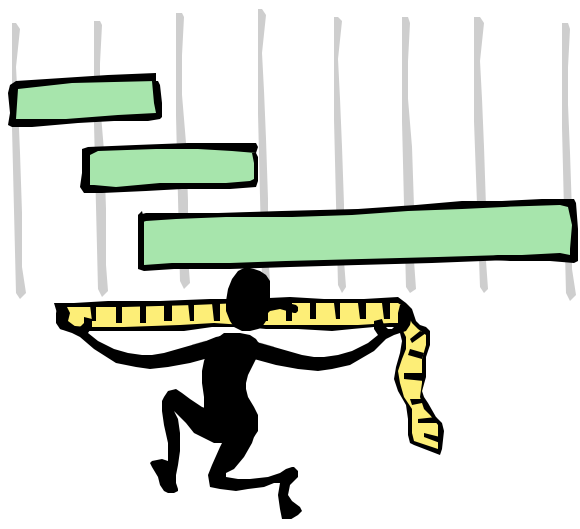
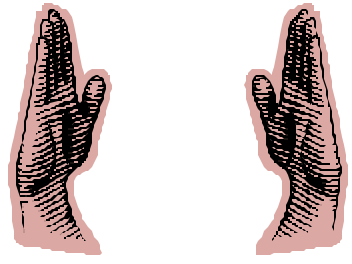


SECTION III:

Math Activities

50+100=150
100+100=200
150+100=250
200+100=300
250+100=350
300+100=400
350+100=450
400+100=500
450+100=550
500+100=600
550+100=650
600+100=700
650+100=750
700+100=800
750+100=850
800+100=900
850+100=950
900+100=1000



Math Power and Probing Questions

Selected activities from *Math Power at Home*, *Math Power in the Community*, and *Math Power in School*, edited by Gerald Kulm, and *Girl Scouts' Science and Mathematics Leaders' Guide*, by Marsha Lakes Matyas, June B. Combs, and Emily Ehrenfeld. Washington, DC: American Association for the Advancement of Science, 1990 and 1991.

The Leader's Role

The first thing to remember is that you do not have to be a licensed teacher or a mathematician to help someone learn and enjoy mathematics. The activities are designed so that you can use them in various ways. Depending on your own personality and style of working, you can be:

- A **leader** showing children how to do their best.
- A **partner** working together, sharing ideas and discoveries.
- A **coach** encouraging and demonstrating whenever necessary.
- A **friend** being supportive and accepting.
- A **parent** aware and caring about needs and progress.
- A **model** being interested and excited about learning mathematics.

Most of all, be yourself and a role model who enjoys getting involved and doing some work and learning. Be willing to explore and make mistakes. Your attitude and energy are much more important than what you know about mathematics. In the words of Jaime Escalante, “you’ve got to have *ganas* (desire).”

About Mathematics

It is important that children develop the mathematical skills and concepts they need for algebra, geometry, calculus, and other high school courses. But unless they learn to enjoy mathematical thinking and see the usefulness of mathematics, many children are unlikely to reach their potential.

Children often think of mathematics as being only about numbers. They see it as abstract and difficult with no useful applications. The activities are designed to emphasize mathematics that involves:

- **Estimating:** finding an answer that is “close enough.” Most real problems involve finding more than just one exact answer.
- **Finding information:** looking at a situation and figuring out what to do and what strategy to use is more important than just “crunching numbers.”
- **Planning:** knowing what to do first and what steps to follow is the way real math problems are solved.
- **Visualizing:** being able to picture a situation or problem and represent it in a drawing or diagram.
- **Organizing:** putting information in order, using tables, graphs, and lists to see patterns and make sense of what is known and what is to be found.

About Learning Mathematics

All too often, the mathematics that children learn in school is mostly rules and memorization. There is no question that learning and understanding anything completely, including mathematics, involves hard work and effort. But hard work can also bring the enjoyment of discovery and the satisfaction of solving a problem.

The activities are intended to show that learning mathematics can be enjoyable. Learning mathematics this way can involve:

- **Cooperation:** working together to solve a problem, not competing to see who can finish first.
- **Enjoyment:** experiencing success in solving a problem or learning a new idea.
- **Hands-on activity:** measuring, drawing, building things.
- **Real-life applications:** using mathematics to explore ideas and solve problems that occur in everyday life.
- **Seeing patterns:** exploring the design, size, and shape of objects and ideas.
- **Problem solving:** using common sense, trial and error, and reasoning to find answers to questions.

The intent of the activities is to help children gain experiences that will motivate and encourage further interest in and study of mathematics; not to remediate or compensate for skills taught in school.

Preparation

Working with children and doing activities requires planning and preparation. **Having everything ready ahead of time and being organized** can make learning mathematics and enjoyable experience.

- **Try the activity yourself first.** This will help you think of ways to improve or adapt the activity to your students. It will also help identify any trouble spots or need for extra planning.
- **Get supplies ahead of time.** Make sure that you have plenty of everything. Have extras on hand in case of mistakes or if you want to try something again.

Doing activities

The activities are designed to let students do things with a minimum of explanation and demonstration. Remember, your role is to be a coach and partner. If there is a trouble spot, encourage the youngster to try things out before stepping in to help. When you do help, try to provide hints and ask questions that lead in the right direction, rather than just giving the answer.

- **Use objects and materials.** Most of these are suggested in the activities, but feel free to adapt and use more suitable or more available materials. Experiment with the materials and do the hands-on work, too.
- **Focus on relationships, why things work, and on ideas.** Let the youngster explain what he or she is doing. Encourage questioning and figuring out why things happen; try not to accept an answer without understanding how he or she got it.
- **Take your time.** It is best to spend enough time so that the youngster understands and enjoys an activity. Rushing to cover more material can be frustrating. Try not to push too far too fast. It is better to stop while you are both enjoying yourselves, saving some anticipation for the next time.
- **Avoid long, complicated, paper-and-pencil calculations.** Have a calculator handy. In most cases, the actual calculation is not as important as how and why to combine the numbers. If the student understands why things work, he or she can push the right buttons on the calculator.
- **Avoid speed contests and competition.** Children can sometimes be motivated by competition, but the activities are designed to emphasize reflective thought and problem solving.

Asking questions

Some of the best teachers provide very little direct information to children. Instead, they ask questions and help children to discover for themselves. Try to practice asking questions that require more than just a “yes” or “no” answer. When you ask a question, **wait for an answer**; do not answer it yourself right away. Here are the kinds of questions you should try to ask:

- How did you figure that out?
- Why does it work that way?
- How you do you know?
- Is there another way to do it?
- What do you like about doing this?

Adapt and Personalize

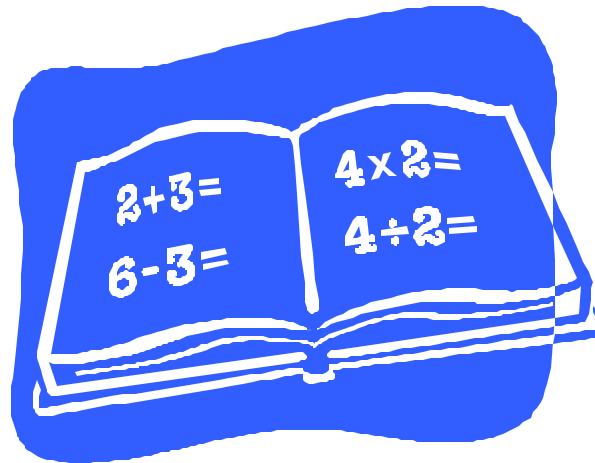
Any book or written activity is a starting point and a source of ideas. Every situation is different, and only you know the kinds of activities and experiences that are likely to work best with your children.

Some of this knowledge comes through experience. You will make mistakes the first few tries. Use these mistakes to learn how to adapt and change the activities so they will be better the next time.

Sometimes you will be surprised. An activity that seems to be a sure winner will fall flat. Other times, children will do great with an activity that you think might be boring to them. The only way to find out is to try.

Once you try an activity, you will think of a lot of different approaches, ideas, and materials that you could use the next time. That is what makes working with children and learning with them so enjoyable.

Reprinted from *Math Power in the Community*, edited by Gerald Kulm. Washington, DC: American Association for the Advancement of Science, 1990. (Re-edited)



Some Important Things Your Child Needs to Know About Mathematics

Excerpts from

U.S. Department of Education
Office of Intergovernmental and Interagency Affairs
Helping Your Child Learn Science
Washington, D.C., 20202

You can help your child learn math by offering her (or him) insights into how to approach math. She will develop more confidence in her math ability if she understands 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 she 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 she solved a math problem. Her explanation might help you discover if she needs 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 him 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 he works, encourage him to talk about what he is thinking. This will help him 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, her math skills will become stronger.

5. **It's 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, she will need a strong grounding in math operations—otherwise, how will she know whether the answer she sees displayed is reasonable!

SEE Math Activities

In the TechLinks for CTCs: Science, Math, Health & Literacy Activities for
Community Technology Centers

Edited by Yolanda S. George, Nathan E. Bell, and Gaynelle Bowden.


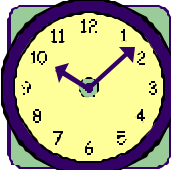
Other activities by Sue P. White from various sources.

Activities

- I. Estimation Challenge
- II. What's Your Wingspan?
- III. Tangrams
- IV. Handshake Problem
- V. The Newspaper Fold
- VI. The Allowance Challenge
- VII. Less is Better
- VIII. Counter Game



Estimation Challenge

<p>The Basics</p>  <p>Grade Level: 2-12</p>  <p>Estimated Time: 25 minutes</p>	<p>The Toolbox</p> <ul style="list-style-type: none"> • 1-2 large boxes of Cheerios • 32-oz. or 48-oz. clear container with lid • 3-oz. or 7-oz. cups, 1/student • paper plates, 1 for every 2-4 students • pencil and paper 	<p>Education Standards</p> <p>Connections Math Standard:</p> <p>Learning to estimate by making connections among various concepts and learning how to apply mathematics in contexts outside of math</p>	<p>Safety Concerns</p> <p>Remind the student not to eat the Cheerios you use in this activity. You may want to provide a separate cup of Cheerios for eating.</p>	<p>For Kids with Disabilities</p> <p>Visually-impaired students can do this activity by feeling the Cheerios container.</p> <p>Mobility-impaired students may use a larger container and larger objects.</p>
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Educational Objective:

To learn how to use estimation to solve everyday problems.

What to Do:

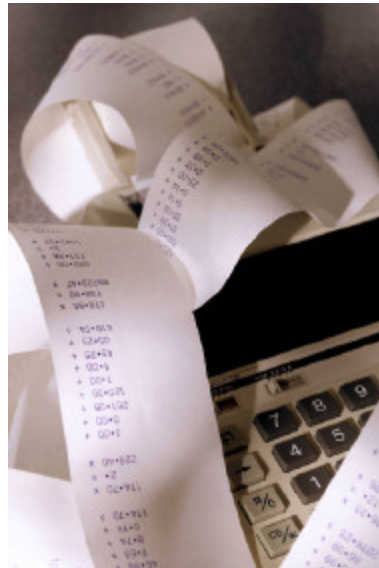
- Prepare the container with Cheerios by counting them out one at a time. Write the number on a small piece of paper and tape it to the inside of the lid. If you are using a 32-oz. container, you should use 3-oz. cups. 7- or 9-oz. cups work best with 48- or 64-oz. containers. Try to get cups whose capacity does not divide evenly into the capacity of the container.
- During the activity, give the students paper plates, a quantity of cereal more than the capacity of the cup, and paper and pencil.
- You may save the materials for future use.

Questions to Ask Students as They Do This Activity:

- About how many Cheerios do you think the container holds?
- If you know the volume of the container and the volume of the cup, how can you figure out how many Cheerios are in the container?
- How many times will the volume of the cup fit into that of the container?
- About how many Cheerios do you think the cup will hold?

Why It Happens:

In order to figure out how many Cheerios are in the container, you need to divide the volume of the container by the volume of the cup. Then, multiply the answer by the number of Cheerios that will fit in the cup. If the cup does not divide evenly into the container, you need to “round off” and take that into account when you come up with your final answer. Remember, this is estimating. Depending on the size of the container and the age of the students, reasonable answers will vary. There will be many reasonable answers, and therefore, “winners” of the prizes.



WEB SITES

- **At Arm's Length**
http://www.pbs.org/wgbh/nova/teachers/activities/2313_threemon_02.html
(Grades 6-12)
- **How Many Pearls?**
<http://www.pbs.org/wgbh/nova/pearl/uncountable.html> (Grades 3-12)

SOFTWARE

- **Carmen Sandiego Math Detective**
The Learning Company, 1998.
(Grades 3-9)
- **Math Blaster 6-9**
Knowledge Adventure, Inc., 1996
(Grades 1-4)

READING ROOM

- Kenda, Margaret, and Phyllis Williams. **Math Wizardry for Kids.** Barron's, 1995. (Grades 3-8)
- Murphy, Stuart. **Betcha!** HarperTrophy, 1997. (Grades 1-4)
- Smoothey, Marion. **Estimating.** Marshall Cavendish, 1995. (Grades 3-8)

Career Connections

It is important for people to know the value of their property so that they can get the right amount of insurance, or ask for the right amount of money if they want to sell it. An appraiser is a person who uses what they know to estimate the value of property.



ESTIMATION CHALLENGE ACTIVITY SHEET


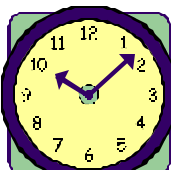
You Will Need:

- A cup
- Cheerios
- Paper plates
- Scrap paper and a pencil

1. Your teacher will show you a large container of Cheerios. Using the materials you are given, how can you estimate the number of Cheerios in the large container you were shown? Write down what you did.
2. Discuss your answer with the other students in your group. Can you think of a way to make your estimate more accurate?
3. We all make estimates every day. Each time you estimate you have to have some information as a reference before you can make a good estimate. What kind of information would you use in making the following estimates:
 - a. You're going through a buffet line at a birthday party. How do you decide how much of each food to put on your plate?
 - b. The bus will pick you up at 7:45 a.m. to take you to school. How do you decide what time to set your alarm so you can make it to school on time?
 - c. Your family of four is expecting three relatives to visit for a special dinner. How do you estimate how much food to buy for the special dinner? How would the ages of the children in your family and your visitors affect your estimates?
 - d. You're going on a field trip to a science museum in a nearby city. If you plan to take public transportation, buy your lunch, and buy a souvenir, how much money should you take with you? What if you are taking a car pool? Can you determine the distance and the car's approximate gas mileage to figure out how much money each person in the car should contribute for gas?



What's Your Wingspan

<p>The Basics</p>  <p>Grade Level: 1-12</p>  <p>Estimated Time: 45 minutes</p>	<p>The Toolbox</p> <ul style="list-style-type: none"> • Tape measure • Paper and pencil • Large chalkboard or dry-erase board and chalk or markers 	<p>Education Standards</p> <p>Data Analysis and Probability Math Standard:</p> <p>Learning to formulate questions that can be answered by collecting, organizing, and displaying data in graphs and charts</p>	<p>Safety Concerns</p> <p>Students should not loop the tape measure around their necks. If students remove their shoes, be sure they don't step on sharp objects or slip on a wet floor.</p>	<p>For Kids with Disabilities</p> <p>Visually-impaired students may need a Braille measuring tape.</p> <p>Mobility-impaired students may need to measure shorter portions of their body and add them together.</p>
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Educational Objective:

To learn measuring skills and problem-solving and to learn how to gather and analyze data

What to Do:

- Gather the materials
- Duplicate the activity sheet

Questions to Ask Students as They Do This Activity:

- How can you solve the problem of measuring someone who is taller or wider than the tape?
- After the students have finished measuring each other, have them share their results while one of the students records the data on a large surface. Ask them if they see any patterns in the information they have gathered.
- What conclusions, if any, can be drawn from the data collected?

- Can you make generalizations based on a small amount of data?

Why It Happens:

No matter what their age, most people have a wingspan that is the same length or almost the same length (within 2 inches) as their height. There are, however, some people whose wingspan are 3-5 inches (or even more) longer than their height.

There are many different ways of looking at the data, and each will give you slightly different information about it. If you have a large enough group-roughly 10 or more-to analyze, you will usually find that the greatest number of participant have wingspans equal to their heights. The category into which most people fall is called the **mode**. Measurements that differ by one or two inches are also very common. In fact, if you count together in one category all the people whose wingspan differ from their height by zero, one, and two inches, you will probably account for most of the people in your sample.

Another way to look at the results is to make a line with “0” as the midpoint and hash marks for +1, 2, 3....8 to the right and -1, 2, 3...8 to the left and make a mark for each person at the appropriate difference: wingspan-height. You would probably find that about half of the people in the sample would be to the left of “0” and half would be to the right. (See Activity Sheet, Part C.) This is called finding the **median**. Depending on your particular sample, the median may well be some number other than “0” such as +1 or -2.

If you added all the plus and minus entries together (adding algebraically so the pluses and minuses cancel out) and divided them by the total entries, you would get the mean. The mean is usually what we think of as the **average**.

Calculating: In finding the mean in Part C, students will be calculating with negative and positive numbers. They may need to be reminded that they should think of numbers on a continuous line with 0 in the middle

-5 -4 -3 -2 -1 0 +1 +2 +3 +4

When adding a positive and negative number, the answer will be between the value of the two numbers they are adding on the number line. For example:

$$\begin{array}{r} +4 \\ + \underline{-3} \\ +1 \end{array}$$

When two positive numbers are added together they make a greater positive number, and when two negative numbers are added together they make a greater negative number. For example:

$$\begin{array}{r} +3 \\ + \underline{+5} \\ +8 \end{array} \qquad \begin{array}{r} -3 \\ + \underline{-5} \\ -8 \end{array}$$

One way to add a long list of positive and negative numbers is to first add all the positive numbers together, and all the negative numbers together, then add the positive and negative totals together.

When dividing a positive number, such as the number of people in the data sample, into a negative number such as might result by adding up the data, the answer (quotient) will always be negative. Of course if the total for the data is positive, the division answer will be positive.

WEB SITES

- **Cool to Rule**
<http://ericir.syr.edu/Virtual/Lessons/Mathematics/Measurement/MEA0015.html>
 (Grades 5-6)
- **The Tides of Change**
http://score.kings.k12.ca.us/lessons/Tides_of_Change_Lessons.html (Grades 7-12)

SOFTWARE

- **Math Alive**
 BonusPoint, Inc., 1998
 (Grades 6-12)
- **Leapfrog Math: Intermediate 1-4**
 Meridian Creative Group
 (Grades 3-6)

READING ROOM

- D'Amico, Joan and Karen E. Drummond. **The Math Chef: Over 60 Math Activities and Recipes for Kids.** Wiley, 1997. (Grades 3-8)
- Friedhoffer, Bob. **Magic Science: Math, Measurement, the Mind.** Educational Design, 1996. (Gr. 3-6)
- Pluckrose, Henry. **Size.** Children's Press, 1995. (Grades K-2)

Career Connections

A person who analyzes data or numerical facts is called a statistician.