

Step 4: Test the Hypothesis (Part 1)

Once you've written your research question, collected information, identified your variables, and written a testable hypothesis, it is time to conduct the experiment to test your hypothesis. When you are planning a way to test your hypothesis, you should write a step-by-step procedure describing the materials needed, the set-up of the experiment, and the observations and measurements that will be made. The goal of a well-designed experiment is to allow anyone who reads it to understand the process you are using and to allow someone else to complete the experiment just by following your directions.

Read each research question below. A set of experimental procedures follows each research question, but the procedures are out of order. Put the steps in logical order by writing numbers on the lines. (#1 is the first step and so on.)

1. What amount of sunlight is best for growing pea plants?

- _____ Plant one plant in full sun, a second in partial sun, and a third in full shade.
- _____ Measure and record the height of each plant every other day for three weeks.
- _____ Purchase 3 pea plants of the same height.
- _____ Water each plant with the same amount of water (1000 ml) each day.

2. Does salt water or fresh water freeze faster?

- _____ Check on the containers every 10 minutes.
- _____ Fill 2 clear containers with 250 ml of cold water.
- _____ Record observations as you check on containers.
- _____ Add 20 grams of salt to container #1. Do not add any salt to container #2.
- _____ Put the 2 containers in the freezer at the same time.
- _____ Label container #1 "Salt water" and container #2 "Fresh water."

3. Does the thickness of a rubber band affect the pitch of the note created when the rubber band is plucked?

- _____ Observe the pitch of the sound created from each band.
- _____ Pluck each rubber band.
- _____ Gather a thick rubber band, a thin rubber band, and a small cardboard box.
- _____ Stretch both rubber bands around the box so they are side by side.

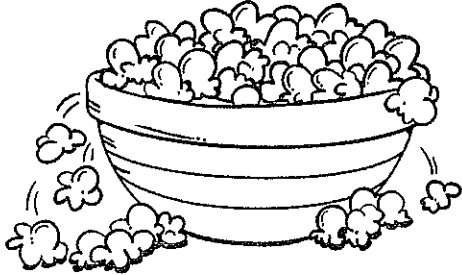
4. Will the shape of an object affect its buoyancy (ability to float)?

- _____ Mold one section of clay into a round ball.
- _____ Observe the results and the water level in each container.
- _____ Place one shaped section of clay in each container.
- _____ Fill 3 small clear containers three-quarters full of water.
- _____ Mold a second section of clay into a square.
- _____ Divide a stick of modeling clay into 3 equal sections. (Weigh them to make sure they're equal.)
- _____ Mold the third section of clay into a wide, hollow boat shape.

Step 4: Test the Hypothesis (Part 2)

It is important that the experiments you design are controlled, fair tests. Only one variable should be manipulated at a time, and everything else needs to be held constant.

Read the following experiment descriptions. Each experimenter has made at least one mistake. Tell what the experimenter did wrong AND suggest how the experiment could be improved.



1. Tara wanted to find out which brand of popcorn results in the fewest unpopped kernels. She purchased 3 of the same size bag of different brands of microwave popcorn. Tara popped Brand A for 3 minutes and 30 seconds, Brand B for 3 minutes and 45 seconds, and Brand C for 4 minutes. She poured each bag into a separate bowl and counted how many unpopped kernels remained.

What did Tara do wrong? _____

How could she improve her experiment? _____

2. Jeremiah is testing which paper towel is most absorbent. He takes 4 different brands of paper towels and cuts them to the same size. He holds each paper towel under running water and observes the results.

What did Jeremiah do wrong? _____

How could he improve his experiment? _____

3. Tina and Jazmine want to know which flavor of hard candy lasts the longest. They choose 4 flavors of candy. Tina puts 2 in her mouth and, at the same time, Jazmine puts 2 in her mouth. They time to see which candy lasts longest.

What did Tina and Jazmine do wrong? _____

How could their experiment be improved? _____

4. Demetrius wants to find out if the size of a ball will affect how high it bounces. He chooses a ping-pong ball, a softball, and a bowling ball. He drops each from a height of 2 meters. His friend holds a meter stick and records the bounce of each ball.

What did Demetrius do wrong? _____

How could he improve his experiment? _____

5. Now that you can find the flaws with others' experiments, it's time to try writing your own procedures! Below are three research questions. There are many different ways to set up experiments for these questions. Choose one of the questions (circle your choice) and, on the back of this paper, write a set of experimental procedures to test the question. Make sure the steps are specific enough that someone could do your experiment without asking you any questions!

Question A: Which battery lasts longer?

Question B: Which paper towel is strongest when wet?

Question C: Which laundry detergent removes grass stains best?