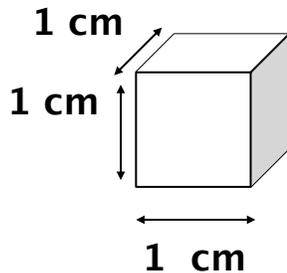


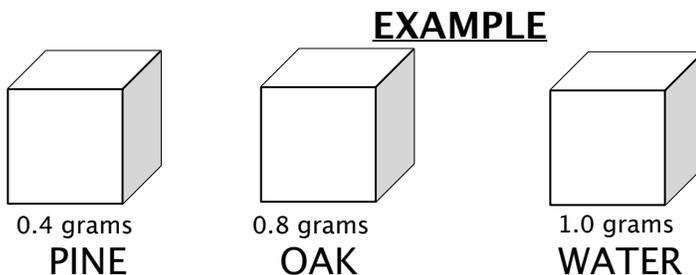
AIM: What does an object's density tell us?

**Density = mass/volume measured in  $\text{g}/\text{cm}^3$**

**This means it measures how much mass is in one cubic centimeter**



**THINK: How much mass is packed into this volume?**



For example, every cubic centimeter of pine has approximate 0.4 grams. However, the same sized piece of oak would have a mass of 0.8 grams--which means an equal sized piece will have twice the mass! A cubic centimeter of water would even be heavier than a cubic centimeter of oak.

**THINK: Density is a ratio between mass and volume**

**Ex. Boys to girls in class:**

**10 boys = 2 boys      (2 boys per one girl)**  
**5 girls                    1 girl**

**However there is more than one way to obtain a ratio of 2 boys to one girl in class. The class may have 20 boys and 10 girls too. Or 30 boys and 15 girls. In each case, when we simplify, there is twice the number of boys than girls!**

**For density we are saying “For every 1 cm<sup>3</sup>, how much mass is there?” (Instead of, “for every girl, how many boys are there?”)**

**In a piece of galena (7.5 g/cm<sup>3</sup>) there is a lot of mass compared to its volume because it has a ratio of 7.5 grams of mass per every 1 cubic centimeter. If we had 10 cubic centimeters, we would have 75 grams of mass (but 75 divided by 10 still equals the ratio of 7.5 to 1.)**

**In a piece of pine (0.4 g/cm<sup>3</sup>) there is low mass compared its volume because for every one cubic centimeter there is only 0.4 grams of mass. That is less than one gram of mass for every cubic centimeter!**

**If we had 10 cubic centimeters of pine, how much mass would it have?**

## **Some final things to study!**

Weight is not the same thing as density!

A heavy object may have a low density and a light object may have a high density.

For example, a pine tree log can have a mass of 454,000 grams (1000 pounds) but its density is still 0.4 grams per cubic centimeter, and it will still float!

A pebble can weigh only 2 grams, and still sink in water because its density is 3.0 grams per cubic centimeter.

Since density is a ratio of mass to volume, an object has the same density no matter what its size, mass, or shape.

However, heating an object lowers its density and cooling an object raises its density

Adding pressure to an object raises its density (molecules packed closer together)

A denser object will plow through a lower density object (example-- a pebble sinking in water.)

A lower density object will float in a higher density object (example a pine log in water.

If we plot volume vs. mass on a graph, the slope of the line tells us the density of the object.

The greater the slope, the greater the density.

The lower the slope the lower the density.