

Orange Unified School District  
**ALGEBRA II / HONORS**  
 Year Course

**GRADE LEVEL:** 9-12

**PREREQUISITES:** Algebra I and Geometry with “C” grade or better

**INTRODUCTION TO THE SUBJECT:**

Algebra II reviews the solving of linear and quadratic equations and inequalities. The course includes aspects of plane analytic geometry, logarithms, complex numbers, sequences and series, probability and statistics, mathematical induction and an introduction to trigonometry.

**ESSENTIAL LEARNINGS: Students will** (Standards are Algebra II unless otherwise noted.)  
 \* Trigonometry Standards; \*\* Probability and Statistics Standards

- Solve, analyze and graph linear equations and inequalities. (1.0, 2.0)
- Perform basic operations on polynomials. (3.0, 7.0)
- Use factor forms to simplify polynomials. (4.0)
- Simplify rational, radical, and exponential expressions. (7.0, 12.0, 15.0)
- Compute with imaginary and complex numbers in standard form and plot complex numbers as points in the complex coordinate plane. (5.0, 6.0)
- Solve, analyze and graph quadratic equations and inequalities, by factoring, completing the square or using quadratic formula. Determine the minimum, maximum, and zeroes of the quadratic function, including real and complex solutions. (8.0, 9.0, 10.0, 17.0)
- Identify and graph the basic conic sections. Given a quadratic polynomial, transform the equation into a standard conic form using completing the square. Identify and/or compute the applicable components of a conic, including radius, center, foci, major and minor axes, asymptotes, vertex, directrix and line of symmetry. (16.0, 17.0)
- Compute the variance and standard deviation of a given data set. (7.0\*\*)
- Understand the inverse relationship between exponential and logarithmic functions and solve problems involving logarithms and exponents. (11.0, 12.0, 13.0, 14.0, 15.0)
- Derive inverses of functions. Perform arithmetic operations and evaluate the composition of two functions. (24.0, 25.0)
- Find the formula for the general term of an arithmetic and geometric sequence and derive the summation formulas of arithmetic series and both finite and infinite geometric series, and compute the sums. (22.0, 23.0)
- Use fundamental counting principle to compute combinations and permutations, as well as compute probabilities. (18.0, 19.0, 1.0\*\*, 2.0\*\*)
- Know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers. (18.0, 20.0)
- Understand the notion of angle and how to measure it, in both degrees and radians and can convert between these measurements. (1.0\*)
- Know the definition of sine and cosine and as  $y$ - and  $x$ -coordinates of points on the unit circle and can compute, by hand, the values of the trigonometric functions at various points. (2.0\*, 9.0\*)
- Are familiar with the graphs of the sine and cosine functions. (2.0\*)
- Know the definitions of the trigonometric functions tangent, cotangent, secant and cosecant. (5.0\*, 6.0\*)
- Solve right triangle and general triangle application problems. (3.0\*, 5.0\*, 9.0\*, 12.0\*, 13.0\*, 14.0\*, 19.0\*)

**COURSE OVERVIEW AND APPROXIMATE UNIT TIME ALLOTMENTS:**

**ASSESSMENT BLUEPRINT:**

Semester	Standard	No. Items in Test
<b>1</b>	1.0 Equations and inequalities involving absolute value	2
	2.0 Systems of linear equations and inequalities	5
	3.0 Operations on polynomials	4
	4.0 Factor difference of squares/perfect square trinomials, sum and difference of two cubes	5
	5.0 Relationship of real and complex numbers; plot complex	2
	6.0 Operations with complex numbers	3
	7.0 Operations/Simplify rational expressions with monomial/polynomial denominators	7
	8.0 Solve and graph quadratic equations	7
	15.0 Algebraic statements: true—always, sometimes, never	2

**FIRST SEMESTER**

**REGULAR BLOCK**

Chapter 1 & 2.1-2.5	Basic Concepts of Algebra (Proof is optional)	15 days	8 days
Chapter 3	Linear Equations and Functions	14 days	7 days
Chapter 4	Products and Factors of Polynomials	12 days	6 days
Chapters 5.1-5.5, 8.3-8.4, 5.6-5.9	Rational Expressions Dividing Polynomials	16 days	8 days
Chapter 6 & Complex Graphing	Irrational and Complex Numbers (Suggestion: include extra section at the end of Chapter 6 on absolute value of a complex number. Also, graphing of a complex number—see top of page 680 from Section 14-4.)	13 days	6 days
Chapter 7.1-7.4	Solving Quadratic Equations	7 days	3 days
Chapter 15.1-15.4	Statistics	5 days	2 days
	TOTAL	82 days	40 days
	Assemblies, testing, final exams	8 days	5 days
		90 days	45 days

**SECOND SEMESTER**

**ASSESSMENT BLUEPRINT:**

<b>Semester</b>	<b>Standard</b>	<b>No. Items in Test</b>
<b>2</b>	9.0 Effect on parabola of changing a coefficient	2
	10.0 Graph quadratic functions; maxima, minima, zeros	2
	11.1 Relationship between/solve exponents and logarithms	7
	12.0 Fractional exponents; exponential functions	4
	13.0 Translate between logarithms in any base	1
	15.0 Algebraic statements: true—always, sometimes, never	1
	16.0 Graph depends on coefficients of quadratic equation	1
	17.0 Recognize equation of circle, ellipse, parabola, hyperbola	1
	18.0 Combinations and permutations	2
	19.0 Compute probabilities	2
	20.0 Binomial theorem	2
	22.0 General term/sums of arithmetic/geometric series	2
	24.0 Functional concepts (composition); operations	2
	25.0 Properties to justify steps	1
	PS1.0 Independent events; solve for probabilities	1
	PS2.0 Conditional probability	1
	TR1.0 Angle measure in degrees and radians	2
	TR9.0 Compute values of trigonometric functions (by hand)	2
	TR12.0 Determine unknown sides or angles in right triangles	2

Chapter 9.1-9.2, 9.4-9.6	Conic Sections: Circle, Ellipse, Hyperbola	8 days	4 days
Chapters 7.5-7.7, 8.5, 8.7, 9.3	Parabolas	9 days	4 days
Chapter 9.7-9.9	Solving Systems (Suggestion: Revisit Conics based on need.)	6 days	3 days
Chapter 10	Exponential and Logarithmic Functions	12 days	6 days
Chapter 11.1-11.6	Sequences and Series (Suggestion: revisit exponential and logarithmic functions based on need.)	9 days	5 days
Chapters 15.5-15.10, 11.7-11.8	Counting & Probability/Binomial Expansion	9 days	4 days
Chapter 12	Triangle Trigonometry	13 days	6 days
Chapter 13.1-13.6	Unit Circle & Graphing Trigonometric Functions	9 days	5 days
	<b>TOTAL</b>	<b>75 days</b>	<b>37 days</b>
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	<b>Assemblies, testing, final exams</b>	<b>15 days</b>	<b>8 days</b>
		<b>90 days</b>	<b>45 days</b>

DATE OF CURRENT CONTENT REVISION: March 2010

DATE OF BOARD APPROVAL: June 14, 2001

**CALIFORNIA STANDARDS TEST—ALGEBRA II**

(Blueprint adopted by the State Board of Education 10/02)

<b>CALIFORNIA CONTENT STANDARDS: ALGEBRA II</b>		<b># of Items</b>
<b>This discipline complements and expands the mathematical content and concepts of Algebra I and Geometry. Students who master Algebra II will gain experience with algebraic solutions of problems in various content areas, including the solution of systems of quadratic equations, logarithmic and exponential functions, the binomial theorem, and the complex number system.</b>		
<b>Algebra II</b>		<b>60</b>
1.0*	Students solve equations and inequalities involving absolute value.	1
2.0*	Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.	5
3.0*	Students are adept at operations on polynomials, including long division.	4
4.0*	Students factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes.	3
5.0*	Students demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically. In particular, they can plot complex numbers as points in the plane.	2
6.0*	Students add, subtract, multiply, and divide complex numbers.	3
7.0*	Students add, subtract, multiply, divide, reduce, and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator.	6
8.0*	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.	4
9.0*	Students demonstrate and explain the effect that changing a coefficient has on 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 $y = a(x-b)^2 + c$ .	2
10.0*	Students graph quadratic functions and determine the maxima, minima, and zeros of the function.	4
<b>Standard Set 11.0* Students prove simple laws of logarithms.</b>		
11.1*	Students understand the inverse relationship between exponents and logarithms, and use this relationship to solve problems involving logarithms and exponents.	3
11.2*	Students judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step.	2 1/2**
12.0*	Students know the laws of fractional exponents, understand exponential functions, and use these functions in problems involving exponential growth and decay.	3
13.0	Students use the definition of logarithms to translate between logarithms in any base.	1
14.0	Students understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.	2
15.0*	Students determine whether a specific algebraic statement involving rational expressions, radical expressions, or logarithmic or exponential functions is sometimes true, always true, or never true.	4

16.0	Students demonstrate and explain how the geometry of the graph of a conic section (e.g., asymptotes, foci, eccentricity) depends on the coefficients of the quadratic equation representing it.	1/3**
17.0	Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$ , students can use the method for completing the square to put the equation into standard form and can recognize whether the graph of the equation is a circle, ellipse, parabola, or hyperbola. Students can then graph the equation.	1
18.0*	Students use fundamental counting principles to compute combinations and permutations.	2
19.0*	Students use combinations and permutations to compute probabilities.	2
20.0*	Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers.	2
21.0	Students apply the method of mathematical induction to prove general statements about the positive integers.	1/3**
22.0	Students find the general term and the sums of arithmetic series and of both finite and infinite geometric series.	2
23.0*	Students derive the summation formulas for arithmetic series and for both finite and infinite geometric series.	NA***
24.0	Students solve problems involving functional concepts, such as composition, defining the inverse function and performing arithmetic operations on functions.	1/2**
25.0	Students use properties from number systems to justify steps in combining and simplifying functions.	1/3**
<b>Probability and Statistics</b>		<b>5</b>
1.0	Students know the definition of the notion of independent events and can use the rules for addition, multiplication, and complementation to solve for probabilities of particular events in finite sample spaces.	1
2.0	Students know the definition of conditional probability and use it to solve for probabilities in finite sample spaces.	2
7.0	Students compute the variance and the standard deviation of a distribution of data.	2
<b>ALGEBRA II TOTAL</b>		<b>65</b>

### **TRIANGLE TRIGONOMETRY STANDARDS**

- 1.0 Students understand the notion of angle and how to measure it, in both degrees and radians. They can convert between degrees and radians.
- 3.0 Students know the identity  $\cos^2(x) + \sin^2(x) = 1$ :
  - 3.1 Students prove that this identity is equivalent to the Pythagorean Theorem (i.e., students can prove this identity by using the Pythagorean Theorem and, conversely, they can prove the Pythagorean Theorem as a consequence of this identity.)
  - 3.2 Students prove other trigonometric identities and simplify others by using the identity  $\cos^2(x) + \sin^2(x) = 1$ , e.g. students use this identity to prove that  $\sec^2(x) = \tan^2(x) + 1$ .
- 5.0 Students know the definitions of the tangent and cotangent functions and can graph them.
- 6.0 Students know the definitions of the secant and cosecant functions and can graph them.
- 9.0 Students compute, by hand, the values of the trigonometric functions and the inverse trigonometric functions at various standard points.
- 12.0 Students use trigonometry to determine unknown sides or angles in right triangles.
- 13.0 Students know the law of sines and law of cosines and apply those laws to solve problems.
- 14.0 Students determine the area of a triangle, given one angle and the two adjacent sides.
- 19.0 Students are adept at using trigonometry in a variety of applications and word problems.