Calculating Density

Name: _____ Date: _____
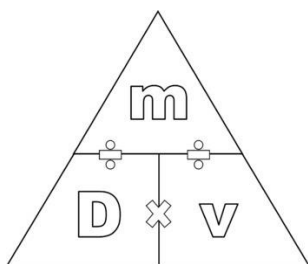
Density is a _____ of matter; that means it can be measured and calculated for any object or substance.

The Density of an object is **calculated** by dividing the _____ by the v_____ that it takes up.

The **equation** is:

$$D = \frac{m}{V}$$

The units can be g/cm^3, kg/cm^3, g/ml, kg/ml, etc.

This "triangle" can be helpful with Calculations.

- If you know the Mass (m) and Volume (V), you can calculate the Density (D) using division. If you know the Density of an object and its volume you can calculate the Mass by multiplying Density and Volume. If you know the Mass of an object and its Density you can calculate the Volume by dividing Mass and Density.
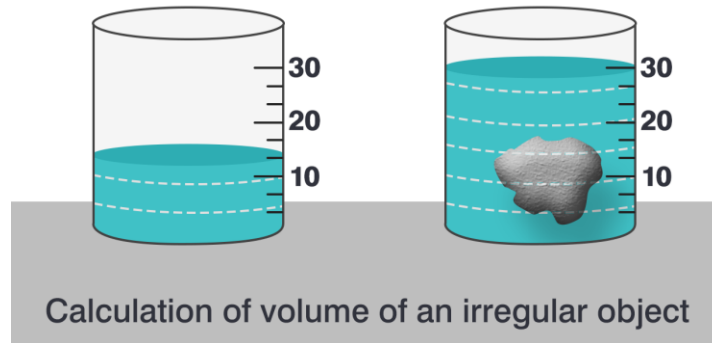
Determining Density

The density of an object can be determined in a couple of ways.

Displacement Method:

This method is used for irregularly shaped objects. There a couple of ways this can be done.

Key point: $1\ ml\ =\ 1cm^3$ (1 ml volume is the same as 1 cubic centimetre volume)

Calculation of volume of an irregular object

Procedure:

Step 1: Add water to a measuring container. Record the volume of water.

Step 2: Place the object in the water. Record the new volume of the water.

Step 3: Subtract the first volume from the second volume; this is the volume of the object.

Step 4: Measure the mass of the object; then divide the mass by the volume.

Example Above:

The mass of the object is $120g$. Volume 1 is $13.5\ ml$ and volume 2 is $30\ ml$.
Calculate the volume.

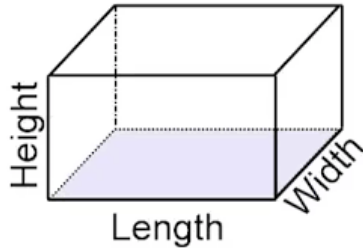*Initial Volume:* _____   Mass: _____

Final Volume: _____
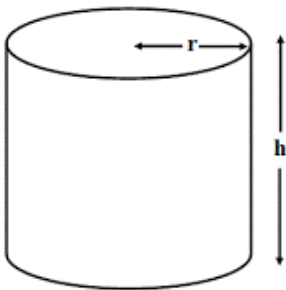
Volume of object: _____

Density: _____

Direct Method:

This method can be used for regularly shaped objects (blocks, cylinders, etc.).

Volume of **Rectangular Prism**:

$$V = l \cdot w \cdot h$$

## Volume of **Cylinder**:

$$V = \pi r^2 h$$

Procedure:

Step 1: Measure the dimensions of the object and use the appropriate formula to calculate the volume (using the correct units that you measured in – units will be "cubed")

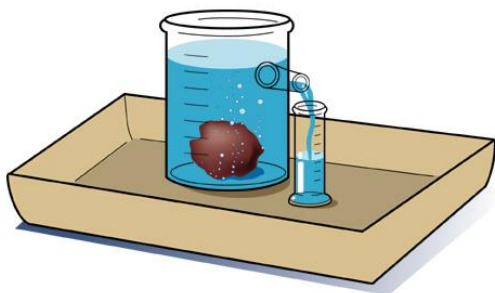**Step 2:** Measure the mass of the object; then divide the mass by the volume.

Example:

The block below has the dimensions show and has a mass of 300g. Calculate the density of the object in g/cm³.

4.2 cm

3.2 cm

4.5 cm
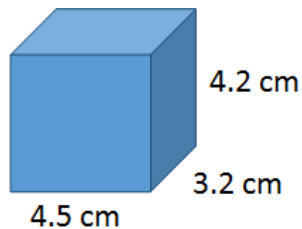
Density: _____

Calculating Density with an Overflow Can:

An overflow can is a good way to measure the volume of a larger object.

Procedure:

Step 1: Fill the can until water starts to pour out

Step 2: Place the solid in the can

Step 3: Collect the overflow water in a graduated cylinder. The volume of the water is the volume of the object. (remember: $1ml = 1cm^3$) $V_{overflow} = V_{object}$

Step 4: Measure the mass of the object; then divide the mass by the volume.

Example:

The irregular shaped object has a mass of 110g. The overflow from the can is measured to be 235 ml. Calculate the density of the object in g/cm^3.