

Orange Unified School District
ESSENTIALS OF MATHEMATICS
 Year Course

GRADE LEVEL: 11-12

PREREQUISITES: Student has received a score below 350 on the math portion of the California High School Exit Exam (CAHSEE) and/or has scored below proficient on the Algebra CST.

INTRODUCTION TO THE SUBJECT:

This is a non-college preparatory mathematics course designed to prepare students to succeed in higher level concepts. The following six strands of sixth, seventh and eighth grade California State Content Standards are addressed: Number Sense, Algebra and Functions, Algebra 1, Statistics, Data Analysis, and Probability, Measurement and Geometry, and Mathematical Reasoning. Concept attainment, skill development, and test-taking skills will be emphasized. This course is designed for juniors and seniors who have been unsuccessful on the CAHSEE exam and/or have scored below proficient on the Algebra 1 CST. Students may receive up to 10 math credits for successful completion of the course.

COURSE OBJECTIVES:

BY THE END OF THE COURSE THE STUDENT WILL BE ABLE TO:

Successfully work problems that are directly related to the sixth, seventh, and Algebra 1 California Content Standards as assessed on the CAHSEE and CST exam.

COURSE OVERVIEW AND APPROXIMATE TIME ALLOTMENTS:
 (California Content Standards are denoted in **bold**)

<u>FIRST SEMESTER</u>	<u>WEEKS</u>
I. Number Sense (7 th Grade: 1.1, 1.2, 1.3, 1.6, 1.7, 2.1, 2.2, 2.3, 2.4, 2.5)	6
II. Mathematical Reasoning (7 th Grade: 1.1, 1.2, 2.1, 2.3, 2.4, 3.1, 3.3)	2
III. Algebra and Functions (7 th Grade: 1.1, 1.2, 1.5, 2.1, 2.2, 3.1, 3.3, 3.4, 4.1, 4.2)	6

	<u>WEEKS</u>
IV. Algebra 1 (2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 15.0)	4

SECOND SEMESTER

I. Algebra 1 (2.0, 3.0)	2
II. Statistics, Data Analysis, and Probability (6 th Grade: 1.1, 2.5, 3.1, 3.3, 3.5) (7 th Grade: 1.1, 1.2, 1.3)	6
III. Measurement and Geometry (7 th Grade: 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 3.2, 3.3, 3.4)	6
IV. Math Life Skills (6 th Grade: 2.5) (7 th Grade: 1.1, 1.6, 1.7)	4

Recommended Texts: California Math Review, Content Standards 6-Algebra 1, Revised to CAHSEE July 2003 Mathematics Blueprints (American Book Company, 2003) and CAHSEE Success, Mathematics (Kaplan) (Supplement).

Recommended Diagnostic Tools: Student CAHSEE strand assessment, Essential Mathematics Website (OCDE), Accelerated Math, textbook diagnostic tests, teacher created tests using Sacramento and Alameda County “Supporting Standards” document.

DATE OF CONTENT REVISION: NEW August 2005

DATE OF BOARD APPROVAL: September 8, 2005

Addendum
THE CALIFORNIA MATHEMATICS CONTENT STANDARDS
GRADES 6, 7, and Algebra 1

STATISTICS, DATA ANALYSIS, AND PROBABILITY (Grade 6)

1.0 Students compute and analyze statistical measurements for data sets:

1.1 Compute the range, mean, median, and mode of data sets.

2.0 Students use data samples of a population and describe the characteristics and limitations of the samples:

2.5 Identify claims based on statistical data and, in simple cases, evaluate the validity of the claims.

3.0 Students determine theoretical and experimental probabilities and use these to make predictions about events:

- 3.1 Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome.
- 3.3 Represent probabilities as ratios, proportions, decimals between 0 and 1, and percentages between 0 and 100 and verify that the probabilities computed are reasonable; know that if P is the probability of an event, $1-P$ is the probability of an event not occurring.
- 3.5 Understand the difference between independent and dependent events.

NUMBER SENSE (Grade 7)

1.0 Students know the properties of, and compute with, rational numbers expressed in a variety of forms:

- 1.1 Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.
- 1.2 Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
- 1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
- 1.6 Calculate the percentage of increases and decreases of a quantity.
- 1.7 Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

2.0 Students use exponents, powers, and roots and use exponents in working with fractions:

- 2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.
- 2.2 Add and subtract fractions by using factoring to find common denominators.
- 2.3 Multiply, divide, and simplify rational numbers by using exponent rules.

- 2.4 Use the inverse relationship between raising to a power and extracting the root of a perfect square integer; for an integer that is not square, determine without a calculator the two integers between which its square root lies and explain why.
- 2.5 Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.

MATHEMATICAL REASONING (Grade 7)

1.0 Students make decisions about how to approach problems:

- 1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
- 1.2 Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.

2.0 Students use strategies, skills, and concepts in finding solutions:

- 2.1 Use estimation to verify the reasonableness of calculated results.
- 2.3 Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- 2.4 Make and test conjectures by using both inductive and deductive reasoning.

3.0 Students determine a solution is complete and move beyond a particular problem by generalizing to other situations:

- 3.1 Evaluate the reasonableness of the solution in the context of the original situation.
- 3.3 Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

ALGEBRA AND FUNCTIONS (Grade 7)

1.0 Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs:

- 1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A).
- 1.2 Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)$.

- 1.5 Represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph.

2.0 Students interpret and evaluate expressions involving integer powers and simple roots:

- 2.1 Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.
- 2.2 Multiply and divide monomials; extend the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent.

3.0 Students graph and interpret linear and some nonlinear functions:

- 3.1 Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems.
- 3.3 Graph linear functions, noting that the vertical change (change in y-value) per unit of horizontal change (change in x-value) is always the same and know that the ratio (“rise over run”) is called the slope of a graph.
- 3.4 Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.

4.0 Students solve simple linear equations and inequalities over the rational numbers:

- 4.1 Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.
- 4.2 Solve multi-step problems involving rate, average speed, distance, and time or a direct variation.

STATISTICS, DATA ANALYSIS, AND PROBABILITY (Grade 7)

1.0 Students collect, organize, and represent data sets that have one or more variables and identify relationships among variables within a data set by hand and through the use of an electronic spreadsheet software program:

- 1.1 Know various forms of display for data sets, including a stem-and-leaf plot or box-and-whisker plot; use the forms to display a single set of data or to compare two sets of data.

- 1.2 Represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).
- 1.3 Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.

MEASUREMENT AND GEOMETRY (Grade 7)

1.0 Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems:

- 1.1 Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters).
- 1.2 Construct and read drawings and models made to scale.
- 1.3 Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.

2.0 Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale:

- 2.1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.
- 2.2 Estimate and compute the area of more complex or irregular two- and three-dimensional figures by breaking the figures down into more basic geometric objects.
- 2.3 Compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor.
- 2.4 Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or $[1 \text{ ft}^2] = [144 \text{ in}^2]$, 1 cubic inch is approximately 16.38 cubic centimeters or $[1 \text{ in}^3] = [16.38 \text{ cm}^3]$).

3.0 Students know the Pythagorean theorem and deepen their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures:

- 3.2 Understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them, and determine their image under translations and reflections.
- 3.3 Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement.
- 3.4 Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures.

ALGEBRA I

Symbolic reasoning and calculations with symbols are central in algebra. Through the study of algebra, a student develops an understanding of the symbolic language of mathematics and the sciences. In addition, algebraic skills and concepts are developed and used in a wide variety of problem-solving situations.

- 2.0 Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.
- 3.0 Students solve equations and inequalities involving absolute values.
- 4.0 Students simplify expressions before solving linear equations and inequalities in one variable, such as $3(2x-5) + 4(x-2) = 12$.
- 5.0 Students solve multi-step problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
- 6.0 Students graph a linear equation and compute the x - and y -intercepts (e.g., graph $2x + 6y = 4$). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by $2x + 6y < 4$).
- 7.0 Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations by using the point-slope formula.
- 8.0 Students understand the concepts of parallel lines and perpendicular lines and how those slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point.

- 9.0** Students solve a system of two linear equations in two variables algebraically and are able to interpret the answer graphically. Students are able to solve a system of two linear inequalities in two variables and to sketch the solution sets.
- 10.0** Students add, subtract, multiply, and divide monomials and polynomials. Students solve multi-step problems, including word problems, by using these techniques.
- 15.0** Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.



