Girl Scouts of Oregon and Southwest Washington

BROWNIE GIRL SCOUT TRY-IT

Society of Women Engineers

What is an engineer? An engineer is someone who uses scientific knowledge to solve problems. There are many types of engineers: Civil Engineers, Electrical Engineers, Environmental Engineers, and Mechanical Engineers are just a few. The different types of Engineers do different things; here is a list of some of the things engineers do:

- *Civil Engineers: design bridges, roads, water systems*
- *Electrical Engineers: design electrical power systems, parts of computers*
- *Environmental Engineers: solve water and air pollution problems*
- *Mechanical Engineers: design cars or other moving machines*
- *Electrical Engineers: design electrical power systems, parts of computers*

To earn this Try-It, complete FOUR of the following activities:

1. Machines make work easier. The items listed below are examples of simple machines. Combinations of these simple machines are used together to make more complicated machines. Look up three of these simple machines in the encyclopedia. Find examples of three of the six simple machines listed. Look in your home, school, car or even toy chest. Document where you found them with a photo, drawing or list.

Pulley	Inclined Plane	Wheel
Lever	Screw	Wedge

2. Can you support the weight of a book at least one foot above the table atop of a flimsy piece of paper? You can if you reshape that piece of paper by folding, rolling or bending it. Engineers know that a material's strength varies with its shape and structure. For example a piece of paper tears easier than a piece of cardboard because paper is thinner than cardboard and cardboard is made up of several layers of paper. Some shapes and structures can support more weight than others.

   Your challenge is to build a structure at least 1' (one foot) high which can support a book. You will need 30 Sheets of 8 1/2" X 11" Paper, a roll of masking tape and a book. You can build your structure anyway you like, but your structure must be portable! (This means you may not fasten or connect it to a table or other fixed structure.) Can your structure support a heavier book or more than one book?

3. Sometimes engineers have limited resources to work with. Build a car using only the following material: scissors, 3 non bendable plastic straws, 4 Lifesavers, 1 piece of paper, 2 paper clips, and tape. The catch is you can only make it move by blowing on it. How far does your car move when you blow on it once? How many puffs does it take to move 6 feet? Engineers redesign things to make them better. Can you redesign parts of your car to make it go 6 feet in less puffs than before? [Leaders: download an illustrated PDF of this activity at http://www-tc.pbskids.org/zoom/printables/activities/pdfs/puffmobile.pdf

4. Engineers often use triangles when they design buildings. That's because triangles are stable shapes. That means they don't bend, twist, or collapse easily when you push on them. Make a geodesic dome using gumdrops and toothpicks. [Leaders: download an illustrated PDF of this activity at http://www-tc.pbskids.org/zoom/printables/activities/pdfs/gumdropdome.pdf

   Build It
   1. Connect five toothpicks in a ring using gumdrops as connectors. This is the base.
   2. Use two toothpicks and one gumdrop to make a triangle on one side of the base.
   3. Instruct them to repeat this all the way around the base until they have five triangles.
   4. Tell them to connect the gumdrops with the toothpicks at the tops of the triangles. Ask how many triangles they have.

5. Have students push one toothpick into each of the top gumdrops.
6. Tell them to use one last gumdrop to connect the five toothpicks at the top.

Try building bigger domes using marshmallows and bamboo skewers. Discuss how a full size dome could be constructed for homes or shelters.

5. Have you ever wondered how something works? Work with an adult and take something apart and put it back together again. Share what you learned with your Girl Scout troop. Some suggestions are: flashlight, egg timer, clock (not electrical), pen, or a backpacking water filter or think of something on your own.

6. Engineers design things to make our lives easier. Think of something you use a lot or would like to use. Can you think of how to make it better or invent something new that you would like to have made? Write or draw a picture of what it would look like. Often engineers start by brainstorming about what is important for the things that they are making. For example a coffee cup must hold a hot drink, keep it warm, and be small enough to hold in your hands. List what is important in your design. Share your design with your Girl Scout troop.

7. Today many engineering jobs are held by women. Interview a woman engineer. Find out what she does in her day-to-day work. What made her decide to become an engineer? What kind of education is required?

8. How can you make a weak material like newspaper strong enough to stand up? One way is to change its shape, like rolling into a tube, crumpling it, or pleating it with folds. Build the tallest tower you can using 2 sheets of newspaper. You can bend, tear, crumple or roll the newspaper. Try to make the tower taller and taller. Keep redesigning it until you can't go any higher. Measure the height of your tower. It must stand for at least 30 seconds without falling over. Try using different types of paper or adding tape to see if it makes a difference in your results. [Leaders: download an illustrated PDF of this activity at http://www-tc.pbskids.org/zoom/printables/activities/pdfs/newspapertower.pdf