Activity 3 Balloon Bed of Nails

In this activity you will make a bed of toothpicks to test the pressure required to pop a balloon.

Concepts Covered

- Force
- Area
- Pressure

What You Need

- cardboard sheet
- two pieces of polystyrene
- tape
- toothpicks
- balloon
- scissors

Popping a balloon with a single toothpick

1. Cut the cardboard in half. Share the other half of the cardboard with another group.
2. Fold the cardboard around the polystyrene and tape the cardboard into a square tube.
3. Remove the polystyrene, place a single toothpick in the center of the polystyrene, and put the polystyrene back into the cardboard tube.
4. Select and blow up 9 balloons. Fill the balloons with different amounts of air (three of each).

Prediction

1. Predict the force needed to pop the balloons. Remember force is mass·gravity.
2. Predict whether the force increases or decreases with balloon size. Why?

Measurement

1. Place masses on the cardboard resting on the balloon.
2. Record the force per toothpick that pops the balloons (F = m·g).

Analysis

1. Calculate the force to pop each balloon if the number of toothpicks is increased to 20.
2. Calculate the force to pop each balloon if the number of toothpicks is increased to 50.

Make the bed of toothpicks

1. Remove the polystyrene foam and make a bed of toothpicks with 20 toothpicks arranged in a regular pattern.
2. With the second piece of polystyrene foam, make a bed of toothpicks with 50 toothpicks arranged in a regular pattern.
Measurement

3. Place masses on the cardboard resting on the balloon.
4. Record the force per toothpick that pops the balloons \( (F = m \cdot g) \) for each balloon and for each bed of toothpicks.

Analysis

3. Compare the force that you calculated in the earlier step and the force measured to pop the balloons.
4. Did the forces compare? Why or why not?