
EXCITING
ENGINEERING
ACTIVITIES
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First Facts

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THINKING BIG

Do you often wonder how the objects around you work? When you're stuck in traffic on a bridge, do you wonder how the bridge is holding all those cars? When the traffic light ahead changes, do you wonder how it works?

An engineer is behind all of these amazing inventions. They design, build, and test products and structures we use every day. Some engineers design and build machines and robots. Others design buildings or work with electricity. Sound amazing? You can be an engineer too! With this book, you'll get to build bridges and buildings, make circuits, and even create a water filter. And the results will be awesome!

Safe Science

Read through each activity before starting. Collect all of the materials that you will need. You may need an adult to help you find or buy some materials. Experiments can be tricky. Be sure to ask an adult for help if you need it.

DOME EGG-SPERIMENT

Eggs just might be nature's most perfect package. A chick can easily crack the shell with its tiny beak. Its shape can support the weight of the hen — plus a lot more! Let's see how much pressure eggs can take before cracking!

Materials:

- 2 eggs (raw)
- container (for yolks and whites)
- paper towel
- several hardcover books

Steps:

1. Carefully crack each egg in half around the middle. Set aside the pointy-shaped halves. Put the yolks and whites in a container and refrigerate them. You won't need these for the experiment, but you can save them for breakfast or bake with them.
2. Rinse and dry the remaining egg halves. You should have four, **dome**-shaped halves left.
3. With the dome side up, place the eggshells on a flat surface. They should be in a square and evenly spaced.
4. Lay a book on top of the eggs. How much weight do you think the eggshells can hold?
5. Keep adding books until the egg shells crack!

How it Works:

You were probably surprised by how many books the egg shells were able to support. It's all in the egg's shape: the dome. You've probably seen it used in buildings, such as the United States Capitol. Many sports stadiums have domes too. A dome can hold up a heavy load. Its shape evenly divides weight.

dome—a structure shaped like half of a ball

PAPER AND PENCIL CIRCUIT

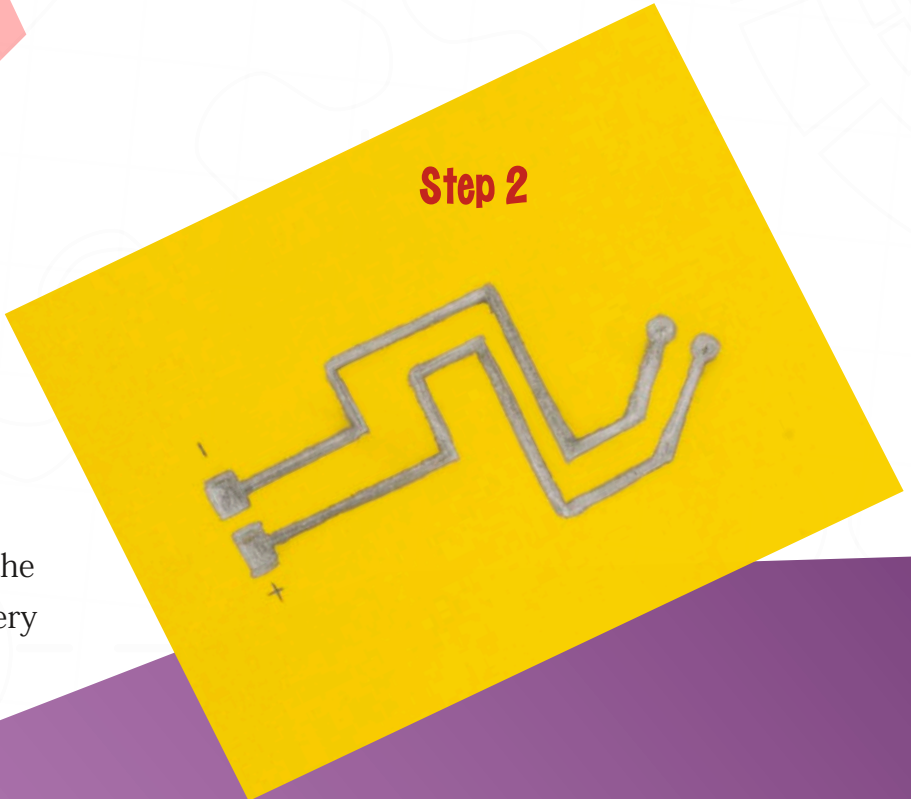
In a flashlight **electricity** travels from a power source to a light bulb through copper wires. The path the electricity follows is called a circuit. But you don't need wires to make a circuit. You can actually draw one on paper!

Materials:

- graphite pencil, 2B or higher
  (You can find these at an art supply store.)
- paper
- ruler
- LED light (5mm)
- 9-volt battery
- clear tape

Steps:

1. Use your pencil to draw a simple design on a piece of paper. Draw a circle, square, or a zig-zag line as shown. This will be the path of your circuit. Make the lines thick for the best results.
2. Leave a small gap, about 1 centimeter, in the line on both the right and left sides of the drawing. (You can erase the line.) The battery and light will go in these gaps.



3. Take the ends of the LED light and separate them a bit. Tape the ends of the LED to the lines on the right side of the page. The light bulb should be in the gap.
4. Place the 9-volt battery upside down in the gap on the left side of the drawing. The battery's positive and negative terminal should each touch one of the lines. You may need to move the battery around to get the terminals to line up. The LED should light up.
5. Play around with different circuit designs. Does the length or width of the line make a difference in how brightly the light shines? Can you add more LEDs?

How it Works:

Graphite is an electrical **conductor**. A conductor is a material that electricity can travel through. Not all conductors are alike. Copper is a better conductor than graphite. That's why electrical wires are often made out of copper.

electricity—flow or stream of charged particles, such as electrons

conductor—a material or object that allows electricity or heat to move through it