Build a Better Future

Interest Project Patch Guide
For Cadette and Senior Girl Scouts

BRIDGING
THE
GAP

A collaboration
Between
Discovery Place, Inc.
and Girl Scouts, Hornets' Nest Council

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BRIDGING THE GAP

Build a Better Future Interest Project Patch Guide

Table of Contents

These activities correspond to the activities found on pages 52-53 in ***Interest Projects for Cadette and Senior Girl Scouts***. They are designed to be fun, easy and inexpensive. The layout of each activity contains simple instructions for preparation. All GSUSA guidelines should be followed when doing these activities.

Introduction

Who, What, Why, When, Where, and How?

Who?

You, of course! This Bridging the Gap Interest Project Patch Guide was written to give Cadette and Senior Girl Scouts extra resources to make it easier to investigate science, engineering, and mathematics Interest Project Patches.

What?

What is Bridging the Gap (BTG)? Bridging the Gap is a nationally recognized science education program developed specifically for Girl Scouting. BTG promotes the idea that girls can learn and have fun exploring science, engineering, and mathematics activities when given the opportunity to try them in a girl-friendly environment.

You may have already tried BTG activities as a Daisy Girl Scout, Brownie Girl Scout, or Junior Girl Scout and know how fun they can be. Fun is of special importance to Bridging the Gap. After all, LEARNING IS DIRECTLY PROPORTIONAL TO THE AMOUNT OF FUN YOU HAVE!

Why?

Why do Bridging the Gap activities? Understanding science and mathematics and being comfortable with engineering and technology can help you succeed in any career path you choose. If you dream of becoming an astronaut or a marine biologist, you know you need strong math and science skills. What many people do not realize is that in today's world, science, math, and technology play a major role in everything we do. So if instead, you dream of becoming an artist, an athlete, or businessperson, you will be better prepared if you have a strong background in science and mathematics. Here are the facts:

- Women with good math skills earn more than women without these skills;
- Engineering will be among the highest paying and fastest growing occupations over the next decade; and
- The fastest growing occupations all require strong backgrounds in science, technology, math and/or engineering.

When?

You can work on your Interest Project Patch whenever you want to do so. Use the Planner Page and Outline to decide which activities you want to do and plan when you want to complete them. One of the great things about being a Cadette or Senior Girl Scout is that you plan your own activities. Just remember to consult with your troop leader or an adult advisor and always follow Safety-Wise guidelines.

Where?

Bridging the Gap activities can be done almost anywhere—at home, at troop meetings, at service unit or council events, at school, or any place you find Girl Scouts. You can even complete some of the activities over the Internet. Some activities require electricity or access to hot water, but each activity section will list what you need before you begin.

How?

How do you know if you want to try this Interest Project Patch? Try the Get Started Activity first. To complete the patch requirements, you must choose at least 7 activities:

- 2 Skill Builder activities
- 1 Technology activity
- 1 Service Project activity
- 1 Career Exploration activity
- 2 more activities from any category you choose

The Get Started Activity counts as one of the seven required activities, leaving only six to complete the Interest Project Patch. Each activity in this Interest Project Patch Guide will help you complete a different Skill Builder or Technology activity and will have more suggestions for possible Career Exploration activities and Service Projects. Additional links are provided to help you connect this Interest Project Patch to a future Gold or Silver project.

Build a Better Future Activities at a Glance

Read the activity descriptions below and then try the ***Get Started With Shrink Art*** to see if you would like to learn more about the subject of this Interest Project Patch. Then refer to pages 52-53 of ***Interest Projects for Cadette and Senior Girl Scouts*** and the corresponding activities in this guide to decide which activities you want to do to complete your Interest Project Patch.

In the Get Started activity, you will make jewelry from recyclable items as you complete Skill Builder #5. Additional activities in this guide provide hands-on activities to:

- Explore the laws of physics as you build your own model of a roller coaster for Skill Builder #1.
- Experiment with inexpensive devices designed to help people with disabilities. Use what you discover to brainstorm your own invention for the disabled for Technology #3.
- Solve a 3-D puzzle as you explore Computer Aided Design for Technology #1.
- Plan your dream bathroom and build basic electronic gadgets as you learn about blueprints for Skill Builder #2.

These activities are only suggestions. Some of the activities will go beyond the basic suggestions in the Interest Project Patch requirements listed in ***Interest Projects For Cadette and Senior Girl Scouts***. If an activity in this book isn't interesting to you, change it or choose another activity. Remember, this is your Interest Project Patch!

Build a Better Future Planner Page

Make a copy of this sheet to plan your Interest Project Patch activities.

My Interest Project Patch Plans

My two Skill Builders are:

1)

2)

My Technology activity is:

1)

My other activities are:

1)

2)

My Service Project is:

1)

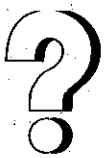
My Career Exploration activity is:

1)

My Gold or Silver links could be:

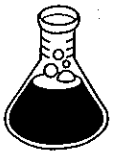
Explanation of Icons

Pay close attention or else!



Here's a question for you

What's happening and why



Technical information

Extra tips and hints

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Get Started With Shrink Art

Corresponding Activity

Build a Better Future, Skill Builder 5

p. 52, *Interest Projects for Cadette and Senior Girl Scouts*

Big Idea

What is this Interest Project Patch all about? How can you build a better future? One way is to recycle items to make new products. In this activity for Skill Builder #5, you will recycle a kind of plastic, **polystyrene**, to make jewelry or decorations.

Time

60 minutes minimum

Materials

From your leader:

- ❑ Colored markers (permanent type)
- ❑ Single hole punch
- ❑ String or lacing to make a necklace or bracelet
- ❑ Scissors

To get yourself:

- ❑ Recycle code #6 plastic
- ❑ Aluminum foil
- ❑ Cookie sheet
- ❑ Conventional or toaster oven
- ❑ Oven mitt or potholder

Safety

Be careful not to touch any hot surfaces when baking the plastic. Let the plastic pieces cool completely before touching them. Be sure to work in a well-ventilated area because the heated plastic will have an odor.

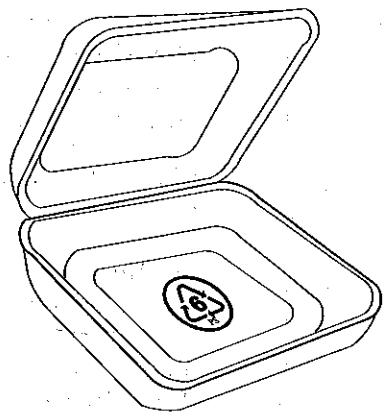
Clean-Up

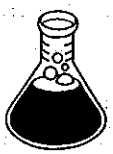
Make sure to put the caps back on the markers when you are finished.

Do it!

1. Gather waste plastic items with the #6 recycle code. Plastic packaging, cups and food containers usually have a recycle code molded into the bottom. The number in the triangle tells you what kind of plastic the container is made out of if you know how to read the code. This #6 plastic is **polystyrene**. This activity works best with thin, clear, molded cups, deli or bakery containers.

***Polystyrene** plastic items are hard and shiny and they break easily. These items are usually clear but can also be black. Example of polystyrene items are the thin clear plastic trays that protect cookies inside the bag, or plastic boxes that hold muffins, cake, and pies from the bakery or deli. Hard, clear plastic containers that hold box lunches or salad are also usually made from **polystyrene**. If you can not find any of these items at home, a local grocery store or fast food restaurant may give you some empty containers.*





Polystyrene is also used to make lots of other things such as Styrofoam® cups and containers, packing material, plastic silverware and plastic cups, jewel cases to hold CDs, plastic toys, and the hard plastic outside cases of televisions and other electronic products.

Although Styrofoam® and thick pieces of #6 plastic are also made of **polystyrene**, don't use them for this activity. These forms of the plastic are hard to work with and the final product will be brittle.

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2. Wash your #6 plastic items. Make sure they are clean and free of any grease.

3. Turn on your conventional oven or toaster oven and preheat to 325°F. Cover a cookie sheet with a piece of aluminum foil.

4. Use your scissors to cut some of the #6 plastic item into pieces. Use only a small part of the plastic at first so that you have more to experiment with later. Use the color markers to color the pieces if you want to decorate them.

5. Place the pieces of plastic onto the aluminum foil-covered tray. Use a marker to trace around the original shape of each piece on the aluminum foil. This will be your record of what the plastic looked like before you baked it.

6. Put the cookie sheet with the plastic on it into the preheated oven and bake it at 325°F for 2 to 5 minutes depending on how thick the piece is. Thicker plastic will need to heat longer than thin plastic. Watch what happens to the plastic as it heats up. The plastic will start to shrink and change shape.

Good ventilation will help with any odors from the baking plastic.

7. Remove the cookie sheet from the oven and let it cool thoroughly. How much did the pieces shrink? Did the pieces shrink more in one direction than the other or did they shrink uniformly so that the basic shape stayed the same? Compare them to your tracings to find out how they shrank.

When objects are made of **polystyrene**, the plastic is heated up until it gets soft, and it is stretched out to be molded. Then it is cooled, to hold its new shape. When you warm up the plastic in the oven, it softens again and returns to its original shape. If the plastic was stretched more in one direction than the other, it will shrink unevenly when it is heated.

8. Experiment by baking other pieces to see how they shrink. Use the hole punch to punch holes in the plastic to see how small the hole shrinks when baked. Use markers to color different patterns on the plastic before baking. What happens when the pieces are heated?

9. Use what you have discovered to design your own jewelry. If you want to make a bracelet or necklace, use the hole punch to put a hole in the plastic before it is baked. After it has cooled, you can put some string or lacing through the hole to finish your piece of jewelry.

To make earrings, trim the colored rim off the clear plastic top of a Dannon® yogurt container and see how it shrinks. Some brands turn into small round shapes, which are perfect for earrings. You can often find hooks and other settings at a local craft store.

What's Happening and Why?

As it was explained before, when objects are made of **polystyrene**, the plastic is heated up until it gets soft, and then it is stretched out to be molded into a new shape. When it is cooled, the plastic holds its new shape. **Polystyrene** and other plastics do not have a definite melting point like some material such as ice, where they change from a liquid to a solid. Instead these plastics have a temperature called a **glass transition point**.

When a plastic is cooler than its **glass transition point**, it is hard and glassy. When the temperature of the plastic reaches the **glass transition point**, the plastic changes and becomes flexible because the molecules inside begin to move around.

The **glass transition point for polystyrene is 212°F**, which just happens to be the same temperature necessary for water to boil. When you warm up the plastic in the oven, it does not melt. It gets hotter than its glass transition point, softens, and returns to its original shape. If the plastic was stretched more in one direction than the other, it will shrink unevenly when it is heated.

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This activity won't work for other kinds of plastic, only for #6 **polystyrene**. Different types of plastics have different temperatures for their **glass transition point**.

What's Next?

Congratulations! You have just completed Skill Builder #5 of the Build a Better Future Interest Project Patch by learning how to recycle polystyrene plastic. Some people believe that disposable plastic plates, cups, and silverware and foam packing peanuts are bad for the environment. But are these things bad or is it how people use and dispose of them that is the problem? Polystyrene objects can be cleaned and reused or simply recycled. Is plastic an environmental problem only when people throw it out because it is inexpensive instead of recycling it?

As you have discovered, polystyrene plastic is very common and if you heat it, you can reshape it to make new things. Plastic plates, cups and silverware can be turned into lots of things such as packing material or cases for audiotapes.

If you want to continue working on this Interest Project Patch use the Interest Project Patch planner to help decide what activities you want to do. Remember, this is your Interest Project Patch. You choose the activities that you want to do.

More to Explore

Find out if your community has a polystyrene recycling program. Check out **www.polyfoam.com** to learn more about polymers and polystyrene.

Career Links

- Talk to your guidance counselor at school and learn more about careers in environmental engineering or chemical engineering.

Service Project Ideas

- Find out what kinds of things can be recycled in your community. Do you have a recycling program to collect them where your troop meets or at your school? If you already have a recycling program, plan a service project to encourage more people to participate in it. If you don't have a recycling program, you can start one.

Gold and Silver Interest Project Patch Links

- Plan to use reusable or recyclable materials as much as possible when you do your project.

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Amusement Park Physics

Corresponding Activity

Build a Better Future, Skill Builder 1

p. 52, *Interest Projects for Cadette and Senior Girl Scouts*

Big Idea

You probably do not think about Newton's Laws of Motion when you are riding roller coasters or other thrill rides at amusement parks or carnivals, but you would not have much fun without these laws. Mechanical engineers and other people who design roller coasters and other rides use their knowledge of physics to keep you safe. In this activity for Skill Builder #1, you engineer the design of your own roller coaster.

Time

60 minutes minimum

Materials

From your leader:

- ❑ 12 feet of 7/16 inch outside diameter clear plastic tubing
- ❑ 4 one quarter inch diameter steel ball bearings
- ❑ Roll of masking tape

To get yourself:

- ❑ Small plastic cup
- ❑ Chairs, other furniture, boxes and books to hold or drape the tubing over
- ❑ A friend to help you (optional)

Safety

Be careful not to lose the ball bearings. Someone could accidentally step on one and slip.

Clean-Up

Dispose of used tape in the trash and put all materials back for the next person to use.

Do it!

1. The ride you are going to design will be similar to a water slide or a single car roller coaster. The 12 feet of plastic tubing will be the track and the ball bearing will be the passenger car. One advantage of using a tube instead of an open track is that the ball will not be able to fly off the track. Some water slides are made of tubes for the same reason.

2. Your coaster does not have an engine to supply power, so you will have to depend on gravity to supply the energy you need to move your ball bearing passenger through the ride. Real roller coasters and water slides also depend on gravity to work. Once you walk to the top of a water slide or are pulled to the top of the biggest hill of a roller coaster, you basically are sliding downhill after you start down. No matter how many hills, loops, twists and curves you move through after that, they are all lower than that first hill.

3. Begin building your model by looking for a high place to support one end of your tubing. Use the masking tape to hold it in place or find some other way to anchor it in place. Be careful not to flatten the tubing when you anchor it. The higher you start, the more energy your ride will have.

4. Tape the plastic cup to the other end of the plastic tubing. The cup must be able to catch the ball bearing when it rolls out of this end of the tubing. Real roller coasters use long flat stretches of track and brakes to slow down and stop a passenger car. A water slide will dump you in a pool of water to stop you. This plastic cup acts as your braking system.

5. Give the ball bearing a test roll and see what happens with a simple no frills set up like the one shown in the picture below. The ball bearing should roll all the way through easily.

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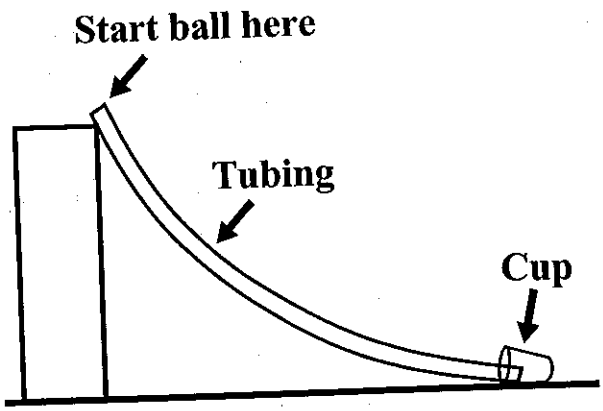

6. Add some variations to your coaster. Try putting in hills, loops, spirals and curves and see what happens when your ball bearing takes a ride. Does it make it all the way through to the end?

You can drape the tubing over boxes or furniture and use masking tape to hold it in place. This is easier to do if you have a friend to help you.

7. Experiment a bit to see what works and what does not. Does the height of the starting hill and later hills and valleys affect how your ride works? Does a small tight elliptical loop work better than a large circular one?

What's Happening and Why?

1. The same laws of physics that allow us to both explore space and keep your car on the road are behind the fun you have on amusement park rides. In the 1600's, three scientists named Johannes Kepler, Galileo, and Isaac Newton showed that you could use mathematics to describe how things move. This was a radical idea at the time.

Before this, people believed that things just moved to their "natural place". For example, a rock fell to the ground because the "natural place" for a rock was the ground and steam would rise because the "natural place" for steam to be was in the air. Because of the work of Kepler, Galileo, and Newton, we now use words like gravity, mass, force, velocity and acceleration when we talk about how things move. We believe that a car moves

down the road because the power of its engine pushes it and not because being down the road is the "natural place" for a car to be. The mathematical language physics uses to describe motion seems complicated but once you learn to understand it you can explain how everything in the universe moves.

2. Newton's First Law of Motion basically says that an object does not change how it moves until a force pushes or acts on it. That means something sitting still will continue to sit still and something moving will continue to keep moving at the same speed in a straight line unless some force ***acts*** on it.

Think about the ride you designed. The ball bearing sat still until you picked it up. When you picked it up you put energy into it. When you dropped it down the tubing a force, gravity, ***acted*** on it and pulled it down and through the tubing. If the tubing wasn't there, the ball bearing would fall straight down, but it doesn't because the tubing pushes back on the ball bearing. This leads into another one of Newton's Laws, the Third Law of Motion.

3. Newton's Third Law of Motion says that for every **action**, there is an equal and opposite **reaction**. This means that if the ball bearing pushes on the inside of the tubing, the tubing will push back on the ball bearing and can change the direction it moves. While gravity makes the ball bearing be pulled down, the tubing pushes it up hills, and around the loops and curves. When you ride real roller coasters, Newton's Third Law of Motion is what keeps you in your seat during the loops that turn you upside down. When the seat is pushing up on you, you are also pushing back on the seat.

4. What about Newton's Second Law of Motion? The Second Law explains the relationship between **force** (amount of push), **mass** (how heavy something is), and **acceleration** (change in how it

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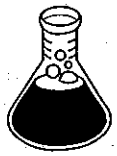
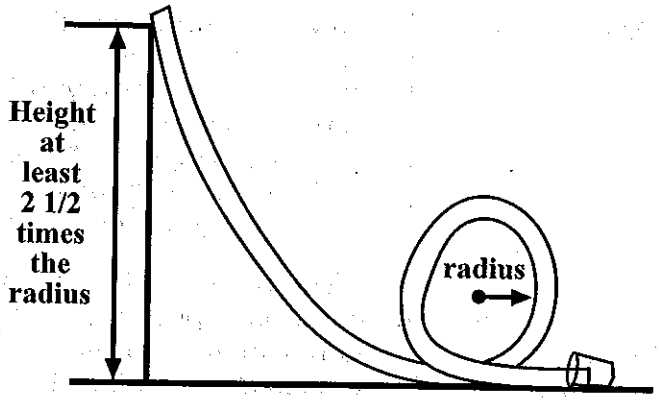
moves). Basically, it says that the heavier something is, the harder it is going to be to move it or change its direction. Another way of explaining this relationship is to say that the **force (F)** it takes to change how something is moving is equal to its **mass (m)** times its **acceleration (a)** or **F=ma** in the mathematical language of physics.



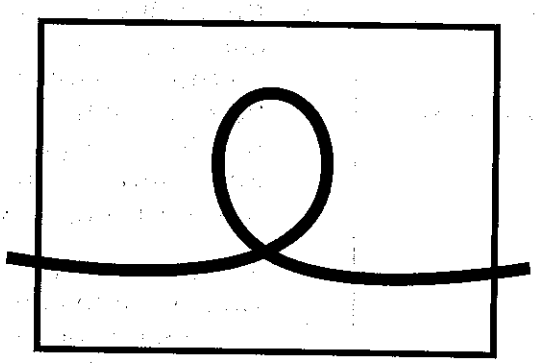
This is why the height of the first hill is so important to roller coasters and similar rides. Think about the ride you designed. When the top of the tubing is raised higher, the **force** caused by the **acceleration** of gravity pulling on the ball bearing is going to increase. This means the ball bearing, which has the same **mass** or weight as before will have more energy to move through the tubing. Think about the equation, **F=ma**. If the **mass (m)** stays the same and the **acceleration (a)** increases, that means the **force (F)** will increase too.

When you ride a roller coaster or similar ride, your body feels and your mind reacts to the changes in **force** and **acceleration** built into the ride. That is what makes it fun! The changes in **force** and **acceleration** make you feel you are flying out of your seat when you go over a hill or are being pushed down through the bottom when you start into a loop. Newton's Second Law also explains why some rides have size and weight restrictions. If you are too small, you don't have enough **mass** to stay safely in your seat!

5. Did you notice that a small loop, especially an elliptical loop, works better than a large circular loop? If a loop is too large when compared to the height of the first hill, the ball bearing will not have enough energy to make it all the way around. A smaller loop needs less energy. To make it around a loop, the height of the hill before the loop needs to be at least 2 1/2 times the radius of the loop.



Most real roller coasters use a specially shaped loop, which is called a **clothoid** loop. On a **clothoid** loop, the radius gets smaller as the loop gets higher which means it needs less energy than a circular loop. A well-designed clothoid loop gives a ride the maximum in speed, thrills, and safety.



elliptical or clothoid loop

6. If you want to learn more about Newton's Laws or better understand the meaning of words such as mass, force, acceleration, gravity, and energy, ask your science teacher for help or sign up to take physics in high school or college.

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What's Next?

Now that you know about some of the physics used in designing roller coasters, try experimenting again. Do you like your new design better? Go online to **www.learner.org/exhibits/parkphysics/** to find out more about the physics of roller coasters and other amusement park rides.

More to Explore

If you really want to learn more about amusement park physics, there is a lot of information available on the Internet. There are also websites, which list the most famous roller coasters and tell about the history of roller coasters.

Career Links

- Research careers in mechanical engineering. Check if you have any engineering related clubs at school. You can also check **www.nae.edu** for information.

Service Project Ideas

- Do a roller coaster activity as part of a science play day for younger girls. You can do this activity on a larger scale by using 25 feet of either 1/2 inch or 1 inch internal diameter plastic tubing and marbles. Make sure the marbles are small enough to roll through the tubing.

Gold and Silver Interest Project Patch Links

- The mechanical engineers that design rides have to check and test every detail to make sure the final product is both fun and safe. Do the same thing when you plan your Gold or Silver Project. Check and test every detail to make sure it runs smoothly and safely.

Assisting with Technology

Corresponding Activity

Build a Better Future, Technology 3

p. 52, *Interest Projects for Cadette and Senior Girl Scouts*

Big Idea

Using and inventing new tools to make life easier is what technology is really about. Everyday tools, doorknobs and devices work well for the most people, but they may not work as well for people who are disabled. In this activity for Technology #3, you will try using different tools, designed for people who have disabilities, to do some everyday tasks and brainstorm some ideas for inventions, that can assist others.

Time

60 minutes minimum

Materials

From your leader:

- ❑ Set of 5 simple devices which assist people with disabilities

To get yourself:

- ❑ Paper
- ❑ Pencil
- ❑ Drawing materials (optional)

Safety

No special precautions are necessary.

Clean-Up

Put away all materials when you finish the activity.

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Do it!

1. Look over the set of devices and try to figure out why they are used. Are these devices useful for people who have limited use of their hands? Can they help people with visual disabilities? Are they useful to people with other types of disabilities?

2. Would some of these devices be useful to you? Try using some of the devices yourself. Did they make it easier or more comfortable to do some everyday task?

3. Have you ever had a temporary or long-term disability? What about your family and friends? What sort of tools would make life easier for a person with that disability?

What's Happening and Why?

Since The Americans With Disabilities Act Law was passed in 1990, our society as a whole has become more sensitive to the needs of people with disabilities. When you used some of the devices, did you find that they made it easier for you to do things too? An invention that makes something possible for a disabled person often make the same thing easier for another person with a different disability or no disability at all. A good tool is a good tool no matter who uses it.

Devices to assist people with disabilities can be as simple as a well-placed strip of Velcro or as sophisticated as a cochlear implant that can help deaf people hear. Many everyday gadgets that you can find in regular stores can be invaluable to a disabled person. One example of this is a can opener, which can be operated with one hand. Another example is the small plastic disks that hold pairs of socks together in the wash. These can make it easier for a visually impaired person to do their laundry.

What's Next?

Think what it would be like to go through your day if you had trouble using your hands, or seeing, hearing or walking. What sort of tools would make your life easier?

Use your pencil and paper to brainstorm and write down your ideas. Make drawings of your invention ideas.

More to Explore

You may want to see if your invention already exists. You can check local stores to see if you can find any of the things you brainstormed for sale or you could check the Internet or books for assistive technology devices. Check **www.bridginggap.org** for web links.

Career Links

- Learn more about careers in biomedical engineering and the new field of rehabilitation engineering research. Find out if the public universities and colleges in your state have centers which specialize in this.

Service Project Ideas

- Do something to make your school, church or troop meeting place more accessible for disabled people.

Gold and Silver Interest Project Patch Links

- Do your best to make your project accessible to people with disabilities.

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3-D Puzzlers

Corresponding Activity

Build a Better Future, Technology 1

p. 52, *Interest Projects for Cadette and Senior Girl Scouts*

Big Idea

Suppose you want to build a house or manufacture some invention that has never been built before? How will you be able to let other people know what it looks like so they can help you build it? You could describe it or draw a picture showing what it looks like, but you would have to make sure that you were able to clearly and accurately communicate your ideas to others. Computer-Aided Design and Drafting (CADD or CAD) is a tool that architects and engineers use to help them design new things and build them. In this activity for Technology #1, you will use CADD style drawings to build a miniature 3-D structure while you solve a 3-D puzzle.

Time

60 minutes minimum

Materials

From your leader:

- ❑ Puzz 3D® miniature puzzle
- ❑ One large die with numbers on the sides

To get yourself:

- ❑ No extra items

Safety

No special precautions are necessary.

Clean-Up

Be sure to return all the puzzle pieces and the instructions to the box when you are finished. See puzzle instructions for how to order replacements for missing puzzle pieces.

1. Your challenge is to correctly put together a 3-D puzzle. The only clues you have to assist you in this task are the pictures in the sheet of instructions and the pictures on the box.

Puzzle pieces with red dots on them are not part of the puzzle. If there are any in the box they should disposed of only after you have completely solved the puzzle.

2. 3-D puzzles are more challenging than flat 2-D puzzles because you have to look at them from six different points of view. You only have to look at flat puzzles from one point of view, the front. The finished puzzle will look exactly like the picture on the box. A 3-D puzzle cannot be **exactly** like a flat picture, so you are going to have to use your brain to imagine how those flat pictures describe a 3-D object.

This type of thinking is called 3-D visualization. It is a very useful skill to have and people get better at it with practice, just like everything else. Good 3-D visualization skills can help you with art, science and math.

3. To help you understand what the six points of view are, look at the large die with the numbers on it. The die is in the shape of a cube and if you check the numbers you can see that it has 6 different sides. These can represent the standard six points of view any three-dimensional object will have.

Hold the die with the #1 facing you. This will be side #1 and will be the **front view** because it is facing you. Side #2 to the right will be the **right side view**. Side #5 on the left will be the **left side view** and side #6 on the back will be the **rear or back view**. The last two views are the **top view**, which is side #3, and the **bottom view**, which is side #4.
Remember:

Side 1 → front view

Side 2 → right side view

Side 3 → top view

Side 4 → bottom view

Side 5 → left side view

Side 6 → rear or back view

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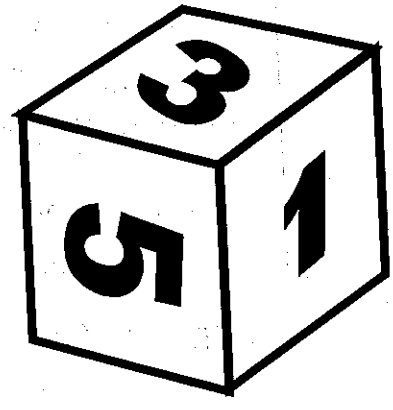
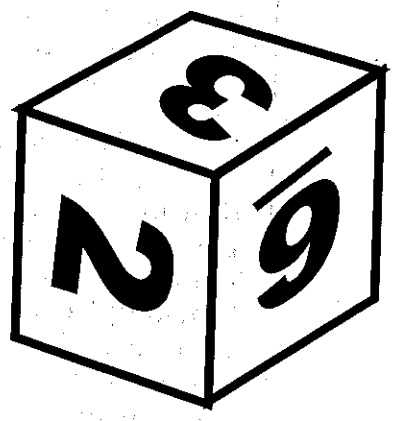
4. Now look at the pictures that come with the puzzle. You will see that they are labeled front view, back view, right side, and left side. Use the information in the drawings and start solving the puzzle. It really helps to pay close attention to the colored details and shapes of the puzzle pieces shown on the illustrations. This is the only way you can tell on which side a piece belongs.

Use the die as a guide to keep the views straight if it helps. In Puzz 3-D® instructions, the 2-D pictures are sometimes illustrated using a type of drawing called a **perspective drawing** which shows two or more of the standard points of view at the same time while looking from a corner **perspective**. The **perspective drawings** on the box will show full color illustrations and the black and white drawings on the instruction sheet will show the shape of the puzzle pieces. The actual number and type of drawings may vary for different puzzles, but the principles are the same.

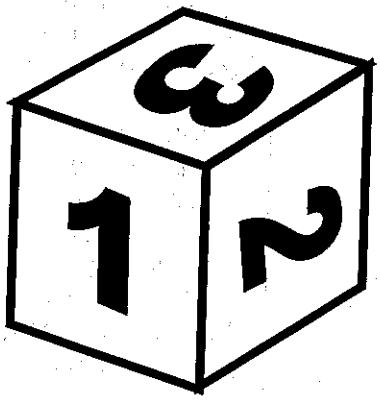
A **3/4 front view** shows the **front view**, part of **the left side view**, and part of the **top view**.



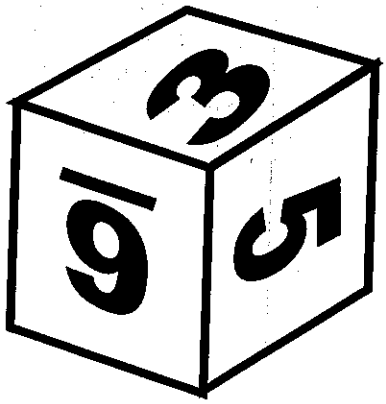
A **3/4 back view** shows the opposite corner, which is the **back view**, part of the **right side view** and part of the **top view**.



There is also a view, which shows the **right side view**, **front view**, and part of the **top view**.



Another view shows the opposite corner, which is the **left side view**, **back view**, and part of the **top view**.



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What's Happening and Why?

Were you able to solve the puzzle? Would you have been able to do it without the pictures? Imagine trying to build a real house, or anything for that matter without clearly drawn plans that you can read as easily as most people can read a book.

Long before computers were invented, engineers and architects developed a standard drawing style and set of symbols to make technical drawings, which everyone could read and understand once they learned the "language" called **drafting**. These drawings were carefully done by hand using pencils, ink, paper, and special drawing tools. Later the drawings were turned into blueprints, which are the instructions people use to build things. Making these drawings took a lot of time, skill and patience and it could take a long time to correct even a small mistake. Imagine, this was like having to write books by hand before the typewriter was invented. You could do it but it was slow.

Computers have dramatically changed how people design things today. While the basic **drafting** language is the same, modern **Computer-Aided Design and Drafting (CADD)** systems do more than just produce technical drawings and blueprints. They can be used to setup construction schedules, run computer simulations on designs to see if they will work, and let people see accurate pictures of the design that are so realistic you could think you are seeing a real object instead of just a design. With powerful enough software and computers, the technology exists so that you could do a 3-D virtual tour, which makes you feel as if you are inside a new house that has not even been built yet.

What's Next?

Despite all the wonderful things a **CADD** system can do, it still is only a tool and it won't do anything without people who know how to use it and understand the **drafting** language. Just as a powerful word processing system is useless unless you know how to write well and have something important to say, a CADD system can't do anything without a creative person who has learned how to design things.

Contact an engineer, architect or another person who uses a CADD system to design things and ask if he or she will show you how they use CADD to do their job.

More to Explore

To really learn about CADD you need to study it the same as any "language". You can take technical drawing or CADD classes at high schools and community colleges, as well as technical schools and universities.

Career Links

- Check out your local community college or technical school to explore the careers open to people who learn Computer-Aided Design and Drafting.

Service Project Ideas

- Help younger Girl Scouts learn 3-D visualization skills. Do the Ant's Eye View activity with Junior Girl Scouts from the BTG *Junior Leader Guide for Junior Science in Action* or the Shapes in Our World activity with Brownie Girl Scouts from the BTG *Brownie Leader Guide for Numbers and Shapes*.

Gold and Silver Interest Project Patch Links

- CADD helps people to clearly communicate their ideas to others in a ways that verbal language can't do. Your Gold or Silver project is your invention. Use both verbal and visual methods to make sure that you clearly communicate your project plans to others.

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Plans and Gadgets

Corresponding Activity

Build a Better Future, Skill Builder 2

p. 52, *Interest Projects for Cadette and Senior Girl Scouts*

Big Idea

To build a large complicated project you often need to have many different types of plans. For example, to build a house you need: a floor plan to show the room layout; an electrical plan to show where to put in the electrical wiring for the lights and appliances; a plumbing diagram to show where to lay the water and drainage pipes; and a landscaping plan to design the yard and exterior. In this activity for Skill Builders #2, you will draw a floor plan to design your dream bathroom and build electrical gadgets while you learn about schematic diagrams.

Time

2 hours minimum

Materials

From your leader:

- ❑ Ruler
- ❑ Scissors
- ❑ Breadboard with clear backing
- ❑ 9V Battery
- ❑ Battery snap
- ❑ LED
- ❑ Connecting Wire
- ❑ 10 Ω Resistor
- ❑ Wire stripper
- ❑ 10,000 Ω (10K Ω) Resistor
- ❑ 10K Ω Potentiometer with wires

To get yourself:

- ❑ Copy of Activity sheet or Graph paper (4 squares per inch)
- ❑ Pencil with an eraser

Safety

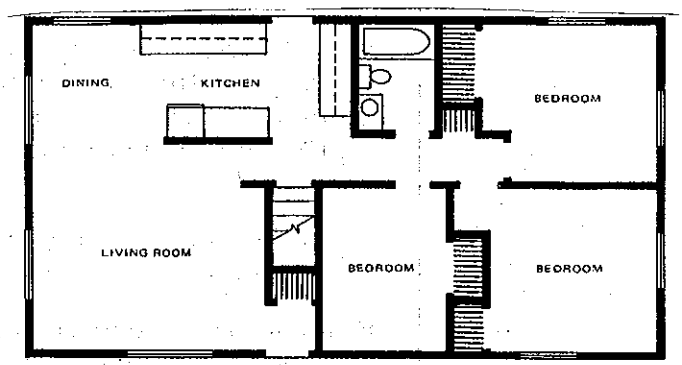
Follow directions carefully for the electronics activities. Always remember to connect the **red** battery wire **last**. If the electronics components overheat, disconnect the red battery wire immediately, and then check your circuit for errors.

Clean-Up

Handle the electronic components carefully and put them back in the labeled containers for the next person to use.

Do It!

1. Imagine that you could shrink a three-bedroom house down to a fraction of its normal size and take off the roof. If you looked straight down from the top, the top view, what you would see would look like the picture below. This type of diagram, which shows how the inside of a house is designed, is called a **floor plan.** A **floor plan** is an accurate scale model of how a house is built.



2. The scale used for a **floor plan** can be different for different drawings. Look at the plan for the bathroom below. Can you figure how big the bathroom of this house is? It is drawn to a scale where each inch of the drawing is equal to four feet in the finished house. Measure the length of the wall in the **floor plan** below with a ruler and you can find out how big the finished room will be. Each 1/4 inch is equal to one foot, so a wall that measures 1-1/4 inches in the **floor plan** will be 5 feet long and a wall that measures 2 inches will be 8 feet long.

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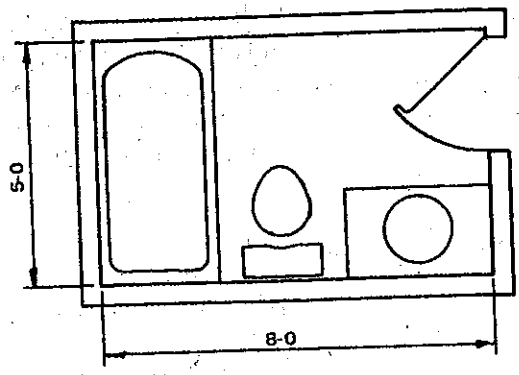
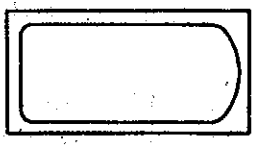


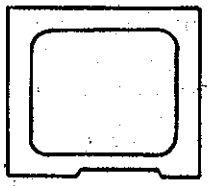
3. As you can see from the **floor plan**, this is a basic bathroom. The person who designed it had to pay attention to things such as:

- Where should you put the door to enter the room? Which way should it open?
- How easily can a person move in this room? Is there enough space to stand, sit, and walk around?
- Will the people who use this room be able to reach things such as water faucets, light switches, towels, etc? Where should the light fixtures and electrical outlets be placed?
- Is the mirror in a convenient location? Is there enough storage for personal items?

From your own experience, how important are these kinds of questions? Can you think of other things that would also be important?

4. Each fixture in the bathroom floor plan is also drawn to the same scale as the walls. The sink, the bathtub and the toilet are also drawn so that 1/4 inch equals one foot so the architect who designs the house and the construction engineer who build it can tell exactly how everything in the house fits together. This is how designers can check that there will be enough space for people to move around and reach things in the finished room.


Standard Tub

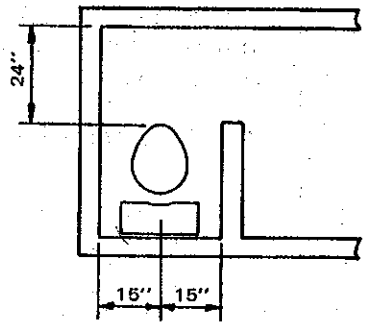

Shower Stall


Wall Hung Sink


Circular Lavatory Sink


Toilet

5. Look at the picture below. You need at least a 30-inch wide space to install a toilet and you must allow more space than this if it is to be accessible for people using wheelchairs.



6. It's your turn to be the designer and create a **floor plan** of your ideal bathroom. Think about what your needs are and what features are important to you. Make a list of these features. Design the room exactly the way you want it to be. To help you draw your **floor plan** to scale, make a copy of the activity sheet by:

a) Making a photocopy, or

b) Using a sheet of graph paper and a pencil to make your own

Each square on the activity sheet is equal to one foot on the 1/4 inch scale and all the fixtures are also 1/4 inch scale. Use your pencil to draw the walls and cut out the bathroom fixtures you want to use. Move them around to see how they fit in your room. You can trace around them to draw them in your floor plan. You can draw cabinets and other features in your floor plan if you want to. Just remember to use the scale where 1/4 inch = twelve inches, 1/8 inch = six inches and 1/16 inch = three inches.

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the walls.
one foot so
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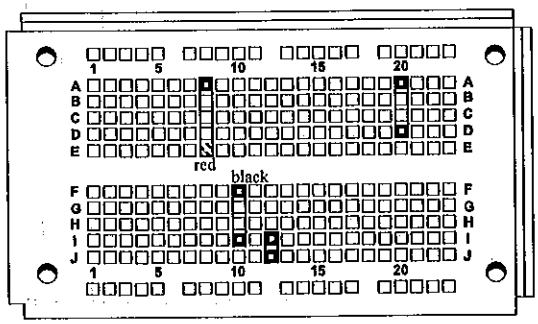
ished

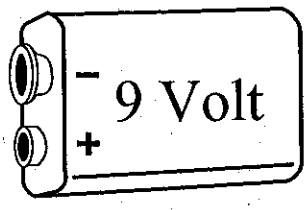
7. Now that you have drawn a floor plan, lets look at another type of plan called a **schematic** or **circuit diagram**. A **schematic diagram** shows you how to build an electrical circuit. An electric circuit is really just a path that lets electricity move around. A schematic diagram is a roadmap of that path. Electronic circuits can be as simple as connecting a light bulb to a battery or as sophisticated as a supercomputer.

The most basic electrical need in a house is a way to turn on an electric light. Because it is not safe or practical to do this for real without the proper training, we will use batteries and miniature components to build this kind of circuit on a small scale. Instead of wiring a light fixture in the ceiling, we will use the following parts to light up an **LED (Light Emitting Diode)**. The chart below will show you what each part looks like and will also list the **schematic diagram** symbol used for each part.

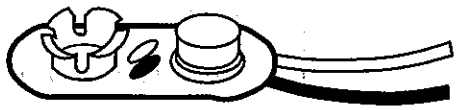
- Breadboard with clear backing



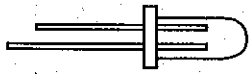
- 9V Battery

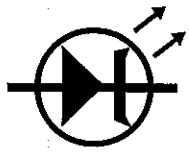


- Battery snap

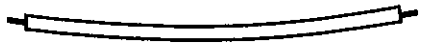


- LED
- Connecting Wire



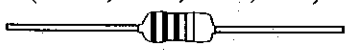


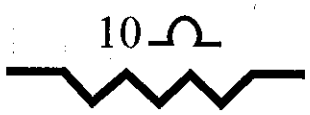
- 10 Ω Resistor



8. You cannot build an electronic circuit unless you have a way to connect the

10 ohm
(Brown, Black, Black, Gold)





wires and other parts together. There are many ways to do this. You can twist the wires together, use springs or clips, or solder the parts together. However, for this activity we are going to use something called a **solderless circuit board** or **breadboard**, which makes it easy to build temporary electronic circuits.

Look at the bottom of the **breadboard**. See the metal strips. Notice how they are arranged in a pattern of short vertical strips and two long horizontal strips. Now look at the top of the **breadboard**. Compare the pattern of the small holes to the pattern of the metal strips. The small holes are just the right size to insert and hold a wire into the metal strip on the bottom of the board. Each vertical group of five holes is connected to the

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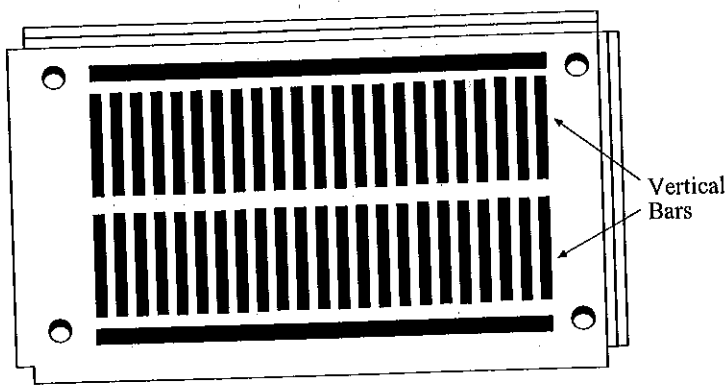
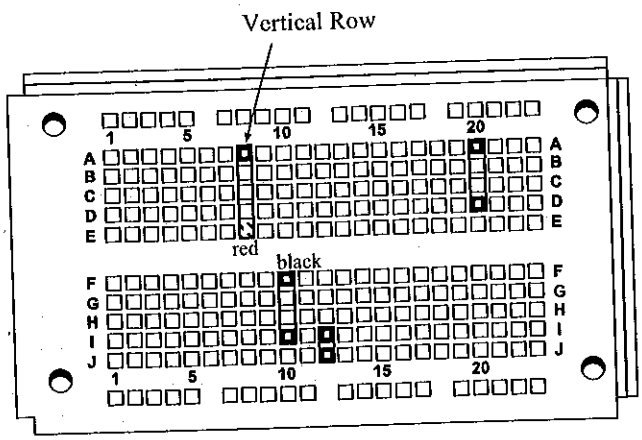
same short vertical metal strip. This allows you to easily connect wires together by inserting them in the same vertical row.

Notice the numbers and letters on the top of the breadboard. This is a labeling system.



Bottom View



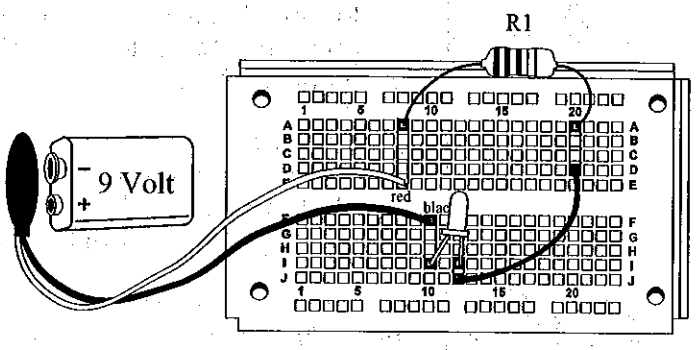
Top View

The horizontal rows have letter names and the vertical rows have numbers. This sets up a coordinate system so that every hole has a name. For example, look at the hole marked in red. It is in horizontal row 'E' and vertical row '8' so the name for that hole is 'E8'. The instructions for building your circuit will use this naming system to identify the holes you will use. These holes are also marked on the breadboard.

9. Start building your circuit. The picture below shows what the circuit should look

like when you are finished.

a) Connect the battery snap to the terminals



of the 9V battery. Make sure the connection is tight.

b) Gently insert the black wire from the battery snap into Hole F10. Push the wire straight down into the hole and be careful not to bend it. Get a feel for how the wire fits securely into the hole.

Only insert bare wire into the hole. If there is not enough bare wire exposed, use the wire strippers to gently pull about 1/2 inch of the insulation off. If the wire is mangled, use the wire strippers to trim the mangled piece off.

c) Remove the black battery wire for now and find the LED. Look at the LED and find the short lead wire and long lead wire. Insert the short lead wire into Hole I10 and the long lead wire into Hole I12.

d) Now get the connecting wire and insert one end into Hole J12 and the other end into Hole D20.

e) Now find the 10 Ω resistor. It can be identified by the pattern of colored bands around it. A 10 Ω resistor has a band pattern of brown, black, black followed by gold or silver. Put one end of the resistor wire, either end will work, into Hole A20 and the other end of the resistor wire into Hole A8.

f) You circuit is almost complete.

NOTES

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Before you connect the battery, compare your circuit to the picture above to make sure you have put all the parts in the correct places. Make sure that you don't have a short circuit by checking to make sure that none of the wires or leads are touching each other.

g) Now you just need to connect the battery. Put the black battery wire back into Hole F10 and the red battery wire into Hole E8. The LED should light up.

If it doesn't, it is okay. Just disconnect the battery and make sure it is OK. Check your circuit for mistakes and try again. The most common mistakes are putting the wires into the wrong holes or putting the LED in backwards. The LED only works if the <u>short lead</u> is in Hole I10.

h) Be sure to disconnect the battery wires when you are done. Don't keep the battery connected for too long because this can overheat the circuit.

What's Happening and Why?

1. The LED lights up only when an electric current is flowing through it and you get an electric current when electrons are moving. Your battery is the source of the electrons. When you connect the positive and negative terminals of a battery together with something that can connect electricity such as a wire, the electrons can move in a loop from the negative terminal, through the wire and back through the positive terminal to the battery.

When the electrons can move on this kind of circular path it is called a complete circuit. All electrical circuits, no matter how complex, form this type of circular path for the electricity to flow through. You can control the electricity and make it do work by putting different components into the circuit. The LED is a component that turns electricity into light. A light bulb is another component that does the same thing. The speaker in a radio is a component that turns electricity into sound and the heating element in a toaster turns electricity into heat.

Components such as resistors, diodes and transistors control the flow of electricity in a circuit. The reason you have to put the LED you are using in the circuit a certain way is because it has a diode in it. A diode will only let the electricity pass through it in one direction, like a one way street. The electrical current must enter through the short lead and leave through the long lead.

Your circuit also has a resistor in it. Resistors are called that because they resist the flow of electricity and are used to control the amount of electricity moving through a circuit. The amount of resistance is measured in units called ohms (Ω). The higher the number of ohms, the stronger the resistance. The strength of a resistor can be identified by the pattern of colored bands around it. A 10 Ω resistor has a band pattern of brown, black, black followed by gold or silver. A gold band means the resistor has a 5% error or tolerance range and a silver band means it has a 10% tolerance range.

2. Connect the battery to complete your circuit and light up the LED again. Can you trace the flow of electricity through your circuit?

The electricity flows out of the battery through the black wire connected to the negative terminal to the vertical metal strip in Row 10 of the breadboard. The electricity flows along the metal strip in Row 10 to reach the short lead of the LED. It flows through the LED and exits through the long lead of the LED and enters the metal strip on Row 12.

From there it enters the end of the connecting wire inserted in Row 12 and moves along the wire to reach the metal strip on Row 20. The electricity moves along the Row 20 metal strip to reach the 10 Ω resistor in Hole A20. The electricity then moves through the resistor and enters the metal strip on Row 8. It travels along the entire upper length of Row 8 and exits the breadboard at Hole E8, moves along the red battery wire and returns to the battery through the positive terminal.

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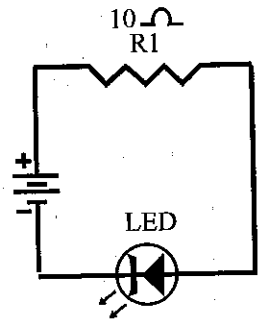
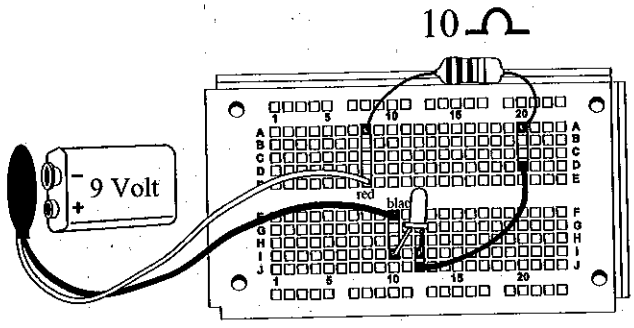
It is often easier and less confusing to draw a picture to show how electricity moves through a circuit. This is what a **schematic diagram** is. Each electrical component has a certain symbol to represent it. If you look back at the chart, which has the pictures of the components, you will also see what the symbols for battery, LED and resistor are. The breadboard doesn't have a symbol because it is just used to connect the wires. Look at the **schematic diagram** for your circuit below and compare it to the actual circuit you built, the picture of the circuit and written description of the circuit.

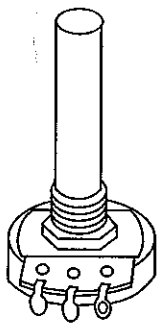




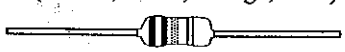
3. **Floor plans** and **schematic drawings** are really models that can help you to visualize a project and bring it down to a manageable size. Imagine how hard it would be to describe a complicated circuit in something like a computer with words. This is why people use special standardized drawings to describe how to build things whether it is a house or an electrical circuit. The right kind of drawing can really be worth more than a thousand words!

What's Next?

1. Now that you have built a circuit and are starting to learn how to read schematic diagrams, try some experiments with resistors and install a "dimmer switch" into your circuit. You will need to use the 10,000 Ω resistor and the 10K Ω potentiometer with wires. The 10,000 Ω resistor is 1,000 times stronger than the 10 Ω resistor you are currently using in your circuit and its band pattern is brown, black, orange followed by gold or silver. A potentiometer is just a type of variable resistor that can vary in strength from zero to 10,000 Ω. A picture of these parts and their schematic symbols is shown below.



10,000 ohm
(Brown, Black, Orange, Gold)



2. Disconnect the red battery wire and remove the 10 Ω resistor. Now insert the 10,000 Ω resistor in the same place with one wire in Hole A20 and the other end wire in Hole A8. Look at the picture below and check your circuit for mistakes and short circuits then reconnect the red battery wire. Look at the LED now. What happened to the amount of light given off by the LED?

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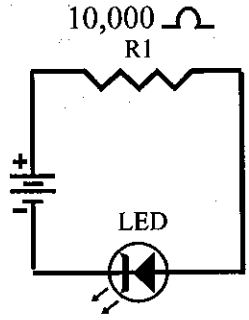
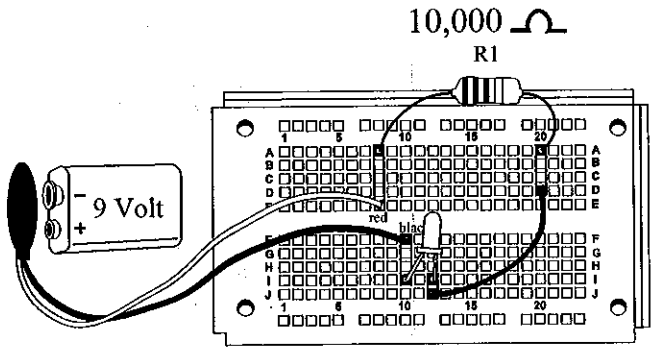
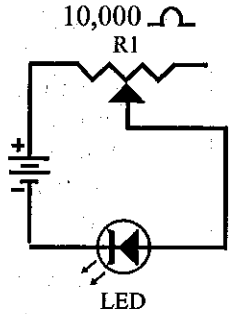
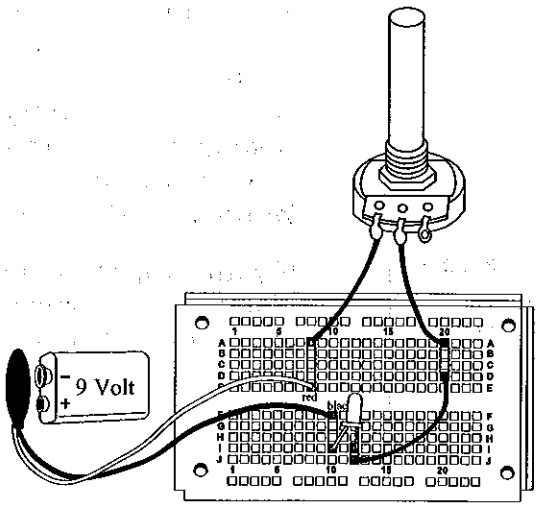
Remember the amount of resistance is measured in units called ohms (Ω). The higher the number of ohms, the stronger the resistance. When the resistance in the circuit is increased 1,000 times, a 1000 times less electricity flows through the circuit. That makes the light emitted from the LED less bright. The LED may be so dim that you will have to look at it from the top rather than the side to get a good view of how bright it is.





3. Disconnect the red battery wire again and remove the 10,000 Ω resistor. Replace it with the potentiometer. Put the wire from the middle connection into Hole A20 and the outside wire into Hole A8. Look at the picture below and check your circuit for mistakes and short circuits then reconnect the red battery wire. Watch what happens to the LED when you hold the potentiometer with one hand and turn the shaft with the other hand. Does the brightness of the LED change?





When you turn the shaft, you change the resistance of the potentiometer. When the resistance is low, the light is bright and it grows dimmer as the resistance is increased. Volume controls and dimmer switches are really just potentiometers, which work by changing the electrical resistance in the circuit.

More to Explore

If you want to learn more about electronics, Radio Shack® and similar stores have electronics hobby kits which you can purchase to learn more on your own. You can also get involved with a ham radio club or sign up for a electronics class at school or at a community college.

Your high school or community college may also have classes on interior design or architecture. You can also use the basic ideas you learned in this activity to draw floor plans for an entire house.

NOTES

NOTES

Career Links

- Check with your guidance counselor or look at a community college or university catalog to discover the many careers you can do if you can read and draw plans. You can find examples in the areas of the building trades, engineering and architecture.

Service Project Ideas

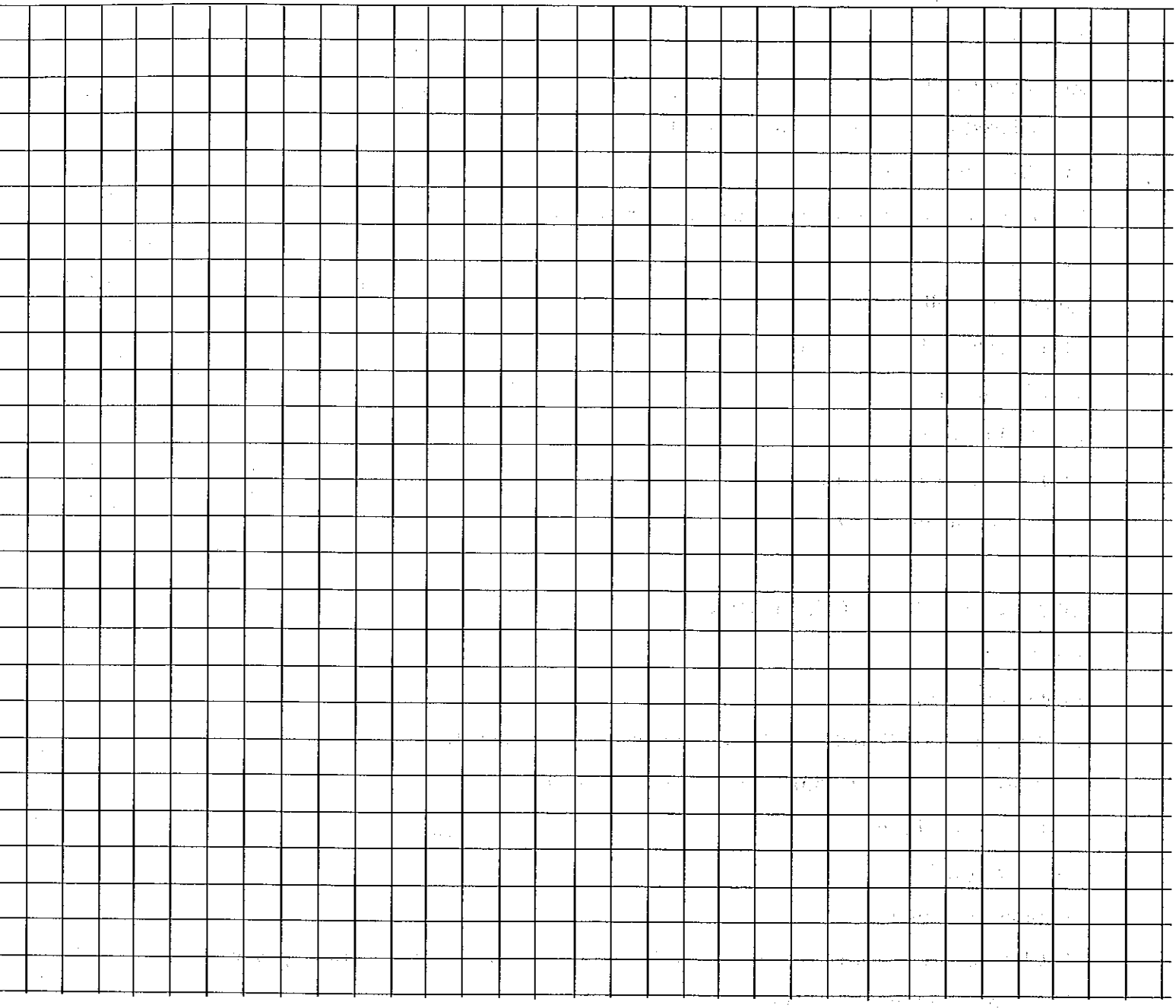
- Draw a floor plan to improve the design of your troop meeting area. Work with your leader and troop sponsor to see if you can make the changes. You can also do BTG electricity activities with younger girls such as Light Bulbs and LEDs from *Discovering Technology* with Junior Girl Scouts or Static Electricity from *Science Wonders* with Brownie Girl Scouts.

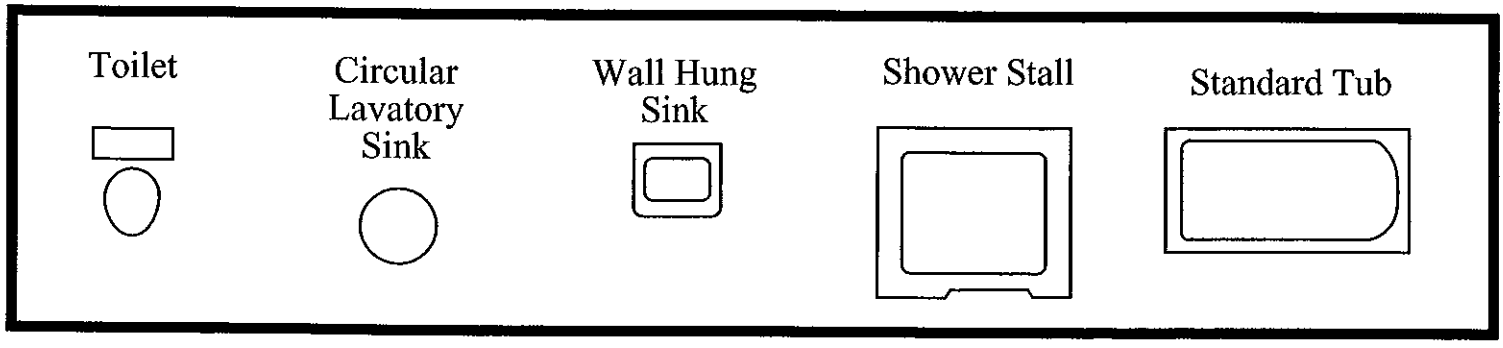
Gold and Silver Interest Project Patch Links

- If your project is indoors, make detailed plans to scale which show the placement of furniture, water, electrical needs, etc.

Plans and Gadgets

Scale: 1/4 inch = 1 foot = 1 square
1/8 inch = 6 inches = 1/2 square
1/16 inch = 3 inches = 1/4 square





Materials List for All Activities

Shrink Art

Materials

From your leader:

- ❑ Colored markers (permanent type)
- ❑ Single hole punch
- ❑ String or lacing to make a necklace or bracelet
- ❑ Scissors

To get yourself:

- ❑ Recycle code #6 plastic
- ❑ Aluminum foil
- ❑ Cookie sheet
- ❑ Regular or toaster oven
- ❑ Oven mitt or pot holder

Amusement Park Physics

Materials

From your leader:

- ❑ 12 feet of 7/16 inch outside diameter clear plastic tubing
- ❑ 4 one quarter inch diameter steel ball bearings
- ❑ Roll of masking tape

To get yourself:

- ❑ Small plastic cup
- ❑ Chairs, other furniture, boxes and books to hold or drape the tubing over
- ❑ A friend to help you (optional)

Assisting with Technology

Materials

From your leader:

- ❑ Set of 5 simple devices which assist people with disabilities

To get yourself:

- ❑ Paper
- ❑ Pencil
- ❑ Drawing materials (optional)

3-D Puzzlers

Materials

From your leader:

- ❑ Puzz 3D® miniature puzzle
- ❑ One large die with numbers on the sides

To get yourself:

- ❑ No extra items

Plans and Gadgets

Materials

From your leader:

- ❑ Ruler
- ❑ Scissors
- ❑ Breadboard with clear backing
- ❑ 9V Battery
- ❑ Battery snap
- ❑ LED
- ❑ Connecting Wire
- ❑ 10 Ω Resistor
- ❑ Wire stripper
- ❑ 10,000 Ω (10K Ω) Resistor
- ❑ 10K Ω Potentiometer with wires

To get yourself:

- ❑ Copy of Activity sheet or Graph paper (4 squares per inch)
- ❑ Pencil with an eraser

Career Links List

Shrink Art

- Talk to your guidance counselor at school and learn more about careers in environmental engineering or chemical engineering.

Amusement Park Physics

- Learn more about a career in mechanical engineering. Check if you have any engineering related clubs at school. You can also check **www.nae.edu** for web links.

Assisting with Technology

- Learn more about careers in biomedical engineering and the new field of rehabilitation engineering research. Find out if the public universities and colleges in your state have centers, which specialize in this.

3-D Puzzlers

- Check out your local community college or technical school to explore the careers open to people who learn Computer-Aided Design and Drafting.

Plans and Gadgets

- Check with your guidance counselor or look at a community college or university catalog a discover the many careers you can do if you can read and draw plans. You can find examples in the areas of the building trades, engineering and architecture.

List of Service Project Ideas

Shrink Art

- Find out what kinds of things can be recycled in your community. Do you have a recycling program to collect them where your troop meets or at your school? If you already have a recycling program, plan a service project to encourage more people to participate in it. If you don't have a recycling program, you can start one.

Amusement Park Physics

- Do a roller coaster activity as part of a science play day for younger girls. You can do this activity on a larger scale by using 25 feet of either 3/4 inch or 1 inch internal diameter plastic tubing and marbles. Make sure the marbles are small enough to roll through the tubing.

Assisting with Technology

- Do something to make your school, church or troop meeting place more accessible.

3-D Puzzlers

- Help younger Girl Scouts learn 3-D visualization skills. Do the Ant's Eye View activity with Junior Girl Scouts from the BTG ***Junior Leader Guide for Junior Science in Action*** or the Shapes in Our World activity with Brownie Girl Scouts from the BTG ***Brownie Leader Guide for Numbers and Shapes***.

Plans and Gadgets

- Draw a floor plan to improve the design of your troop meeting area. Work with your leader and troop sponsor to see if you can make the changes. You can also do BTG electricity activities with younger girls such as Light Bulbs and LEDs from ***Discovering Technology*** with Junior Girl Scouts or Static Electricity from ***Science Wonders*** with Brownie Girl Scouts.

List of Gold and Silver Interest Project Patch Links

Shrink Art

- Plan to use reusable or recyclable materials as much as possible when you do your project.

Amusement Park Physics

- The mechanical engineers who design rides have to check and test every detail to make sure the final product is both fun and safe. Do the same thing when you plan your Gold or Silver Project. Check and test every detail to make sure it runs smoothly and safely.

Assisting with Technology

- Do your best to make your project accessible to people with disabilities.

3-D Puzzlers

- CADD helps people to clearly communicate their ideas to others in a ways that verbal language can't do. Your Gold or Silver project is your invention. Use both verbal and visual methods to make sure that you clearly communicate your project plans to others.

Plans and Gadgets

- If your project is indoors, make detailed plans to scale which show the placement of furniture, water, electrical needs, etc.

Silver and Gold Projects in Science
Real Stories from Real Girl Scouts

Silver Awards

Nicole, age 15
Kennebec Girl Scout Council
Maine

"For my Silver Award project I put together a Mars Science Activity Kit and donated it to my council. The reason I chose to do this project was because I wanted younger girls to be able to know what was happening with Mars, some of the things that may happen in the future, and about Mars in general. I included a list of Web sites, science activities they could do, information about past, current and future missions to Mars, and general information about Mars."

Alicia, age 16
Hi-Low Girl Scout Council

"A friend and I got together to do our Silver Award. We planned and organized a Brownie Girl Scout Earth Day, encouraging Brownies to bring recycled products with them to use for crafts. There were four or five stations, a lunch break, opening and closing ceremonies, and song time (my favorite), where I led all of the girls in crazy songs. We involved several girls from our troop to run stations. Although things were rough at first, they eventually smoothed out and it convinced me to become a teacher because I love kids so much."

Linda, age 13
Mid-Continent Girl Scout Council
Missouri

"My friend and I did a Science weekend. We chose this project because her dad is a science teacher so we would have resources. We also liked this project because we both like kids. We did this for a Brownie troop. It helped them earn the "Science in Action" try-it and it got them a Junior badge, which is one of their bridging requirements. My friend and I learned that Brownies want and can do things for themselves. Third grade Brownies are able to do more than we thought. We also learned the hardships of planning an event. We did have fun making paper and crystals. The Brownies had lots of fun too, and that's the most important part."

Kaity, age 15
Greater New York Girl Scout Council
New York

"I got involved with beach clean ups with my family at our local beach. I decided to make this my Silver Award project (1995) by getting others involved. Through the American Littoral Society, I was given a beach to clean for the National Beach Clean Up. I involved my whole troop as well as the as the community. We contacted the community through our local newspaper and by hanging flyers all over town. We then asked local merchants to donate drinks and snacks for the volunteers. Before the event, I held a workshop for Girl Scout troops in the area and had the parks department and other community workers talk about our role in cleaning up the beach, erosion, etc. We even made posters for store windows and held a poster contest. This was a lot of hard work for me but it paid off because that year we collected over 1200 pounds of trash and had some very unusual finds along the shore. The Annual Beach Clean Up is still being sponsored by my old troop at our local park, and I go to help out now as a Senior Girl Scout."

Meredith T., age 17
Mississippi Valley Girl Scout Council
Illinois

"I planned a science workshop for girls in third through sixth grade. I had women scientists present science through music, water, creative solutions, and Earth Matters! It allowed these girls to have a hands-on experience, while seeing professional women scientists in action!"

Gold Awards

Alicia
Pine to Prairie Girl Scout Council
North Dakota

"I started a recycling program in our community. I started the program because our community did not have a recycling program and there was a need for recycling. I learned that it takes a lot of work to get recycling going. We wrote a grant, met with city board members, and did a lot of paperwork. Most of all, I know I did something good for my community, and it will continue now that I have finished it. The whole community and our environment benefited from this project. It was worth all the work."

Serina, age 16
Girl Scout Council of Hawaii
Hawaii

"My Gold Project, entitled "Math = Fun + Logic," was a weekend workshop for 4th-7th grade girls. It is in this time period that girls may experience difficulty while learning math, and that they then give up on ever learning it. My project was to show the girls, through untraditional math problems, that they can be good at it, or at least be able to use math. I showed them that math is not only numbers and computations, it also is logic, sequence, pattern, connection, etc. Arithmetic is what most girls have trouble with, not the other math subjects; and arithmetic can only be improved through practice.

"At the workshop, I had the girls cook a meal with conversions and ratio, do string designs, learn magic tricks explained through math, and just become comfortable with their own individual math strengths and weaknesses. The favorite activities were a human checkers game (strategy and order) and a burning of our "math fears." I later presented each girl with a necklace containing the ashes of her fears to remind her that if she puts her mind to it, she can do anything—even math!"

Sarah, age 18
Morris Area Girl Scout Council
New Jersey

"For my Gold Award project, I created a science program for first through third graders to introduce them to the idea that anyone can have fun with science. I chose the project because I have been interested in science since I was a young girl. I learned a lot about my own skills with people, especially children."

Gold and Silver Project Ideas

Even if your Gold Award project is not related to science, you can still incorporate skills you develop through Interest Projects in the "Nature, Science and Health" category into your project. Take a look at some of these ideas gathered from different web sites for Girl Scout Cadette/Senior troops across the country:

- Create an interpretive map for a self-guided historical walking tour around your community, using math and mapping skills.
- Present a series of games and workshops utilizing sensory experiences to show girls first-hand what it's like to be disabled.
- Involve your community in an effort to clean up a polluted area, such as a lake or stream. You can also organize a community effort to clean up and improve facilities at a local park or nature center.
- Develop a web page for your school, troop or Council, or assist in maintaining an existing one.
- Plan and implement a recycling program in your school. Get people involved through an educational campaign, teaching people about environmentalism and the benefits of recycling. Arrange for the program to be continued after you graduate.
- Repair a troop house, making sure it complies with Safety Wise standards. Build a wheelchair ramp, if the house doesn't already have one, and make other improvements to ensure the house is accessible to all.
- Create a landscaping project for your school or Council. Consult with a landscape architect, if possible, to learn more about irrigation, maintenance, design and other aspects of the project.
- Conduct stargazing workshops for younger girls, teaching them about constellations and astronomy. Volunteer at a local observatory to learn more.
- If you are interested in the arts, you can write and produce a play that touches upon such themes as environmentalism, space exploration, modern technology or another topic related to science or nature.
- Develop and distribute science activity kits, with instructions and materials, for children who are hospitalized with extended care needs.
- Work with a local historical society and/or extension service to create a native plants education program. Develop a resource binder with reference information for the project.

Build a Better Future Activity Survey

Approximately how long did you spend on each of the following activities?

Shrink Art _____minutes

Amusement Park Physics _____minutes

Assisting with Technology _____minutes

3-D Puzzlers _____minutes

Plans and Gadgets _____minutes

What activity did you enjoy most, and why?

What activity did you like the least, and why?

Did you further explore any of the activities?

Which ones?

Give an example of what you did.

What can be done to make these activities more fun and/or successful?

Thank you for your help and your opinions!!!

Please return all forms to: