Mathematics Standards

A high quality mathematics program is essential for all students and provides every student with the opportunity to choose among the full range of future career paths. Mathematics trains the mind to be analytical – providing the foundation for intelligent and precise thinking. To compete successfully in the worldwide economy, today's students must have a high degree of comprehension in mathematics. The *Mathematics Content Standards for California Public Schools, Kindergarten Through Grade Twelve* focus on essential content for all students and prepare students for the study of advanced mathematics, science and technical careers, and post-secondary study in all content areas. All students are required to grapple with solving problems; develop abstract, analytical thinking skills; learn to deal effectively and conformably with variables and equations; and use mathematical notation effectively to model situations. The goal of mathematics education is for students to:

- Develop fluency in basic computational skills
- Develop an understanding of mathematical concepts
- Become mathematical problem solvers who can recognize and solve routine problems readily and can find way to reach a solution or goal where no routine path is apparent
- Communicate precisely about quantities, logical relationships, and unknown values through the use of signs, symbols, models, graphs, and mathematical terms.
- Reason mathematically by gathering data, analyzing evidence, and building arguments to support or refute hypotheses.
- Make connections among mathematical ideas and between mathematics and other disciplines

Technology should be used to promote mathematics learning. Technology can help promote students' understanding of mathematical concepts, quantitative reasoning, and achievement when used as a tool for solving problems, testing conjectures, assessing data, and verifying solutions. When students use electronic tools, databases, programming language, and simulations, they have opportunity to extend their comprehension, reasoning, and problem-solving skills beyond what is possible with traditional print resources. Technology may help students develop the skills, knowledge, and insight necessary to meet rigorous content standards in mathematics and make a successful transition to the world beyond school. Technology supports, but is not a substitute for, the development of quantitative reasoning and problem solving.

When students delve deeply into mathematics, they gain not only conceptual understanding of mathematical principles but also knowledge of, and experience with, pure reasoning. One of the most important goals of mathematics is to teach students logical reasoning. The logical reasoning inherent in the study of mathematics allows for applications to a broad range of situations in which answers to practical problems can be found with accuracy.

By grade eight, students' mathematical sensitivity should be sharpened. Students need to start perceiving logical subtleties and appreciate the need for sound mathematical arguments before making conclusions. As students progress in the study of mathematics, they learn to distinguish between inductive and deductive reasoning. Understand the meaning of logical implication; test general assertions; realize that one counterexample is enough to show that a general assertion is false. Understand conceptually that although a general assertion is true in a few cases, it is not true in all cases; distinguish between something being proven and a mere plausibility argument; and identify logical errors in chains of reasoning. The table reflects typical grade-level groupings of these disciplines in both integrated and traditional curricula. The lightly shaded region reflects the minimum requirement for mastery by all students. The dark shaded region depicts content that is typically considered elective.

Discipline	Grades				
	Eight	Nine	Ten	Eleven	Twelve
Algebra I					
Geometry					
Algebra II					
Probability and Statistics					
Trigonometry					
Linear Algebra					
Mathematical Analysis					
Advanced Placement Probability and Statistics					
Calculus					

Mathematics Standards

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.
Students: 1.0 (1.1); 2.0; 3.0; 4.0; 5.0; 6.0; 7.0; 8.0; 9.0; 10.0; 11.0; 12.0; 13.0; 14.0; 15.0; 16.0; 17.0; 18.0; 19.0; 20.0; 21.0; 22.0; 23.0; 24.0 (24.1/2/3) and 25.0 (25.1, 25.2, 25.3).

GEOMETRY
The geometry skills and concepts developed in this discipline are useful to all students. Aside from learning these skills and concepts, students will develop their ability to construct formal, logical arguments and proofs in geometric settings and problems.
Students: 1.0; 2.0; 3.0; 4.0; 5.0; 6.0; 7.0; 8.0; 9.0; 10.0; 11.0; 12.0; 13.0; 14.0; 15.0; 16.0; 17.0; 18.0; 19.0; 20.0; 21.0; and 22.0.

ALGEBRA II
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.
Students: 1.0; 2.0; 3.0; 4.0; 5.0; 6.0; 7.0; 8.0; 9.0; 10.0; 11.0; 12.0; 13.0; 14.0; 15.0; 16.0; 17.0; 18.0; 19.0; 20.0; 21.0; 22.0; 23.0; 24.0 and 25.0.

TRIGONOMETRY
Trigonometry uses the techniques that students have previously learned from the study of algebra and geometry. The trigonometric functions studies are defined geometrically rather than in terms of algebraic equations. Facility with these functions as well as the ability to prove basic identities regarding them is especially important for students intending to study calculus, more advanced mathematics, physics and other sciences, and engineering in college.
Students: 1.0; 2.0; 3.0 (3.2, 3.2); 4.0; 5.0; 6.0; 7.0; 8.0; 9.0; 10.0; 11.0; 12.0; 13.0; 14.0; 15.0; 16.0; 17.0; 18.0; and 19.0.

MATHEMATICAL ANALYSIS
This discipline combines many of the trigonometric, geometric, and algebraic techniques needed to prepare students for the study of calculus and strengthens their conceptual understanding of problems and mathematical reasoning in solving problems. These standards take a functional point of view toward those topics. The most significant new concept is that of limits. Mathematical analysis is often combined with a course in trigonometry or perhaps with one linear algebra to make a yearlong pre-calculus course.
Students: 1.0; 2.0; 3.0; 4.0; 5.0 5.1, 5.2); 6.0; 7.0; 8.0.

LINEAR ALGEBRA
The general goal in this discipline is for students to learn the techniques of matrix manipulation so that they can solve systems of linear equations in any number of variables. Linear algebra is most often combined with another subject, such as trigonometry, mathematical analysis, or pre-calculus.
Students: 1.0; 2.0; 3.0; 4.0; 5.0; 6.0; 7.0; 8.0; 9.0; 10.0; 11.0 and 12.0.

PROBABILITY and STATISTICS
This discipline is an introduction to the study of probability, interpretation of data, and fundamental statistical solving. Mastery of this academic content will provide students with a solid foundation in probability and facility in processing statistical information.
Students: 1.0; 2.0; 3.0; 4.0; 5.0 5.1, 5.2); 6.0; 7.0; 8.0.

ADVANCED PROBABILITY and STATISTICS
This discipline is a technical and in-depth extension of probability and statistics. In particular, mastery of academic content for advanced placement gives students the background to succeed in the Advanced Placement examination in the subject.
Students: 1.0; 2.0; 3.0; 4.0; 5.0; 6.0; 7.0; 8.0; 9.0; 10.0; 11.0; 12.0; 13.0; 14.0; 15.0; 16.0; 17.0; 18.0; and 19.0.

Mathematics Standards

CALCULUS

When taught in high school, calculus should be presented with the same level of depth and rigor as are entry-level college and university calculus courses. These standards outline a complete college curriculum in one variable calculus. Many high school programs may have insufficient time to cover all of the following content in a typical academic year. For example, some districts may treat differential equations lightly and spend substantial time on infinite sequences and series. Others may do the opposite. Consideration of the College Board syllabi for Calculus AB and Calculus CD sections of the Advanced Placement Examination in Mathematics may be helpful in making curricular decisions. Calculus is a widely applied area of mathematics and involves a beautiful intrinsic theory. Students mastering this content will be exposed to both aspects of the subject.

Student: 1.0 (1.1, 1.2, 1.3); 2.0; 3.0; 4.0 (41., 4.2,, 4.3, 4.4); 5.0; 6.0; 7.0; 8.0; 9.0; 10.0; 11.0; 12.0; 13.0; 14.0; 15.0; 16.0; 17.0; 18.0; 19.0; 20.0; 21.0; 22.0; 23.0; 24.0; 25.0; 26.0 and 27.0.