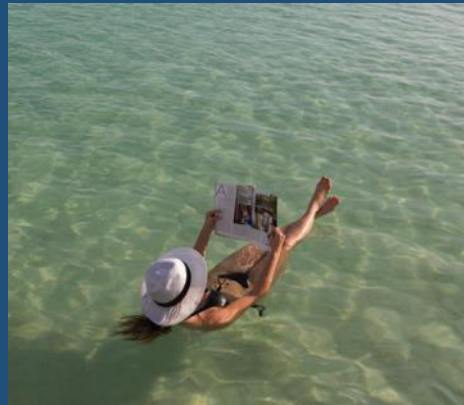
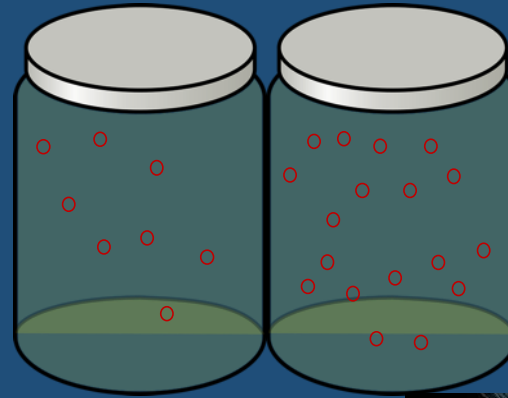


Mass, Volume, Density, and Buoyancy Lesson

1. Mass
2. Mass vs weight
3. Volume
4. Density
5. Archimedes
6. Buoyancy
7. Water



TeachWithFergy

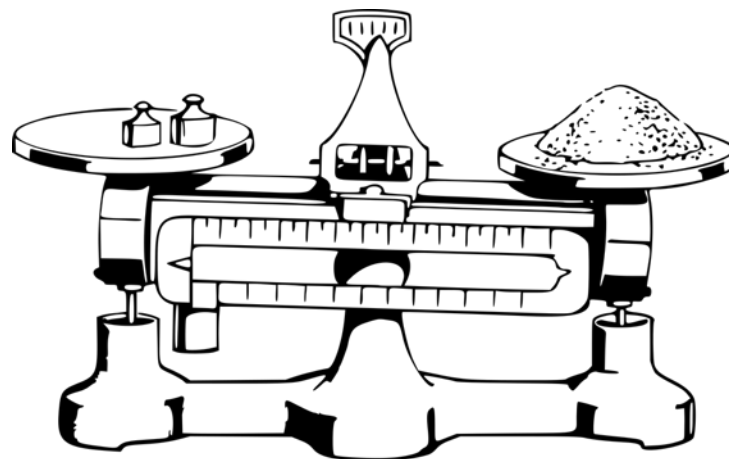
Preview File

Please enjoy this preview of your Student Version of the lesson. I've created this PDF for ease of viewing and to decrease the file size but of course, your lesson will be in PowerPoint format.

- Some slides appear blank because they have been removed.
- Student versions have portions of the text removed which is given in the teacher version and appear as _____
- Other slides may have on them, this represents writing that has been removed.

Mass

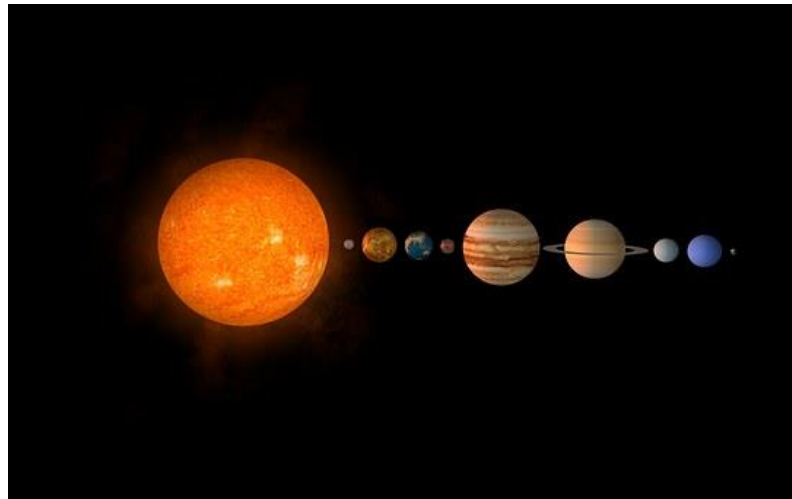
- Mass –
- Measured using a balance compared to a known amount of matter (known mass)
- _____



Mass

- _____

- Your mass would be the same anywhere in the Universe, because the amount of matter inside you is the same everywhere in the Universe.



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Practice

If a 20 kg object experiences an acceleration due to gravity of 10 m/s^2 , what will be its weight in Newtons?

Practice

A 100 kg person stands on a scale on the moon, looks down, and sees a reading of 160 N. What is the acceleration due to gravity on the moon?



Practice

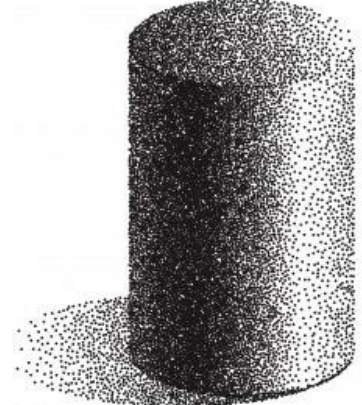
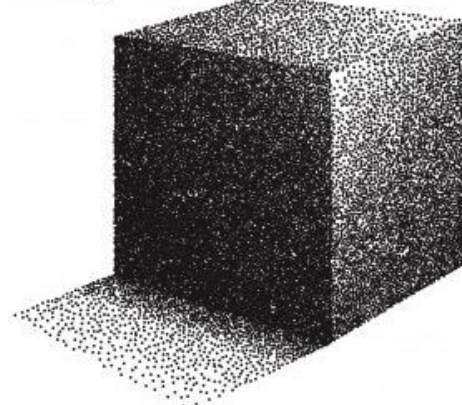
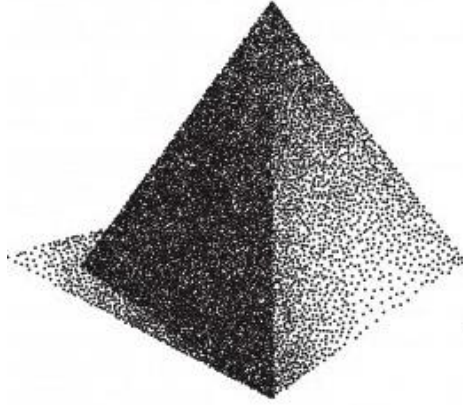
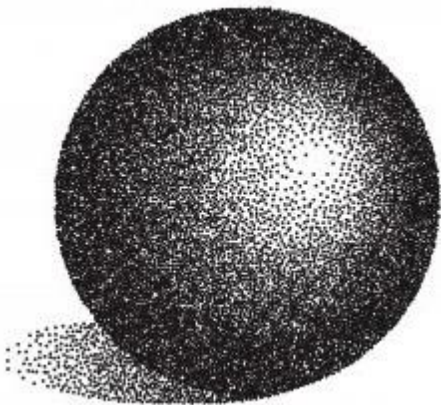
You have If you go to the moon, which has a gravity that is 0.165 of Earth's,

- a) what will your mass be?

- b) what will your weight be in pounds?

Volume

- _____
- Measured in milliliters (mL), liters (L), and centimeters cubed (cm^3).
- Area –



Volume

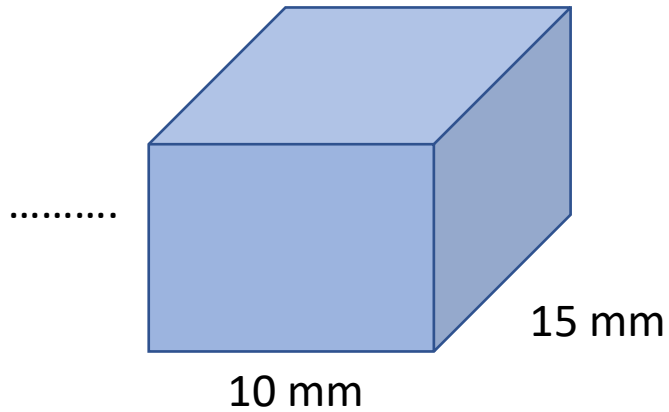
- For irregularly-shaped objects, ...
- When an object is placed in water, it will displace (move) its volume in water away
 - To determine the volume of the object,
.....



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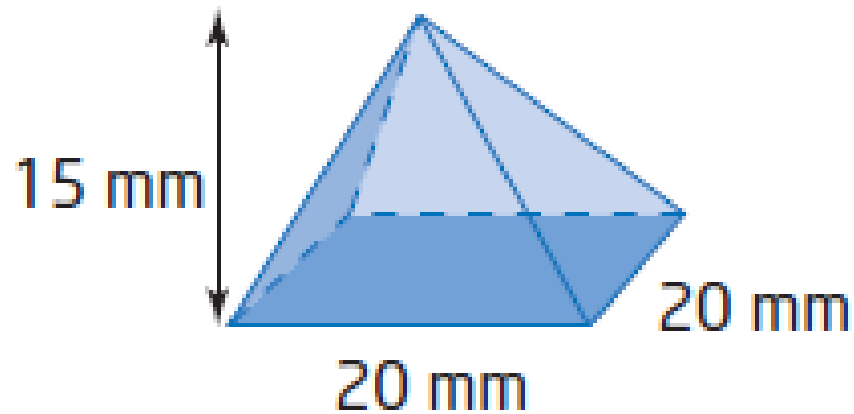
Practice

Determine the volume of the object.



Practice

Determine the volume of the object.



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Practice

Determine the volume of Spaceship Earth at Epcot Center, Walt Disney World.



Density

- Density –
- _____



Brick → lots of stuff per volume = high density



Sponge → less stuff per volume = low density

Density

- Which is heavier?



1 kg of feathers

OR

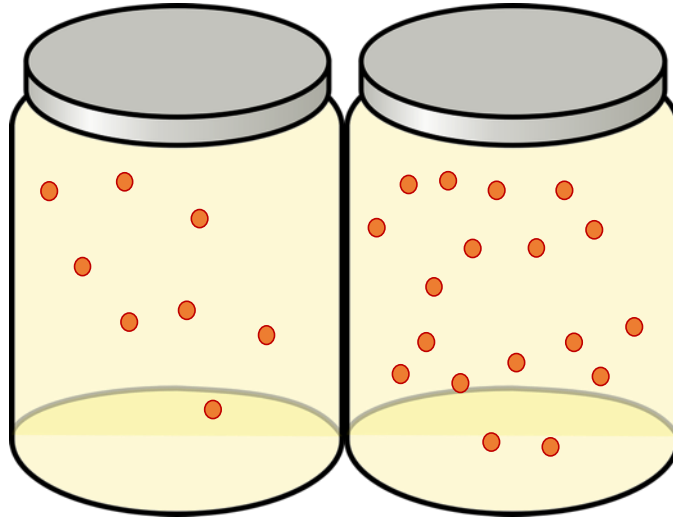


1 kg of lead

- _____

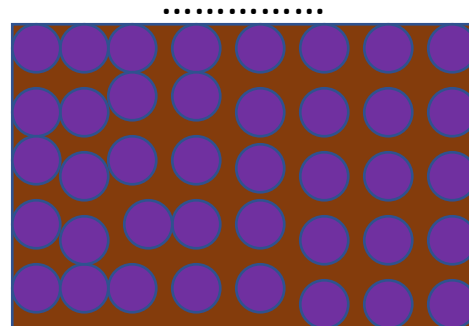
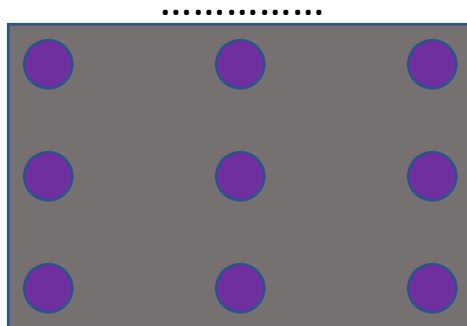
Density

Which container is more dense? Explain.



Density

- If you have two objects (say) of the same size, which will feel heavier? Why?
-
 - Both objects have the same volume, but
Therefore, ...
 - _____



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Density

When solving density problems, use the GUESSS method:

G: Givens

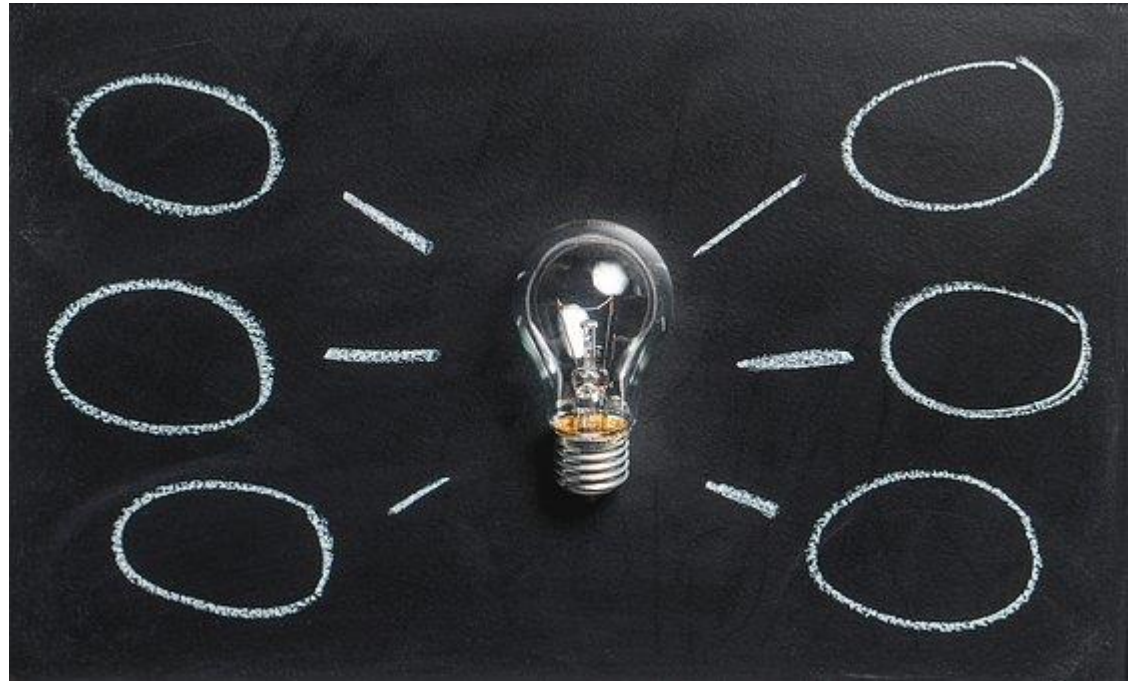
U:

E: Equation

S:

S: Solve

S:



Density

Example: What is the density of a 5-g cube with one side having a length of

G: $m = 5\text{g}$, $v = \dots\dots\dots$

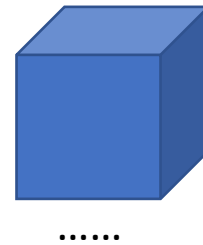
U: $d = ?$

E: $d = m / V$

S: $d = 5\text{g} / \dots\dots\dots$

S: $d = \dots\dots\dots$

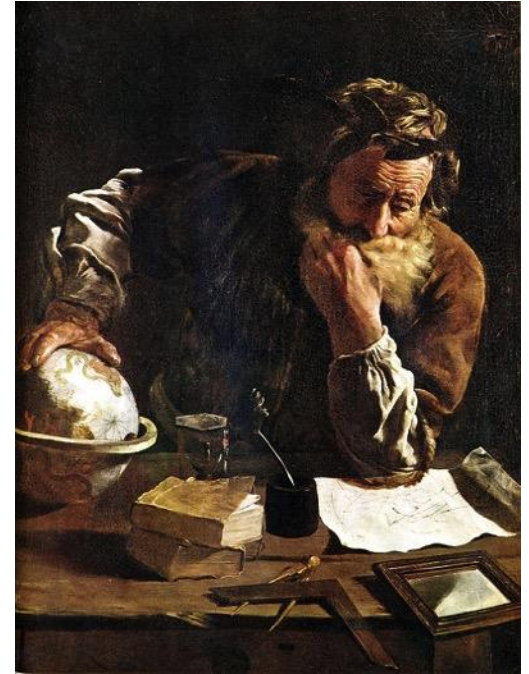
S: Therefore, the density of the cube is



Archimedes

287-212 BC

- Famous Greek mathematician
- Much of Archimedes' fame comes from his relationship with Hiero, the king of Syracuse, for whom he performed a number of favors using his intellect.



Archimedes



The most famous of these favors for the king was that of the gold crown

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Archimedes

PUT IT IN WATER



Archimedes

- After sinking it in water, he observed Is it authentic?
- _____
- The crown is



Buoyancy

- Buoyancy –
- If an object is, it will float
- Negatively buoyant –
- Positively buoyant –



- _____

Buoyancy

- Recall: when an object is placed into a fluid, ...
 - i.e. the pepper pushes out water because it needs room

- _____



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Buoyancy

That is why you weigh less in water:

.....



Buoyancy

Since the downward force (gravity) is
..... of water, you can push heavy
objects like a boat easily in water.



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Buoyancy

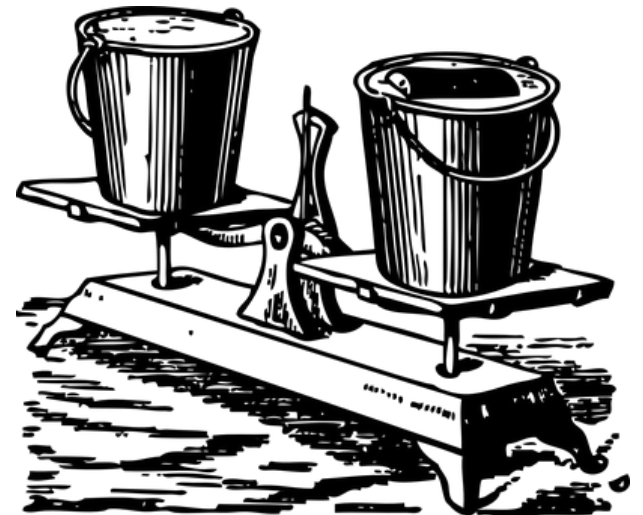
- If the mass of an object is greater than the mass of displaced fluid, it will sink.

- _____



Buoyancy

- _____
- If the force of gravity (mass of object $\times$ gravity) is greater than the buoyant force, the object will sink.



Buoyancy

- Example: You place an object that weighs into fresh water, and it displaces of water.
 - This object will be negatively buoyant and will sink.
 - Downward force (.....) is greater than the upward force (.....).
- If you put the same object into salt water, it would still weigh, but would be buoyed up by a force of, and it would float.

Buoyancy

How can boats that are made of steel or even concrete float?

- _____



Buoyancy

- If, however, the boat takes on water, then the part of the boat once filled with air (not very dense) now becomes filled with water (much denser).
- _____



Water



- Water is the most common fluid, but what is the density of water?
-
- _____

Water

Applications

- Life jackets keep you afloat because they_____
- Scuba divers can increase and decrease the amount of air in their suits to go up or down



Floating

- _____

- If you breathe out, you will sink.



Fat Floats

If you add oil to water, the oil will float to the top because

People who are obese can also float without holding their breath because



Oil Spills

An oil spill can have devastating consequences because oil doesn't dissolve in water and is less dense.

As a result, it floats on the surface. _____



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The Dead Sea

- Famous location near Jordan
- times more salty than the ocean
- People can float without holding their breath

