

Density Lab

Mass: how much matter is in an object

Volume: the amount of space something takes up

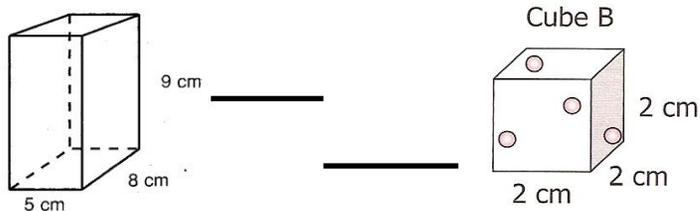
Density: how much matter there is within a given amount of space

$$\text{density} = \text{mass} \div \text{volume}$$

Objective: determine the density of three objects, and compare the densities with a bar graph.

Finding the volume of regular solids

You may remember from math class that to find the volume of a regular solid you multiply length \times width \times height. When we work with density and the volumes of regular solids we work with the unit of cm^3 (cubed). Did you know that 1 mL equals 1 cm^3 ? See if you can calculate the following volumes.



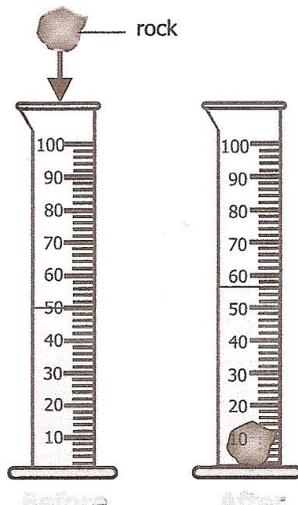
Finding the volume of irregular solids

Typically, to find the volume of an object you multiply length \times width \times height, but if the object is irregular you must use another method. The easiest is to determine how many mL it displaces when it is put into water. Look at the picture.

1. What is the volume before the rock is placed in the cylinder? _____

2. What is the volume after?

3. What is the difference? _____



The difference or displacement of water tells you the volume in (mL) of the rock.

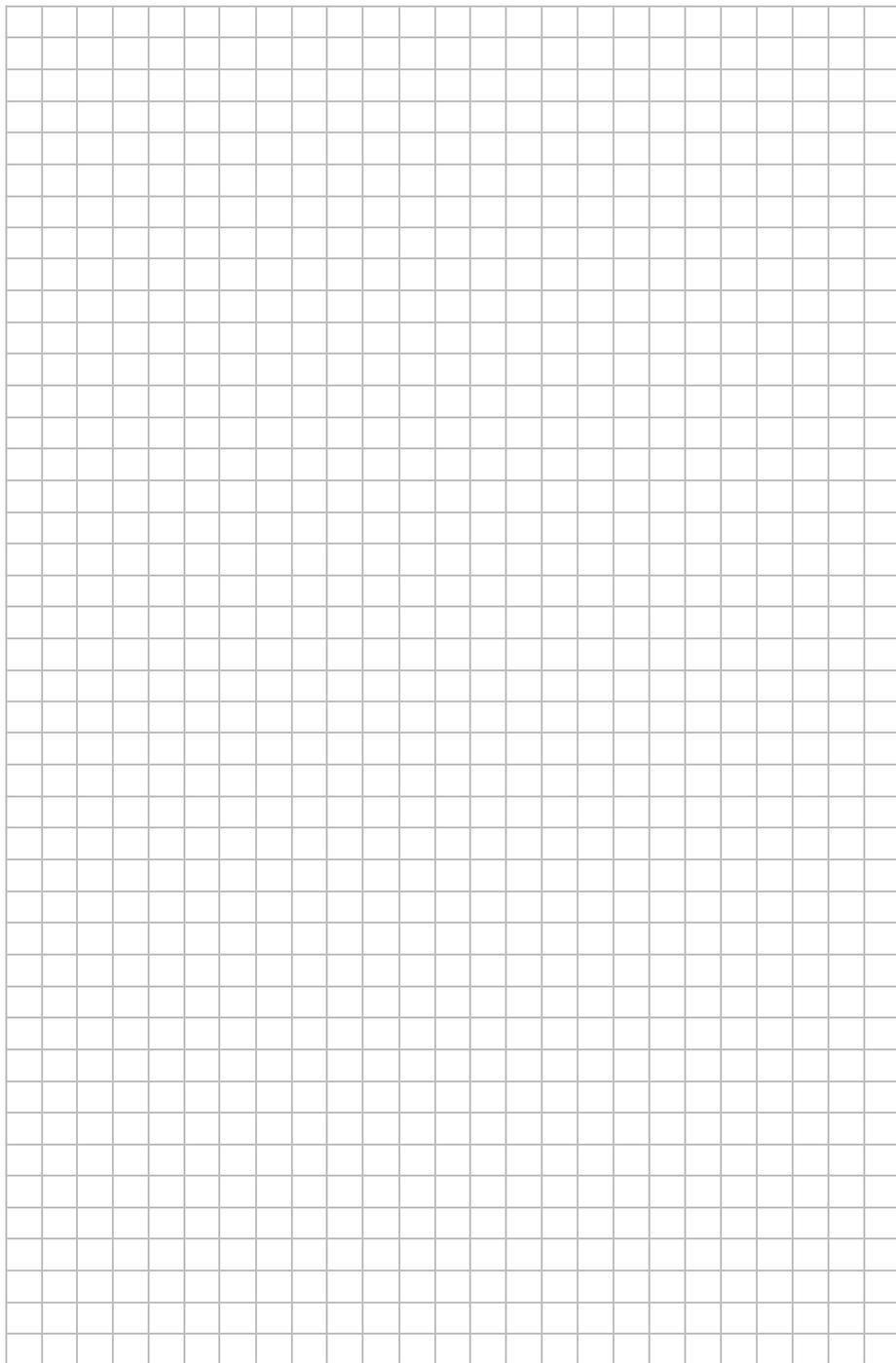
Procedure to find an object's density:

- 1) Measure the object's mass with the triple-beam balance.
 - a) Confirm that all of the weights are set to zero and that the balance reads zero before you begin. If your balance needs calibration, use the knob under the plate, or ask me for assistance.
 - b) Place the object on the plate, adjust the weights (this takes practice!), and record the mass to the hundredth of a gram (two decimals).
- 2) Measure the object's volume.
 - a) If the object has a regular shape, like a prism, then record the volume in cubic centimeters (round to a whole number).
 - b) If the object is irregular, like a rock, then use a beaker of water to measure the rock's displacement in milliliters.
- 3) Divide mass by volume, round to one decimal place, and record in the data table.

Hint! When you measure the density of something with an irregular shape, like a rock, you can use more than one rock to make it easier to see how much the water changes height. Just make sure to record the mass of those same rocks, too! 😊

Record your data here:

Object	Mass (g)	Volume (cm^3 or mL)	Density (g/cm^3 or g/mL)



Density practice problems (round your answer to one decimal place!).

YOU MUST SHOW WORK TO RECEIVE CREDIT

1. A block of aluminum occupies a volume of 15.0 mL and has a mass of 40.0g. What is its density?
2. A rectangular block of copper metal weighs 1900g. The dimensions of the block are 8.4cm by 5.5cm by 4.6cm. From this data, what is the density of copper?
3. A block of lead has dimensions of 4.5cm by 5.2cm by 6.0cm. The block weighs 1600.0g. From this information, calculate the density of lead.
4. 29.0g of iron is added to a graduated cylinder containing 46.0mL of water. The water level rises to the 49.0mL mark. From this information, calculate the density of iron.
5. A cup that weighs 350.0g is filled with 225mL of a liquid. The weight of the cup and the liquid combined is 700.0g. From this information, calculate the density of the liquid.