

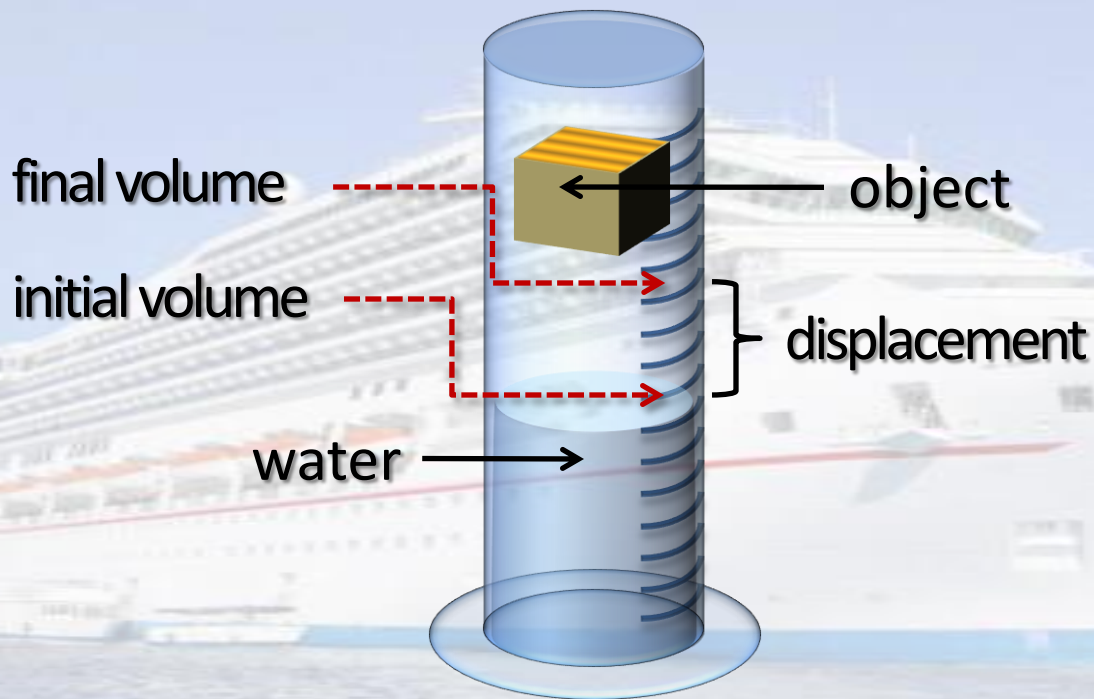
ARCHIMEDES' PRINCIPLE



Why Things Float

DISPLACEMENT

- When an object is dropped into water, the object sinks and the water rises.

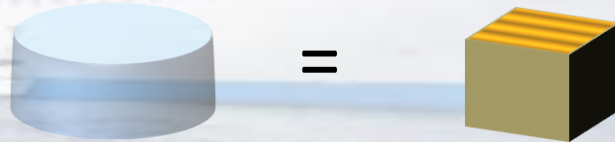


- The increase in the volume of the water when an object is dropped into it is called the displacement.



VOLUME OF THE DISPLACED WATER

- Two samples of matter cannot occupy the same space at the same time.
- When an object is dropped into water, the water rises to make room for the object.
- The volume of the displaced water is the same as the volume of the object that displaces it.



REVIEWING DENSITY

- Density is the mass per unit volume.

- $D = \frac{m}{V}$

- so, $m = D \times V$



- Since the volume of the displaced water is the same as the volume of the object that displaces it, whichever is more dense also has more mass.
- Whichever has more mass also weighs more.

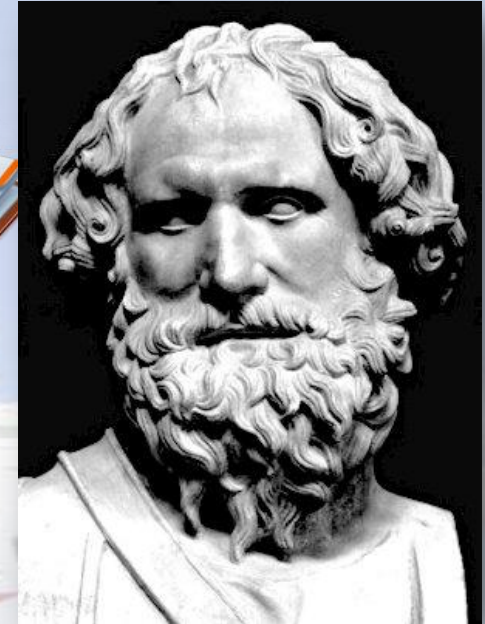
WHO WINS?

- Both the displaced water and the object that displaces it are being pulled down by gravity.
- Whichever one weighs more is being pulled down harder. (Weight is the force of gravity.)
- Whichever one is more dense weighs more.
- Whichever one is more dense is pulled down harder, and pushes the other out of the way.
 - It moves down while the other moves up.

ARCHIMEDES' PRINCIPLE

Archimedes' principle = the buoyant force on an object is equal to the weight of the fluid displaced.

- As we said, when an object is dropped into water, the object sinks and the water rises.
- The force exerted by the displaced water flowing back down into place is equal to the weight of the water.
- If that force is equal to the weight of the object, (which it is if the water is equally or more dense than the object) the object floats.
- If the density of an object is less than the density of water, it floats.



Archimedes



FLOAT YOUR BOAT

- Ships are large and heavy.
- But they are not solid.
- The inside of the hull is basically hollow.
- As a result, the density of the ship is low compared to water.
- That's why it floats.

