independent and dependent events H.1.f. Solve problems involving conditional probability	
42. **[S-CP5]** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.*	H.1.d. Find the probability of independent and dependent events H.1.f. Solve problems involving conditional probability	
Use the rules of probability to compute probabilities of compound events in a uniform probability model.		
43. **[S-CP6]** Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.*	H.1.f. Solve problems involving conditional probability	
44. **[S-CP7]** Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.*	H.1.d. Find the probability of independent and dependent events	
45. **[S-CP8]** Apply the general Multiplication Rule in a uniform probability model, P(A and B) = [P(A)]x[P(B|A)] =[P(B)]x[P(A|B)], and interpret the answer in terms of the model.*	H.1.d. Find the probability of independent and dependent events	
46. **[S-CP9]** Use permutations and combinations to compute probabilities of compound events and solve problems.*	H.1.b. Use counting techniques, like combinations and permutations, to solve problems (e.g., to calculate probabilities)	