

# EARLY LEARNING

# MATH *at* HOME

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HELPING YOUR  
CHILDREN  
—BIRTH TO AGE FIVE—  
LEARN AND ENJOY  
MATHEMATICS



*A public service publication of the  
California Mathematics Council,  
the professional organization for  
pre-k–college mathematics educators*

## ABOUT THIS PUBLICATION

*Early Learning Math at Home: Helping Your Children—Birth to Age Five—Learn and Enjoy Mathematics* was developed by the California Mathematics Council (CMC), the state's largest professional organization for pre-k through college mathematics educators. Funding for the preparation and distribution of this document was provided by a generous grant from the Heising-Simons Foundation. Paul Giganti, Jr., the author and the CMC Chair of Special Projects, is a mathematics education consultant, and author of children's books with mathematics themes. To contact the author, e-mail:

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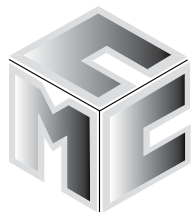
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### The California Mathematics Council



The California Mathematics Council (CMC) believes 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 will ensure continual improvement towards 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.

For more information about the California Mathematics Council, or to become a member, visit:

***www.cmc-math.org***

### The Heising-Simons Foundation



Established in 2007, the Heising-Simons Foundation is dedicated to sustainable, research-based solutions in education, science, environment, and policy. One of the Foundation's primary interests in education is promotion of the development of math skills in young children, preschool to grade 3. This includes efforts to increase capacity in preschool–grade three teacher preparation and professional development, curriculum development, policy, advocacy, and research.

For more information about the Heising-Simons Foundation, visit:

***www.heisingsimons.org.***

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# WELCOME YOUR CHILDREN TO MATH AT A YOUNG AGE

**P**arents are teachers too! The first five years of a child's life are a critical time for learning. As a parent or guardian, you are your children's first and most important teacher and what you do in their early years makes a difference. Young children whose parents frequently talk to them, play with them, and read to them have an advantage later on when they enter school. Did you know that parents can also give children their first positive experiences in mathematics, and these can set the tone for mathematics learning throughout their children's lives? Don't make the mistake of thinking that learning mathematics begins in school; you can give your children a wonderful start in early math learning right at home.

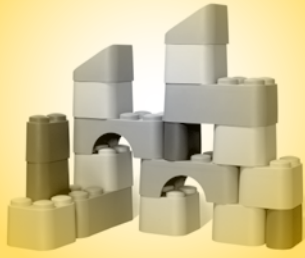
Your children's first experiences with mathematics should be enjoyable activities that are shared with you—where you both learn. Because parents and guardians are also children's first role models, it is important that your children see you doing math and taking the time to work with them. And what better way could there be than playing with your children AND doing math at the same time?



Photo by Rachel Davis

We hope you find this booklet to be a valuable, informative, and useful resource—one that will encourage you and your young children to do math together. Even if you haven't studied much mathematics yourself, you can promote math in your home. This booklet will give you ideas and resources to support your role in your children's early introduction and understanding of the first important math concepts. The information you will find in these pages represents our best thinking about how to help very young children learn mathematics. The California Mathematics Council's goal in publishing this booklet is to encourage stronger, more informed parent support for their children's mathematics education, and to increase the mathematics achievement of all students.

Plant the seeds of mathematics learning early in your children's lives and provide your family with many ways you and your children can have FUN doing mathematics together.



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## GIVING YOUR CHILDREN A GOOD START IN MATH

As a parent, it may be tempting to think you don't need to worry about helping your children learn mathematics until elementary school, but the seeds of many important math concepts are planted when children are very young. Young children begin learning math before they take their first steps. When toddlers hold up two fingers and say they are "this many years old," they are already doing math and are ready to learn more. In fact, early experiences can determine how your children look at math for the rest of their lives. It's never too early to start learning—and liking—math!

### MATH ADVICE FOR PARENTS OF YOUNG CHILDREN

#### ■ HAVE HIGH EXPECTATIONS FOR YOUR CHILDREN

Be confident that your children can and will learn math. Make sure you tell them they can do math, encourage them to always do their very best, and actively praise their efforts when they do. Always encourage your children to tackle problems they come across and solve them in creative ways.

#### ■ TALK ABOUT MATH IN POSITIVE WAYS

Be positive when you talk about math in front of your children. Never tell your children that math is too hard or that you hated it when you were in school. Let your children know that math is important and point out how you use math in your everyday life. Actively seek out opportunities to explore math together. Make math fun and enjoy it WITH your children!

#### ■ MAKE MATH PART OF YOUR FAMILY EVERYDAY

We all do a lot of math every day without even thinking about it. When you look around with "math" in mind, it's amazing how many activities you will find that involve math that you can do with your children. Find opportunities at home, in the kitchen, in their bedrooms, at bath time, during play time, inside the house, and outside the house. Spend time with your children on simple board games, picture puzzles, and building blocks. Involve your children in shopping, cooking, or home projects to show them that math is practical and useful. Let your children see you do math every day.



Photo by Paul Giganti, Jr.

■ **FIND A REGULAR TIME TO DO MATH WITH YOUR CHILDREN**

Children's days are as busy as adults' days. If you don't make time to do math with your children on a regular basis, the opportunities will slip away. Make it a personal goal to do at least ten minutes of math with your children every day. Find a regular time each day when you are normally with your children and not rushed; those are the best times to do a bit of math together. Just as you find time to read to your children at night, also find time to do math! Some families like to do a little math at the dinner table when everyone is together. Some parents do "bedtime math" right after reading a book. Pose a problem, solve it together, then call it a day!

■ **POINT OUT MATH TO YOUR CHILDREN EVERYWHERE**

You can help your children see how useful math is by pointing it out wherever you see it—not just in your home, but everywhere you go. Tell your children about the math you do in your job and why it's important. When you are outside your home, look for ways to point out math: "What shape does that tree look like?" "How many steps did we go up?" "How many seconds until the elevator arrives?" "How many pennies did we get in change today?" If you start looking for math in the world, you will find it everywhere—and so will your children.

■ **"TALK MATH" TO YOUR CHILDREN**

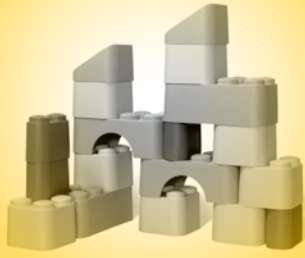
Find opportunities to use size, location, and number words in all sorts of situations—on a walk, taking a bath, reading a book together, and, of course, while playing with your children. Use math words—big/small, more/less, heavy/light, in/out, on/under, top/bottom, up/down, over/around, behind/next to, near/far, inside/outside, first/second, and last/next—in simple sentences as often as you can, such as, "Sit here next to me." Or, "I'm giving you more blocks; now I have less. Give me three back!" Make sure your children "talk math" too; when they solve a problem, ask them to explain how they did it.

■ **IF YOUR CHILDREN GO TO DAY-CARE OR PRESCHOOL . . .**

Ask about the school's math program and what math materials are available. Preschools and day-care centers often have wonderful reading and language programs, but many are just becoming aware that mathematics is also important in young children's days. Make a point of looking at the math materials that will be available to your children. Does the school or center have a "math-rich" environment? Are there lots of building blocks of all different kinds? Are there lots of things to count, sort, and put together and take apart? Ask the teachers about their math program and make sure there is learning time set aside for math EVERY day!



Photo by Nikki Easterday



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## FINDING MATHEMATICS EVERYWHERE

**M**athematics is important! If your children discover mathematics at a very early age, they will learn that mathematics has a purpose and that it's not just a subject people study in school. For young children, math is about shape, color, size, order, pattern, and the number of objects. You can help introduce your children to some basic math concepts inside and outside your home and everywhere you go. By understanding and pointing out the math in things and situations that are important to children, you will help them become comfortable with math ideas and concepts long before they go to school. Start the math learning early in your family!

Here are some BIG math ideas that you can help your young children discover. You don't have to be a teacher or math expert to share them with your children; they are simple early concepts that are easy for you and your children to do, and they will provide you with wonderful opportunities to have a good time doing math together.

### ■ SORT ALL SORTS OF THINGS

Sorting may not seem like math at all—numbers are hardly involved—but sorting objects that are similar but slightly different into groups has a lot to do with seeing differences and similarities and how things are related and not related, and these are powerful links to understanding a great deal of mathematics. Sorting is about carefully observing things and helps young children learn to compare and classify. As a parent, encourage your children to sort all sorts of things in all sorts of ways. Your home is a sorting playground!

The best place to start is with two piles: a pile with objects that have some characteristic in common and another pile with objects that don't have that same characteristic. You and your children can sort toys with wheels and toys without wheels; stuffed animals you have seen in a zoo and those you have never seen in a zoo; blue toys and toys that aren't blue; shoes with laces and shoes without laces; toys they want to keep and toys to give to Goodwill. At first you can suggest things and ways to sort them. Once your children understand the concept, have them make up their own ways to sort objects. Listen carefully; sometimes they will come up with ideas you would never think of. Together with your children, look all over your house for things to sort. The more you look, the more things you will find that are perfect for sorting!

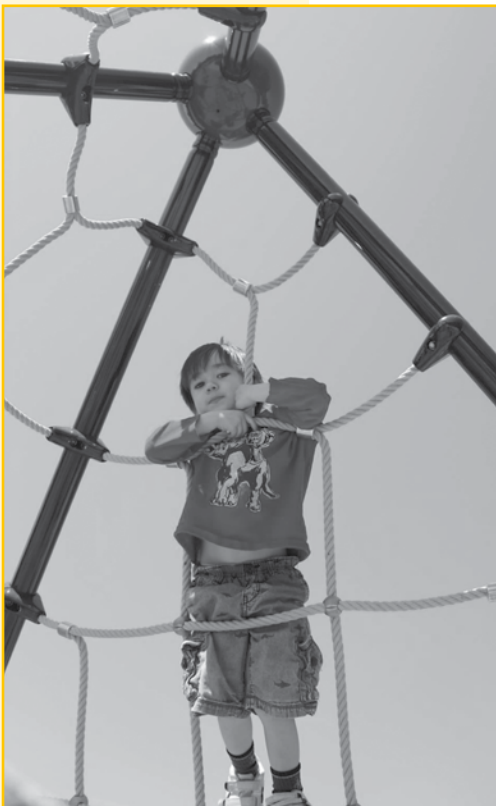


Photo by Nikki Easterday

## ■ ARRANGING THINGS IN ORDER

Understanding order is very important to young children. We make sense of our world when we put things in order and many basic mathematics concepts depend on order. You can order things by size: largest to smallest; by time: which came first to which came last; by preference: your favorite things versus those things you don't like as much; and by many other qualities.

Lucky for you, your home is full of interesting things to put in order and you can help your children learn how to learn this concept! Your children can put a set of blocks in order from largest to smallest and then do the same with all the different sized bottle tops you can find. Have your children put their toys in order from favorite to least favorite. In the kitchen, let them put cans of food in order from heaviest to lightest. Have them put your family pictures in order from oldest to newest. Be creative! Look around with your children and together you will find lots of things to put in order in lots of different ways.

## ■ DISCOVER SHAPES EVERYWHERE

Shape is the foundation for the study of geometry. You don't need to wait until your children start school to study geometry; all sorts of shapes are all around us in our world. You and your children can have fun looking for them together. Start by pointing out familiar shapes—such as a round plate, a square napkin, or a triangle half-sandwich—by name—circles, squares, triangles, and more—wherever you see them. When you point out the shapes, always say their geometric names, then ask your children if they can find a similar shape and tell you the shape's geometry name as well.

“Look. I see a clock; it's a circle. Can you find something else that's a circle?”

Geometric shapes are everywhere: search your home, go to the store, take a walk. You will find all sorts of triangles, squares, circles, rectangles, and even a rhombus, if you look for them!

Your children's world is a math gold mine. To help your children see math everywhere, you must first be able to find it yourself. Think “math” as you look around your home and wherever you go. The more things to sort, count, and order that you and your children discover, the more they will begin to see math everywhere on their own.

## FINDING MATH IN YOUR HOME

### IN A PLAY AREA, YOUR CHILDREN CAN:

- Count blocks as they build a tower.
- Sort buttons by size, number of holes, or color.
- Put dolls, cars, balls, or blocks in order from largest to smallest.
- Find different ways to sort all the shoes.
- Make a Geometry Picture Book by drawing and coloring objects with math shapes that they find around the house or outside.

### IN THE KITCHEN, YOUR CHILDREN CAN:

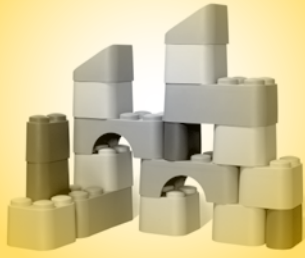
- Name familiar shapes—circles, squares, triangles—such as a round plate or square napkin.
- Put cans of food in order by size or type.
- Sort silverware from the dishwasher to the silverware drawer.
- Count plates, utensils, cups, or even olives.
- Divide a plate of cookies evenly so that each family member gets an equal share.
- Find how many glasses of milk are in a full milk carton (you can always pour it back).
- With your help, double a favorite recipe.

### AROUND THE HOUSE, YOUR CHILDREN CAN:

- Count the days on a calendar until a special event, such as a birthday or holiday.
- Find the length and width of a room by counting foot steps, one in front of the other.
- Draw a “map” picture of where things are located in their bedroom.

### OUTSIDE THE HOUSE, YOUR CHILDREN CAN:

- Plant a garden with rows and columns of seeds.
- Count the petals on different flowers.
- Count how many times they can jump rope or shoot baskets in a row.
- Find triangles, squares, circles, and rectangles around the neighborhood.



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# THE EARLIEST MATHEMATICS LEARNING: BIRTH TO AGE TWO

**B**abies learn mathematics too! Infants begin to develop an understanding of math and skills very early in the first year of life. It's not the sort of math that children learn in a classroom: instead they learn by exploring with their sight, touch, hearing, and taste. Math helps infants and toddlers deal with the new world around them and get what they want.

As a parent you can take an active role in this very early math learning if you first understand what sorts of information infants and toddlers learn when they grasp, taste, or listen to something new. Then you can help make these earliest math experiences more frequent and interesting.

## **GEOMETRY: THE FIRST MATHEMATICS WE LEARN**

Soon after birth, the mathematics of geometry becomes very useful to infants as they begin to explore. Geometry lets infants and toddlers discover how shapes are arranged and fit together. We call these discoveries *spatial relationships*. This early knowledge is very important because it helps babies recognize things and people—the things they want and the things they don't want. For example, when babies hold, wave, and mouth a teething ring, they learn that it is round and smooth with no sharp corners, easy to hold, just so heavy, and great to suck on, but not as good as food when they are hungry.

## **WHAT WE KNOW ABOUT INFANTS, TODDLERS, AND MATHEMATICS**

We know very little about how babies learn math because, until infants and toddlers can talk, they can't tell us what they know and understand. Here are a few things that have been observed about babies and mathematics.

- One of the first things babies recognize is their mother's face, and they can soon tell this important person from everybody else, something that's a great deal of work for a computer to do! Infants also learn to recognize their favorite toy or blanket from all others. Shape, size, texture, and taste are the mathematical variables that allow them to know that one thing is different from another. Babies also begin to recognize patterns at a few months of age.
- Infants and toddlers explore shapes and spatial relations by passing an object from hand to hand: is it sharp, hard, or heavy?; by tasting it: does it have taste and can you eat it?; by banging and even trying to break it: what's it made of, is there something inside? While parents may not like when toddlers do these things, they are similar to the steps scientists use when they investigate something new.
- Infants and toddlers often learn spatial relationships, such as location, direction, and distance, by using their bodies. They first develop spatial



sense when they reach for things, then when they move through their environment by rolling over and eventually crawling.

- Toddlers can often tell the difference between one, two, and three objects. They don't "count" objects, but they learn to recognize that "three-ness" is different from "two-ness." For this reason, most toddlers can't tell the difference between higher numbers of objects—for a long time it's one, two, three, or MORE.

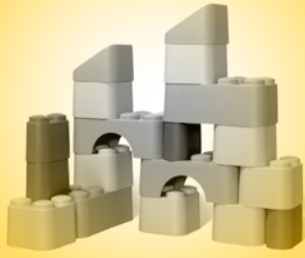
### **WHAT PARENTS CAN DO TO ENHANCE INFANTS AND TODDLERS MATHEMATICS LEARNING**

Children need to see, touch, and examine lots of things. They need to look at, hold, and explore the many characteristics of objects. What may appear to adults as play is actually active exploring and information gathering for an infant or toddler. They are always busy filling their minds with sights, sounds, and sensations that may prove useful later—just as when you eat a very bitter berry, you never make that mistake again! Your role as a parent is to make sure those sensory experiences are as varied, frequent, and SAFE as possible. Here are some things you can do to promote the earliest math learning.

- Make sure that even the youngest babies have lots of things to observe within their field of vision, such as brightly colored, high-contrast objects, moving mobiles overhead, a window with changing scenery, and pictures on the wall. Every so often change what babies can see when they look around so they can observe different things.
- Provide infants with simple toys they can explore, such as rings, rattles, and soft or stuffed toys with different textures. Don't forget things that make different sounds, such as rattles, shakers, and drums. Provide toddlers with a variety of objects—such as blocks, balls, and simple geometric shapes of different sizes, colors, and patterns—to explore, sort, and compare, but always be aware of objects that can be choking hazards.
- Frequently change the toys that babies and toddlers play with. Even babies get bored—change stimulates even the youngest minds. You don't have to buy new toys; just put some toys away for a while and take others back out.
- Provide toddlers with lots of different containers for play—large, small, round, square, tall, short—some that nest neatly and some with lids. Have a separate set they can fill and empty when they take a bath. Containers may not seem like toys to us but, in a toddler's hands, these "toys" can teach math concepts long before entering preschool.
- Sometimes the simplest toys are the best for learning. The more things toddlers can do with a toy, the more their imaginations are at work. Blocks of all different sorts and sizes (but not too small) are great examples of the simplest toys that teach MANY things to young children.



Photo by Green Toys™



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## THE ROLE OF PLAY IN LEARNING MATH

Play is fundamental—a fun AND mental activity. When young children play they are growing intellectually, physically, socially, and emotionally. Time spent playing is productive, valuable, and essential to a child's development. Play is a child's work: when children play, their bodies and minds are at work. Children learn as they play and, in turn, play gives children an opportunity to practice what they have learned. At the earliest ages, children begin to discover and explore their world—including the world of mathematics—through play.

When children are exposed to a variety of interesting objects and situations during play, they actively think about relationships such as bigger or smaller, more or less, longer or shorter, heavier or lighter, and nearer or farther away. Although play at a young age does not guarantee mathematical learning, it offers children rich possibilities for mathematical investigations, insights, and discoveries. Play helps them develop powerful mathematical understandings well before they enter school.

### WHY SHOULD YOU MAKE TIME FOR UNSTRUCTURED PLAY?

The American Pediatric Society recommends that young children have a minimum of 60 minutes a day of unstructured play. Unstructured play is play children choose for themselves, often done alone or with another child, and without adult interference. When play is controlled by adults or carried out by adult rules, children attend to adult concerns and adult desires. When play

is child-driven, children use their imagination and creativity, practice independent decision-making, and develop problem-solving skills. Most importantly, free play, such as playing with blocks, allows boys and girls to seek out their own interests, move at their own speed, and follow their own paths to discovery. Children who have ample opportunities for unstructured play often have an advantage when they enter school because this play helps them develop longer attention spans, solve problems on their own, and gain self-confidence—all of which are important in school and throughout life.

### WHAT ARE THE BEST TOYS FOR UNSTRUCTURED MATHEMATICS PLAY?

The best toys for unstructured play are those with the fewest rules and most possibilities. The famous



Photo by Paul Giganti, Jr.

architect, Frank Lloyd Wright, credited the wooden blocks his mother gave him as a child with his early interest in architecture. We know children use their imaginations when they pretend to be pirates or ballerinas, but children use their imagination just as much when they build with blocks, sort buttons, or fill and empty containers with water. Toys that require children to create and invent their own uses help children develop early math concepts such as balance, shape and size, sorting, order, pattern, counting, and problem solving, while at the same time developing small motor skills and eye-hand coordination. Open-ended toys that are also natural tools for developing math skills and concepts include the following:

- Toddler busy boxes with knobs to turn, bells to ring, and all sorts of colorful things to move
- Toys with pieces that stack from largest to smallest
- Shape sorting toys with pegs and holes that have different sizes, shapes, and colors
- Boxes, bowls, cups, plastic tubs—and different stuff such as water at bath time or sand in the backyard—so they can fill and empty them
- Felt boards with a variety of geometric shapes and sizes
- Blocks that join together in different ways—for boys AND girls
- Wooden cubes, plastic colored shapes, or pattern blocks
- Large beads of different colors, sizes, and shapes for stringing patterns
- Magnetic shapes for building 2-dimensional or 3-dimensional creations
- Geometric 3-dimensional shapes and blocks for building
- A plastic balance scale, along with uniform objects (such as cubes) for weights—and a lot of different objects around the house to weigh
- Collections of different, but related, objects—such as coins, buttons, keys, plastic lids, stamps, and nuts and bolts—to sort in different ways
- Measuring cups and spoons, and containers to fill, empty, and compare

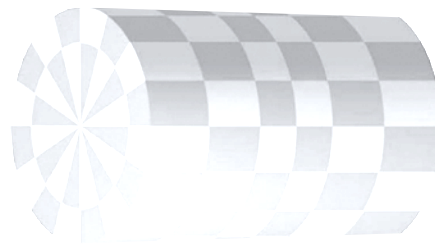
### **WHAT ARE THE ROLES OF PARENTS IN YOUNG CHILDREN'S PLAY?**

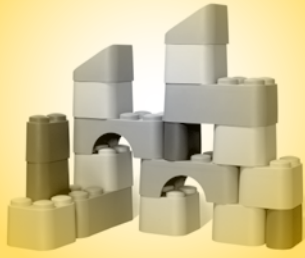
Parents play an important role in children's unstructured play. Only you can plan for a balance in your children's lives, including setting aside enough time for play, providing multi-purpose toys, and making sure your children have a safe place to play without too many distractions. While television can promote learning, it is passive learning since the child is only a watcher, not an active participant. TV time should be limited for young children in favor of active play. Turn OFF the TV when it's not TV time; studies show that TV disturbs children's active play—even when they aren't watching it!

And don't forget, when your children are quietly playing, take this wonderful opportunity to carefully observe them in their world of play. Watch closely and you will discover the different ways your children choose to learn, and what you learn can help you encourage your children's unique talents and interests.

## **BEWARE OF CHOKING HAZARDS!**

When choosing small toys or blocks for children **under age three**, take special care to avoid anything that has lead content or may be a choking hazard. The U.S. Consumer Product Safety Commission recommends that the minimum size of any block or toy part not be smaller than a cylinder measuring  $1\frac{1}{4}$  inches wide and  $2\frac{1}{4}$  inches long. Pictured below—shown life-sized—is the recommended minimum size block to avoid choking.





HELPING YOUR  
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# MATH GAMES TO PLAY WITH YOUNG CHILDREN

Here are a few math games you can play with your children. Each is a two-person game—designed to be played by a parent or older child with a younger child. Some are very simple and meant to be played with very young children; others are a bit more difficult. No age is indicated because children, as well as their abilities, mature at different rates. You will know very quickly after you start a game if your child is ready for that game. If you have to do a lot of “teaching” and your child still doesn’t understand, move on to something else; don’t push too hard!

## ■ WHAT COMES NEXT?

This game is about building simple patterns. You can play the game with any sorts of objects, but you will need a lot of them so you and your child can continue building the pattern. You start, for example, by placing an apple, then an orange, then another apple and orange in a straight line. Then ask your child, “What comes next?” If your child hesitates, hand him or her an apple, and let him or her put it next in the line. Then add another orange and ask, “Now what’s next?” If you want to make it a bit harder, on your turn place both an apple and an orange at the end of the line, before you ask

the question. You can play this game with colored blocks, stickers, buttons, and many other things. Eventually graduate to more advanced patterns, such as red block, red block, blue block, red block, red block, blue block. Together you can invent new, more complicated patterns.

## ■ WHAT ANIMAL AM I?

Young children all love animals and, from an early age, they learn amazing facts about different animals. You start this game by saying something like, “I’m thinking of an animal that has four legs; what is it?” If your child guesses your animal right off, great! But if he or she guesses wrong, say something like, “No. My animal barks; what is my animal?” Continue to give clues—as easy or as hard as your child can use—and have your child continue to guess until he or she names your animal! Although this may not seem like math, we call different characteristics *attributes* and use them to sort and classify in mathematics. After your child guesses a few of your animals, ask if he or she would like to think of an animal and have you guess. Just think of how many animals there are that you and your child can guess!



Photo by Paul Giganti, Jr.

### ■ **ADD A BLOCK**

Both boys and girls should play with building blocks often—and from a very young age. This game is about building skills that help young children develop spatial and small motor skills. The blocks you use to play the game do not all have to be the same; in fact, different shaped blocks make for a more interesting game. Start by placing a block on the tabletop or floor. Now ask your child to add one block of his or her choice on top of yours. Keep taking turns until you can't make the building any taller without blocks falling. Remember: this is NOT a contest. If your child's block falls off, let him or her try again. Play this game with different kinds of blocks. You will find the more you play this game, the better your child will become at building, balancing, and planning ahead.

### ■ **FOLLOW ME**

This is a game that, in its simplest form, even babies and toddlers can play. Start with a physical motion, such as putting your hand on your head. Then ask your child to do what you are doing: "Follow me!" After he or she puts a hand on his or her head, take your hand off your head and pinch your nose, again saying, "Follow me!" The motions you want your children to "follow" can be simple or complex, depending on their age. For example, standing on one leg may be OK for a four year-old but too difficult for a toddler. After your child understands the game, play it by making one motion after another while your child follows along—without any need for words. Another version of this game is called "Clap Like Me." To play it, you clap a pattern, such as clap, clap, pause; clap, clap, pause. Then you say, "Clap like me." Don't forget to let your children make up clapping patterns too.

### ■ **DRAW THIS**

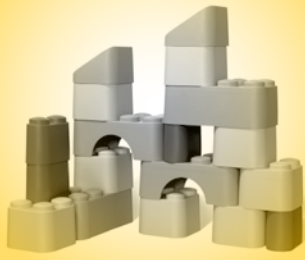
To play this game you need to sit side-by-side at a table, with you and your child each having a sheet of paper and a selection of crayons, colored pens, paints—whatever you choose. Start by picking up a crayon (use only ONE color to start) and drawing something simple on your paper, such as a circle in the middle of the page. Then ask your child to do the same on his or her paper. Don't expect your child's shape to be as good as yours; drawing ability comes with age and practice. After he or she has copied your first shape, draw a new shape somewhere on your paper, such as a triangle or Tic-Tac-Toe grid. Be creative, but keep your child's age and drawing ability in mind. Keep taking turns as long as you would like and, if you plan ahead, you might end up with something you both recognize, such as a stick figure or smiley face. When your child understands the game, trade roles and have him or her start the drawing, with you following along.

There are many more games you can play with your children. Just make sure that, when you choose games to play together, they are a good fit for your child's age and ability and, most of all, they are FUN!

## WHAT ABOUT FLASH-CARDS AND WORKBOOKS?

You may be tempted to give your children a headstart in mathematics by using flash cards and workbooks to help them master basic skills. Don't worry; there will be plenty of time to learn basic math facts and operations in school.

Instead, think of your role in your children's early learning as providing a vast and varied math playground of hands-on activities for your children to experience, enjoy, and explore. Early childhood is the time when children should enjoy learning. Anything that might make learning math seem like work to children may make them anxious or, even worse, make them dislike doing math. Concentrate on finding ways to make math learning fun and interesting, and always be aware when they get tired or bored with an activity. Make math fun and you will be giving your children more than a set of basic skills, you will be giving them a love of learning that will last.



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## COUNTING AND YOUNG CHILDREN

Counting seems so simple—we hardly give it any thought. However counting is the foundation for many mathematics concepts and procedures. It is also important because it is one of the first math concepts young children learn. You can help them learn AND enjoy counting!

Even young children have the desire to “count” things in their early exploration of the world. If children develop an early understanding of the many aspects of counting, they will have an advantage when they begin to study mathematics in school. Early counting experiences give parents wonderful opportunities to help children explore and practice this basic skill.

Because young children often want to count, you can often try counting with children as young as one. You will know right away if children are not ready for counting; they simply won’t be interested. If your young child is not interested in counting, don’t worry; wait a month and then try again. The first counting you do with your children should be fun, like playing a game. It’s very important that both of you enjoy early counting experiences.

### COUNTING ONE NUMBER FOR ONE OBJECT

When your children learn to count one number for one object, they have mastered a concept called *one-to-one correspondence*. For counting to be useful, you must count only ONE number for ONE object. It’s important not to skip or add extra numbers while you count so the last number you say is the total number of objects you are counting. This concept seems natural to adults, but many young children struggle with one-to-one correspondence because, in the beginning, counting sounds like a song to them, just like the alphabet song. There is nothing wrong with children saying numbers quickly but, when they are counting, they must slow down and take care to count one number for one object—otherwise the number they end with will not match the number of objects, and this makes counting less than useful.

### COUNTING ALL SORTS OF OBJECTS

Young children need to count lots of different things. The more opportunities and the more varied the objects young children have to count, the better they will understand the meaning and use of numbers—and the more confidence they will have with mathematics later on.

The best objects for young counters tend to be separate objects that they can move around and count easily. As children become good counters, they will learn to count things they cannot touch or move around. For many children, favorite early “counters” are Cheerios, cookies, or fish crackers—math you can eat!

To begin, take five of the same object—fish crackers, for example—and put them in a line with a bit of space between each one. Before you count, help your children form a “counting finger,” a fist with one finger pointing out. Using their counting finger, you can help them touch the first cracker in the row. Together count out-loud “One,” and, with the finger still touching the cracker, move it away from the line of crackers so that it doesn’t get counted a second time—a mistake young counters often make. Now count “Two” while their counting finger moves to touch and move the second cracker. Continue in the same way until you have counted the last cracker, “Five,” and moved it into the pile. Make sure you say “You’ve counted FIVE crackers!” so that your children learn that counting has a purpose—to find out how many. Of course, now comes the fun part—eat the crackers!

### **COUNTING MANY MORE THINGS**

If your children can correctly count five objects and are interested in counting more, increase the number slowly and, in time, try counting things they can’t touch or move. There is no rule for how high a child should be able to count at any given age. Be careful and don’t push your children too fast. If they aren’t having fun, it may be TOO many. You will know you have it right when counting is enjoyable for both of you.

### **MATH TIPS FOR PARENTS OF YOUNG COUNTERS**

- Find things to count with your children every day, everywhere, and in every way. Start slowly with just a few things and objects that look a lot alike. As your children’s ability to count grows, increase the size of the collections and find different types of things to count.
- Children discover that counting is more than a sing-song repetition when they count real objects such as crackers, cookies, or stuffed animals. Encourage your children to say just one number when they touch or point to each object. Arrange objects in different ways for counting: in piles, rows, and circles. When your children finish counting, encourage their counting by saying, “One, two, three cookies. You counted three cookies. Great!”
- Sometimes children forget which objects they have counted and which they haven’t counted. If this happens, have your children move each object into a “counted” pile as they count. If your child gets frustrated or continues repeating the same mistake, be patient and do something else for a while. Try again another day!
- Don’t worry if your children use their fingers when they count objects they can’t touch. Fingers are the earliest math tools children have! They are always handy and ready to use. Children will stop using their fingers to count when they learn there are faster and better ways to do math.

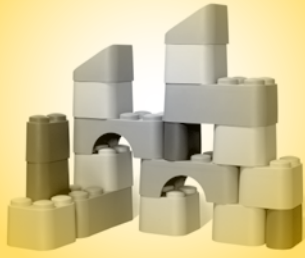
## **COUNTING LOTS OF THINGS**

Anything can be counted! Make a game of finding all sorts of things to count—inside and outside! With the earliest counting, it’s best to find objects that are mostly the same, such as spoons—even if all the spoons aren’t exactly the same. By sometimes counting big things and then sometimes counting little things, children will learn that five spoons is quite different from five elephants, but that both have “fiveness” in common.

Try counting these things:

- Stairs as you go up or down.
- The glasses of orange juice in an orange juice carton (you can always pour it back).
- How many times you can hop on one foot (how many on the other foot?).
- Eggs in the carton.
- Shoes, then pairs of shoes.
- Spoons, knives, and forks—separately or together as “utensils.”
- The petals on different flowers.
- Blue cars on the freeway.
- The pennies you save.

Encourage your children to look all around and come up with many different things to count!



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# MATH, READING, AND LANGUAGE TOGETHER

All parents know that reading books and talking to young children promotes their language development. But did you know that children's books and "math talk" can also hook them into learning mathematics? When done in the right way, combining math, reading, and language can enrich you and your children's enjoyment of all three subjects at the same time!

## COMBINING READING TIME AND MATHEMATICS LEARNING

To get the most learning out of children's books, with or without a math theme, don't just read the words and turn the pages—ask questions! For example, the book, *The Very Hungry Caterpillar* by Eric Carle, is about a caterpillar that eats his way through the book while counting. You and your child would have a great experience if you just read this book from cover to cover, but good stories often provide opportunities for a parent and child to stop and do math together in a comfortable, enjoyable setting.

The story of the *Very Hungry Caterpillar* begins on Monday when the caterpillar ate through one apple, but was still hungry. Here is the first place in the book where you and your children can explore the story AND do some math. Since most books don't ask questions, you have to make up questions that bring out the math. Don't just turn the page; pause and ask your children questions, such as

"How many things do you think the caterpillar will eat on the next page?"

After your child answers one or more questions, turn the page and continue reading. Be careful not to ask too many questions or your child may lose interest in reading the book. On the next page, the story continues when the very hungry caterpillar ate through two pears, but was still hungry. Here you might stop and ask, "Can you count the pears he ate?"

Once your children are comfortable answering your questions, encourage them to make up and ask their own questions that you can answer or help them answer. Keep reading, asking



Photo by Paul Giganti, Jr.



questions, and doing math, as long as your children stay interested. You don't need to stop on every page—it's important to keep moving so your children don't lose the storyline. If your children get tired, put the book down and pick it up at another time; you don't always need to finish a book in one sitting. Since children have favorite books they like to read over and over, you can read a book again and ask new questions! Always keep in mind that the whole idea is to make math and reading a pleasant experience for you and your children.

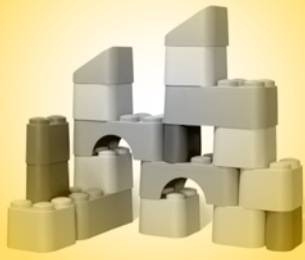
### **THE ROLE LANGUAGE PLAYS IN YOUNG CHILDREN'S MATHEMATICS LEARNING**

When infants, toddlers, and preschoolers are introduced to new mathematics concepts, it is important that parents talk with their children about what they are seeing, hearing, and doing.

- You can “talk math” to young children even before they utter their first words. We know toddlers understand many mathematics concepts long before they themselves can talk and tell us what they understand. For example, with the concepts of BIG and LITTLE, if you frequently point out things using the words “big” and “little” to describe them to toddlers even before they begin to talk, one day they will point at something new and say, “big!” They can learn the concept of “big” weeks or months before they can speak the word.
- All people, from birth throughout adulthood, are interested in their bodies. Help little children explore the math of their bodies: count their one nose, one mouth, two eyes, two ears, two hands, two feet, two knees, two thumbs, and ten fingers; then have them count yours!
- Ask children a lot of questions and get them to tell you what they are thinking while doing math. By introducing and using simple math words around young children, parents can help children understand the meaning of numbers, shapes, and other mathematics concepts.
- If your children are English learners, use your home language first, then, if possible, repeat the words in English when explaining a math idea. Hearing an idea in two languages will help children understand that different languages can describe the same concept.

## **MATH & CHILDREN'S LITERATURE**

- Anno's Counting Book*, by Mitsumasa Anno
- Bear in a Square*, by Stella Blackstone (also in Spanish)
- The Button Box*, by Margarette S. Reid
- Caps for Sale*, by Esphyr Slobodkina
- Changes, Changes*, by Pat Hutchins
- Color Zoo*, by Lois Ehlert
- Each Orange Had Eight Slices*, by Paul Giganti
- Fish Eyes*, by Lois Ehlert
- Gray Rabbit's Odd One Out*, by Alan Baker
- How Many Feet in the Bed?* by Diane Hamm
- How Many Snails?* by Paul Giganti
- Is It Larger? Is It Smaller?* by Tana Hoban
- The Line Up Book*, Marisabina Russo
- Math in the Bath*, by Sara Atherlay
- More Than One*, Miriam Schlein
- One Hungry Monster*, by Lynn Munsinger
- One Watermelon Seed*, Celia Barker Lottridge
- Over in the Meadow*, Ezra Jack Keats
- A Pig Is Big*, Douglas Florian
- Rooster's Off to See the World*, by Eric Carle
- Rosie's Walk*, by Pat Hutchins (also in Spanish)
- Round Is a Mooncake*, by Roseanne Thong
- Round Trip*, by Ann Jonas
- Shapes and Things*, by Tana Hoban
- Ten Black Dots*, by Donald Crews (also in Spanish)
- Ten, Nine, Eight*, by Molly Bang
- The Very Hungry Caterpillar*, by Eric Carle
- What Comes in 2's, 3's & 4's?* by Suzanne Aker
- Who's Hiding?* by Satoru Onishi



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## ENGAGING ENGLISH- LANGUAGE LEARNERS

Language doesn't have to be a roadblock to your child learning mathematics. There are many child-friendly strategies for sharing math ideas that require very little language. It doesn't matter what language is spoken in your home or whether your child already knows that language—children can learn many math concepts without the need to understand many words. If you are a parent of a young child who does not speak English, here are some strategies teachers have found to be very effective with English-language learners in the classroom—they work equally well at home.

### ■ BUILD MEANING IN REAL SITUATIONS

For many young children, mathematics can seem very abstract. When math problems are related to things they see and do in everyday life, the concepts often become more real and more meaningful. Money and math is a great example. Working with dimes, nickels, and pennies can give young children an early introduction to base 10 (1s, 10s, 100s, . . .), something they will use all their lives. Changing 10 pennies into a dime and 10 dimes into a dollar teaches children that ten 10s equals 100.

Taking a walk around your neighborhood and looking for geometric shapes provides another real-world math experience. Geometry is everywhere; signs, buildings, flowers, automobiles, and playing fields all have geometric shapes. Soon your children will be pointing out shapes wherever you go.

### ■ DOING MATH WITH REAL OBJECTS

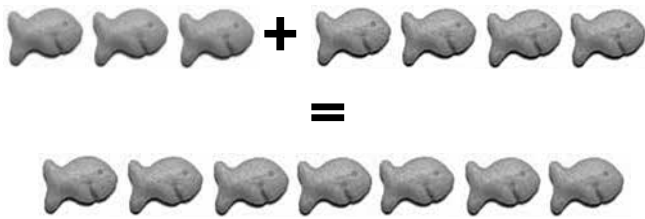
Blocks, beans, buttons, and animal crackers—to name just a few things—are objects that children can handle and sort. They help children make hand-to-eye-to-brain connections and can make a positive difference in learning math for young language learners. Teachers often teach abstract math concepts in the classroom using things children can manipulate such as small blocks and plastic counters (teachers often refer to these as *manipulatives*).

At home you and your children can solve simple problems with easily found objects that make wonderful manipulatives. Things as simple as dried beans and fish crackers can help your children learn math concepts by giving them the opportunity to use



Photo by Paul Giganti, Jr.

their senses of sight and touch while they use their minds to think. Using simple manipulatives can help children “see” what they might not understand if it was explained only with words. For example, here is how you might represent 3 fish crackers plus 4 fish crackers.



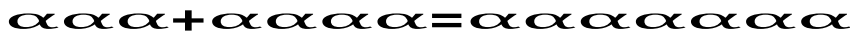
Children can count the “fish” together to find out how many.

Other things, such as blocks, shapes, and puzzles, can help children learn more advanced concepts, such as those in geometry. You may find that your children enjoy math more and learn faster if their hands AND minds are involved. Don’t hesitate; let them manipulate!

■ **DRAW PICTURES AND DIAGRAMS**

It’s true: “A picture is worth 1000 words.” Pictures and diagrams can help children understand many math ideas using a minimum of words. Many math concepts can be shown clearly and easily with simple pictures and diagrams. Be aware that pictures are more abstract than using real objects, but drawing pictures is still easier than using language for many young children. It helps them organize their thinking and allows them to explain their ideas with greater ease—and drawing pictures is fun, too!

Children don’t automatically draw pictures to learn math. It helps if you as the parent suggest using pictures as a way to understand a situation or, even better, draw pictures yourself while you solve math problems together. For example, once your young children have mastered counting a pile of real fish crackers, you can introduce the concept of addition by using pictures of fish crackers or drawing simple squiggles to represent the fish. This doodle drawing represents 3 fish plus 4 fish:



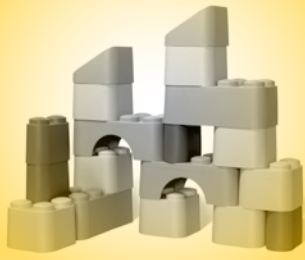
Your child can solve the problem by counting the “fish” in the drawing.

■ **ENCOURAGE YOUR CHILDREN TO USE ALL THEIR SENSES IN SOLVING PROBLEMS**

The more opportunities your children have to use all their senses when faced with new and unfamiliar math situations and problems, the easier it will be for them to learn math at a young age. All of our senses—but especially our eyes and hands—help us learn throughout our lives. After all, language is only ONE way we learn.



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# GETTING READY FOR KINDERGARTEN AND BEYOND

Kindergarten is an important time in children’s lives. A good start in kindergarten can make an important difference in success throughout the early grades and beyond. Parents know this and often ask, “How do I know if my child is ready for kindergarten?”

Kindergarten readiness in mathematics is not as simple as checking off a set of basic skills—success often comes from higher-level math practices rather than simple skills. A better way to predict if your children are ready for kindergarten is to know what they will be asked to do on a daily basis in kindergarten.

California, as well as most of the other states, has adopted a uniform set of standards for mathematics, kindergarten through high school. These standards, called the *Common Core Mathematics Standards\**, list specific skills by grade. They also list *Standards for Mathematical Practice* that broadly describe qualities children must have in order to do well in math.

## EARLY GRADES VERSION OF THE COMMON CORE STANDARDS FOR MATHEMATICAL PRACTICE

1. Students who do well in math 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 think they have solved a problem, they think about whether an answer makes sense. If other children did the problem in a different way, they listen to their solutions and try to understand them.
2. Students who do well in math use numbers in real and abstract ways. They are able to think about numbers and their relationships in imaginary and actual situations. They consider the size and meaning of numbers in different situations, and apply this “number sense” in solving problems. Good math students make sense of a problem and apply all the math they know to consider if their answer makes sense.
3. Students who do well in math use all the information they have, and all the math they know, to find answers. They make good guesses and apply logical thinking to explore and test their ideas. They can use objects such as counters, diagrams, drawings, and sound thinking to explain how they arrive at their answers. They ask good questions and listen carefully to the ideas of other students.



Photo by Paul Giganti, Jr.

4. Students who do well in math solve problems they encounter in preschool, at home, and in their daily life using mathematics. They use drawings, pictures, diagrams, blocks, counters, coins and, when possible, writing simple equations to make models of situations and problems they encounter.
5. Students who do well in math consider all the math tools available to them for every problem-solving situation, including objects, paper and pencil, number lines, models, shapes, measurement tools, and simple calculators. They carefully choose the best tools for the job and use those tools in the right way to solve the problem.
6. Students who do well in math try to be clear when they share mathematical ideas with others by using the best vocabulary, numbers, and math symbols they know. They try to make sure the math work they do is correct and, when they find an error, they redo their work to get the best possible answer for each problem.
7. Students who do well in math try to discover and observe patterns in mathematical situations. They use their understanding of the base 10 system and geometry to see how numbers and shapes work together, and how order and patterns can help them solve problems in math. Good students can see the big picture AND pay careful attention to the individual facts and numbers in problems.
8. Students who do well in math notice when things happen in math problems again and again, and are creative—or find shortcuts—in solving problems. Good students apply what they have learned in similar problems and continually check their progress as they work. They use their experience, knowledge, and observations to solve new problems more quickly.

When you read these new Standards, keep in mind that these personal qualities and abilities are not required of your children to enter kindergarten; they are goals for all learners to work on as they study mathematics in school from kindergarten through 12th grade.

Although the *Standards for Mathematical Practice* will ask a great deal of students, parents should remember that young children can begin to learn these qualities in their natural environment and through everyday interactions. To build a sound foundation of mathematical thinking, children need many hands-on math experiences and opportunities to learn by doing—without pressure. The most important things children need before entering kindergarten—apart from the required maturity—are that they be comfortable with solving problems and enjoy math!

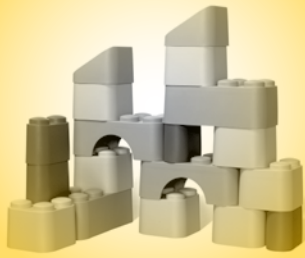
\*To read more about the *Common Core Mathematics Standards*, go to:

***[www.corestandards.org](http://www.corestandards.org)***

## MATH IS MORE THAN ARITHMETIC

When most adults think about mathematics, the first things that come to mind are addition, subtraction, multiplication, and division—what we call arithmetic. We think of these concepts first because they are the basic skills we adults use every day. So it seems natural to many parents to teach their children arithmetic as soon as possible. However, beginning basic math skills for very young children are very different. The world of mathematics for children who are 0–5 years old is all about shape, size, location, pattern, and how many. To young children, math is so much more than arithmetic!

You may be able to teach your young children how to add two numbers together the way you learned, but, if they are not ready to understand the math behind the procedures, pushing them too soon may hurt rather than help their overall early math learning. Focusing on arithmetic for young children is like building a house without a foundation. This booklet highlights the early mathematics your children should first experience to build a sound foundation in mathematics—before learning arithmetic.



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## RESOURCES TO HELP YOU AND YOUR YOUNG CHILD WITH MATH



Photo by Paul Giganti, Jr.

If you want more information about mathematics and young children, and how to support your child's math learning, you should find the following list of publications and Internet websites helpful.

### PUBLICATIONS

*Family Math for Young Children*, by Grace Dávila Coates and Jean Kerr Stenmark (Lawrence Hall of Science, University of California, Berkeley Press, 1997). Family Math is a program that brings teachers, students, and families together to do math and support young math students. This book, the third in the series, was developed for families with children from preschool through grade three. It is full of great hands-on activities you can do at home.

*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 [www2.ed.gov/parents/academic/help/math/index.html](http://www2.ed.gov/parents/academic/help/math/index.html). It suggests what parents can do with children from preschool age through grade 5 to strengthen math skills and build strong, positive attitudes toward math. Many other government education resources can also be found at this website.

*Math On Call* (Great Source Education Group, 2004). This booklet will come in handy when your children ask you questions about mathematics. It has short definitions, examples, and lessons on more than 300 math concepts in a very easy to read small book. This is a great reference to have as your children go from preschool to elementary school and beyond.

*Young Children and Mathematics* (Juanita Copley, 2009.) If you want to read more on the subject of mathematics learning and young children, this easy-to-read text provides indepth and practical information, as well as fun math activities for children ages 3–5.

*Children are Born Mathematicians* (Eugene Geist, 2008). This college textbook for early childhood mathematics is a comprehensive and chronological view of mathematics development in children, beginning at birth and going through the third grade.

## INTERNET SITES

The *Early Math Learning* website ([www.earlymathlearning.com](http://www.earlymathlearning.com)) includes free downloads of PDF files of this *Early Learning Math at Home* booklet as well as individual chapters. Additional articles and resources for families will be added regularly.

The *California Mathematics Council* maintains a For Families section at its website ([www.cmc-math.org/family/main.html](http://www.cmc-math.org/family/main.html)). Here you will find articles on mathematics education issues of interest to parents, hands-on activities to do at home, and information on how to host your own Family Math event at your preschool or education center.

The *Math Forum* ([www.mathforum.org](http://www.mathforum.org)) is a web portal to everything “mathematics.” Here you can ask Dr. Math questions and get answers! You will also find weekly and monthly math challenges, Internet math hunts, and math resources organized by grade level.

*Head Start—Early Childhood Learning and Knowledge Center* ([www.eclkc.ohs.acf.hhs.gov/hslc](http://www.eclkc.ohs.acf.hhs.gov/hslc)) is linked to the federal Head Start Program. Here you will find information about government programs for early learning, including resources that are available to families.

*Thinkfinity* ([www.thinkfinity.org](http://www.thinkfinity.org)) is a project of the Verizon Foundation. This website has more than 55,000 resources—including many that focus on math—that have been screened by educators to ensure that content is accurate, up-to-date, unbiased, and appropriate for students. The resources on this website are grouped by grade level and subject area.

*PBS Parents*, the early education website of the Public Broadcasting Service ([www.pbs.org/parents/education/math/activities](http://www.pbs.org/parents/education/math/activities)), offers numerous resources, including the stages of mathematics learning listed for babies through second grade children. It is also a rich source of math activities to do at home.

*Math at Play* ([www.mathatplay.org](http://www.mathatplay.org)) offers multimedia resources for anyone who works with children from birth to age five. Here you can explore early mathematical development and the important ways that caregivers nurture children’s understanding of math concepts through social-emotional relationships, language, everyday play experiences, materials, and teaching.

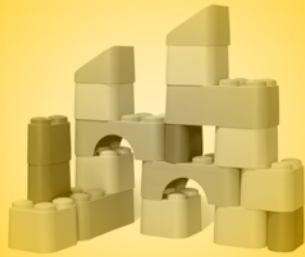
*Let’s Read Math* ([www.letsreadmath.com/math-and-childrens-literature/preschool/](http://www.letsreadmath.com/math-and-childrens-literature/preschool/)) wants to make parents and families aware of the growing body of children’s literature with themes related to mathematics. Here you will find a long annotated list of live links to preschool children’s books with math themes, listed by title, author, and mathematics topic.

## WHAT ABOUT TV, COMPUTERS, AND SMART PHONES?

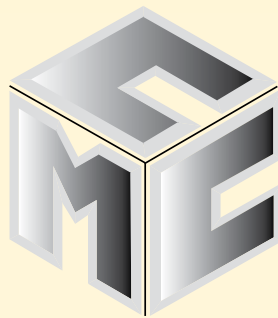
We live in a world of fantastic technologies, and our children’s future will involve their use of technology to do wonderful things. However, as wonderful as television, computers, smart phones, and tablets are, they are not a substitute for hands-on learning, unstructured play, physical activity, or direct parent/child interaction. For example, the activity of having a child “build” a structure out of imaginary blocks on a flat screen is NOT the same as when a parent and child build a tower with real wooden blocks.

Children should grow up using—and being comfortable with—all forms of technology, including those that can help them learn. But, for our youngest learners, time spent in front of a screen should never win out over time spent actively exploring their world. While children should do both, only parents can set limits and create a balance in the many ways that their children learn.

EARLY LEARNING **MATH** *at* HOME



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