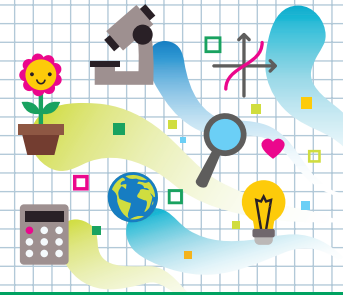




# HEADS IN, HEARTS IN

## Pingpong Catapults

### Instructions for Set-Up



### Supplies

- “Guide for Families” handout
- Clear plastic standup display (optional)
- “Engineering Process” handout (1 per participant or family)
- Paper
- Pencils
- Pieces of cardboard cut into 6-inch by 6-inch squares
- Scissors
- Plastic spoons (2 per participant)
- Rubber bands (4 per participant)
- Masking tape
- Plastic straws (4 per participant)
- Popsicle sticks (8 per participant)
- Pingpong balls
- Measuring tape, yardstick or ruler
- Display table

### Activity Preparation

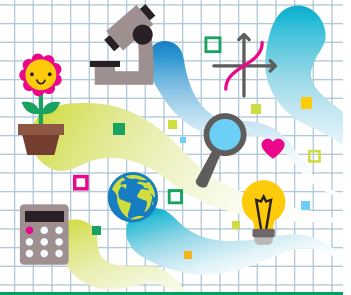
- ▶ Purchase or locate items on supply list.
- ▶ Print one copy of the “Guide for Families” handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- ▶ Print one “Engineering Process” handout per participant or family. Optionally, print and laminate a few to leave on the table.
- ▶ Cut cardboard pieces into 6-inch by 6-inch squares. (Scrap pieces from shipping boxes work great.)
- ▶ Set up the display table and arrange needed supplies



# HEADS IN, HEARTS IN

## Pingpong Catapults

### 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.

A **catapult** is a type of launcher. One type of catapult can be made using a rubber band. The launching process involves a transfer of energy. The energy transfer happens when you pull the rubber band back and then you release it. Rubber bands are elastic. The elasticity allows you to stretch the band and then enables the band to return to its original shape.

#### What you will do and learn:

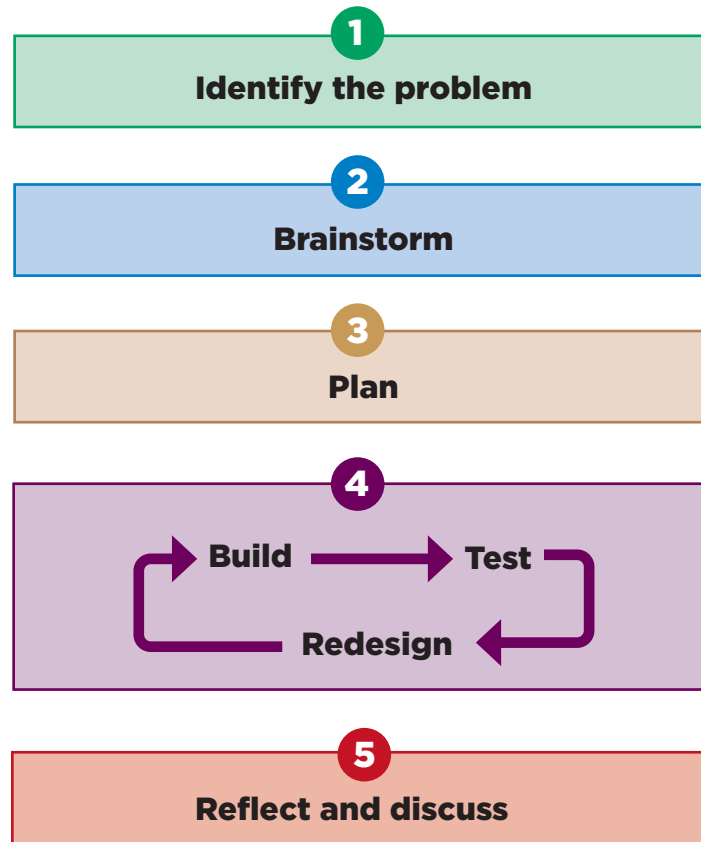
In this activity, you will practice using the engineering process to build a catapult. The goal of this activity is to see how far you can launch a pingpong ball using your catapult.

### Instructions

1. Using the “Engineering Process” handout, start to work through building your catapult.
2. Identify the problem: How can you build a catapult that will launch a pingpong ball as far as you can?
3. Brainstorm: Have you ever seen a catapult? How does it work? What about the catapult makes things fly further? Where does the energy come from to launch a catapult? How will you keep the pingpong ball in your catapult?
4. Plan: Make a drawing or sketch of your catapult design. Gather your materials.
5. Build: Build your catapult using the supplied materials.
6. Test: Load a pingpong ball into your catapult, pull it back and let your pingpong ball fly. Using the measuring tape, yardstick or ruler, measure the distance the pingpong ball traveled.
7. Redesign: Make some changes to your design to improve your catapult. Try some of the ideas you came up with during your brainstorming.
8. Repeat steps 6 and 7 as many times as needed.
9. Reflect and Discuss: What are some real-world uses for catapults? What materials might you use if you wanted to make a catapult on a larger scale? What else could you use besides a rubber band?

# 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?