BRIDGES™
IN MATHEMATICS

Building Bridges

to Your Child's Math Education...

In the Classroom

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Educational Excellence

Background

What does math mean to your child's future? **Everything!** Careers ranging from auto mechanics to electricians to architects to doctors to pilots require a sound background in math. Advances in technology are changing the workplace, and these changes mean that students need to know more math in order to adapt to these new environments. Math is critical in making all types of daily decisions about health treatments, travel routes, best buys, grocery shopping, home repairs, budgeting, and payment options. It also develops our ability to problem solve, critically examine situations, make logical judgements, defend our positions, and critique the opinions of others.

Family involvement in learning is important. After all, you are your child's first teacher! You are critical to your child's success in school. Studies show that when there is a high level of parent involvement, students do better in school. "Although the school is the primary learning environment for formal mathematics, the home and community also play significant roles. Only through the cooperations of the school, the home, and the community can students become fully prepared for a lifelong appreciation of mathematics." -CA CCCSSM Framework

Remember that no matter what your own experiences are with math, you can be a positive influence on your child, especially if you convey to them your confidence that their math abilities will grow and that math can be fun! From puzzles to games to solving problems, math stretches our imaginations and allows us the opportunity to think deeply.

To support your child you can encourage their interest in math, help them develop good study skills, and find ways for them to explore math outside of school. "Parental involvement in the mathematics education of their children can take many different forms. Some parents may show their support by voicing to their children consistent respect for the value of education in general and mathematics specifically." - CA CCCSSM Framework

Developing Positive Attitudes About Math

Do you see reading as an important everyday tool in your daily life, both at home and on the job? Step back and think about the role of reading in your home - you've probably enjoyed reading to your child since she/he was tiny. You've set an example and developed a positive attitude towards reading and shaped your child's understanding of the importance of reading as something that's fun but also important. In today's world, reading is literacy.

Now think about math. What's your attitude about math? Do you see math as an important everyday tool in your job and in your life? Do you avoid doing things that involve math? Are you sharing your attitudes about math with your child? Your answers indicate how your attitude may be influencing your child's attitude about math.

Everyone is a mathematician! Saying things such as, "Math is hard," or "I'm not good in math so I don't expect you to do well either," or "I didn't like math in school," undermines your child's math ability and self-confidence. However, encouraging a can-do attitude and an appreciation for the importance of learning math will go far in opening doors in education and in life. It is important for your child to appreciate the value of math. In your everyday interactions try to portray positive attitudes and values about mathematics.

What does it mean to do math, to be a mathematician? To learn math a student must learn to solve problems, to communicate their thinking, to use appropriate math symbols and tools, to reason logically, and to make connections. **Let's take a closer look at each one of these components.**

Problem Solving is the cornerstone of mathematics. A problem solver asks questions, investigates and explores ideas and possible solutions, has stick-to-it iveness, searches for more than one approach, and applies math in everyday situations. They also ask, "Does my answer make sense?"

Communicating mathematically means to write and speak about ideas, solutions, and reasons. Listening to other students explain their thinking is also valuable to understand different ways of thinking and reasoning. It is important to be able to justify your answer and critique other answers.

Representations means using the mathematical language of numbers, charts, words, graphs, pictures, and symbols. Different forms of representations help with organization and communication. Representation can also involve using technology.

Reasoning means thinking logically, looking for patterns and asking if the pattern is accidental or if the pattern has a reason to it, looking at similarities and differences and making choices based on differences, as well as looking for relationships among things. Sense making is also part of reasoning, asking if the solution is reasonable for the situation. If so, why? If not, why not?

Connecting math ideas is powerful in understanding math and making that understanding more long lasting. Math is not a collection of separate strands (such as geometry and algebra) although it is often presented that way. Math is integrated, connected. Connections take place from one grade to the next, from one strand to the next, and from one school subject to the next. Connections also occur from the math classroom to everyday life.

*Some information adapted from Oregon Council of Teachers of Mathematics

Common Math Terms and Teacher Phrases:

Algebra Readiness: To be algebra ready means to have a deep understanding of multiplication, fractions, problem solving, and critical thinking. It means understanding the basic math principles. Five concepts form the basis of Algebra Readiness: algebraic structure, patterns, proportional reasoning, reversibility, and functions.

Basic Skills: The most basic idea in mathematics is that **mathematics makes sense!** This includes understanding place value, our number system, the scale of numbers (scale means the largeness or smallness), basic fact mastery, relationships between and among numbers, as well as both fluency and flexibility with computation.

Fluency: A person fluent in the language of math is efficient, accurate, and flexible in thinking about numbers. The foundation for fluency not only involves quick recall of basic facts. It also means understanding the place value system and the meaning of mathematical operations.

Contexts: The words, phrases, and stories that a math problem is part of. It helps to explain the meaning of the math problem and to determine the most reasonable solution for the problem.

Number: "Number" means all kinds of numbers such as decimals, fractions, percentages, single digit numbers, multi digit numbers, and so on.

Operations: Operation means how one number "operates" on another number. The four operations in mathematics are addition, subtraction, multiplication, and division. In later grades, the meaning of operations is extended to exponents, square roots, and so on.

Properties: Using the operations also includes understanding their properties. Properties are the rules of mathematics no matter what numbers are involved. One example is the *commutative property for addition* which means that it makes no difference in which order numbers are added. Example: 3+2=2+3

Represent Numbers: In math we call this composing and decomposing! For example, we want students to view the number 17 flexibly as a 10 and a 7, or a 5 and a 12, or a 15 and a 2. This flexibility is useful when combining with other numbers but also applies when working with the concepts of algebra and geometry.

Why Math Looks Different

Why does the math my child studies in school and brings home look different from the math I remember?

You are probably wondering why the math looks different. Research has helped us reshape the way math is taught. We know more about how students' brains function and we know better ways to help them do math and understand math based on their stages of development and their learning styles. Let's take a closer look at math classrooms of yesterday and today.

Yesterday's Classroom – Focus on Memorization

The mathematics taught years ago focused on memorized facts and specific methods for solving problems and plugging numbers into formulas. In the past, teachers thought students were good in mathematics if they could do math quickly, especially if they could do it in their heads, even though they might not have understood what they were doing. Students are still being taught the same skills you learned in school, but they are now learning them with understanding.

Today's Classroom – Focus on Understanding by Active Learners

Today, basic skills are still taught but with an emphasis on thinking and understanding. No matter how well your child can do calculations, this ability is not very useful if she/he doesn't understand them. It is also very important to know how or when to use particular math skills. National and international studies have shown that students have made steady improvement in math since 1990 with the shift towards math taught to standards combined with learning that is focused on understanding mathematics.

Because society has changed, the math that students need to know has also changed. Doing math "in your head" is a valuable skill as it comes in handy in making quick calculations and estimations in restaurants, in stores, and at the gas pump. But instead of worksheets filled with problems calling only for number calculations, your child may be bringing home problems that relate to real life, such as working with salaries and the cost of living and life expectancy, and making decisions based on comparisons. Because technology is used in so many different ways today, students need to be able to reason about problems and explain mathematics. Real learning is more than just a student listening to a teacher and doing 20 similar problems on a worksheet. Think about your own learning experiences. You probably remember those times when you actively participated in a learning activity much more than when you just listened to and watched the teacher. The old Chinese proverb captures the focus in today's classroom:

I hear and I forget; I see and I remember; I do and I understand.

The goal of mathematics education today is to develop a lifelong understanding that is both useful at home, in the workplace, and in college. Whatever your child chooses to do in life, having a strong understanding of mathematics will open doors to a productive future.

*Some information adapted from Oregon Council of Teachers of Mathematics

In the Classroom

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 CA CCSSM include two types of standards: Eight **Standards of Mathematical Practice** (identical for each grade level) and eight **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, 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.

Practice Standards

The Practice Standards represent a picture of what it looks like for students to understand and do mathematics. Although the description of the Practice Standards remains the same at all grade levels, the way these standards look as students engage with and master new and more advanced mathematical ideas does change. To see what the Practice Standards look like at your child's grade level, you can access the California Math Framework at the following link:

http://www.cde.ca.gov/ci/ma/cf/draft2mathfwchapters.asp.

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

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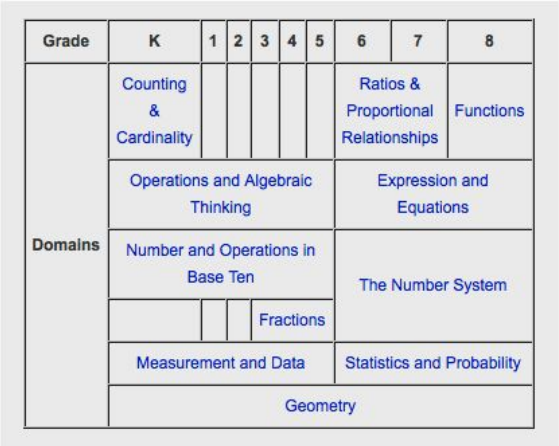
Content Standards

Domains

- Counting and Cardinality
- Operations and Algebraic Thinking
- Number and Operations
- Measurement and Data
- Geometry
- Proportional Relationships
- The Number System
- Expressions and Equations



Content Emphases by Major and Minor Areas

Not all of the content in a given grade is emphasized equally in the standards. Some areas require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.

Fluency

Grade	Standard	Expected Fluency
K	K.OA.A.5	Add/Subtract within 5
1	1.OA.C.6	Add/Subtract within 10
2	2.OA.B.2 2.NBT.B.5	Add/Subtract within 20 (Know single digit sums from memory) Add/Subtract within 100
3	3.OA.C.7 3.NBT.A.2	Multiply/Divide within 100 (Know single digit products from memory) Add/Subtract within 1000
4	4.NBT.B.4	Add/Subtract within 1,000,000
5	5.NBT.B.5	Multi-digit multiplication
6	6.NS.B.2 6.NS.B.3	Multi-digit division Multi-digit decimal operations

Fluency is not meant to come at the expense of understanding but is an outcome of a progression of learning and sufficient thoughtful practice. It is important to provide the conceptual building blocks that develop understanding in tandem with skill along the way to fluency; the roots of this conceptual understanding often extend one or more grades earlier in the standards than the grade when fluency is finally expected. Wherever the word fluently appears in a content standard, the word means quickly and accurately. It means more or less the same as when someone is said to be fluent in a foreign language. To be fluent is to flow: Fluent isn't halting, stumbling, or reversing oneself. A key aspect of fluency in this sense is that it is not something that happens all at once in a single grade but requires attention to student understanding along the way. It is important to ensure that sufficient practice and extra support are provided at each grade to allow all students to meet the standards that call explicitly for fluency.

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