

# Showerhead Showdown Challenge



UNITED STATES  
**AIR FORCE ACADEMY**

PA#: USAFA-DF-2020-208  
Author: Sandy Lamb

Mechanical engineers like to create things and enjoy complex problem solving with fellow team members. They have excellent oral and written communication skills and enjoy the challenge of making things work more efficiently. Mechanical engineers feel successful when their ideas solve problems that make our lives better. They are inquisitive, analytical, innovative and have a desire to help the world around them.



In this challenge you will create a showerhead prototype that will conserve water but still wash off soap. Are you ready to try your hand at mechanical engineering? You will need at least two people on your team.

### Materials:

4 clear plastic cups

Craft foam sheet

Plastic bowl or tub to catch water

Push pins to make holes

Stopwatch or timer app

Pen and permanent marker

Water

Ruler or measuring tape

Scissors

Engineering Design Challenge Sheet

**Ask:** How can your team create a showerhead that will save water but still rinse off soap?

**Imagine:** Make some observations by looking at different types of showerheads. You'll notice that they come in several shapes and sizes. Some have a few large holes while others have small holes. Some even come with a combination of large and small holes. Do the size and number of holes make a difference? Let's see.

### Directions:

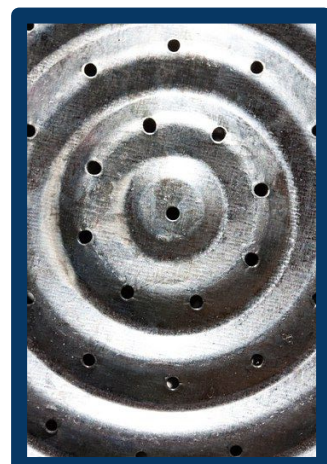
1. Trace the bottom of the cup on a piece of craft foam. Cut the foam out.
2. Use the permanent marker to make a horizontal line across the middle of all four plastic cups. Use a ruler or measuring tape to ensure that the line is in the same spot on all of them.
3. Using a pushpin, carefully poke one hole in the bottom of a plastic cup. Stick the point of a pen in the hole to make it a little larger.
4. Using a pushpin, carefully poke six small holes on the bottom of a second cup.
5. Place the foam circle under the cup with the large hole. Hold the cup over the catch tub. Fill the cup to the marker line with water. Have a teammate record how long it takes for the water to drain from the cup on the engineering design sheet.
6. Repeat the process with the cup with six small holes. .

**Plan:** Now that you have some background knowledge, create a plan for your showerhead. How many holes will you make? Where will they be on the bottom of the cup? On the plan section of the engineering design process page, write down your steps and include a sketch of your hole design for the bottom of the cup.

**Create:** Take a third cup and create your first prototype. Test it out and record how many seconds it took for the cup to drain.

**Improve:** Using the fourth cup, see if you can improve your design. The longer the water stays in the cup, but still flows to rinse off soap, the better your design is. Complete the improve portion on the engineering design process page.

In an average American home, a shower typically lasts 8.2 minutes using 17.2 gallons of water.



Group \_\_\_\_\_

# Showerhead

## Showdown Challenge

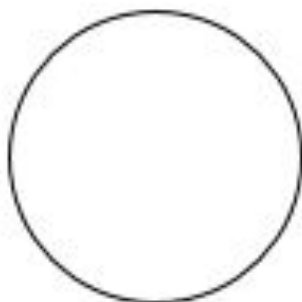
### Ask

How can we create a showerhead that will save water but still rinse off soap?

### Plan

- 1.
- 2.
- 3.
- 4.
- 5.

Our holes will look like this.

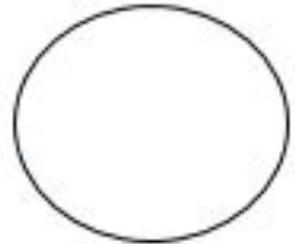


The large hole took \_\_\_\_\_ seconds to empty. 6 small holes took \_\_\_\_\_ seconds to empty.

### Imagine

### Create

Our showerhead looked like this.



### Improve

This is what we did to improve it.