

Mathematics in the Home

Your home is a great place for you to begin to explore and “talk” mathematics with your child. Incorporating math activities and language into familiar daily routines will show your child how math works in his everyday life and provide him with a safe environment in which to take risks by trying new things.

Some Important Things Your Child Needs to Know About Mathematics

You can help your child learn math by offering their insights into how to approach math. They will develop more confidence in their math ability if they understand the following points:

1. Problems Can Be Solved in Different Ways.

Although most math problems have only one answer, there may be many ways to get to that answer. Learning math is more than finding the correct answer; it's also a process of solving problems and applying what you've learned to new problems.

2. Wrong Answers Sometimes Can Be Useful.

Accuracy is always important in math. However, sometimes you can use a wrong answer to help your child figure out why they made a mistake. Analyzing wrong answers can help your child to understand the concepts underlying the problem and to learn to apply reasoning skills to arrive at the correct answer.

***Ask your child to **explain** how they solved a math problem. Their explanation might help you discover if they need help with number skills, such as addition, subtraction, multiplication and division, or with the concepts involved in solving the problem.

3. Take Risks!

Help your child to be a risk taker. Help them see the value of trying to

solve a problem, even if it's difficult. Give your child time to explore different approaches to solving a difficult problem. As they work, encourage them to talk about what they are thinking. This will help them to strengthen math skills and to become an independent thinker and problem solver.

4. Being Able to Do Mathematics in Your Head Is Important.

Mathematics isn't restricted to pencil and paper activities. Doing math "in your head" (mental math) is a valuable skill that comes in handy as we make quick calculations of costs in stores, restaurants or gas stations. Let your child know that by using mental math, their math skills will become stronger.

5. Its Sometimes OK to Use a Calculator to Solve Mathematics Problems.

It's OK to use calculators to solve math problems—sometimes. They are widely used today, and knowing how to use them correctly is important. The idea is for your child not to fall back on the excuse, "I don't need to know math—I've got a calculator." Let your child know that to use calculators correctly and most efficiently, they will need a strong grounding in math operations— otherwise, how will they know whether the answer they sees displayed is reasonable!

Rhyme and Sing Preschool

Young children love to hear, sing and say nursery rhymes and songs. Counting rhymes and songs can be both enjoyable for them and introduce them to basic mathematics concepts, such as number names and number sequence.

What You Need

- ★ Book of nursery rhymes or songs
- ★ Feather

What to Do

- ★ Teach your child the following counting rhyme:

Four Little Ducks

Four little ducks that I once knew,
Fat ducks, skinny ducks, they were, too.
But one little duck with a feather on her back,
She ruled the others with a quack! quack! quack!
Down to the river they all would go,
1, 2, 3, 4, all in a row.
But one little duck with a feather on her back,
She ruled the others with a quack! quack! quack!

—Say the rhyme with your child several times. When she can say the rhyme all the way through, have other family members join you. Give your child a feather and have her lead everyone around the room as you all sing.

- ★ For the following rhyme, show your child how to perform the actions indicated.

Five Little Speckled Frogs

Five little speckled frogs (*hold up five fingers*)
Sitting on a speckled log (*sit on your heels*)
Eating some most delicious bugs (*pretend to eat*)
Yum! Yum!
One jumped into the pool (*jump*)
Where it was nice and cool (*cross arms over chest and shiver*)
Now there are four little speckled frogs. (*Hold up four fingers*)
Burr-ump! (*Continue until no frogs are left.*)

—After saying the rhyme, ask your child to hold up the correct number of fingers to show how many frogs are in the rhyme at the beginning. Then have her hold up the correct number of fingers and count to five with you as you say each numeral.

★ Teach your child any counting rhymes and songs that were your personal favorites when you were a child, or have your child ask her grandparents what rhymes they knew when they were children. Other counting rhymes, songs and games that you may want to teach your child include “One, Two, Buckle My Shoe,” “This Old Man,” “Ten in a Bed (Roll Over)” and “One for the Money.”

Number Hunt Preschool

By counting, using number names and learning to recognize differences in number values, children build a foundation for the development of number sense and mathematical reasoning.

What You Need

- ★ 3 plastic eggs that come apart (or similar containers)
- ★ Buttons
- ★ Plastic netting

For titles of books that contain counting rhymes and songs, see the list of children’s books in the Resources section at the end of this booklet.

What to Do

- ★ In pieces of netting, loosely wrap different numbers of buttons and place one bag of buttons in each egg. With your child out of the room, hide the eggs.
- ★ Call your child into the room and tell him/her that you’ve hidden three eggs and that you want her to find them. As he/she finds each egg, have him/her count aloud—“1,” “2,” “3.”
- ★ When he’s/she’s found all the eggs, have him/her open each one and take out the bag of buttons (but not open it). Ask him/her to count how many buttons are in each bag.

Sort It Out Preschool–Kindergarten

Sorting and matching activities introduce young children to many mathematical operations, including classification and measurement.

What You Need

- ★ Pairs of socks of different sizes and colors
- ★ Laundry

What to Do

★ When you're sorting and folding clean laundry, have your child join you and do such things as the following:

- Hold up a pair of matching socks that belong to her and say, for example, "These socks go together because each sock is red and each one fits the same size foot—yours!"
- Pick up another sock and ask your child to look through the pile for the sock that matches it. When she chooses a sock, have her tell you how she knows that it's the right one.
- Continue holding up socks until your child has paired them all. If she mispairs any socks, gently correct her by asking her to tell the color of each sock and to put the socks together to see if they are the same size.
- After you've done this activity several times, let your child choose the socks for you to pair. (Occasionally choose a wrong sock to give her the chance to help you correct your mistake!)

A-Weigh We Go! Kindergarten–Grade 1

Observing, estimating, weighing and comparing are all essential mathematics skills.

What You Need

- ★ Bathroom or kitchen scales
- ★ Objects to weigh, such bags of sugar, flour, potatoes or onions; boxes of detergent and cookies; shoes of different sizes
- ★ Paper and pencil
- ★ A small plastic zipper bag filled with sugar and much larger zipper bag filled with cornflakes (or popped popcorn)
- ★ Suitcase (box)

What to Do

★ Show your child two objects, such as a five-pound bag of sugar and a 10 pound bag of potatoes, and ask him to guess which weighs the most. Show him how to use a scale to weigh the objects and see if his guess is right or wrong.

★ Next show him several objects and ask him to guess how much each weighs. Have him write his estimates, then weigh the objects to see if they're correct.

★ If you choose, have your child estimate his own weight, as well as that of other family members, and use the bathroom scale to check his guesses.

★ Extend the activity or make it more challenging by doing the following:

—Show your child the small plastic bag filled with sugar and the larger bag filled with cornflakes or popped popcorn. Ask your child which will weigh more, the smaller or the larger bag? Have him weigh the bags to check whether his guess is correct. Afterwards, point out that bigger does not always mean heavier.—Ask your child how he can weigh a suitcase that is too large to fit on the bathroom scale. Listen carefully to his answers—try some of his suggestions, if possible—and praise him for learning to think through problems. If he doesn't come up with a solution, show him that one way to find the weight of the suitcase is for him to stand on the scales while holding it and noting the total weight. Then put the suitcase aside and weigh himself again and note his weight. If he subtracts his weight from the total weight, the answer is the weight of the suitcase.

Penny, Nickel, Dime Kindergarten–Grade 1

Activities that involve money are a good way to develop mathematical reasoning and to reinforce what children are learning in school about numbers and arithmetic operations, such as addition and subtraction.

What You Need

★ Dice

★ Pennies, nickels, dimes

What to Do

This is a good game to play with the family.

★ Have each player roll the dice and say the number. Then give the player that number of pennies. Explain that each penny is worth one cent.

★ When a player gets five pennies, replace the pennies with a nickel.

Explain that five pennies have the same value as one nickel—that is, five cents. When she gets five more pennies, replace the pennies and the nickel with a dime. Help her to see that the value of five pennies plus the value of a nickel (five cents) equals 10 cents, which is the value of a dime.

★ The first player to reach a set amount—25 or 50 cents, for example—wins.

In the News (paper) Kindergarten–Grade 1

Newspapers are good resources for building number sense and arithmetic skills and using mathematical reasoning.

What You Need

- ★ Newspaper
- ★ Safety scissors
- ★ Pencil or crayon
- ★ Glue
- ★ Paper
- ★ Hole puncher
- ★ Yarn

What to Do

★ Give your child a newspaper and a set of numbers to look for—for example, from 1 to 25 (or 1 to 100 if she is familiar with the higher numbers). Have her cut out the numbers and glue them in numerical order onto a large piece of paper. Call her attention to any ways in which the numbers differ—for example, some will be in a bigger size of type than others, some will be in bold or italic type. Have her read the numbers to you, then put the paper aside. Have her practice counting up to that number then counting down from it. Also try having her count to the number by 2s or 5s.

★ Next, have your child make a counting book by using pictures she's cut from the newspaper. Have her write the page numbers at the bottom of each blank page and paste one item on page 1, two on page 2 and so forth. Explain that all of the things she puts on a page must be alike in some way—all animals, all basketball players, all cars and so on. Help her to write the name of the item on the appropriate page.

★ Have your child read the book to you. Afterwards, ask her questions such as the following:

—How many pictures did you cut out altogether ($1+2+\dots+10$)?

—How many total pictures are on pages 1-3? on pages 1-6?

—We know that $6 = 2 \times 3$. Are there twice as many pictures on page 6 as on page 3?

—Are there twice as many pictures from page 1 to 6 as from pages 1 to 3?

—Which are there more of: pictures on pages 2, 3, and 4, or pictures on pages 5 and 6?

Newspapers also can be used to help young children learn to recognize numbers in different sizes and kinds of type and to understand that the way a number looks does not change its value.

Fill It Up Grades 1–2

Filling empty containers provides opportunities to explore geometric concepts, such as “more or less” and volume, and to apply measurement skills.

What You Need

- ★ Measuring cup
- ★ Four large glasses of equal size and shape
- ★ Water

What to Do

- ★ On a table, put the glasses in a row and fill them with water as follows: $\frac{1}{3}$ cup, $\frac{1}{2}$ cup, $\frac{3}{4}$ cup, 1 cup. Ask your child questions that encourage her to compare, estimate and think about measurement. Ask, for example, “Which glass has more water? Which has less?”
- ★ Pour more water into one of the glasses to make it equal to the amount of water in another glass. Move the glasses around so that the glasses that have the same amount of water are not next to each other. Ask your child to find the glasses that have the same amount of water.
- ★ Help your child to do math in her head. Ask questions such as, “If I have four cups of water and I need seven, how many more do I need to pour?”

Tracking Time Grades 2–3

Introducing children to statistics and data analysis can begin by having them collect information, analyze it and describe or present their findings in an organized way.

What You Need

- ★ Stopwatch, watch or clock
- ★ Newspaper
- ★ Blank paper
- ★ Graph paper
- ★ Ruler
- ★ Small round object to trace to make a pie chart
- ★ Pencil and markers or crayons

What to Do

★ Show your child how to keep track of the time he spends on two activities, such as watching television and doing homework. Help him to make a chart with two columns, one labeled “Television” and one labeled “Homework.” Down the left side of the chart, write the days of the week. Tell him that you want him to write the number of minutes he spends doing each activity on each day. At the end of the week, sit down with him and talk about what the table shows. Help your child to make a chart to use as he watches television. Give him a stopwatch (or an easy-to-read clock or watch) and tell him to record how much time of each television show is used for commercials and how much time is used for the actual show. Have him keep the record for one night of viewing. On the graph paper, help him to make a bar graph that shows the different amounts of time devoted to the show and to commercials. Or, show him how to make a pie chart.

★ Together with your child, keep track of how he spends time in one 24-hour period: time spent sleeping, eating, playing, reading and going to school. Help him to measure a strip of paper 24 inches long, with each inch representing one hour. Using a different color for each activity, have him color the number of hours he spends in each activity. You and other family members can make similar charts; then your child can compare the charts and see how everyone in the family spends time.

A good way to show children how statistics are used in the “real world” is to call their attention to statistical charts in newspapers and magazines and talk with them about what the charts show and why this information is important.

Fraction Action Grades 2–3

In introducing children to the concept of *fractions*—numbers that aren’t whole numbers (such as $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$)—it’s often a good idea to use objects that they can see and touch.

What You Need

- ★ Large clear container (holding at least 2 cups)
- ★ Masking tape
- ★ Marker
- ★ Measuring cups ($\frac{1}{2}$, $\frac{1}{3}$ or $\frac{1}{4}$ cup measure)
- ★ Unpopped popcorn

What to Do

★ Invite your child to help you make popcorn for the family. Begin by having her put a piece of masking tape from top to bottom on one side of the large container.

★ For younger children, use a $\frac{1}{2}$ cup measure. For older children, use a $\frac{1}{3}$ or $\frac{1}{4}$ cup measure. Choose the unit of measure and fill the measuring cup with popcorn. Give the cup to your child and ask her questions such as the following:

—How many whole cups do you think the container will hold?

—How many $\frac{1}{2}$ cups (or $\frac{1}{3}$ cups or $\frac{1}{4}$ cups) do you think it will hold?

★ Let your child pour the measured popcorn into the clear container. Have her continue to pour the same amount into the container until it is full. As she pours each equal amount, have her mark the level on the container by drawing a line on the tape. Then have her write the fraction, corresponding to the unit of measure on the line. After the container is full, have your child count up the total number of cup increments ($\frac{1}{2}$, $\frac{1}{3}$ or $\frac{1}{4}$) and compare it to her estimate from above.

★ As you measure out the popcorn to pop, ask your child to answer questions such as the following:

—How many $\frac{1}{2}$ cups equal a cup? Two cups?

—How many $\frac{1}{4}$ cups equal $\frac{1}{2}$ cup? A whole cup?

★ Pop the corn and enjoy!

Children may reasonably want to say, for example, that $\frac{1}{4}$ cup plus $\frac{1}{4}$ cup makes $\frac{2}{4}$ cups. Letting them work with measuring cups or other measuring devices can let them see that $\frac{2}{4}$ is the same as $\frac{1}{2}$.

Simply Symmetrical Grades 3–5

A shape is symmetrical if it can be cut along a straight line into two halves that are mirror images of each other. Learning about symmetry gives children a good sense of geometric principles and calls on their mathematical reasoning abilities.

What You Need

★ Shapes such as a circle, a square and a rectangle, cut from heavy paper

★ Sheets of paper (rectangular)

★ Pencil, marker or crayon

★ Magazine pictures of symmetrical objects

★ Safety scissors

★ Glue

What to Do

★ As your child watches, show her the square that you've made. Fold it in half and show her that the two parts are exactly alike—or *symmetrical*. Do the same with the circle and the rectangle. Then give the shapes to your child and ask her to make the folds herself. Extend the activity by having her do the following:

—Find as many ways as she can to fold half of the square onto the other half. (*There are four ways: two diagonals and two lines “down the middle”*).

—Do the same for the rectangle. (*There are only two ways: down the middle of the long side, then down the middle of the short side. In going from a square to a rectangle, the diagonals are lost as lines of symmetry.*)

—Do the same with the circle. (*Circles can fold along any diameter. Use this discovery to introduce your child to the word “diameter”—the length of a straight line that passes through the center of a circle.*)

—Ask her to find the center of a circle by folding it in half twice. (*She'll discover that any diameter—line of folding in half—passes through the center of the circle, an activity that will prepare her for understanding more complicated geometry later on.*)

★ Show your child a rectangular piece of paper. Ask her, “What shape will you get if you hold this piece of paper in half?” Have her fold the paper, then ask, “Did you get a square or another rectangle?” Using scissors to cut the paper, show her that a rectangle will fold to a square only if it is twice as long as it is wide.

★ Fold a sheet of paper in half lengthwise. Have your child draw half of a circle, heart or butterfly from top to bottom along the fold on each side of the paper. Have her cut out the shapes that were drawn. Unfold the paper to see the symmetrical figure.

★ Cut out a magazine picture of something that is symmetrical (try, for example, a basketball or a computer screen). Cut it down the center (the line of symmetry). Glue one half of the picture on the paper. Ask your child to draw the missing half.

★ With your child, explore your house for symmetrical designs— things that have equal sides. Ask your child how many she can find. Tell her to look at wallpaper, floor tiles, pictures, bedspreads and appliances.

★ Have your child print the alphabet. Then ask her to find a letter that has only one line of symmetry—only one way to be divided in half. (*B has one.*) Ask her to find a letter that has two lines of symmetry— two ways to be divided in half. (*H has two.*) Ask which letters look the same when they're turned upside down? (*H, I, N, O, S, X and Z.*)

Check It Out Grades 3–4

The checkout lane of a grocery store can be a good place for children to practice using mental math by estimating the cost of groceries and figuring out change.

What to Do

★ As you wait in a grocery checkout lane, use the time to have your +child estimate what the total cost of your groceries will be. Tell him that one easy way to estimate a total is to

round off numbers. That is, if an item cost 98 cents, round it off to \$1. Explain that the answer he gets won't be the exact cost, but it will be *about* that. Tell him that the word *about* shows that the amount you say is just an estimate.

★ Using the estimated total, ask your child: "If the groceries cost \$16 and I have a \$20 bill, how much change should the checker give back to me? If the cost is \$17.25, what coins is she likely to give me?"

★ At the checkout counter, ask your child to watch as the items are rung up. What's the actual total cost of the groceries? How does this amount compare to the estimate? When you pay for the items, will you get change back from your \$20 bill, or will you have to give the checker more money?

★ If you receive change, have your child count it to make sure the amount is correct.

Grocery shopping can be a good place to show children a practical use for calculators—for example, as a way to keep a running total of what the groceries cost.

Put It Away Grades 1–5

Putting away groceries helps children develop classifying and mathematical reasoning skills and the ability to analyze data.

What You Need

★ Groceries

What to Do

★ Make a game out of putting away groceries. As you empty the bags, group the items according to some common feature. You might, for example, put together all the items that go in the refrigerator or all the items in cans.

★ Tell your child that you're going to play "Guess My Rule." Explain that in this game, you sort the items and she has to guess what rule you used for grouping the items.

★ After your child catches on to the game, reverse roles and ask her to use another "rule" to group these same items. She might, for example, group the refrigerator items into those that are in glass bottles or jars and those in other kinds of packaging. She might group the cans into those with vegetables, those with fruit and those with soup. When she's regrouped the items, guess what rule she used.

Children can often make up very creative rules for classifying things. Don't be surprised if you have trouble guessing your child's rule!

Children develop positive attitudes toward math when they see that their parents and families value it. Find ways to show that you enjoy math. Let your child see you using math not only for routine activities, such as paying bills and following recipes, but also for fun, by playing number games and solving math puzzles.

Helping children practice number recognition can take many forms. such as the following:

Encourage them to listen for common expressions that include numbers and numberwords, such as: “Two’s company, three’s a crowd”; “Two can play that game”; or “Three strikes and you’re out.”

Ease on Down the Road Grades 3–5

An important mathematical concept for children to learn is the relationship between two quantities such as *miles per hour* or *cost per gallon*.

What You Need

- ★ Maps
- ★ Marker
- ★ Paper and pencil or pen

What to Do

On car trips with your child—short or long—take advantage of the following opportunities that allow him to apply his math skills:

- ★ Before leaving on a trip, give him a map and tell him that you want him to be your “navigator” as you drive. Help him to mark the route that you will take. Then show him how to use distance numbers on the map to estimate the distances between different locations. Check the odometer before you begin the trip and have him write down the mileage.
- ★ As you’re driving, ask him to check the route marked on the map and let you know in advance when you’ll need to turn onto another road—the name and about how far away it is. Point out road signs along the way that tell how many miles to a junction or town or city. Let him point out some for you.
- ★ On the highway, ask your child to read road signs and look for signs

Involving children in planning trips and in giving them important jobs on the trip, such as following the correct route, can increase their self-confidence as well as their math skills. However, if they make mistakes, such as giving the wrong direction for a turn, they need to be reassured that mistakes are part of learning. Help them to understand that went wrong and how to get back on track.

What Are My Chances? Grades 2–5

Playing games that involve chance is one way to introduce children to the meaning of probability.

What You Need

- ★ Two coins
- ★ Paper and pencil

What to Do

Play these coin games with your child:

★ Flip one coin. Every time it comes up heads, your child gets 1 point. Every time it comes up tails, you get 1 point. Flip it 50 times. Tally by 5s to make it easier to keep track of scores. The player with the most points wins. If one player has 10 points more than the other person does, he scores an extra 10 points. Ask your child to notice how often this happens. (*Not very often!*)

★ Flip two coins. If the coins come up two tails or two heads, your child scores 1 point. If it comes up heads and tails, you get 1 point. After 50 flips, see who has more points. Ask your child if he thinks this game is fair. What would happen if one player received 2 points for every double heads and the other player received 1 point for everything else. Would that be fair?

★ Flip one coin. Then flip the other. If the second coin matches the first coin, your child scores 1 point. If the second coin doesn't match the first coin, you receive 1 point. Try this 50 times. Is the result the same as in the previous game?

Call attention to the role that probability plays in everyday life by pointing out how it is used in TV weather forecasts or sports stories.

Card Smarts Variations for All Grades

Games with number cards can help children develop strategies for using numbers in different combinations by adding, subtracting, multiplying and dividing.

What You Need

- ★ Sets of number cards, 1-10 (you can make your own using heavy paper or index cards)
- ★ Pencil and paper
- ★ Coin

What to Do

Here are some games that you and your child can play with number cards:

★ **Number Sandwich** With your younger child, review the numbers 1 through 10. Make sure that he knows the correct order of the numbers. Sit with him and shuffle and place two sets of number cards in a pile between you. Have him draw two cards from the pile and arrange them in order in front of him, for example 3 and 6, leaving a space between. Then have him draw a third card. Ask him where the card should be placed to be in the right order—in the middle? before the 3? after the 6? ★ **More or less?** Sit with your younger child and place a shuffled set of number cards between you. Flip the coin and have your child call “heads” or “tails” to see if the winner of each round will be the person with a greater value card (heads) or a smaller value card (tails). Then each of you will draw a card. Compare the cards to see

who wins that round. Continue through all the cards. When your child is comfortable with this game, change it just a bit. Divide the cards evenly between the two of you. Each of you places the cards face down and turns over one card at the same time. Have your child compare the cards to see if his card is more or less than yours. If his card is more than yours, ask him how much more. If it is less, ask how much less. The player with the greater or smaller value card (depending on whether heads or tails was tossed) takes both cards. The winner of the game is the player with more cards when the cards have all been used.

★ **Make a number**

This game is for your older child and can be played with family and friends. Give each player a piece of paper and a pencil. Deal each player four number cards with the numbers showing. Explain that, using all four cards and a choice of any combination of addition, subtraction, multiplication and division, the player must make as many different numbers as possible in two minutes. The player gets one point for each answer.

Calculated Answers Variations for All Grades

Learning to use the special functions of calculators can expand children's knowledge of many arithmetic operations, help them to recognize number patterns and increase their ability to reason mathematically.

What You Need

★ Calculator with counting function

What to Do

★ Give your child a calculator that is appropriate for his age (one with large, easy-to-read keys is especially helpful). Show him how he can make the calculator "count" in sequence for him. (For most calculators, this is done by pushing a number button, then the + sign, then the button for the number to be added, then the = sign: for example: $1 + 1 =$. To make the calculator count in sequence by adding 1, keep pushing the = button: $1 + 1 = 2 \dots 3 \dots 4 \dots 5$ and so on). Give the calculator to your child and have him try this, starting with $1 + 1$.

★ When your child is comfortable with this function, have him explore number patterns such as $2 + 2 =$, $5 + 5 =$, $50 + 50 =$, and so forth. ★ Next, show your child that he can use the same procedure to subtract—by substituting the – sign for the + sign: $50 - 1 =$, or $100 - 5 =$. Encourage him to explore other patterns.

★ Let your older child learn about negative numbers by seeing what the calculator shows when they count down from 0 (for example, $0 - 2 = -2$).