

Density!!!!!!

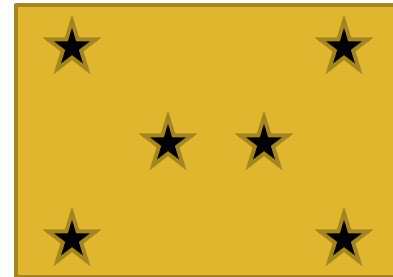
Let the fun begin!

What is Density?

Density is....

- “Mass per unit volume”
- How closely packed the “stuff” is within an object.
- If something is *more dense* that means more *stuff* is taking up that objects space, and is more closely packed.

Which is denser?

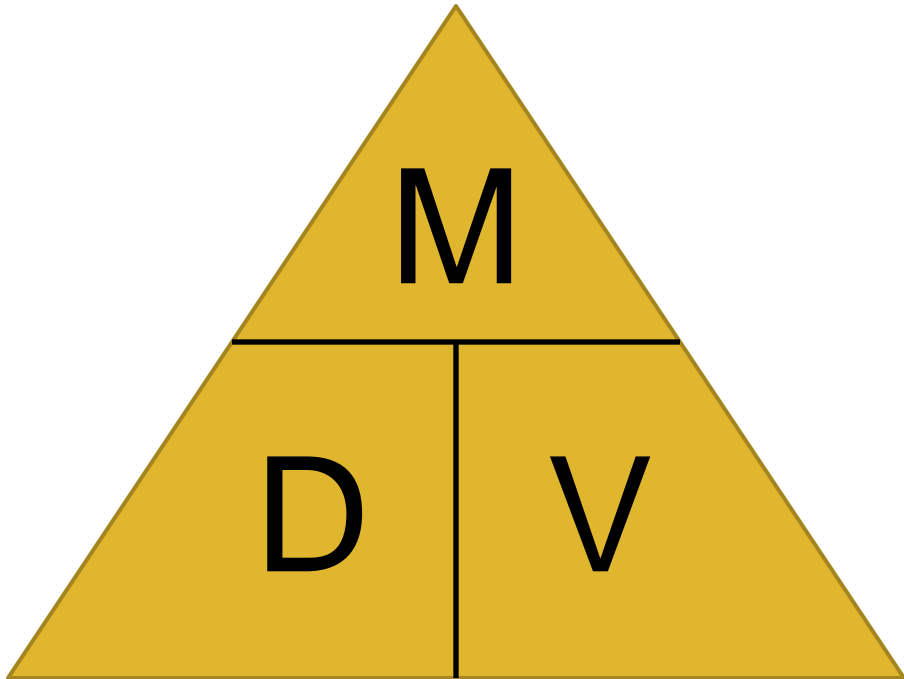


Density Examples and other important information

- An elevator with 15 people in it would be more dense than the same elevator with only 3 people in it.
 - Density does depend on size as well as how compact the molecules are inside:
 - If I have the same amount (say 10g) of an object that is extremely dense and an object that has a much lower density (say gold versus Styrofoam) I will need much more of lower density substance to get 10 grams worth than the denser substance.
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How do I calculate Density?

The triangle of power!



- Density = Mass/Volume
 - Mass = Density x Volume
 - Volume = Mass /Density
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Density of water (important to know)

- Water has a density of 1g/mL
 - 1 gram for every 1 milliliter.
 - If I have 20 grams of water, I have 20 ml of water.
 - If I have 50ml of water, I will have 50 grams of water.
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Floating and Sinking with Density

- If something has a greater density than 1g/mL then it will SINK
 - ex: $3\text{g/mL} > 1\text{g/mL}$
 - If something has a smaller density than 1g/mL then it will FLOAT!!!
 - ex: $.5\text{g/mL} < 1\text{g/mL}$
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More floating and Sinking

- That same “rule” applies for any fluid. As long as the object/liquid you are putting into the fluid has a lower density (smaller number) it will ALWAYS float.
 - As long as the object/fluid has a greater density (larger number), it will ALWAYS sink!
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A test to see if you were paying attention:

- 5 g/mL
 - 2 g/cm³
 - .8g/mL
 - 1.5 g/mL
 - .99 g/cm³
 - 1.01g/cm³
- Sink!
 - Sink!
 - Float!
 - Sink!
 - Float!
 - Sink!
-

What *IS* Volume??

Volume is...

- How much space an object takes up or occupies.
- This includes all substances:
 - solids, liquids, gases



Which has the biggest volume??

Mass vs. Weight

Mass is...

- The amount of matter in an object.
- How much “stuff” is inside of it.

Weight is...

- A reflection of gravity’s pull on an object.
 - Hence.... People weigh less on the moon because there is a smaller force pulling them down. (but their *mass* stays the same!)
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What about units??

Density:

- Solids: g/cm^3
- Liquids: g/mL

Mass:

- Grams

Volume:

- Solids: cm^3
- Liquids: mL

Density units are special

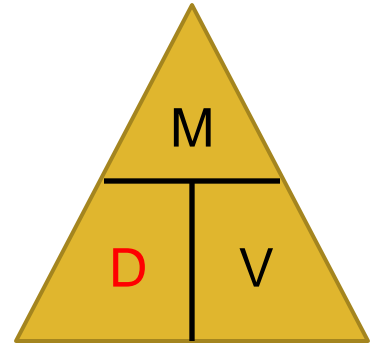
- Density's units are always written as:
 - g/ml or.... g/cm³
 - This means grams *per* ml or cm³
 - If I have 5g/ml, that means for every 5 grams, I have 1ml. Therefore, if I have 20 grams, I will only have 4ml of fluid. This liquid would be more dense than water
 - If I have 12g/cm³, that means I have 12g for every 1cm³, so, if I have 3cm³, then I will have 36g. This is more dense than water.
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Let's try a couple of problems!

If I fill a cup with 250 mL of gasoline, and the mass is 200 grams, what is its density?

I'm solving for density.... So what do I do with the triangle of power???

Cover "D" and find out that I divide mass by volume!



$$D = ??$$

$$M = 200 \text{ g}$$

$$V = 250 \text{ mL}$$

$$D = m/v$$

$$D = 200\text{g} / 250 \text{ mL}$$

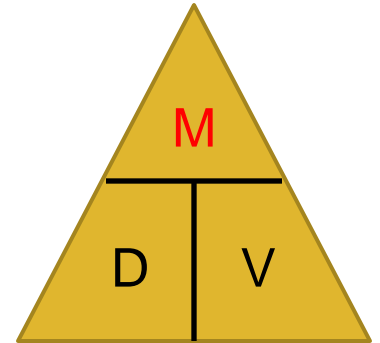
$$D = .8 \text{ g/mL}$$

Let's try a couple of problems!

Chloroform has a density of 1.73 g/ml, if I have 25 mL of it, what is the mass?

I'm solving for mass.... So what do I do with the triangle of power???

Cover "M" and find out that I multiply density by volume!



$$D = 1.73 \text{ g/mL}$$

$$M = ??$$

$$V = 25 \text{ mL}$$

$$M = D \times V$$

$$M = 1.73 \text{ g/mL} \times 25 \text{ mL}$$

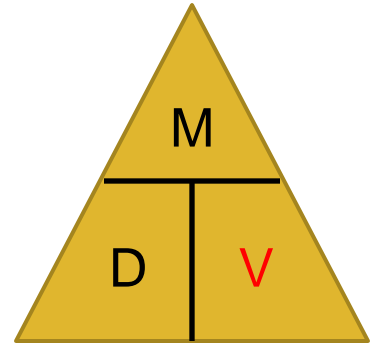
$$M = 43.25 \text{ g}$$

Let's try a couple of problems!

Glycerin has a density of 1.26 g/ml, if I have 25 grams of it how much do I have in mL?

I'm solving for volume.... So what do I do with the triangle of power???

Cover "V" and find out that I divide mass by density!



$$D = 1.26 \text{ g/mL}$$

$$M = 25 \text{ g}$$

$$V = \text{????}$$

$$V = M/D$$

$$V = 25 \text{ g} / 1.26 \text{ g/mL}$$

$$V = 19.84 \text{ mL}$$
