Determining Density

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An Introduction to Density

Density is a property of a material that compares the mass of an object and its volume. The density of a substance can assist us in identifying an element or mineral. The density also may cue us about the changes in a substance, such as water, when it goes through a density shift near its freezing point.

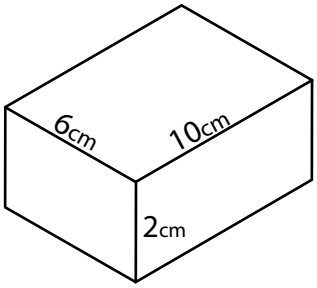
Finding the Density of a Regular-shaped Object

Finding the density of a regular-shaped object is very straightforward. Density equals mass divided by volume

The formula for Density is: **D = M/V**

First, find the volume of the object by measuring the length, the width, and the height in centimeters. Multiply the three dimensional values together. The units will be expressed as cm^3.

V = L x W x H



V = 10cm x 6cm x 2cm

V = 120cm³

Next, find the mass by using a triple beam balance. Record the mass in grams.

Now, find the density of each regular-shaped object by taking the mass of the object and dividing it by the volume as the formula above indicates.

Show Your Work Below:

	Object #1	Object #2
Name Object:	_____	_____
Object Mass:	_____	_____
Object Length:	_____	_____
Object Width:	_____	_____
Object Height:	_____	_____
Object Volume:	_____	_____
Object Density:	_____	_____

VOCABULARY

Area

Density

HELPFUL TERMS

Mass

Surface area

Volume

Weight

Inside This Packet

MATERIALS NEEDED

Graduated cylinder

Irregular-shaped objects

Metric ruler

Regular-shaped objects

Triple-beam balance

Students should be able to:

Calculate the density of regular and irregular-shaped objects

Finding the Density of an Irregular-shaped Object

Take a large object and submerge it in a pail of water. Take a small object and submerge it in a pail of water. What are your observations? Try two other objects of different volumes. What did you notice? The volume of the object gets displaced by an equivalent amount of water. Therefore we can determine the volume of an object by measuring the amount of water that it displaces. Using graduated cylinders or large beakers makes these measurements easier to read.

Find a rock or mineral specimen that will fit into a graduated cylinder.

While dry, measure the mass of the object using the triple beam balance.

Object Mass: _____

Find the volume of water displaced by your selected specimen.

Object Volume: _____

Calculate the density of the object and show your work.

Object Density: _____

Questions:

1. Does the density of an object change if you take it to the moon?

_____

2. If an object is split into two parts, what happens to the density?

_____

_____

3. Explain what is happening in the following series of numbers and units.

3 cm, $3cm^2$, $3cm^3$

_____

_____

4. What are some possible sources of error in the density calculations used with the displacement of water method?

_____

_____

5. Calculate below the percent error for your sample. What does the percent error tell us?

_____

_____

Information for the Teacher

Density Calculations

For the calculation of the densities choose two regular-shaped objects that are similar in volume with very different masses. Use a known substance with a known density for the irregular-shaped object.

Also, review the percent error formula:

$$\% \text{ error} = \frac{(\text{experimental value}) - (\text{true value})}{\text{true value}} \times 100$$

Have the students calculate their % error given the actual density of the material. Discuss their percent error values.

New York State Standards

Middle School Activity

Standard 1: Math: Key idea 1

Standard 4: Key idea 3