

A G I R L S C O U T I N I T I A T I V E

**I T ' S H E R F U T U R E**

**Encourage a Girl in Math, Science and Technology**

**girls go tech**

[www.girlsgotech.org](http://www.girlsgotech.org)

 **Girl Scouts.**



To the Important Adults in Girls' Lives,

*"I was never good at math or science."*

Have you ever used this phrase? If so, take a moment to think about the message you're sending to a girl who looks up to you.

Studies show that young girls enjoy math, science and technology just as much as boys do. Yet by eighth grade, twice as many boys as girls show interest in science, engineering and mathematics careers. As a result, only 22 percent of engineers and scientists are women – even though women make up nearly half the workforce. If this pattern continues, many of today's girls will miss out on the jobs of the future.

Adults like you hold the keys to change. How well a girl learns is often directly tied to a caring adult's involvement in her education. You can encourage a girl to see math, science and technology all around her. You can make it fun for her to explore these worlds. You can help her to find her own answers.

Girl Scouting has encouraged girls to explore the world around them through science, math and technology for over 90 years. Today, Girl Scouts of the USA and the Ad Council have partnered to help you. Using this booklet as a starting point, you can show a girl that she need never stop excelling in math, science and technology. This message is a lifelong lesson and a wonderful gift.

Thank you!

Jackie Barnes

Interim CEO

Girl Scouts of the USA

Peggy Conlon

President and CEO

The Advertising Council

## The Scientific Process

The scientific process is really just:

- Asking a question
- Making a guess
- Gathering information (to see if your guess is right)
- Interpreting that information
- Coming up with new questions

## Did You Know?

Women have been mathematicians since the 4th century? Hypatia, an Egyptian, was the first woman mathematician that we know about. She lived from 370-415 AD.

## HOW TO USE THIS BOOKLET

### Relax!

Not a scientist? That's OK! When you and the girl in your life learn together, she'll feel less like she's in school and more like she's on an adventure. What IS important is that you help her ask the questions that will lead her to the answers for herself.

### *Here are three things to keep in mind when working with a girl:*

- Let her take the lead in handling materials, giving directions and exploring.
- Work as a team – don't set out to compete.
- Give her time to think and explore. Silence often means that thinking is going on.



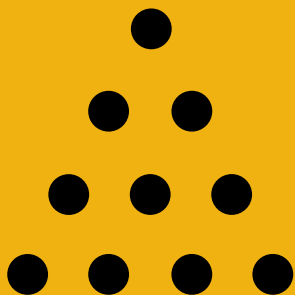
**READY TO GET STARTED?** The pages that follow offer a range of activities to help you encourage a girl in math, in different areas of science, and in technology. Activities are designed to appeal to a broad age range. Choose what's most appropriate for you and the girl in your life.

## MATH

How do you encourage a girl in math when your own memories of math class may be less than ideal? Get her excited about all that math can be.

Many people think of math as adding, subtracting, multiplying and dividing. That's ONE type of mathematics – arithmetic. But math is so much more than that. It's the algebra that NASA uses to plot a rocket's path to Mars. It's the trigonometry surveyors use to locate a new road. It's the mathematical models that astronomers use to figure out the origins of the universe.

And it's all around you. Here are some activities you and your girl can do together to see how math is part of your daily life.



## Checker Challenge

Place ten checkers in the arrangement of a triangle on the dots. Rearrange any 3 of the dots so that the triangle formed points down instead of up.

Girlfacts "Math Mania" Girl Scouts of the USA.

Look for the solution on Page 10

## Math Hunt

How many daily examples of math can you think of? There are checkbooks to balance, measurements to use for recipes, tips to calculate and grocery charges to add. Set a timer for three minutes and see how many daily math-related activities the two of you can come up with together.

## Shape Up

Look for geometry all around you. Find different shapes around the home, at school, on the playground or in another area. Check floors, walls, doors, windows, leaves, flowers or other items. The shapes can be as simple as circles or triangles, or they can be more complex. They can even be three-dimensional, like cylinders, cubes or spheres. Find out the names of shapes you don't already know.

# EARTH SCIENCES

## GEOLOGY

What makes planet Earth, Earth? That's the question asked by geology. Here are some fun ways to learn about soil, sand and rock.

The earth is made up of layers, just like a giant sandwich. At the center is magma or lavarock that's heated so much that it's almost a liquid. Farther out is rock that's been stuck in the middle for centuries and is very dense (pressurized). And near the top are pebbles, sand, soil, and parts of plants and animals that used to live there (fossils). By looking at the different layers of earth, geologists can figure out what happened in a place many years ago.

### *Think About It*

These are the questions geologists are always looking to answer:

- Which layer is the "first" or oldest?
- What other things do you expect to find mixed in among the rocks?
- What did the land used to look like?
- What happened here (over a very long time)?

## Jell-O® Mountain

Geologists take core samples to see these different layers. Here's a fun way to try your hand at core samples.

**Materials Needed:** Three different packages of quick-setting gelatin or pudding; cut up fruit, nuts, jimmies, mini-chocolate chips, etc; three bowls; spoons; one big bowl/cake pan/ baking dish; straws

### What To Do:

1. Follow the directions for making the gelatin or pudding. Add raisins, chips or fruit to each. Be sure to put only one item per gelatin/pudding.
2. After each gelatin or pudding has set, gently remove it from its bowl and gently place it in the larger bowl, baking dish or cake pan. There should be a large three-story "earth."
3. Take a straw and gently twist it straight down through all three layers. Stuck part way? Leave it where it is and try another straw somewhere else in the "earth."
4. Carefully, gently, draw the straw out of the "earth." Slit the straw open lengthwise and see what has been "cored" from the "earth."

### Think About It

Why did the straw get stuck before it reached the bottom?

Why do geologists take more than one core sample of an area?

## ASTRONOMY

Astronomy is the study of space, which is actually not all that – spacious. It's filled with stars, planets, comets, meteors, asteroids and galaxies.

### Star Search

Go outside at night and look up – keep in mind that you'll see more the farther away you are from artificial light. Can you find:

- Stars (twinkling lights)
- Constellations (groups of stars that make up patterns like the Big Dipper, the Little Dipper, or Orion's Belt)
- Planets (lights that don't twinkle)

## Star Light, Star Bright

Like our Sun, other stars also create their own light (it's actually burning gasses that make up a star's light). Stars shine all the time, but during the day the sun's light drowns out the light from all the other stars. Likewise, city lights, or household lights can make it hard for you to see the stars at night.

## Physical Facts

Anyone who's ever learned to skate, ski, blade or board has probably learned some physical facts the hard way:

- Things at rest, stay at rest – until something moves them.
- Things in motion, stay in motion – until something slows or stops them.
- Gravity pushes things down – down hills, as well as down to the ground.
- When one object moves across another, friction is produced. This slows things down. It also produces heat – along with scrapes and cuts!

- Planes (flashing colored lights that move quickly)
- Satellites (non-twinkling lights that move in an arc)
- Shooting stars/meteors (non-twinkling lights that move really quickly)
- The moon

## PHYSICAL SCIENCES

### PHYSICS

Why do things do the things they do? That's the question explored by physics, the study of the way things work.

#### On a Roll

Here's an activity that shows how to get something that's not moving, to move.

**Materials Needed:** Toy car, skate or skateboard; flat surface (newspaper, big book, poster board)

**What To Do:** Try to get the toy car, skate or skateboard to move across the flat surface. What are the different ways to get it to move? (HINT: Look at the "Physical Facts", at left).

#### Think About It

Why does it eventually stop?

What can be done to make it roll longer?

What can be done to make it roll faster?

Check out the "Physical Facts" on the left for some ideas.

#### The School of Hard Knocks

Now that things are moving, getting around should be simple, right? But there might be a few bumps along the way. See what happens when you take a small stuffed animal or doll and put it on the toy car, skate or skateboard. What happens to the stuffed animal or doll when the skate stops moving? Place a pencil, ruler or stick in the path of the skate. Make the skate run over it. What happens to the stuffed animal or doll when the skate hits the stick?

### *Think About It*

Which of the “Physical Facts” is causing the stuffed animal or doll to get hurt?  
How can you keep the stuffed animal or doll from getting hurt?  
What “real world” safety item did you just create?

## CHEMISTRY

Chemistry is about what things are made of. Help the girl in your life see how chemistry affects her every day.

Has she ever walked across wet grass in jeans? Her pants get wet, right? And not just around the ankles, but higher up – even higher than the grass was actually growing. Know why? It’s because of capillary action.

Capillary action happens because water is sticky – water molecules stick to each other and to other things, like glass, cloth, fibers and soil. And so the water actually drags itself up the cotton fibers of your jeans – and up your leg. Many things make use of capillary action to work. Here’s one.

### **It’s Magic!**

Learn how to make a paper snake move like a real one right before your eyes.

**Materials Needed:** A paper-covered straw; small dish or plate; glass of water

#### **What To Do:**

1. Scrunch the paper covering down the length of the straw, until you have it all folded down on itself.
2. Take the scrunched paper covering off the straw and put it on the dish (keeping it all folded up). This is your paper snake.
3. Dip the straw into the glass of water. Put your finger tightly over the top of the straw, holding the water in place inside the straw.
4. Carefully drip a drop of water onto the end of the paper snake. Watch it move!



### *Think About It*

Try dripping a drop of water in the middle of the snake. What happens? What happens when you put too much water on the snake? Why? Does using something other than water still work?

### **Blast Off!**

Chemical reactions can fuel engines. That's how rocket ships blast off. Here's how to make your own rocket.

**Materials Needed:** A 35mm film canister (one whose lid seals from the inside); 8" X 11" piece of paper; tape; scissors; ruler; Alka Seltzer® tablets; water; newspaper

#### **What To Do:**

1. Fold the paper in half, widthwise. Cut the paper along the fold so you have two pieces. Take one piece and wrap it around the canister, fastening it with tape (the paper will be longer than the canister). Make sure that you can still snap the lid on the canister, and that it can stand upright on its lid.
2. Out of the second half of paper, make a small circle. Make a cut from one edge to the center of the circle. Fold the circle into a small cone. Tape it in shape. Then tape it to the paper that is wrapped around the canister.
3. Lay the newspaper down. Work over the paper for the rest of the experiment.
4. Take the lid off the canister and fill it 1/3 with water.
5. Drop one Alka Seltzer® tablet in the canister. Quickly put the lid on, and place the rocket (lid down) on the paper. **STAND BACK** and watch the rocket blast off!

### *Think About It*

When Alka-Seltzer® tablets are put in water, there is a chemical reaction that makes a lot of gas ("plop, plop, fizz, fizz"). How does this gas make the rocket move? What would give the rocket more – or less – power? Play around with the ingredients that make up the chemical reaction.

- Add more water – or less.
- Add more tablets.
- Break up the tablets.



## Go Power

Of course, real rockets don't run on Alka-Seltzer® tablets and water. They run on a different type of chemical reaction.

What happens is that the rocket's fuel, when combined with oxygen and an electric spark (energy), produces a chemical reaction – an EXPLOSION! And it's this explosion that makes the rocket blast off.

## True Blue Skies

You can't see light, unless it bounces off of something – dust particles, water particles, or gas molecules. Water and dust particles are big. They will reflect just about every wavelength that hits them. They often look white – like clouds. Gas particles (the air you breathe) are smaller and reflect the shorter – or blue – wavelengths best. That's why the sky looks blue. The more water there is in the air (like fog, snow or humidity), the less “Truly Blue” the sky looks.

## Black as Night

The reason space seems black is that there is no atmosphere (gas particles) to reflect the light. When there is no light seen, your eye registers it as “black.”

# LIFE SCIENCES

## BIOLOGY

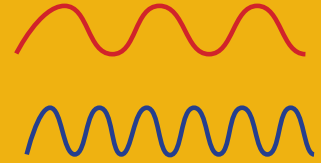
What do living things need to live? Help the girl in your life find out by exploring biology (the study of living things).

### Spineless

Biologists study life everywhere they can. One form of life found almost everywhere are the “invertebrates,” which means “without a spine.”

Go outside (or in a dark, damp place indoors) and see how many different types of invertebrates you can find. Draw pictures of them, or describe them. See if you can tell:

- How many legs each has



Each color of light has its own wavelength. Some colors have short waves (many “ups and downs”), others have long waves (fewer “ups and downs”). Your eye sees each of these wavelengths as a different color. Blue has the shortest wavelength.

## Piecing it Together

Biologists look at life forms and ask themselves these questions:

- What are its parts and pieces?
- Why does it have those parts and pieces (what does it do)?
- How does it help it survive where it survives?

- Where it prefers to be
- If something is living there that you can't see
- If the critter is a hunter (quick movers with sharp parts), or a plant eater (slower moving and no/few sharp parts)

## Bioengineering

Bioengineering happens when people design a living thing to meet a certain need. For example, long ago people created certain breeds of dogs to do certain things. Try to figure out what different breeds were bred to do. Check for:

- Body shape
- Body size
- Type of leg
- Type of nose
- Kind of coat/fur

Then think about what would a dog need to:

- Run long distances
- Look for missing people
- Bring back animals that have been hunted
- Swim
- Go down rabbit holes

## Check It Out

Talk with a local breeder, veterinarian or animal trainer to find out more about dogs and the traits they were bred for. Or, go online. You can check out the American Kennel Club, as well as clubs that focus on individual breeds.



## TECHNOLOGY

Technology is already a major force in the lives of today's girls. Just think how most are connected via PCs, cell phones or pagers, not to mention VCRs, MP3 players, DVDs and countless other devices with embedded chips. And that doesn't include all the daily appliances, machines, vehicles and instruments that also use technology. One way to help a girl appreciate the impact of technology is to have her keep a log for a week listing how and when she uses technology. How many items did she come up with?

### HELPING GIRLS COZY UP TO TECHNOLOGY

Here are some things you can do to encourage the girl in your life to pursue her interest in technology:

- Be a role model: use technology in your daily life. Share with her what you do at work, and show her how science, math and technology are important to your job.
- Spend time actually sitting down with her at a computer – at home or at the library. Visit Web sites and discuss safety.
- Counsel her to take classes in technology as she enters middle school, and support her in that decision.
- Show her how technology can be a tool in the process of learning – from playing computer games to contributing to a survey on wildlife sightings.

### FIX SOMETHING

Show a girl how to put technology into action by fixing something. For example, she might change the oil in a car, fix a leaky faucet, replace a light switch or fuse, replace a small appliance part, or repair a bicycle.

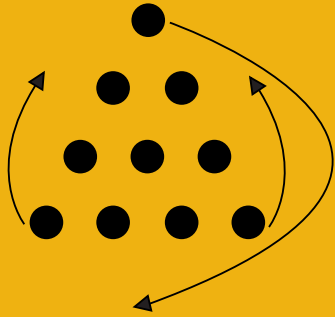
Here are some of the tools or resources she'll need:

- Something in need of repair
- Owner's manual
- Computer (Internet resources)
- Library
- Appropriate tools for the job



The U.S. Department of Labor reports that the top five fastest-growing occupations are computer-related. And, according to the Pew Research Center-Internet and American Life Project, if current trends continue, Internet use, within a generation, is likely to equal that of the telephone (94%) or television (98%).

*Checker Challenge Answer  
from Page 2*



## SHARING FAMILY MEMORIES

One of the fun ways to use technology is to share family memories. Here are some of the things the girl in your life can learn how to do:

- Catalog pictures from a family trip.
- Transmit pictures to family and friends by e-mail or download site.
- Create a CD of an event or trip, a family trip or reunion Web site, an online video or slideshow.
- Plan a family reunion or hold an online family reunion.

Here are some of the tools and resources that may be needed:

- Camera, film, pictures developed and placed on CD (by film processor)
- Computer (instant messaging, e-mail, online planning platform, zip drive)
- CD burner or computer disk
- Digital camera and software
- Software for photos, slide shows, Web production, etc.
- Video camera
- Video conferencing capability
- Maps

### **Be a good technology role model**

Being a good “technology role model” for girls doesn’t mean you have to know it all. It simply means being willing to learn and being open to what technology presents.

Don’t have a computer? Improve or look for other resources in your community. For example, most libraries have Internet access for their patrons. Computers are great tools, but there’s a low-tech way to do most everything.

## RESOURCES

Here are some resources to help you and the girl in your life continue exploring math, science and technology.

### PRINT

***The Girl Difference: Short-Circuiting the Myth of the Technophobic Girl***, a review of current research on girls and technology, is available as a research review or executive summary. Call 1-800-221-6707 to purchase.

***Children's Software Revue***, a bimonthly magazine, rates software for children, <http://www.childrensoftware.com>

***The Cool Careers for Girls*** series by Ceel Pasternak and Linda Thornburg. Targets middle-school-age girls and focuses on career paths and mentoring. (Manassas Park, Va.: Impact Publications)

***The New Way Things Work*** by David Macaulay. (New York, NY: Houghton Mifflin Co. 1998)

### ONLINE

**Girl Scouts of the USA:** <http://www.girlscouts.org>  
The Girl Scouts Web site has a section for girls called Just 4 Girls. Areas include interactive technology badges and highlights of famous women from many different careers.

**NASA:** <http://www.nasa.gov>  
The National Aeronautics and Space Administration is behind the USA's space program. Find out all things spacey at their Web site.

**Public Broadcasting Stations:** <http://www.pbs.org> and <http://www.pbskids.org>.

The local and national PBS stations have tons of cool science stuff for kids – both online and on screen. Check out the national Web site, the national kids' Web site, and links to your local stations.

**Smithsonian Institution:** <http://www.si.edu> and <http://www.si.edu/kids>

The Smithsonian Institution is not just one museum, but 15 different ones! You can find them all online. Or, even better, plan a trip to Washington, DC and see them for yourself. Many of its exhibits travel throughout the country and might be headed to you. Check their online schedule!

## FROM GIRL SCOUTS

**Girl Scouts of the USA** helps girls around the country learn more about math, science and technology with opportunities including science camps, science kits and hands-on activities from flight simulation to archaeological digs.

*As Gina Ryan, Executive Director and CEO of the Society of Women Engineers put it: "When Juliette Gordon Low founded the Girl Scouts, she taught girls life skills – cooking, sewing, etc. The Girl Scout purpose is no different today – teaching girls survival skills for the 21st century in science, math, engineering and technology."*

To learn more about Girl Scouts, contact your local Girl Scout council. To find your local council, look in the white pages under "G." Or visit [www.girlscouts.org](http://www.girlscouts.org) and use the council finder.

**Chair, National Board of Directors**  
Cynthia B. Thompson

**Interim Chief Executive Officer**  
Jackie Barnes

Design & Production: Rappy & Company, Inc.

Illustrations: Lisa Adams

Inquiries related to Girls Go Tech should be directed to  
Marketing Department, Girl Scouts of the USA,  
420 Fifth Avenue,  
New York, N.Y. 10018-2798.

This publication may not be reproduced, in whole or in part in any form  
or by any means, electronic or mechanical, including photocopying,  
recording, or by any information storage and retrieval system now  
known or hereafter invented, without the prior written permission  
of Girl Scouts of the USA, 420 Fifth Avenue, New York, N.Y. 10018-2798.

© 2003 by Girl Scouts of the USA. All rights reserved.



420 Fifth Avenue  
New York, NY 10018-2798

[www.girlscouts.org](http://www.girlscouts.org)