Introduction

All students need a high-quality mathematics program designed to prepare them to graduate from high school ready for college and careers. In support of this goal, California adopted the California Common Core State Standards: Mathematics (CA CCSSM) in August 2010, replacing the 1997 statewide mathematics academic standards. As part of the modification of the CA CCSSM in January 2013, the California State Board of Education also approved higher mathematics standards organized into model courses.

The CA CCSSM are designed to be robust, linked within and across grades, and relevant to the real world, reflecting the knowledge and skills that young people will need for success in college and careers. With California's students fully prepared for the future, our students will be positioned to compete successfully in the global economy.

The development of the standards began as a voluntary, state-led effort coordinated by the Council of Chief State School Officers (CCSSO) and the National Governors Association (NGA) Center for Best Practices. Both organizations were committed to developing a set of standards that would help prepare students for success in career and college. The CA CCSSM are based on evidence of the skills and knowledge needed for college and career readiness and an expectation that students be able to know and do mathematics by solving a range of problems and engaging in key mathematical practices.

The development of the standards was informed by international benchmarking and began with research on what is known about how students' mathematical knowledge, skills, and understanding develop over time. The progression from kindergarten standards to standards for higher mathematics exemplifies the three principles of focus, coherence, and rigor that are the basis of the CCSSM.

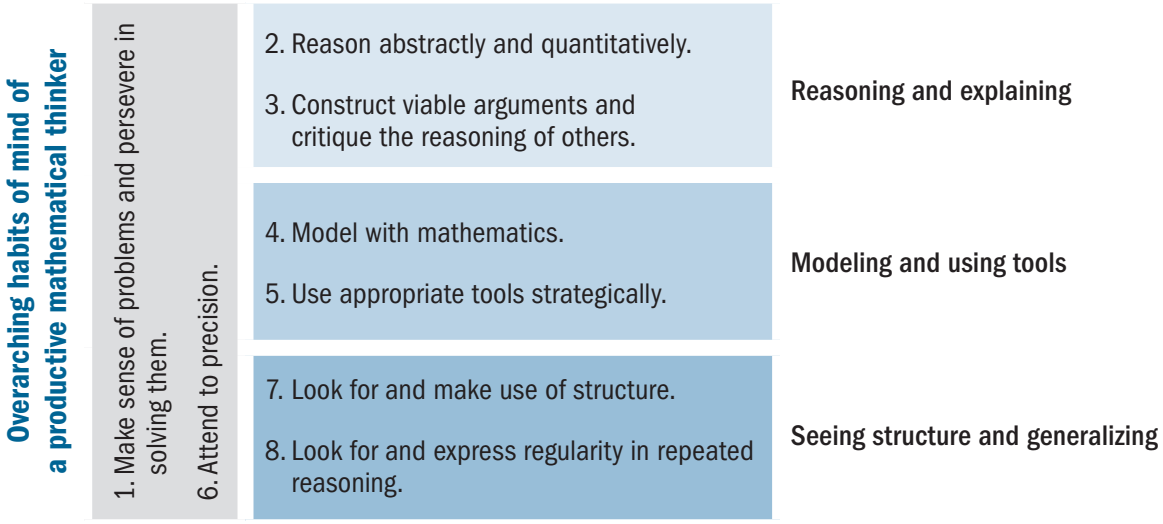
The first principle, *focus,* means that instruction should focus deeply on only those concepts that are emphasized in the standards so that students can gain strong foundational conceptual understanding, a high degree of procedural skill and fluency, and the ability to apply the mathematics they know to solve problems inside and outside the mathematics classroom. *Coherence* arises from mathematical connections. Some of the connections in the standards knit topics together at a single grade level. Most connections are vertical, as the standards support a progression of increasing knowledge, skill, and sophistication across the grades. Finally, *rigor* requires that conceptual understanding, procedural skill and fluency, and application be approached with equal intensity.

Two Types of Standards

The CA CCSSM include two types of standards: Eight Mathematical Practice Standards (identical for each grade level) and Mathematical Content Standards (different at each grade level). Together these standards address both "habits of mind" that students should develop to foster mathematical understanding and expertise and skills and knowledge—what students need to know and be able to do. The mathematical content standards were built on progressions of topics across grade levels, informed by both research on children's cognitive development and by the logical structure of mathematics.

The Standards for Mathematical Practice (MP) are the same at each grade level, with the exception of an additional practice standard included in the CA CCSSM for higher mathematics only: **MP3.1: Students build proofs by induction and proofs by contradiction. CA** This standard may be seen as an extension of Mathematical Practice 3, in which students construct viable arguments and critique the reasoning of others. Ideally, several MP standards will be evident in each lesson as they interact and overlap with each other. The MP standards are not a checklist; they are the basis of mathematics instruction and learning. Structuring the MP standards can help educators recognize opportunities for students to engage with mathematics in grade-appropriate ways. The eight MP standards may be grouped into four categories as illustrated in the following chart.

Structuring the Standards for Mathematical Practice[1]



The CA CCSSM call for mathematical practices and mathematical content to be connected as students engage in mathematical tasks. These connections are essential to support the development of students' broader mathematical understanding—students who lack understanding of a topic may rely too heavily on procedures. The MP standards must be taught as carefully and practiced as intentionally as the Standards for Mathematical Content. Neither should be isolated from the other; effective mathematics instruction occurs when the two halves of the CA CCSSM come together as a powerful whole.

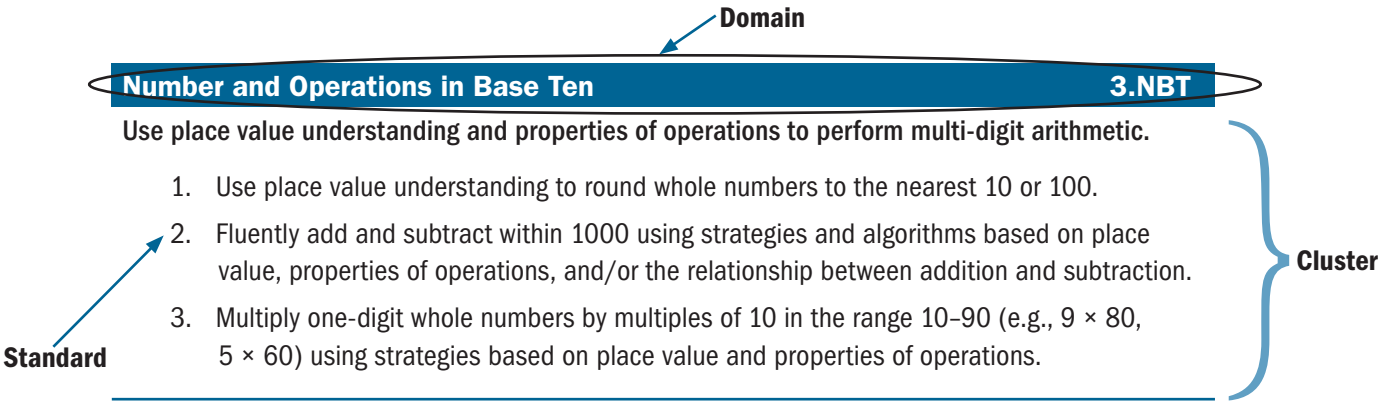
How to Read the Standards

Kindergarten–Grade 8

In kindergarten through grade 8, the CA CCSSM are organized by grade level and then by domains (clusters of standards that address "big ideas" and support connections of topics across the grades), clusters (groups of related standards inside domains), and finally by the standards (what students should understand and be able to do). The standards do not dictate curriculum or pedagogy. For example, just because Topic A appears before Topic B in the standards for a given grade does not mean that Topic A must be taught before Topic B.

The code for each standard begins with the grade level, followed by the domain code and the number of the standard. For example, "3.NBT 2" would be the second standard in the domain of Number and Operations in Base Ten of the standards for grade 3.

1. Bill McCallum. 2011. *Structuring the Mathematical Practices.* http://commoncoretools.me/wp-content/uploads/2011/03/practices.pdf (accessed April 1, 2013).



Higher Mathematics

In California, the CA CCSSM for higher mathematics are organized into both model courses and conceptual categories. The higher mathematics courses adopted by the State Board of Education in January 2013 are based on the guidance provided in Appendix A published by the Common Core State Standards Initiative.[2] The model courses for higher mathematics are organized into two pathways: traditional and integrated. The traditional pathway consists of the higher mathematics standards organized along more traditional lines into Algebra I, Geometry, and Algebra II courses. The integrated pathway consists of the courses Mathematics I, II, and III. The integrated pathway presents higher mathematics as a connected subject, in that each course contains standards from all six of the conceptual categories. In addition, two advanced higher mathematics courses were retained from the 1997 mathematics standards: Advanced Placement Probability and Statistics and Calculus.

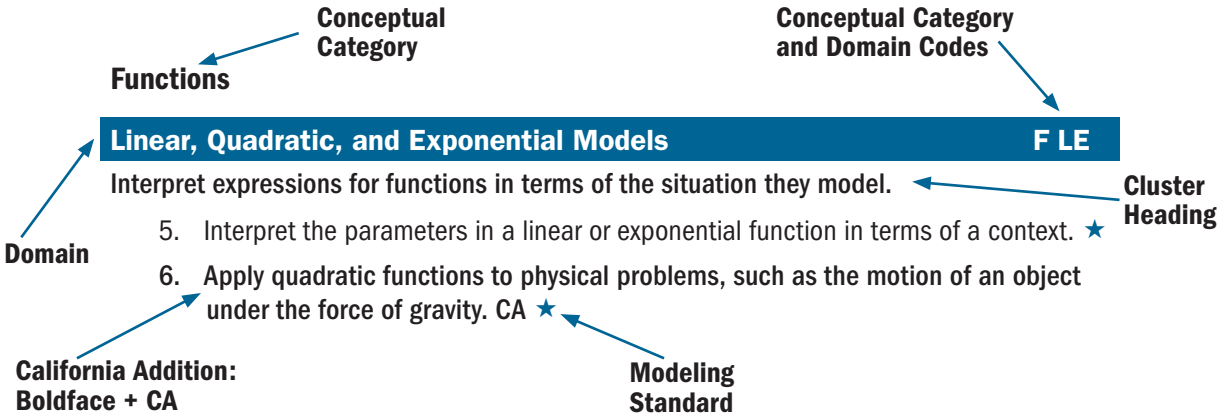
The standards for higher mathematics are also organized into conceptual categories:

- Number and Quantity
- Algebra
- Functions
- Modeling
- Geometry
- Statistics and Probability

The conceptual categories portray a coherent view of higher mathematics based on the realization that students' work on a broad topic, such as functions, crosses a number of traditional course boundaries. As local school districts develop a full range of courses and curriculum in higher mathematics, the organization of standards by conceptual categories offers a starting point for discussing course content.

The code for each higher mathematics standard begins with the identifier for the conceptual category code (N, A, F, G, S), followed by the domain code and the number of the standard. For example, "F-LE.5" would be the fifth standard in the domain of Linear, Quadratic, and Exponential Models in the conceptual category of Functions.

2. Appendix A provides guidance to the field on developing higher mathematics courses. This appendix is available on the Common Core State Standards Initiative Web site at http://www.corestandards.org/Math.



The star symbol (★) following the standard indicates that it is also a Modeling standard. Modeling is best interpreted not as a collection of isolated topics but in relation to other standards. Making mathematical models is an MP standard, and modeling standards appear throughout the higher mathematics standards indicated by a ★ symbol. Additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics is indicated by a plus symbol (+). Standards with a (+) symbol may appear in courses intended for all students.