

## Supplies

- “Guide for Families” handout
- Clear plastic standup display (optional)
- “Engineering Process” handout (1 per participant or family)
- Paper
- Pencils
- Marbles (1 per participant or family)
- Paper towel tubes
- Toilet paper tubes
- Various household materials, such as dominoes, blocks, toy cards, books, balls, fans, plastic tubing, cardboard, cereal boxes, popsicle sticks, string, balloons, tape, rubber bands, cups, bowls, and others
- Display table

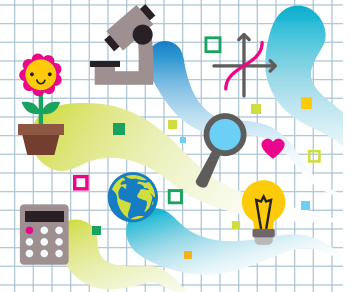
## Activity Preparation

- ▶ 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 the “Engineering Process” handout, one 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

## A Tube Rube 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.

Engineers are in charge of building machines to accomplish many different tasks such as moving materials from one place to another or putting a product together. A **Rube Goldberg machine** is built to accomplish a simple task in an interesting way. (Rube Goldberg was an American cartoonist and inventor known for his cartoons showing complicated gadgets performing simple tasks.)

#### What you will do and learn:

In this activity, you will use engineering skills to design and build a Rube Goldberg machine to get a marble through a cardboard tube and into a cup. You can use any materials to build your machine and build it any way you want as long as it results in the marble moving through a tube and into a cup as the last step. Try using multiple materials to find an interesting way to end up with the marble in a cup.

### Instructions

1. Using the “Engineering Process” handout, start to work through building your Rube Goldberg machine.
2. Identify the problem: How can you move a marble through a tube into a cup with the most steps?
3. Brainstorm: How can you build the machine? What might happen if you pick a different solution?
4. Plan: Make a drawing or sketch of your design. Try to include at least three different steps in your plan. Gather your materials.
5. Build: Build your machine.
6. Test: Test your machine to see if, through multiple steps, you can make a marble move through a cardboard tube and into a cup as your last step. Watch what happens and where the marble lands. Does your machine work and move your marble through the tube and into the cup?
7. Redesign: Make some changes to your design to improve your machine or make it more complicated. 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: How did you find the solution to this problem? What materials could you use instead of the materials provided today? How would it have been different with different materials?