

Supplies

- “Guide for Families” handout
- Clear plastic standup display (optional)
- “Engineering Process” handout (1 per participant or family)
- Paper (for drawing design)
- Pencils
- Tape
- 8.5-inch by 11-inch copy paper (5–7 per participant or family)
- Several lightweight books
- Display table

Activity Preparation

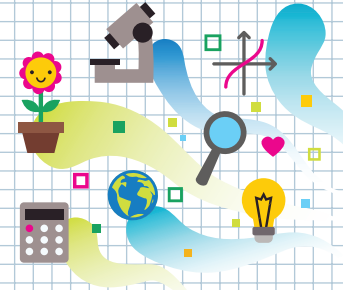
- ▶ Purchase or locate items on supply list.
- ▶ Print one copy of the “Guide for Families” handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- ▶ Print one “Engineering Process” handout per participant or family. Optionally, print and laminate a few to leave on the table.
- ▶ Set up the display table and arrange needed supplies.



HEADS IN, HEARTS IN

The Strongest Column

Guide for Families



Learning Objectives

What you need to know:

Engineering is a process used to solve problems by designing, building and testing things. An engineer is a person who uses math and science to create new things, solve problems or make things better.

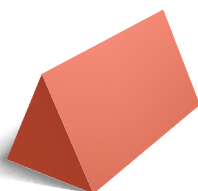
Some engineers work to build structures or buildings. A **structure** is the result of building or constructing something by arranging materials or parts. How a structure or building is designed can affect how safe and durable it is. A **column** is part of a structure designed to support a larger structure above it. For example, four poles, or columns, can hold up the roof of a pavilion. Columns come in various shapes such as a **cylinder**, a **triangular prism** or a **rectangular prism**.



cylinder



rectangular prism



triangular prism

Instructions

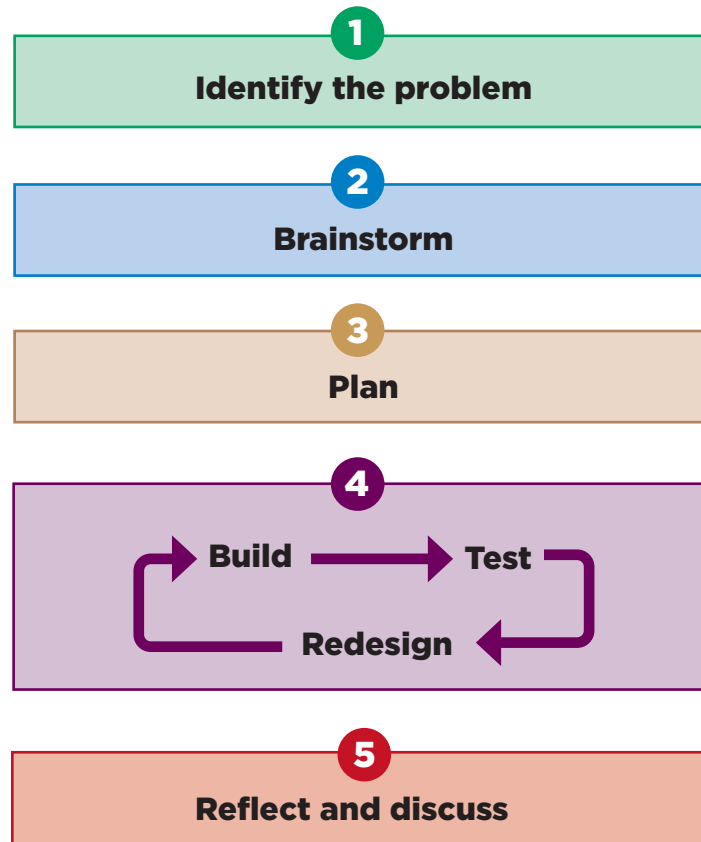
- Using the “Engineering Process” handout, start to work through building your column.
- Identify the problem: Build a table that can support six books using tape and paper.
- Brainstorm: Why might different column shapes support more weight than others? Which column shape do you think will build the strongest support? How many legs do you need for your table?
- Plan: Make a drawing or sketch of your design. Gather your materials.
- Build: Build tables. If you are having trouble coming up with a design on your own, you can use the following column shapes in your design, or come up with one of your own:
 - Cylinder: Roll a piece of paper, and tape it together to make a cylinder.
 - Triangular Prism: Take a piece of paper and fold it into thirds lengthwise. Tape the two edges together so the ends make a triangle shape.
 - Rectangular Prism: Take a piece of paper and fold it into fourths lengthwise. Tape the two edges together so the ends make a square shape.



- Test:
 - Will your table hold six books? Test your design and find out.
- Redesign: Make some changes to your design or create a new table with a different design to see if your table can hold more weight.
- Repeat steps 6 and 7 as many times as needed.
- Reflect and Discuss: How did your table hold up when supporting six books? What other materials could support the weight of six books? How would a solid design compare to a hollow design?

Engineering Process Handout

Engineering Process



- 1. Identify the problem:** Engineering is about identifying problems and designing solutions. As you go through these activities, think of the goal you are trying to achieve.
- 2. Brainstorm:** What are the many different ways I could solve this problem? What are the potential advantages and disadvantages of different ideas? What things do I need to think about to make that solution successful?
- 3. Plan:** What are the different ways I can solve this problem or make the build? What steps can I take to try out my solution? What do I need to do to prepare my build? What might happen if I choose that solution? During your design phase, you might discover new problems that you need to brainstorm.
- 4. Build:** Construct and carry out the design. As you build your design, you might come up with more problems that you need to brainstorm and design new ideas for.
Test: How does my solution work? Does it solve the problem? Is it effective? Are there additional problems?
Redesign: How can I improve my design? What can I try to make my solution work better?
- 5. Reflect and Discuss:** How did the solution turn out? What could I do differently next time? How would my design be different if I had different materials?