

HELPING YOUR CHILDREN LEARN AND ENJOY MATHEMATICS

MATH *at* HOME

- MAKING MATH PART OF YOUR FAMILY'S LIFE
- GIVING YOUR CHILD A GOOD START IN MATH
- DISCOVERING THE MATH IN YOUR HOME
- CONNECTING MATH AND READING
- UNDERSTANDING COMMON CORE MATH STANDARDS
- HELPING WITH MATH HOMEWORK
- BUILDING A MATH TOOL-KIT
- ENGAGING ENGLISH LEARNERS IN MATH
- LINKING TECHNOLOGY TO MATH
- MEETING THE ALGEBRA CHALLENGE
- TAKING A LOOK AT HIGH SCHOOL MATH
- PREPARING FOR COLLEGE AND CAREER



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and the California Math Project: North Coast*

ABOUT THIS PUBLICATION

Math at Home: Helping Your Children Learn and Enjoy Mathematics was first developed by the Sonoma County Office of Education in 2001, and updated in 2010. The text was written by Paul Giganti, Jr., math consultant and author of children's books (pgiganti@berkeley.edu). The art designs are Sue Schreiner and photographs by Patty Bernstein. This 2014 edition was made available through a partnership of the California Mathematics Council, the California Mathematics Project: North Bay, and the Office of Education Sonoma County.

CALIFORNIA MATHEMATICS COUNCIL | www.cmc-math.org



The California Mathematics Council (CMC) is the state's largest professional organization for pre-kindergarten through college mathematics educators. CMC believes that all students have the capacity to become mathematically competent and confident when provided a rigorous and challenging mathematical program supported by high expectations and quality teaching. CMC is committed to:

- Promoting professional activities that ensure continual improvement toward excellence in the teaching of mathematics;
- Communicating with educators, parents, the public, and legislative bodies concerning issues related to teaching rigorous, challenging mathematics; and
- Increasing the diversity of membership of the California Mathematics Council and the diversity of leadership in mathematics education at the local, state, and national levels.

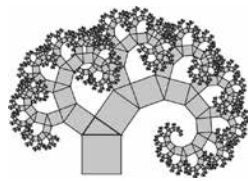
SONOMA COUNTY OFFICE OF EDUCATION | www.scoe.org



The mission of the Sonoma County Office of Education (SCOE) is to foster student success through service to students, schools, and the community. As one of 58 county offices of education in California, SCOE

functions as an educational service agency and strategic partner to the 40 school districts in Sonoma County and their 182 schools. The agency provides service and support to help districts meet legal mandates, operate cost-effectively, and raise student achievement. SCOE provides fiscal oversight to districts, operates schools for special education and alternative education students not enrolled at district sites, and coordinates career technical education (CTE) throughout the county. Under the direction of an elected county superintendent of schools, SCOE also leads and organizes efforts to bring increased educational resources to Sonoma County and initiates projects to engage parents and the community in the education of children.

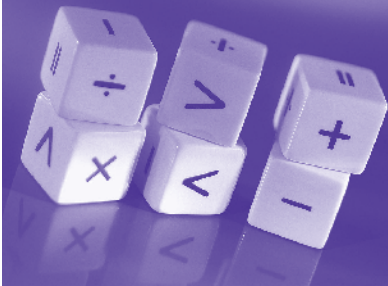
CALIFORNIA MATH PROJECT: NORTH COAST | www.cmpnorthcoast.org



Established in 2001, the California Math Project: North Coast (formerly the North Bay Math Project) is one of 19 California Mathematics Project regional sites. Led by Sonoma State University mathematics faculty and K-12 mathematics educators, the California Math Project: North Coast (CMP:NC) provides professional learning opportunities in mathematics for K-12 teachers in Del Norte, Humboldt, Lake, Mendocino, and Sonoma

counties. The Project's mission is to deepen teachers' understanding of mathematics and strengthen their ability to communicate mathematical concepts. Working with schools, districts, county offices of education, and efforts such as the Regional System of District and School Support, CMP:NC has become an integral part of mathematics education in North Coast public schools. The Project has hosted numerous professional learning opportunities and secured grants from the California Mathematics and Science Partnership and CPEC. Lesson Study has been used as the vehicle for transferring the information learned by teachers into the classroom. The Project has also taken advantage of a variety of technologies to enhance, record, and distribute its work.

MATH *at* HOME



HELPING
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A MESSAGE TO PARENTS

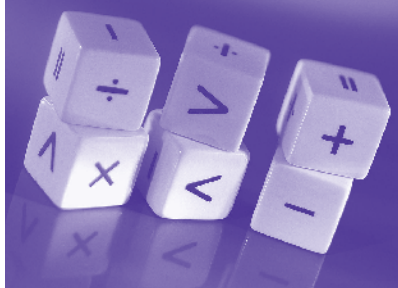
It's common knowledge that young children whose parents read to them have a tremendous advantage in school. But did you know that you can also help your children learn mathematics by doing and supporting math at home?

Today, mathematics is more critical to school success than ever before. The standards for mathematics and the state tests are very demanding because they reflect the mathematics that will be required for entrance into college and transition to a career. Modern occupations now require a firm foundation in mathematics—and that's true for almost any type of job your children will consider in the future.

How you encourage and promote your children's math learning, from preschool to high school, can be pivotal to their attitude toward mathematics and their achievement in this subject area. Even if you haven't studied mathematics in depth yourself, you *can* assist your children. Something as simple as expecting your children to be capable in math can make a difference in their mathematics learning.

This booklet is designed to give you ideas and resources to support your role in your child's math education. The information you'll find in the pages that follow comes from a variety of sources and represents today's best thinking about how to help children learn mathematics. The goal in publishing the booklet is two-fold: to encourage stronger, more informed parent support for math education and to increase the mathematics achievement of all our students.

The Sonoma County Office of Education, California Math Project: North Coast, and California Mathematics Council bring this booklet to you in the hope that you and your family will find it to be a valuable, informative, and useful resource.



HELPING
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MAKING MATH PART OF YOUR FAMILY'S LIFE

Every child and adult needs to know and understand mathematics. It's part of our everyday life. We all “do math.” We count money, measure things, sort from biggest to smallest, know how many miles it is into town and how long it takes to get there. At work, we may use spreadsheets, a calculator or computer, a cash register, or a precision measuring tool. The list goes on and on.

Children are taught mathematics in school, but research shows that families are an essential part of this learning process. In other words, by doing math with your children and supporting math learning at home, you can make a great difference.

There are many ways to make math part of your family's life. As you establish your own traditions for supporting your children's math learning, consider the following checklist of key ideas.

■ ALWAYS TALK ABOUT MATH IN POSITIVE WAYS

Regardless of your own mathematics background, let your children know that learning math is very important. Communicating a positive, can-do attitude about math is the single most important way for you to ensure that your children are successful in mathematics. Always be positive when you talk about math—never tell your children that math is too hard or that you hated it when you were in school. Let them know how critical math is by pointing out how people use math in everyday life. Encourage them to always do their very best in this subject area.

■ KNOW WHAT YOUR CHILDREN ARE STUDYING IN MATH

Be aware of the math your children are learning each year and know the standards they're required to meet. Ask them what they're studying in math class, regularly check in with them about math homework, and help them with school projects when it's appropriate. If your children experience difficulties in their math learning, work with them to overcome these trouble spots. (Some strategies for helping with math are provided on page 12.) Don't hesitate to talk with your child's teacher if you need more information or assistance.

■ **HAVE HIGH EXPECTATIONS FOR YOUR CHILDREN**

Research shows that when you believe your children can learn challenging concepts, they will rise to the occasion—so expect a lot from them! Be confident that your children can learn mathematics and then actively support them as they do so. Seek out math-focused programs and activities for them. As they get older, encourage them to take as many advanced mathematics courses in high school as possible.

■ **ENCOURAGE YOUR CHILDREN TO USE TECHNOLOGY IN MATH**

Help your children use calculators, computers, and the Internet to do math at home. Mathematics and technology are great partners. Tasks such as long and complex calculations, charts, tables, graphs, and spreadsheets show the power of using mathematics and technology together. Doing tasks that involve math and technology helps prepare your children for the future.

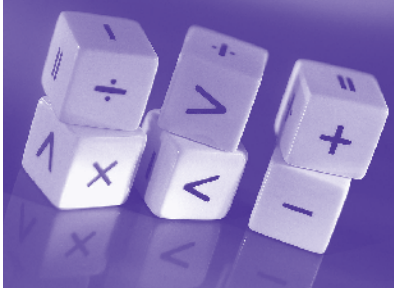
■ **MAKE MATH AN EVERYDAY PART OF YOUR FAMILY**

Find math at home. (The information on page 6 provides some ideas on how to do that.) Spend time with your children on simple board games, puzzles, and activities that involve math. Involve your children in activities like shopping, cooking, and home fix-it projects to show them that math is practical and useful. Encourage your children to solve problems that involve math. Engage your children in conversations about what they're thinking about when they solve math problems. Find opportunities to explore math together.



■ **NOTICE MATHEMATICS IN THE WORLD**

You can help your children see the usefulness of mathematics by pointing it out wherever you see it—not just in your home, but *everywhere*. Tell your children about the math you do in your job and why it's important. When you're outside your home, look hard for ways to point out math: What shape does that tree look like? How many more miles before we get there? How does mathematics figure in sports, music, car building, or the design of a Ferris wheel? If you start looking for math in the world, you'll find more and more of it—and so will your children.



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GIVING YOUR CHILD A GOOD START IN MATH

Young children begin learning math before they take their first step into a kindergarten classroom. When toddlers hold up three fingers and ask for “this many cookies,” they are already doing math and ready to learn more.

As a parent, it may be tempting to think you don’t need to worry about helping your child learn mathematics until elementary school, but the seeds of many important math concepts are planted when children are very young. In fact, early experiences can determine how your child looks at mathematics for the rest of his or her life. It’s never too early to start learning—and liking math!

Children between the ages of two and four generally experience mathematics through simple counting. Counting is a basic and very important concept that helps children bring order to the world around them. Early counting and “how many” experiences introduce children to math concepts that become deeper and more complex in elementary school. For example, counting three dimes becomes a way of understanding 30 cents.

The more opportunities young children have to count, the better they understand the meaning and use of numbers—and the more confidence they’ll have with mathematics later on. By reading your children counting books, singing counting songs, and playing counting games, you’re having fun with numbers and giving them a foundation for success in math.

TIPS FOR PARENTS OF YOUNG COUNTERS:

- Count frequently. Find things to count every day, everywhere, and in every way. Start slowly with just a few things. As your child’s ability to count grows, find bigger and bigger collections of different things to count.
- Count real objects: cookies, coins, toys, etc. Children discover that counting is more than a sing-song repetition when they count real objects. Encourage



Photo by Paul Giganti, Jr.

THE COUNTING GAME: A FUN ANYTIME MATH ACTIVITY

The Counting Game is so simple it can be played by young children, yet so mathematically intriguing it can challenge older children as well. It's a perfect "anywhere, anytime" game. Anyone who can count to 20 can play it. Here's how it goes:

1. Two people take turns counting aloud. The first person starts at ONE and the game is over when the counting reaches TWENTY.
2. Each player counts aloud by saying one, two, or three more numbers *in order* from where the other player stopped counting.
3. Whoever says the number TWENTY, by itself or in a group of numbers, is the winner.

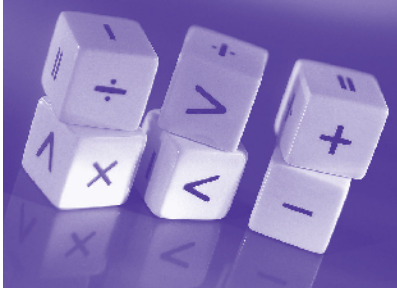
For example:

<i>Player One</i>	<i>Player Two</i>
1, 2, 3	4
5, 6	7, 8
9, 10, 11	12
13, 14	15, 16
17	18, 19, 20!

At first glance, the game seems like a simple way for young counters to practice—but there's actually more to it than that. If you play this game with an older child, you'll both start to see number patterns and discover that there's a strategy for winning. (Hint: it has to do with the multiples of 4.)

You can play four or five rounds of the Counting Game quickly—so play it often to give your child a chance to figure out the winning strategy. Later on, try modifying the rules of the game by having a different winning number, such as TWENTY-ONE, and see what happens.

- your child to say one number as he or she touches each object. Arrange objects in different ways for counting—for example, in piles, rows, and circles.
- Reinforce your child's counting. When your child finishes counting, you could say, "One, two, three cookies. You counted three cookies!" To correct a mistake, gently count again along with your child, holding a finger and touching each cookie as you say the number.
 - Sometimes children forget which objects they've counted. If this happens, have your child move each object into a "counted" pile as he or she counts. If your child gets frustrated or continues repeating the same mistake, be patient. For the moment, you could simply stop counting and try it again another day.
 - Don't worry if your child uses his or her fingers for counting. Fingers are the best mathematical tools children have! They're always handy and ready to use. You can also encourage your child to use other objects to keep track of their count: one bean for every letter in their name or one popsicle stick for each door in your home.
 - Once your child has mastered basic counting, start practicing how to count by twos, fives, and even tens. This will give your child a great start for learning math in school.



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DISCOVERING THE MATH IN YOUR HOME

Math is everywhere! It's in the world that surrounds us, it's in nature, and it's in your home, both inside and out. By pointing out the math in everyday life, you can help your young child learn some basic concepts and understand why math is so important.

If your child is in kindergarten or one of the early grades, you can really reinforce the math they're being taught in school with practice at home. Math at home doesn't have to happen sitting at a desk. During playtime, on a walk, while you're fixing dinner, or when your child is just looking for something to do—these are all great opportunities to suggest a math activity. Here are a few ideas that will help your children discover—and use—the math around them.

IN A PLAY AREA, YOUR CHILD CAN:

- Count blocks as he or she builds a tower.
- Sort toys by size, kind, or color.
- Put dolls, cars, or blocks in order from largest to smallest.
- Play “What am I thinking of?” by describing a toy's size and shape.
- Play make-believe “store” with toys and play money.

IN THE KITCHEN, YOUR CHILD CAN:

- Look for familiar two-dimensional shapes—circles, squares, triangles, etc.—like a round plate or square napkin.
- Put cans of food in order by size or type.
- Sort silverware from the dishwasher to the drawer.
- Count plates, utensils, cups, or even olives.
- Divide a plate of cookies evenly so that each family member gets an equal share and decide what to do if there are some left over.
- Find how many glasses of milk are in a full milk carton.
- Help you double a recipe, or cut one in half.

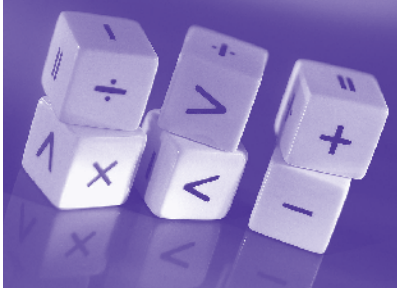
AROUND THE HOUSE, YOUR CHILD CAN:

- Count the days on a calendar until a special event.
- Find the length and width of a room by pacing it off.
- Draw a diagram of how to rearrange furniture in a room.
- Make a “map” of the whole house.
- Create a family TV schedule and track the amount of time watched.

OUTSIDE THE HOUSE, YOUR CHILD CAN:

- Set up and operate a lemonade stand.
- Plant a garden with rows and columns of seeds.
- Count the petals on different flowers.
- Measure a sunflower or bean plant daily, keeping track of how it grows.
- Count how many times he or she can jump rope or shoot baskets in a row.
- Keep a daily chart of the temperature.
- Find triangles, squares, circles, and rectangles around the neighborhood.





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CONNECTING MATH AND READING

All parents understand the importance of reading, but have you ever combined math and reading at the same time? It's possible to put math and reading together in a meaningful way and have fun doing it. Reading books with math themes will enhance your children's enjoyment and pique their interest of both subjects simultaneously.

Reading a math-focused children's book is especially effective when you take the time to encourage your child to think about the math in the story. This means you may need to modify your approach to reading together when you choose a book with a math theme.

For example, *The Doorbell Rang* by Pat Hutchins is a delightful story about sharing cookies. You and your child will enjoy reading it from cover to cover, but you can also use it as an opportunity to do mathematics together in a comfortable, relaxed setting. Take advantage of the math situations embedded in the story by following these suggestions.

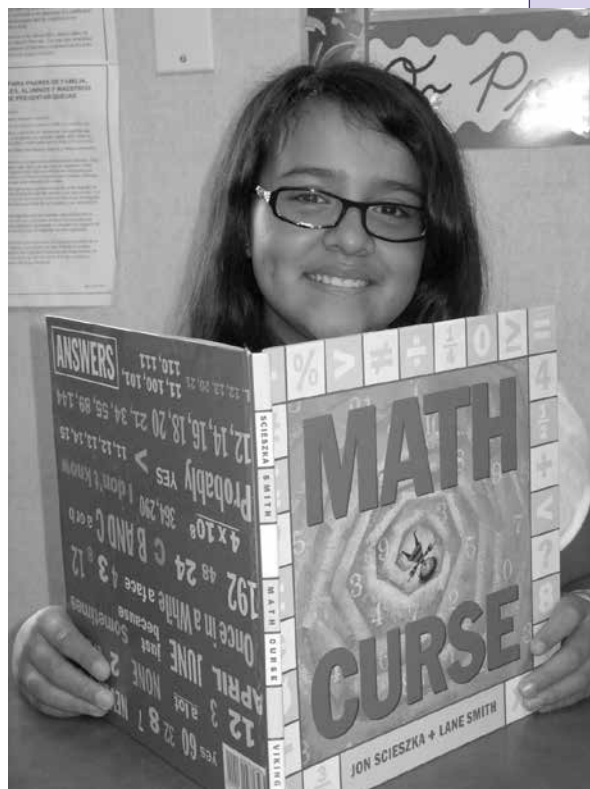
- Before beginning the book, it might be fun to bake some cookies or have a plate of store-bought cookies nearby to help your child visualize the math problems you'll be reading about—just don't eat them until the end of the story!
- Read a few pages, then pause when you come to the first math situation in the book. Ask a math-related question that anticipates what happens next. For example, "How many children have to share the cookies now?"
- Once your child solves the problem, continue reading. Stop and ask other math-related questions as long as your child stays interested. (Don't stop too often or your child may lose the story line.)
- Sometimes it's wise to skip over information that's in the book. For instance, the first math situation in *The Doorbell Rang* occurs when two children must share 12 cookies. The book reads, "That's six each" Instead of immediately reading this line, you might say, "If there are 12 cookies to begin with, how many cookies will each child get?"
- Let your child do the math (or sort the cookies you have on hand) and answer the question. Be patient and allow time to solve the problem before continuing to read. "You're right! That's six each"

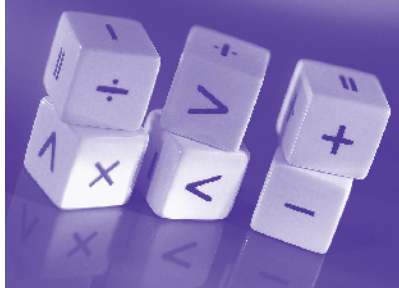
This is just one example of how to combine math and reading. Children's books with math themes will give you many opportunities to stop and do math.

CHILDREN'S LITERATURE WITH MATH THEMES

When children's books have math themes, reading becomes an opportunity to enjoy a good story and think about math at the same time. Take the opportunity to explore math concepts while reading together at home! The books listed here artfully combine reading and math. They are appropriate for kindergarten through fourth or fifth-grade readers.

12 Ways to Get to 11, by Eve Merriam
17 Kings and 42 Elephants, by Margaret Mahy
Alexander, Who Used to Be Rich Last Sunday, by Judith Viorst
Amanda Bean's Amazing Dream, by Cindy Neuschwander
Anno's Counting Book, by Mitsumasa Anno
Anno's Magic Seeds, by Mitsumasa Anno
Anno's Mysterious Multiplying Jar, by Masaichiro and Mitsumasa Anno
The Button Box, by Margarette S. Reid
A Cloak for the Dreamer, by Aileen Friedman
Counting on Frank, by Rod Clement
The Doorbell Rang, by Pat Hutchins
Each Orange Had Eight Slices, by Paul Giganti, Jr.
Frog and Toad are Friends, by Arnold Lobel
G is for Googol, by David M. Schwartz
A Grain of Rice, by Helena Clare Pittman
Grandfather Tang's Story, by Ann Tompert
The Greedy Triangle, by Marilyn Burns
How Big is a Foot?, by Rolf Myller
How Many Feet in the Bed?, by Diane Johnston Hamm
How Many Snails?, by Paul Giganti, Jr.
How Much is a Million?, by David M. Schwartz
If You Made a Million, by David M. Schwartz
Incredible Comparisons, by Russell Ash
The King's Chessboard, by David Birch
Math Curse, by Jon Scieszka and Lane Smith
One Grain of Rice, A Mathematical Folktale, by Demi
One Hundred Hungry Ants, by Elinor J. Pinczes
Only One, by Marc Harshman
The Phantom Tollbooth, by Norton Juster
A Remainder of One, by Elinor J. Pinczes
Rooster's Off to See the World, by Eric Carle
Round Trip, by Ann Jonas
Sir Cumference and the First Round Table, by Cindy Neuschwander
Ten Black Dots, by Donald Crews
The Twenty-One Balloons, by William Pene du Bois
The Very Hungry Caterpillar, by Eric Carle
What Comes in 2's, 3's & 4's?, by Suzanne Aker





HELPING
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UNDERSTANDING THE COMMON CORE MATH STANDARDS

California has adopted new curriculum and instruction standards called the California Common Core Standards for Mathematics. They represent national agreement on the mathematics that students must understand at each grade level in order to be career- and college-ready when they graduate from high school. The Common Core also lists eight Standards for Mathematical Practice, highlighted below, that describe how mathematically proficient students are expected to use and apply their mathematical knowledge.

1. MAKE SENSE OF PROBLEMS

Good students try hard to make sense of a problem, find a way to begin a new problem, and keep working even when a problem is difficult. When they believe they have solved a problem, they think about whether an answer makes sense. If other students did the problem in a different way, they listen to their solutions and try to understand their reasoning.

2. REASON ABSTRACTLY

Good students use numbers in real and abstract ways. They use numbers, math symbols, and equations to represent mathematical relationships in abstract and actual situations. They consider the size and meaning of numbers in different situations, and apply this “number sense” in their thinking and problem solving. Good math students consider whether their answer makes sense and solves the problem.

3. CONSTRUCT ARGUMENTS

Good students use all the information they have, and all the math they know, to find answers. They make intelligent guesses and apply logical thinking to explore and test their ideas. They are able to use math tools such as models, diagrams, calculations, and technology, along with sound mathematical thinking, to explain their answers. They ask good questions and listen carefully to other students’ ideas and solutions.



Photo by Ross Hause

4. MODEL WITH MATHEMATICS

Good students solve math problems they find in school, at home, and in their daily life. Using mathematical modeling, they work with numbers to find real-world solutions. They make drawings, create diagrams, and build physical and computer models of the problems they encounter. When possible, they write equations that model situations.

5. USE TOOLS APPROPRIATELY

Good students consider all the math tools available to them for every problem-solving situation, including objects, paper and pencil, calculators, models, spreadsheets, and statistical software. They carefully choose the best tools for any given mathematical situation, and use those tools in the right way to solve the problem.

6. ATTEND TO PRECISION

Good students calculate accurately and efficiently, and share mathematical ideas with others by using the best vocabulary and math notation they know. They take care to make sure the mathematics they do is correct. When they find an error, they redo their work to get the best possible answer for each problem.

7. LOOK FOR AND USE STRUCTURE

Good students try to discover and observe patterns, logical order, and structure in math situations. They use the order and patterns they discover to help them solve problems. Good students can step back and view the whole picture, while at the same time paying careful attention to individual facts and numbers.

8. LOOK FOR REPEATED REASONING

Good students decide whether to apply a traditional method, use a creative approach, or employ a shortcut in solving a problem. Good students apply what they've learned in similar problems and continually check their progress as they work. They use their experience and observation of patterns to solve similar problems efficiently.

STANDARDS: MORE THAN ARITHMETIC

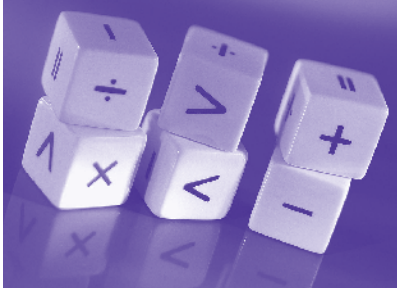
Studies show that students need to learn more than paper-and-pencil arithmetic to thrive in our increasingly complex and technology-rich world. That's why mathematics instruction is changing with the Common Core Standards. These standards focus on preparing students for college and career, so they take real-world applications into account. With the new standards, mathematics learning goes beyond the use of step-by-step procedures and engages students in solving problems in both traditional and creative ways.

Arithmetic skills, although still critical, are no longer enough for students who will graduate into a world marked by advances in science and technology and changing workplace expectations. In addition to learning arithmetic in math class, your children will now be asked to:

- Solve real-life problems;
- Explain their thinking to others;
- Identify and analyze trends from data;
- Create graphs, charts, and other representations of information;
- Use modern technology to solve mathematical problems.

Instead of math worksheets, your children may have homework that is related to real life—investigating patterns, mapping their neighborhood, or creating a personal budget. This kind of learning builds a deeper understanding of mathematics and its uses in the world.

The full text of the *Common Core Standards for Mathematical Practices* can be found at www.corestandards.org/Math/Practice



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HELPING WITH MATH HOMEWORK

Many parents worry about helping their children with math homework, especially as their children get older and the mathematics becomes more complex. If that's the case, here's something you'll be happy to learn: you don't have to be a mathematics expert to help with math homework.

Providing a well-lit table and comfortable chair is an important place to start, but remember, the best location for homework is not necessarily your son or daughter's bedroom. If your child studies at the kitchen or dining room table instead, you can help without having to sit down the entire time. You can assist when help is needed and still go about your own tasks. At the same time, you'll have the opportunity to keep homework time focused by giving your child support, encouragement, and gentle reminders.

A good strategy is to pass by your child's work area and periodically "check in." A quick glance will often tell you if it's time to stop and provide some extra support. When it's clear that your assistance is needed, sit down and give your child your full attention. Although it's sometimes difficult, maintaining a calm demeanor and being patient can really help your child when he or she is struggling with math.

Many parents worry about not knowing the math their children are studying. In this case, the way to provide homework help is actually quite simple: ask questions and practice careful listening. Simple generic questions can help your child gradually make sense of math, build confidence, and encourage mathematical thinking and communication. When given the opportunity to talk about math, children are often able to remember what they learned in class and see the solution themselves. A good question can open up your child's thinking about the problem at hand.

Here are some useful questions for parents to try. Remember that listening to your child's answers—and providing calm responses—is as important as the questions you ask.

WHEN YOUR CHILD ISN'T SURE HOW TO BEGIN A PROBLEM, ASK:

Can you tell me what you know now? What math facts do you have?
What do you need to find out? Can you estimate the answer?
How might you begin? What can you try first?
Can you make a drawing or picture to get started?

WHILE YOUR CHILD IS WORKING ON A PROBLEM, ASK:

How can you organize your information?
Will a list or table help?
What would happen if ...? Show me what you did that didn't work.
Can you explain the strategy you're using to solve this? Why did you ...?
What could you do next?
Do you see any patterns?

WHEN YOUR CHILD FINDS AN ANSWER, ASK:

Does that answer make sense? Why do you think that?
How did you get your answer? Why do you think it's right?
Convince me that your solution makes sense. Explain it in a different way.

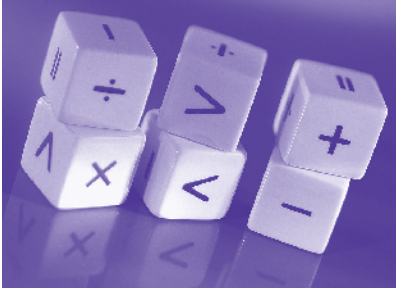


When questions alone just won't do, another strategy for helping your child is to identify a friend or relative who knows more mathematics than you do. Find out if that person would be willing to answer an occasional phone call from your son or daughter.

The Internet can also be a resource when your child needs homework assistance, although some sites charge a fee for this service. One free website that's worth exploring is Ask Dr. Math, www.mathforum.com/dr.math, which is a project of the Math Forum at Drexel University. This site has a large searchable archive of math questions and answers for students of all ages. It also invites students to submit questions if they aren't able to find the help they need.

PROBLEM-SOLVING STRATEGIES

1. Guess and check
2. Look for a pattern
3. Draw a picture or diagram
4. Act it out
5. Work backwards
6. Simplify the problem
7. Eliminate possibilities
8. Make a systematic list
9. Get advice or do research
10. Sleep on it!



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BUILDING A MATH TOOL-KIT

When elementary and middle school students work on math, they sometimes need a little help getting organized. Math requires a few basic tools, and it can be frustrating when children are doing math homework and those tools aren't readily available.

You can encourage and support math learning at home by building a “math tool-kit” with your child. A tool-kit is a collection of just about every tool your child will need for math homework—all contained in a handy box.

To create the tool-kit, you'll want to find or purchase the following list

of supplies. All of these items can be purchased cheaply at discount or drug stores.



Photo by Ross Hause

- **A SHOEBOX OR PLASTIC BOX THAT CLOSSES.** A box about a foot long will hold all the tool-kit items.
- **A COUPLE SHARPENED PENCILS**—one never seems to be enough.
- **A SMALL PLASTIC PENCIL-SHARPENER.** It's amazing how long it can take to find a sharpener if there's not one in the box.
- **ONE LARGE PINK ERASER.** In math, mistakes are part of the learning process and the small eraser on the end of a pencil just doesn't last long enough.

- **A SMALL PAD OF SCRATCH PAPER.** This is helpful for drawing pictures and writing down calculations that don't need to go on your child's homework paper.
- **A PLASTIC OR WOODEN RULER.** Make sure to get one that's marked in *both* inches and centimeters.
- **A PAIR OF SCISSORS.** The ones with plastic handles and metal blades are best.

- **A GLUE STICK.** You'll be surprised how often your child uses this for math projects.
- **A COMPASS FOR DRAWING CIRCLES.** Get the kind that holds a real pencil. This tool is used by students in grades 4 to 8.
- **A PLASTIC OR METAL PROTRACTOR** for measuring angles. This tool is also used by grade 4-8 students.
- **ABOUT 20 "COUNTERS" FOR SOLVING PROBLEMS.** Counters can be buttons, pennies, lima beans, or any other small objects.
- **A SOLAR-POWERED POCKET CALCULATOR** (no batteries needed) that adds, subtracts, multiplies, and divides. This is helpful for checking work and doing complex calculations. Your child will probably begin using a calculator in fourth grade.

The math tool-kit will be more meaningful if your child helps you find the tools on a "math shopping trip." Once home, your son or daughter can make the tool-kit their own by decorating it with stickers and cut-out pictures.

Another great idea is to suggest that your child occasionally use the math tool-kit *just for fun* to draw a math picture or write a math story—even when there's no assigned homework.

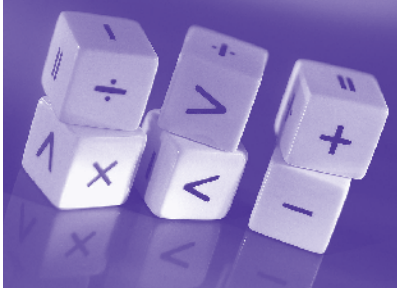
PICKING THE BEST MATH TOOL

Part of being "good" at math is choosing the right math tool for the job. What would be the best math tool (estimation, mental math, calculator, or pencil and paper) to solve each of these math problems?

1. $3256.98 \div 78$
 Estimation Mental math
 Calculator Paper and pencil
2. 500×30
 Estimation Mental math
 Calculator Paper and pencil
3. Which is closer to 1,000?
 $398 + 607$ *or* $292 + 655$
 Estimation Mental math
 Calculator Paper and pencil
4. 312×7
 Estimation Mental math
 Calculator Paper and pencil

Answers:

1. A calculator is often the best tool for a complex division problem such as this, although upper grade students should be able to find the correct answer using paper and pencil.
2. Whenever a problem can be done quickly in your head, there should be no need for a calculator or pencil and paper. In this problem, basic knowledge of multiplication is all that's needed, so mental math is a good tool.
3. Since an exact calculation of these addition problems isn't required, this problem can be done using estimation. By "rounding off" the numbers, it's easy to tell that $398 + 607$ is closer to 1,000.
4. For most people, pencil and paper is probably the best tool for this problem. The multiplication is not so difficult that a calculator is needed to get a correct answer quickly. Mental math would probably not be successful since most people can't hold this many numbers in their head. Finally, because an exact answer is required, estimation would not be appropriate.



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MATHEMATICS

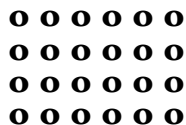
ENGAGING ENGLISH LEARNERS IN MATH

Teachers have discovered a number of techniques to supplement spoken and written math instruction in order to help English learners grasp mathematical concepts. These hands-on strategies work just as well at home as in the classroom and are great resources for parents looking to support their children's math learning. If you are the parent of English-language learners, encourage your children to use techniques like the ones described below. Remember, the more opportunities that your children have to hear, see, and respond to math situations and problems, the more likely they are to learn mathematics quickly and correctly.

DRAW PICTURES AND DIAGRAMS

Pictures and diagrams can build understanding while minimizing the language needed to communicate mathematical ideas. Many math concepts can be pictured clearly and easily in drawings that require few, if any, words. This makes using diagrams an excellent way for students with limited English to "see" math and share their mathematical thinking with others. Drawing diagrams also helps students organize their work and find solutions to math problems with greater ease.

Children don't automatically draw pictures to learn math, so it helps if adults suggest using this approach. You can also show them how to do this by drawing pictures yourself as you solve math problems. The concept of multiplication, for example, can be illustrated by drawing equal rows of circles. This drawing represents 4×6 :



The number of rows (4) multiplied by the number of circles in each row (6) tells you the number of circles (24). Children can verify that $4 \times 6 = 24$ by actually counting all of the circles in the diagram.

PRACTICE WITH BLOCKS AND BEANS

Objects that children can handle and sort can create hand-to-eye-to-brain connections that make a positive difference in learning math. In the classroom, teachers often use small blocks and plastic counters (known as manipulatives) to show students how math concepts work. At home, your children can practice simple addition, subtraction, multiplication, and

division problems using similar objects. Something as simple as dried beans can help your children learn a math concept at the kitchen table, giving them the opportunity to see what they didn't quite grasp when it was explained in words. Other objects, shapes, and puzzles can help them learn more advanced concepts, like those in geometry.

Ask your children's teachers to suggest how objects found at home can be used to reinforce what's being taught in school. You may find that your children enjoy mathematics more, and learn more, if both their hands and minds are involved.

BUILD MEANING IN REAL SITUATIONS

For many students, mathematics seems too abstract. When it can be related to things they see and do in everyday life, the concepts become real and meaningful.

The interplay of money and mathematics provides a great example. Thinking in terms of dollars, dimes, and pennies can help students learn addition, subtraction, and the base 10 system as they're used in the real world. Changing 10 pennies into a dime and 10 dimes into a dollar teaches children about "regrouping."

Learning about geometry by taking a walk around town and looking for geometric shapes is another real-world math lesson. After all, traffic signs, buildings, clocks, automobiles, and playing fields all have geometric shapes.

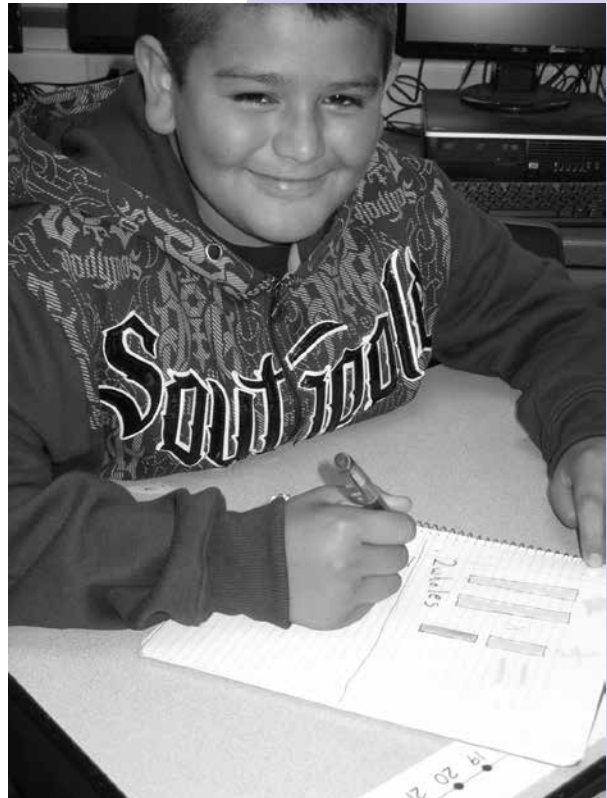
TALK AND WRITE ABOUT MATH

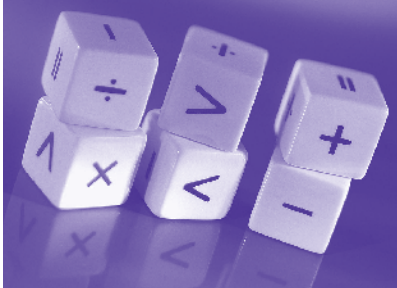
Putting math concepts into words is the most advanced math-learning strategy for students who are also learning English. Talking and writing about math may be difficult at first, but it can be rewarding! When students learn to express their mathematical ideas in words, it builds math and language skills at the same time.

Encourage your child to start slowly, then expand a little bit at a time. Here's one example, which can be done in English or your home language. Begin by asking your child draw a picture of a math situation or problem, such as "How many wheels do three tricycles have?" Then, ask your child to make up a title for the picture, like "3 Tricycles," and write it at the top of the page. If your child is young, start by simply talking about the drawing, doing the writing yourself, or taking turns writing. Gradually transition your child to doing all the explaining and writing by him or herself.

Next, identify each part of the drawing and say or write a sentence to explain it: "My drawing shows that there are 9 wheels on 3 tricycles." (Make sure to use a complete sentence.) If you do activities like this regularly, your child will soon be talking and writing about every math situation!

The secret to putting math into words is that the more often children do it, the more comfortable they become in expressing their mathematical thinking. This is a very important skill for success in math throughout all grade levels.





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LINKING TECHNOLOGY TO MATH

Calculators and computers were invented to save time and allow us to solve challenging problems with greater ease. These tools are so good at this that they've become essential for doing mathematics at home and in the workplace. Technology gives us visual images of mathematical ideas, helps us organize and analyze data, and allows us to make calculations quickly, efficiently, and accurately.

Technology can also help students learn and understand mathematics. It can stimulate interest, increase problem-solving abilities, and—when used wisely—give all students increased access to math. With proper guidance, your children can use technology tools to solve difficult mathematical problems, build computational skills, and tackle real-life math problems like planning a family road trip, building a budget, or saving for a purchase.

But technology is not a replacement for learning and doing mathematics. As much as we might like technology to provide magic solutions to math problems, it doesn't do that. For technology to help us with math, we must still know how and when to add, subtract, multiply, and divide. We must understand numbers, know how to make calculations, and be familiar with problem-solving strategies. This is true for both children and adults.

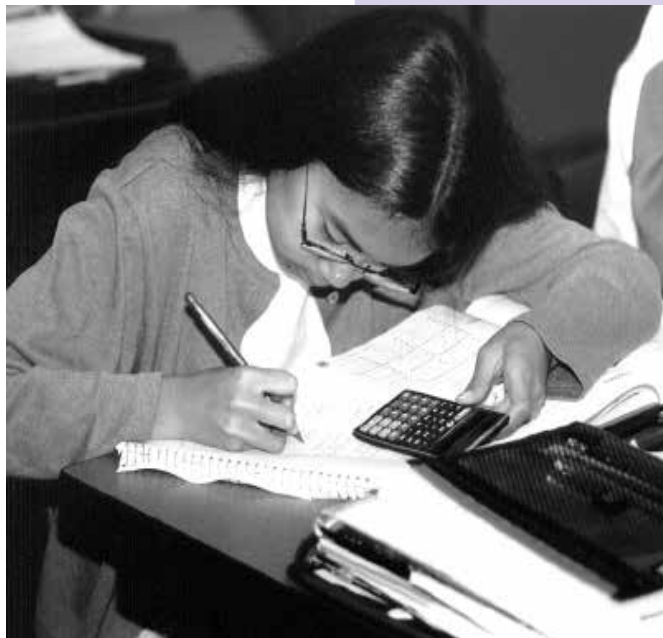
A calculator won't help your children find the solution to a "story problem" if they don't know whether it requires multiplication or division. Technology can support and develop student learning of mathematics, but it does not replace basic skills or understanding of math concepts.

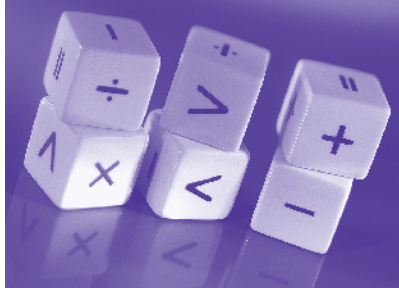
Here are some thoughts about how technology might figure in your children's mathematics learning.

- Help your children decide which math tool is best for a given problem—technology, paper and pencil, mental math, or estimation. Help them

think and talk through the process of solving the problem. Writing the problem on paper first may make it easier to choose the best tool for solving it (see exercise on page 15).

- If you have a calculator, computer, or other math tools at home, guide your children in exploring the kinds of tasks they can perform. Help them experiment, then let them play! When the time comes to choose a tool for a real math task, they'll be more likely to select the best one.
- When using calculators and other technology, determining if the answer makes sense is critically important. Learning basic math facts, knowing how to estimate, practicing mental math, and understanding the math behind real-life situations will help your children do that.
- Sometimes a calculator or computer can help children focus on problem-solving procedures or see number patterns without getting bogged down by calculations. These tools and other specialized technologies can also assist students who have special needs or physical challenges become more engaged in math.
- For children struggling to learn math facts, software and online programs can provide extra drill and practice. Most of these programs are engaging, move at the student's pace, and give immediate feedback. They can be very helpful, but parents are cautioned not to put too much emphasis on math drills alone.
- High-tech tools can give older children opportunities to see visual representations of complex mathematical ideas. For example, spreadsheet software can help students organize statistical information, turn numbers into visual charts and graphs, identify patterns in science and math, and make predictions based on the information they compile.
- Graphing calculators are great tools for high school students, allowing them to pose "what if" questions and see what happens when a single variable is changed and everything else remains the same. Because these calculators can produce 20 graphs in the time it takes to plot just one with paper and pencil, it encourages students to thoroughly explore mathematics situations.
- Internet websites can provide students of all ages with math instruction, homework help, interactive math-focused games, interesting problems, and challenging puzzles. The Internet resources listed on page 27 are a good place to start looking for educational math websites.





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MEETING THE ALGEBRA CHALLENGE

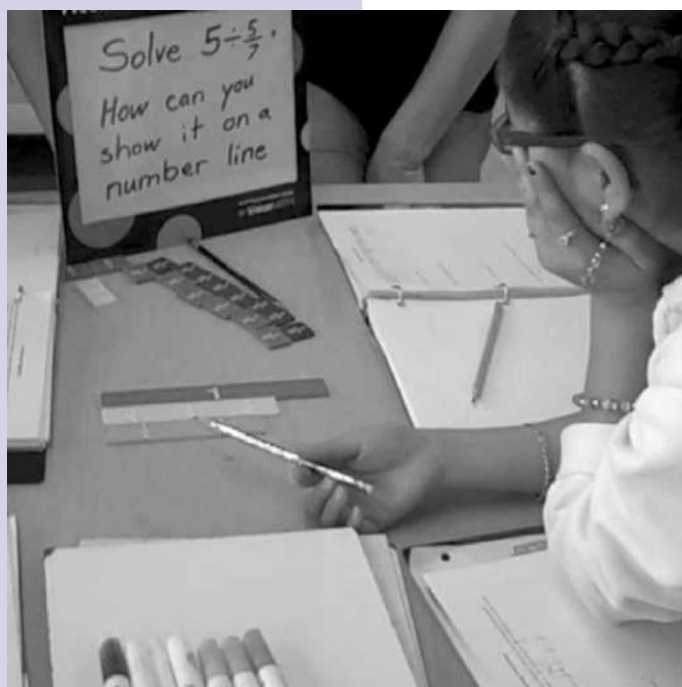
Algebra is important! It helps us investigate, describe, and understand our world. Algebra is mathematics that allows us to use letters and symbols to generalize relationships and analyze mathematical situations via formulas and equations. For students, algebra is also the gateway to success in college and careers!

Algebra represents a different way of thinking about and using math. Everyone needs algebra. It is useful in all areas of mathematics—measurement, statistics, probability, problem solving, and geometry—and it is now required in most professions, including those that depend on science, technology, engineering, and mathematics (STEM). To learn

higher mathematics, all students need to master this abstract way of thinking as part of a solid mathematics foundation.

Because of increased international competition and a growing body of research about college and career readiness, our state's Common Core Mathematics Standards introduce “pre-algebra” ideas in the elementary grades, then add more sophisticated algebra concepts through middle school. Although algebra is only one of the mathematics subjects that students are required to study, it presents a unique challenge for many learners because it is a transition from concrete arithmetic and computation to the symbolic language and abstract thinking of advanced mathematics.

Parents and guardians can actively support their children as they learn algebra throughout the grades and smooth their transition to higher math. As a parent, you aren't expected to teach your children algebra yourself, but you can help by understanding algebra's importance, supporting your children as they learn pre-algebra skills in elementary and middle school, and giving encouragement and moral



support when they advance to higher mathematics in the traditional or integrated high school course sequences of the Common Core mathematics curriculum.

What do your children need to study in elementary and middle school to ensure later success in algebra? They will need to:

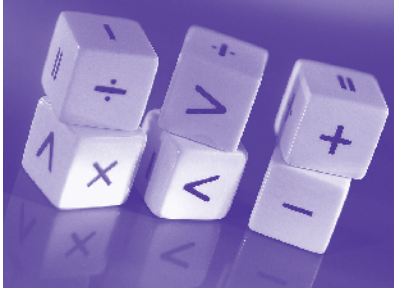
- **BUILD FLUENCY WITH NUMBERS:** A strong “number sense” allows students to understand the uses of mathematics beyond simple computation. An understanding of how numbers fit together in our number system is needed in order to make generalizations in algebra.
- **DEVELOP PROFICIENCY WITH FRACTIONS:** The same concepts and skills that allow us to add, subtract, multiply, divide, convert, and compare equivalent and unlike fractions are also used in solving algebraic equations.
- **DISCOVER AND INVESTIGATE PATTERNS:** Patterns are everywhere in our world. Once students discover patterns, they also need to find the rules underlying those patterns. Algebra can be used to describe the “rules” of patterns mathematically.
- **GENERALIZE RELATIONSHIPS:** A function is a relationship between two characteristics that vary, but are affected by each other. Algebra can be used to make mathematical generalizations about such relationships that are true for all cases.
- **INTEGRATE IDEAS OF GEOMETRY AND EQUATIONS:** The ability to analyze two- and three-dimensional geometric shapes, understand proportional relationships, and find unknown lengths, angles, and areas can all be described using algebraic equations, formulas, and graphs.

These broad topics alone do not lead to proficiency in algebra, but they are essential components. As your children are introduced to these concepts and study them in greater depth throughout the grade levels, seek assistance as soon possible if they struggle. Algebra builds on previous mathematical knowledge, so it is essential that students don't fall behind.

WHAT IS ALGEBRA?

Algebra generalizes mathematical ideas by using letters or symbols for numbers in equations. It is a language of variables, operations, and formulas.

Algebra is often used to state mathematical generalizations, such as the laws of physics that determine whether bridges and buildings stand or fall. Algebra allows us to discover important patterns in nature and express those patterns in equations that are universal and can be used in problem-solving situations.



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TAKING A LOOK AT HIGH SCHOOL MATH

Mathematics concepts increase in difficulty and complexity when students enter high school. All students should expect to encounter material that is more challenging than what they studied in elementary and middle school. Success in high school math courses is the result of hard work and perseverance.

You can help your high school students be successful in mathematics by understanding what they are required to learn, encouraging them to keep up with homework, and suggesting they ask questions in class. Tell your children you have confidence in their ability to succeed and actively support their learning at home and in school. Always speak positively about mathematics and remind your children how important math is for getting into college.

To help you understand the requirements and challenges of high school mathematics, here is some key information.



THERE ARE STANDARDS FOR HIGH SCHOOL MATH

The high school mathematics curriculum is based on the Common Core Standards. These standards cover the body of conceptual understanding, skills, and applications that all students should learn to be “college and career ready.” Courses that incorporate the Common Core Standards are more rigorous and demanding than mathematics classes offered in the past. They are designed to prepare students for the challenges they will face, no matter what they study in college or which career they choose.

THREE YEARS OF HIGH SCHOOL MATH IS THE GOAL

To graduate, California requires all high school students to successfully complete at least two years of mathematics including Algebra I or a combination of courses that meet the content standards for algebra. However, most colleges and universities now require three full years of high school mathematics for admission and many, including the University of California, now recommend that students who wish to major in science, technology, engineering, or math

take four years of high school mathematics, including calculus or statistics.

THERE ARE TWO HIGH SCHOOL MATHEMATICS COURSE SEQUENCES

All college-prep high school mathematics courses now align with the Common Core Standards and offer students two course-of-study “pathways.” Though the content has changed, schools may offer the traditional sequence of courses—Algebra I, Geometry, Algebra II—or they may offer classes that integrate these subjects each year in a Mathematics I, II, and III course sequence. Both sequences include the same mathematics concepts, but organize them differently.

MATH LEARNING IS TESTED PRIOR TO GRADUATION

Beginning in 2014-15, every eleventh-grade student in California must take the Smarter Balanced Assessment for high school mathematics, a rigorous test aligned to the Common Core Standards. This assessment includes open-response items that assess students’ reasoning and problem solving, along with multiple-choice items that address basic procedural knowledge and understanding.

During the transition to the Common Core Standards, students will still be required to take and pass the California High School Exit Exam (CAHSEE), which is not directly aligned to the Common Core Standards. However, all of the mathematics on the Exit Exam is addressed in the Common Core Standards. Students who have mastered the standards will be prepared to do well on the High School Exit Exam.

AP COURSES PROVIDE ADDITIONAL CHALLENGES

If your child is successful in mathematics and enjoys academic challenges, he or she may have the opportunity to take Advanced Placement (AP) mathematics courses. These courses offer the highest level of mathematics study available in high school and are meant to count for college credit. Taking AP math courses can provide an advantage to college-bound students because colleges and universities often give special consideration to applicants who have completed these courses.

If your child is having difficulty in a high school math course, talk to the teacher, school counselor, or principal. They can recommend additional learning strategies and may provide extra resources, such as after-school tutoring or summer school, that can make a difference in your child’s success.

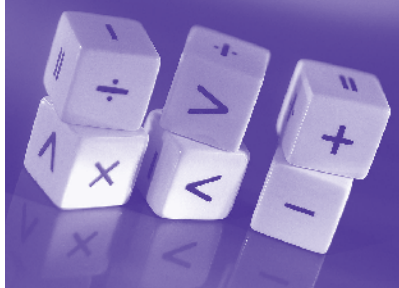
EXERCISES, PROBLEMS, AND INVESTIGATIONS

Students don’t study math exclusively by completing worksheets filled with numbers anymore. Although great emphasis is placed on learning mathematical facts and procedures, schools are also teaching students to think and communicate mathematically.

Math exercises, problems, and investigations are examples of the kinds of work students are doing in school to foster mathematics learning. The samples below illustrate how each approach leads to a different type of learning.

- **A MATH EXERCISE:** Find the area and perimeter of a rectangle with a length of 7.5 inches and a width of 4.75 inches.
- **A MATH PROBLEM:** The perimeter of a rectangle is 36 inches. What are all the possible whole number dimensions of this rectangle?
- **A MATH INVESTIGATION:** What is the relationship between the area of a rectangle and its perimeter? For a rectangle with an area of 48 square feet, what are its possible dimensions—that is, what lengths, widths, and perimeters are possible? Do all rectangles with the same perimeter have the same area? Prepare a report describing your work and your findings. Provide any charts, tables, or graphs that help explain your thinking.

More information about the Common Core Standards for high school mathematics is available at your local school or online at: www.corestandards.org/Math/



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PREPARING FOR COLLEGE AND CAREER

You play a role in your children's college plans! As a parent, you can advise them, encourage them, and support them in this decision. You can make sure they know the benefits of going to college.

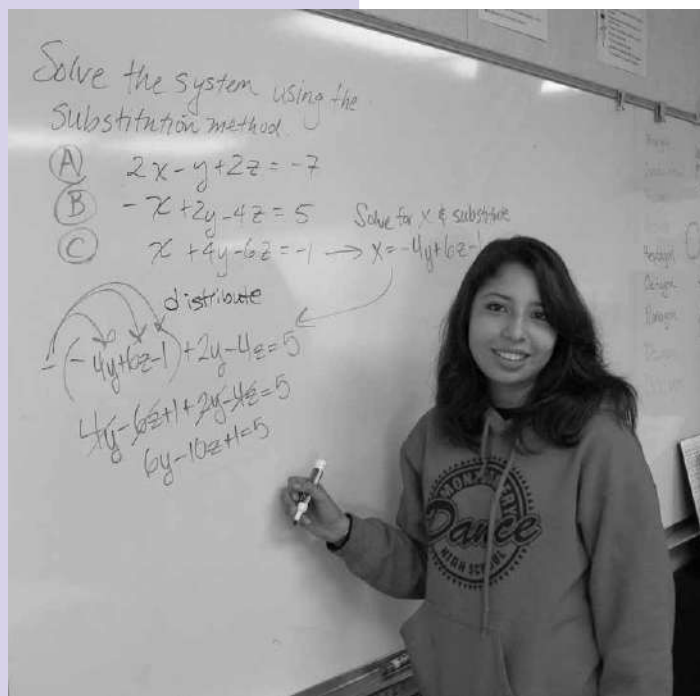
One benefit has to do with your child's future earning potential. It is well known that people who graduate from college usually make more money than those with only a high school education. Beginning salaries can be twice as much for college graduates, so earning a four-year degree can be integral to your child's financial success in life. It is also generally true that the greatest potential for job growth comes in occupations that require a college diploma. Jobs requiring only a high school education are less likely to lead to future job growth and economic success.

The importance of a college education today can be compared to that of a high school diploma 40 years ago. Over a lifetime, students with a college

degree—no matter what field—earn vastly more than those without a degree. The payoff is huge, and it's growing. More and more of today's jobs require a degree or credential. There are also more career choices for people who go to college, regardless of their major area of study. College is the gateway to more options and better opportunities for students.

However, college isn't only about preparing students to make a living. In addition to providing a pathway to a high-paying job, college helps young adults become intelligent and well-informed individuals. It provides an opportunity for students to spend time considering what they want to do in life, learn what they are truly passionate about, see more of the world, make new friends and other connections, learn financial

responsibility, and mature in their decision-making. College stimulates students to think, ask questions, and explore new ideas—all of which are



great advantages in both personal and professional life. Though college doesn't ensure happiness or success, it opens doors and helps create opportunities for the future. And more! Studies have shown that when students go to college, their children are more likely to go to college as well.

Why is mathematics important for college? Students completing a sequence of college-prep high school math courses more than double their chances of successfully earning a four-year college degree.

Two-year colleges and vocational training also require rigorous math, so students planning to attend community college or vocational school, or go directly into an entry-level job, should consider taking three years of high school mathematics. If they later decide to go to a four-year college or university, they will be better prepared to transfer or enroll.

COLLEGE ADMISSIONS REQUIREMENTS

In order to attend a four-year college or university, your children must take specific required high school courses. These courses are designed to prepare high school students for advanced study at the college level regardless of their choice of major. Your children must complete each of these courses with a C or better in order to apply for most public or private colleges and universities in the United States.

UNIVERSITY OF CALIFORNIA AND CALIFORNIA STATE UNIVERSITY REQUIREMENTS

History and Social Science

Two years of history/social science, including one year of U.S. history or one-half year of U.S. history and one-half year of civics or American government; and one year of world history, cultures, and geography.

English

Four years of college-preparatory English composition and literature.

Mathematics

Three years, including Algebra, Geometry, and Algebra II, or Mathematics I, II, and III.
Four years of mathematics recommended.

Science

Two years with lab, chosen from biology, chemistry, and physics. Three years of science recommended.

Language other than English

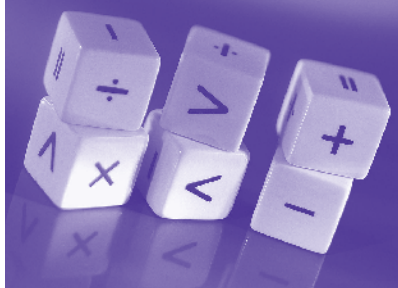
Two years in same language required. Three years of a foreign language recommended.

Visual and Performing Arts

One year of art chosen from the following: dance, drama/theater, music, or visual art.

College Preparatory Elective

One additional year selected from the subjects listed above or another approved course.



HELPING
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RESOURCES TO HELP YOU AND YOUR CHILD WITH MATH

If you'd like more information about family math activities, mathematics education, or strategies for supporting your child's math learning, you'll find the following list of publications and Internet websites helpful.

PUBLICATIONS

Adding It Up: Helping Children Learn Mathematics (National Academies Press, 2001). This report from the National Research Council of the National Academies will be of interest to parents who want to explore current research about mathematics education in the United States.

Algebra To Go (Great Source Education Group, 2000). This reference book is designed to help students when they're not clear about a math topic and need someplace to look up definitions, procedures, explanations, and rules. The book uses lots of graphics and charts, and includes test-taking strategies, tips for using graphing calculators, and more.

Family Math, by Jean Stenmark, Virginia Thompson, and Ruth Cossey (Lawrence Hall of Science, University of California, Berkeley Press, 1986). *Family Math* is a popular book with dozens of math activities that parents and children, age 8 to 12, can do together. Included are activities related to number sense, geometry, probability and statistics, and algebra. A Spanish version of the book, *Matemática Para La Familia*, is also available.

Family Math for Young Children, by Grace Dávila Coates and Jean Kerr Stenmark (Lawrence Hall of Science, University of California, Berkeley Press, 1997). A sequel to the first *Family Math* publication, this book was developed for families with children age 4 to 8.

Family Math—The Middle School Years, Virginia Thompson and Karen Mayfield-Ingram (Lawrence Hall of Science, University of California, Berkeley Press, 1998). The activities in this book cover algebraic reasoning and number sense and are appropriate for students in grades six, seven, and eight.

A Family's Guide: Fostering Your Child's Success in School Mathematics (National Council of Teachers of Mathematics, 2004). This guide summarizes what today's mathematics classroom is like, offers tips on how parents can help their children have a positive attitude about mathematics, and presents practical ways to discuss and do math at home together.

Helping Your Child Learn Mathematics (U.S. Department of Education, 2004). This publication, available in both English and Spanish, may be downloaded for free at www.ed.gov/parents/academic/help/hyc.html.

It highlights activities that parents can do with children from preschool age through grade 5 to strengthen math skills and build strong, positive attitudes toward math.

Math On Call (Great Source Education Group, 2004). Short definitions, examples, and lessons on over 300 mathematics concepts studied in kindergarten through eighth grade are included in this small handbook for middle school students and parents.

INTERNET SITES

Calculation Nation (calculationnation.nctm.org), developed by the National Council of Mathematics Teachers, uses interactive games organized around content from the upper elementary and middle grades math curriculum. Students must establish an account to play online math strategy games that promote learning about and practice with fractions, factors, multiples, and much more.

The *California Mathematics Council* (cmc-math.org/for-families) website includes a “For Families” section that offers free math education articles and activities for students from pre-kindergarten through high school. Use the pull-down menu to access the many resources that are available including free PDF’s of this *Math at Home* booklet.

Figure This! (www.figurethis.org) includes a collection of math challenges for middle school students and their families. Each challenge comes with a hint and the complete solution, along with related information and questions to think about.

Illustrative Mathematics (www.illustrativemathematics.org) is an online resource of free mathematical tasks that illustrate every one of the Common Core Standards for each grade.

The Math Forum (www.mathforum.org) hosts “Ask Dr. Math” and has weekly/monthly math challenges, Internet math hunts, and math resources organized by grade level.

The *National Library of Virtual Manipulatives* (nlvm.usu.edu) promotes three key areas of mathematics: procedural skills, conceptual understanding, and problem solving. Over 100 virtual manipulatives are sorted by grade level, providing interactive tutorials that engage students in number sense, algebra, geometry, measurement, and probability learning. The site offers a free trial version; there is a modest charge for an individual license.

Thinkfinity (www.thinkfinity.org) is a project of the Verizon Foundation. The site has thousands of resources—including many math-focused ones—that have been screened by educators to ensure that content is accurate, up-to-date, and appropriate for students. Resources are grouped by grade and subject area.

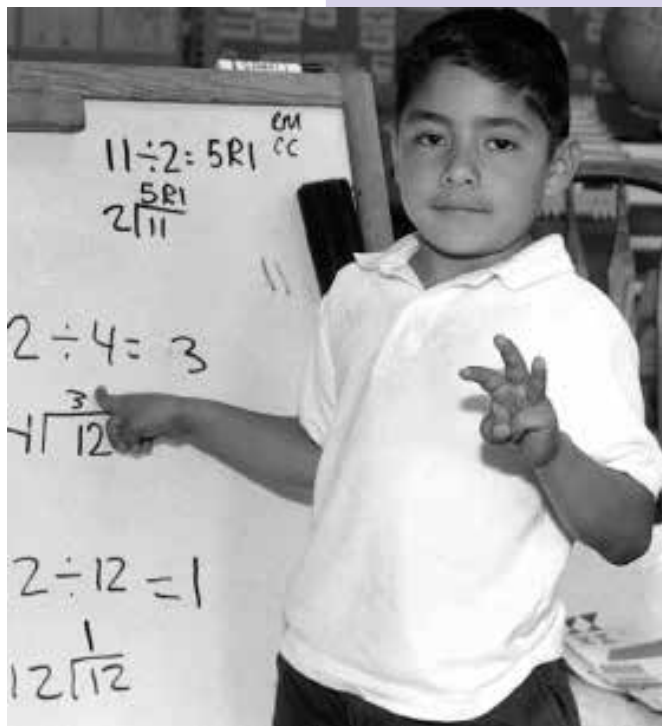
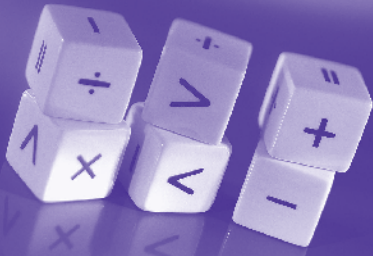


FIGURE *it* OUT



A FEW MATH CHALLENGES FOR YOUR FAMILY

THIRTY-TWO PEOPLE ENTER A PING-PONG TOURNAMENT. When a person loses a game, he or she is eliminated from the contest. How many games must be played to figure out who is the best Ping-Pong player?

AT A FIRE SCENE, A FIREMAN STOOD ON THE MIDDLE STEP OF A LADDER to shoot water onto the flames. When the smoke cleared, he went up three steps. A sudden burst of flames forced him to go down five steps. A few minutes later, he climbed up seven steps and worked there until the fire was out. Then he climbed the seven remaining steps and entered the building. How many steps does the ladder have?

A RANCHER HAS 48 METERS OF FENCING TO BUILD A CORRAL FOR HIS COWS. Since his property is bordered by a river, what is the biggest rectangular area he can fence if he uses the river as one side of the corral?

AT A PARTY ATTENDED BY 12 FRIENDS, the activities begin with every person shaking every other person's hand once (and only once). How many handshakes take place?

OSGOOD SMART GLUED TOGETHER 125 SMALL CUBES to make one big solid cube, then he painted all six sides of the big cube bright red. Later on, he broke the big cube back into small cubes and found that some cubes had three sides painted, some cubes had two sides painted, some cubes had one side painted, and some cubes had no paint on them at all. How many of each color variation did he have?

A 200-POUND MAN AND HIS TWO DAUGHTERS (each of whom weigh 100 pounds) are standing on the bank of a river teeming with piranhas. They want to get to the other side, but their canoe can hold no more than 200 pounds. How can they get across?

A GIANT HERO SANDWICH HAS BEEN CREATED THAT IS 30 FEET LONG. It has been divided into four parts so that each part is one foot longer than the previous one. What are the lengths of the four pieces?

IF YOU HAVE CHOCOLATE, STRAWBERRY, AND VANILLA ICE CREAM, how many *different* double-dip cones can you make? Remember, some people like to eat their strawberry *before* they eat their chocolate, and some like it the other way around.

IF A STATE'S LICENSE PLATES CONSIST OF ONE DIGIT followed by three letters, followed by three digits—such as 1ABC123—how many unique license plates can be issued?

HOW MANY DIFFERENT SHAPES, not counting reflections or rotations, can be cut from a 3-inch by 3-inch grid if cutting is allowed on the grid lines only?

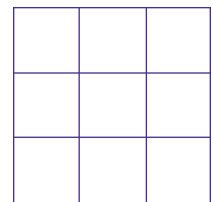
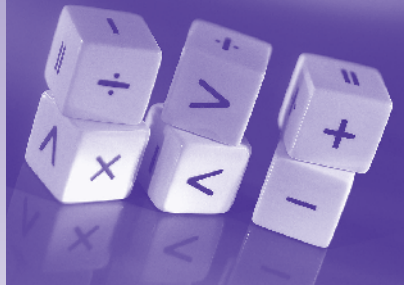


Photo by Ross Haase

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