

## Understanding Density

Pillow fights are a lot of fun. Pillows are usually filled with soft, fluffy stuffing, like feathers. Feathers are ideal for pillow fights because they have a low density - they don't hurt much when you swing a pillow filled with them at your friend. In this lesson, we will learn about density and observe the density of objects like feathers, cotton candy and bricks.

Density is a word we use to describe how much space an object or substance takes up (its volume) in relation to the amount of matter in that object or substance (its mass).

Another way to put it is that density is the amount of mass per unit of volume. If an object is heavy and compact, it has a high density. If an object is light and takes up a lot of space, it has a low density.

So, if we know the volume and mass of an object, we can calculate the density using the equation  $\text{density} = \text{mass} / \text{volume}$ .

divided by

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

amt. of matter  
amt. of space

### Mass

**Mass** is a measurement of the amount of matter in an object or substance. Mass is very important because it's a universal measurement - it's used by scientists all over the world and even astronauts on the International Space Station. Mass is measured in grams (expressed as g) and kilograms (expressed as kg).

### Volume

**Volume** - how much space an object or substance takes up - is measured in cubic meters, but you'll more commonly see it in the simplified form of liters (expressed as L) and milliliters (mL). We often use measuring cups to find out how much volume a substance has, though we can also find the volume of an object by measuring its sides.

## How can density help explain the results in our sinking and floating pop lab?

Density	
Coke	D Coke
390	360
380	380
1.03	.95

- The mass of plain water is 1 gram for every volume of 1ml. This means water has the density of 1 g/ml (We usually say cubic centimeter [cm<sup>3</sup>] instead of milliliter [ml] but since they are the same volume this doesn't concern us much.)
- Both cans of Coke had a volume of 380cm<sup>3</sup> including the can (or 380 ml.)
- The regular Coke had the mass of about 390g.
- The diet Coke had the mass of about 360g.
- Anything with a density greater than water will sink in water and anything with a density less than water will float in water.

Are the densities of each can of pop more than or less than the density of water?  
Explain for both the regular and diet.

Does this explain our results? yes.

Density of coke is \_\_\_\_\_  
than the density of water.  
AND  
Density of diet coke  
is \_\_\_\_\_ the density of water.

Explain,  
here!