

Density Calculations

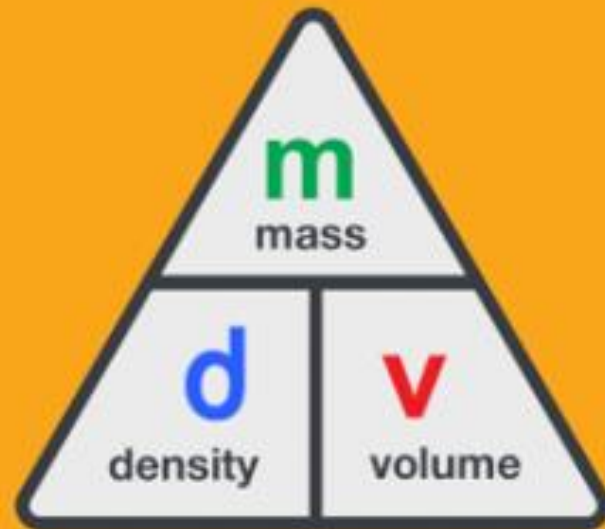
Density Formula

density

mass

$$d = \frac{m}{v}$$

volume



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

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

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

I Can Statements

At the end of this lesson, you should be able to say, with confidence:

- I can use the triangle method to calculate the values of density, mass, or volume

Calculating Density

We can calculate the density of any substance by dividing its mass by its volume.

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

Scientific Equations

Scientific equations show the relationship between various quantities and different symbols are used to represent each quantity.

$$d = \frac{m}{v}$$

Symbols

Density = d

Mass = m

Volume = v

Units

Each variable in a scientific equation also has an associated unit that must be included in the answer.

Units

Density (d) = g/cm^3 or g/mL

Mass (m) = g

Volume (v) = cm^3 or mL

Solving for Other Variables

Once you know the basic equation, you can change the equation to solve for the other quantities or variables, by using basic algebra.

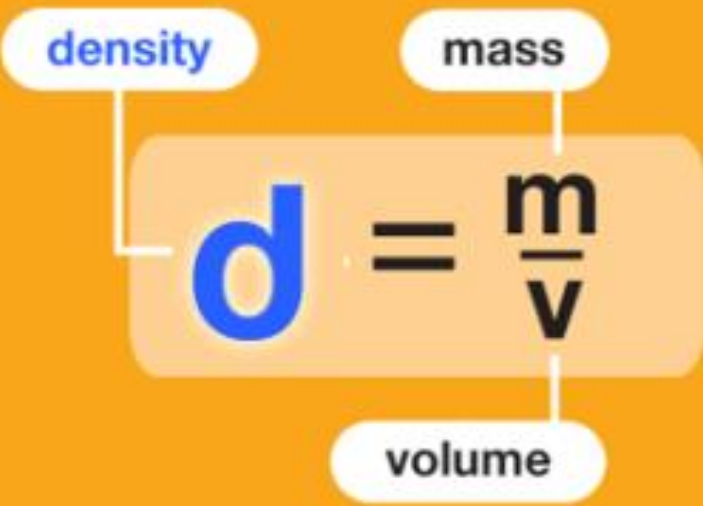
$$D = \frac{M}{V} \rightarrow (V)D = \frac{M}{V} (V) \rightarrow VD = M$$

$$VD = M \rightarrow \frac{VD}{D} = \frac{M}{D} \rightarrow V = \frac{M}{D}$$

Triangle Shortcut

But when you have three variables, there is a faster way to solve for the other two variables by using the triangle shortcut.

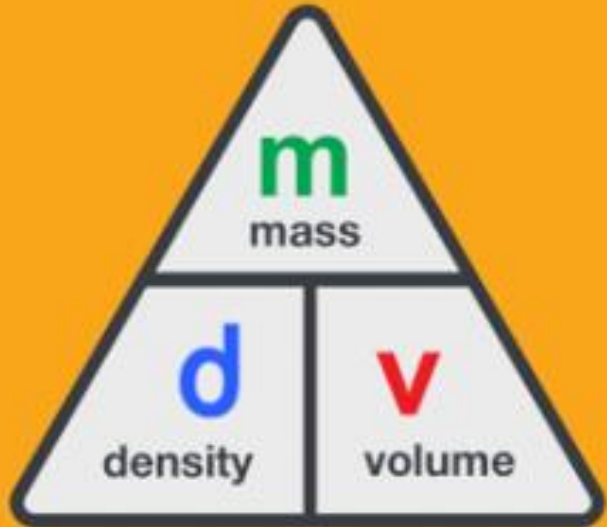
Density Formula



density = $d = \frac{m}{v}$

mass

volume



m
mass

d
density

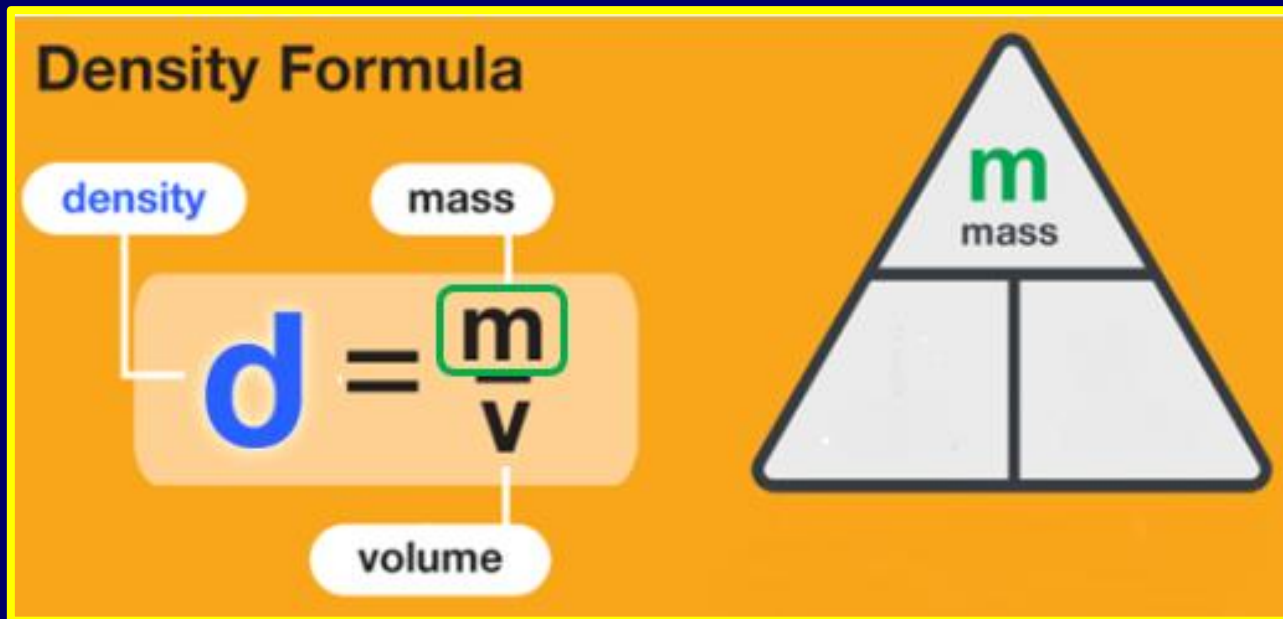
v
volume

density = *mass* ÷ *volume*
mass = *density* × *volume*
volume = *mass* ÷ *density*

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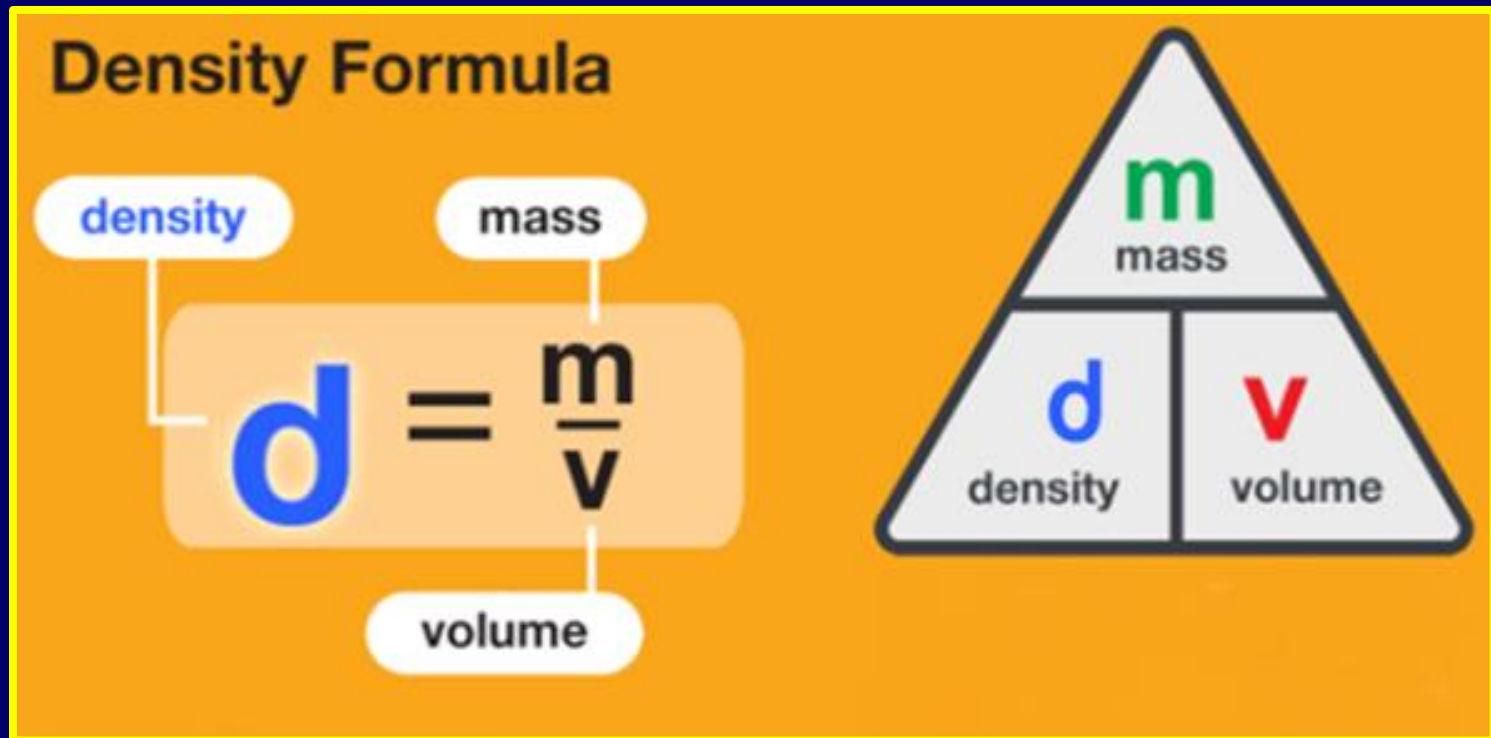
Triangle Shortcut

With the triangle shortcut, you place whatever is on top of the fraction in the top portion of the triangle.



Triangle Shortcut

The other two variables go into the places at the bottom of the triangle.

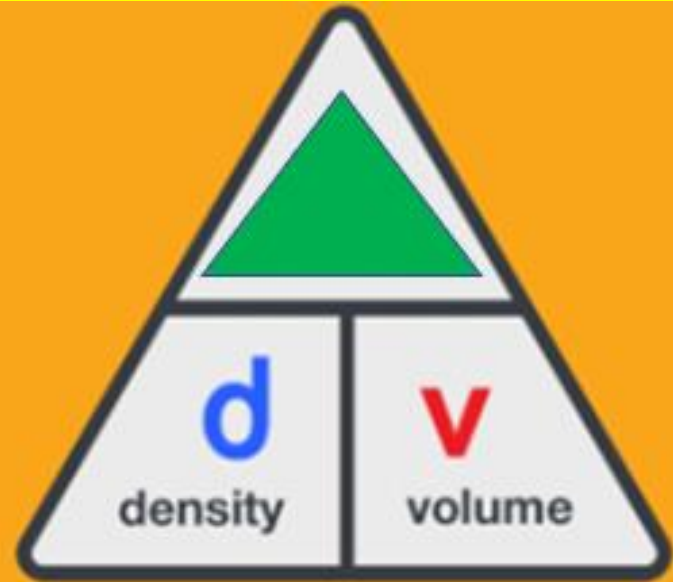


Triangle Shortcut

To write the equation for mass, you simply cover up mass, and you are left with Density next to Volume.

Mass Formula

$$m =$$



Triangle Shortcut

When two variables are right next to each other, it means you are supposed to multiply.

Mass Formula

$$m = dv$$

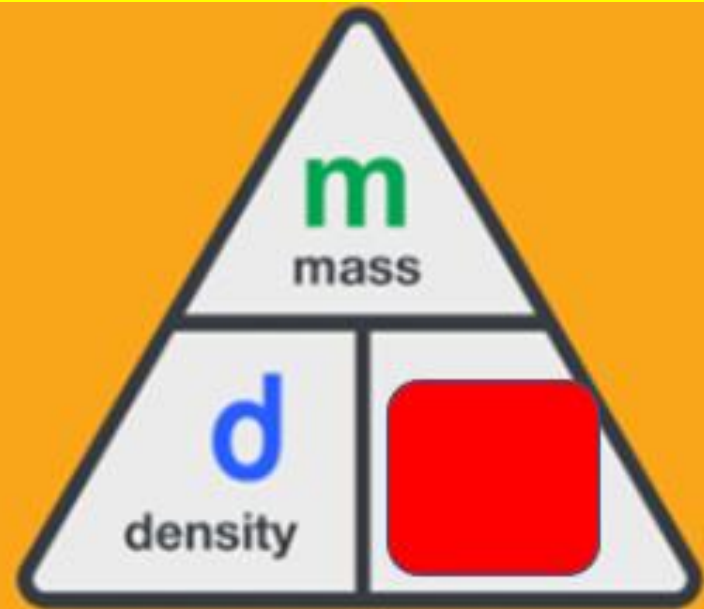


Triangle Shortcut

To write the equation for volume, you simply cover up volume, and you are left with Mass over Density.

Volume Formula

$$V =$$

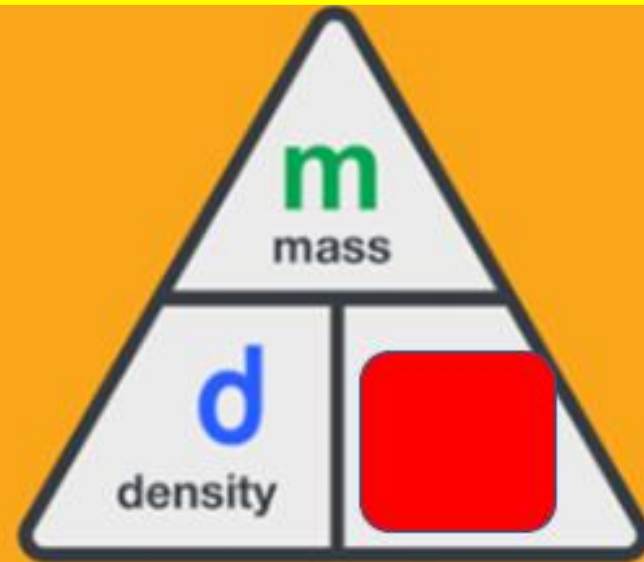


Triangle Shortcut

When one variable is on top of another variable, it means you are supposed to divide.

Volume Formula

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



Example Problem

0.259 cm³ of gold has a mass of 5 grams. What is the density of gold?

First Step

Figure out which variable you are being asked to calculate

What is the density of gold?

Second Step

Figure out which equation to use

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

Example Problem

0.259 cm³ of gold has a mass of 5 grams. What is the density of gold?

Third Step

Find the known values for the other two variables in the problem.

$$m = 5 \text{ g}$$

$$V = 0.259 \text{ cm}^3$$

Example Problem

0.259 cm³ of gold has a mass of 5 grams. What is the density of gold?

Fourth Step

Place the known values into the equation and solve for the answer.

$$m = 5 \text{ g}$$

$$V = 0.259 \text{ cm}^3$$

$$d = m / v = 5 \text{ g} / 0.259 \text{ cm}^3 = 19.3 \text{ g} / \text{cm}^3$$

Metric Density Units

Confused about whether to use the density unit of g/cm^3 or g/mL ?

If it is a solid, the metric unit for the density is usually g/cm^3 .

If it is a liquid, the metric unit for the density is usually g/mL .

But this is not always the case.

Just be sure to refer to the unit used for volume in the problem.

The End

