Simple Physics

1. Floating

- Floating means an object remains on the surface of a liquid without sinking.

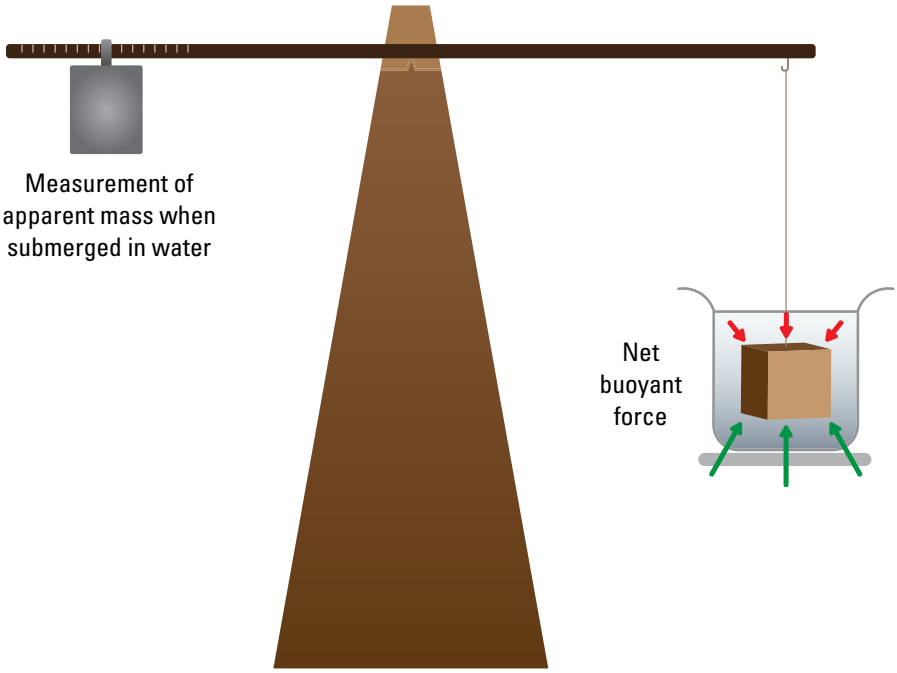
Archimedes Principle: $F_b = pgV$

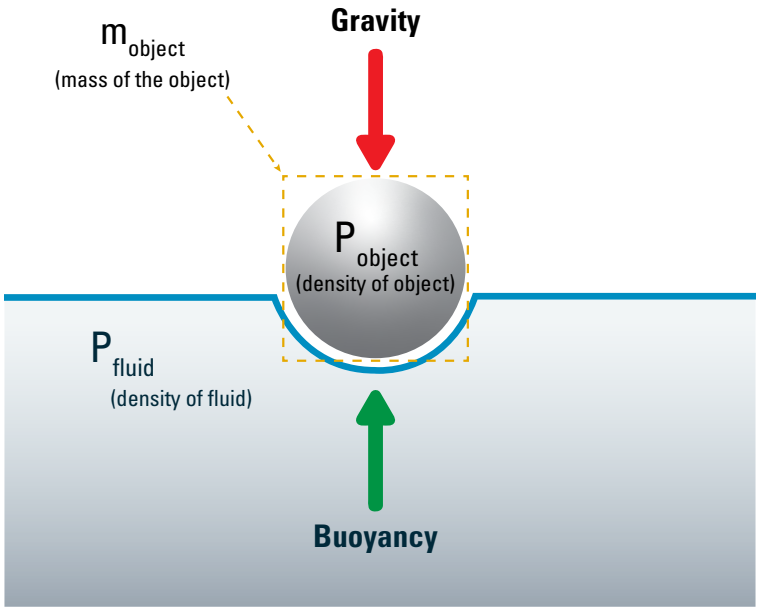
F_b = buoyant force
p = density of the fluid
V = volume of displaced fluid
g = acceleration due to gravity

Buoyant force = weight of water displaced. $F_{buoyant} = p_{fluid}\, gV$

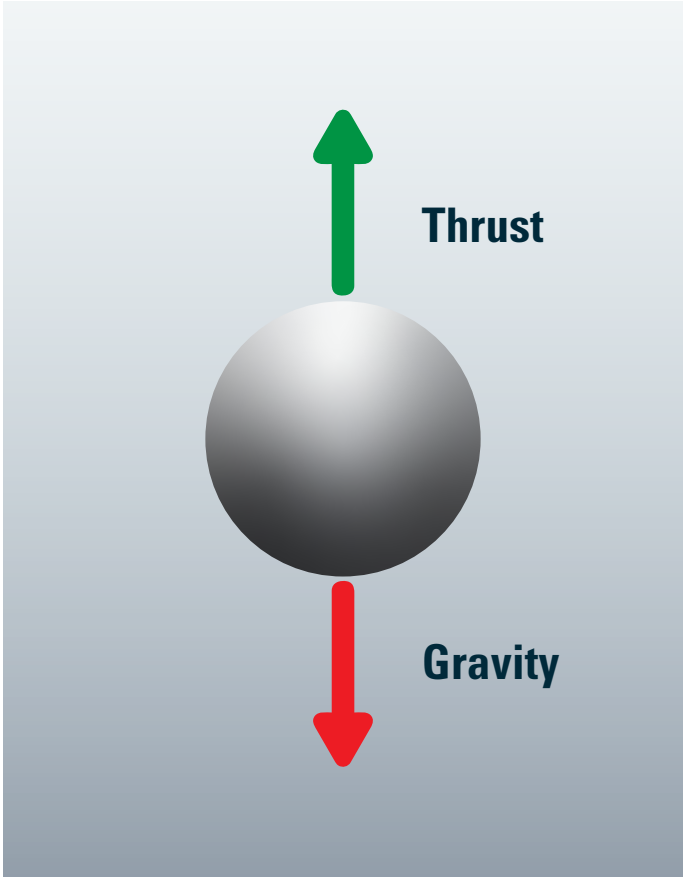
where V = volume of submerged object, but since

$V = \frac{m}{p_{object}}$, the buoyant force can be expressed as $F_{buoyant} = mg \frac{p_{fluid}}{p_{object}}$



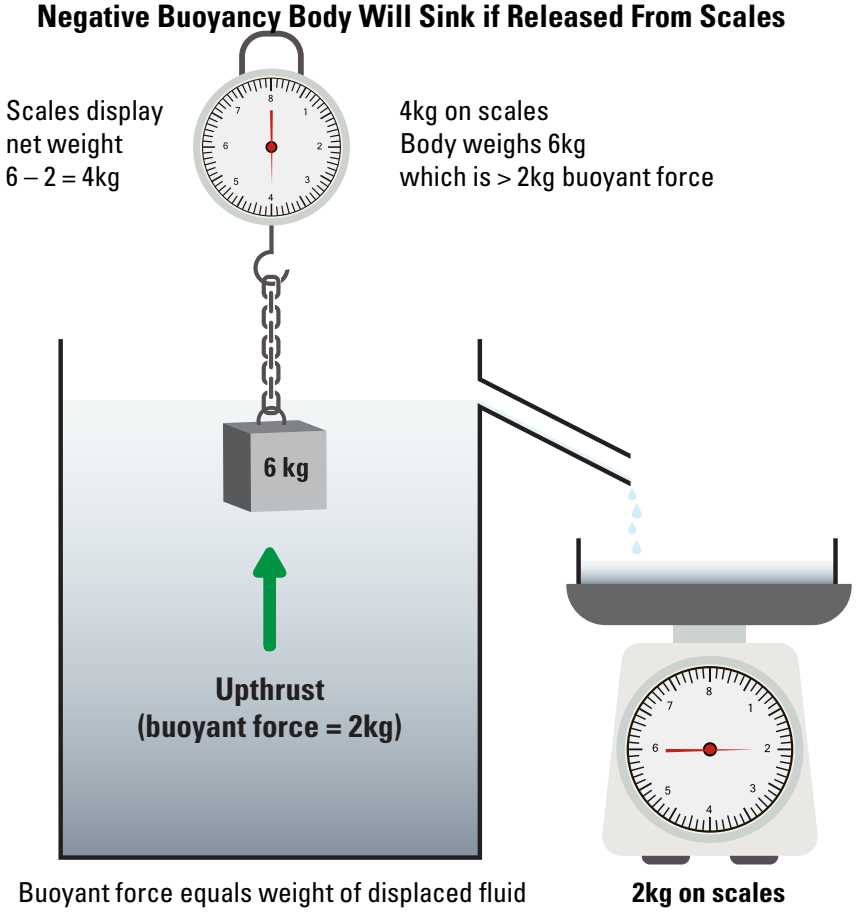


Buoyancy, or thrust (upthrust), is an upward force exerted by fluid on an object fully or partially immersed. Pressure increases with depth due to the weight of the overlying fluid.

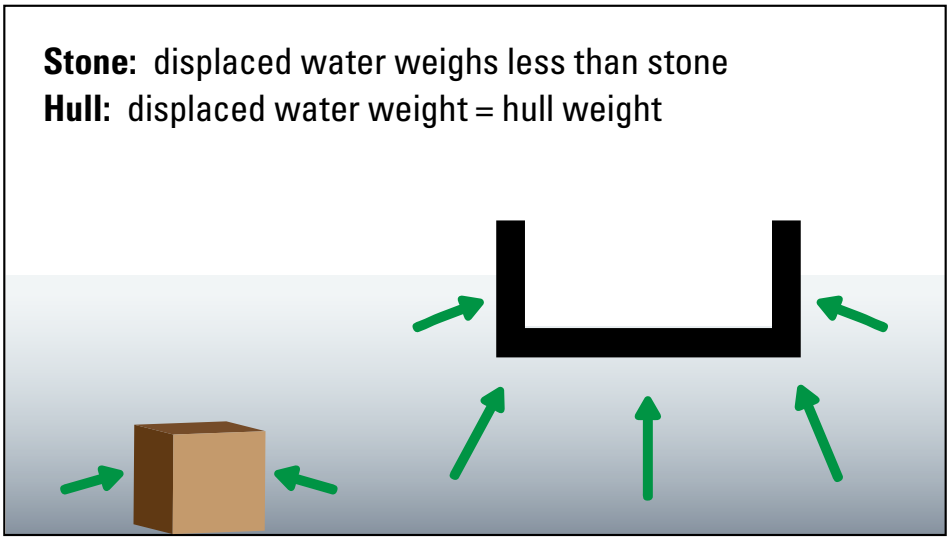


A block of limestone will sink when dropped into water because the density of limestone is much greater than the density of water. A limestone block would have been placed on a barge or boat to displace the weight of the water equal to the stone's weight and keep the limestone block on the water's surface.

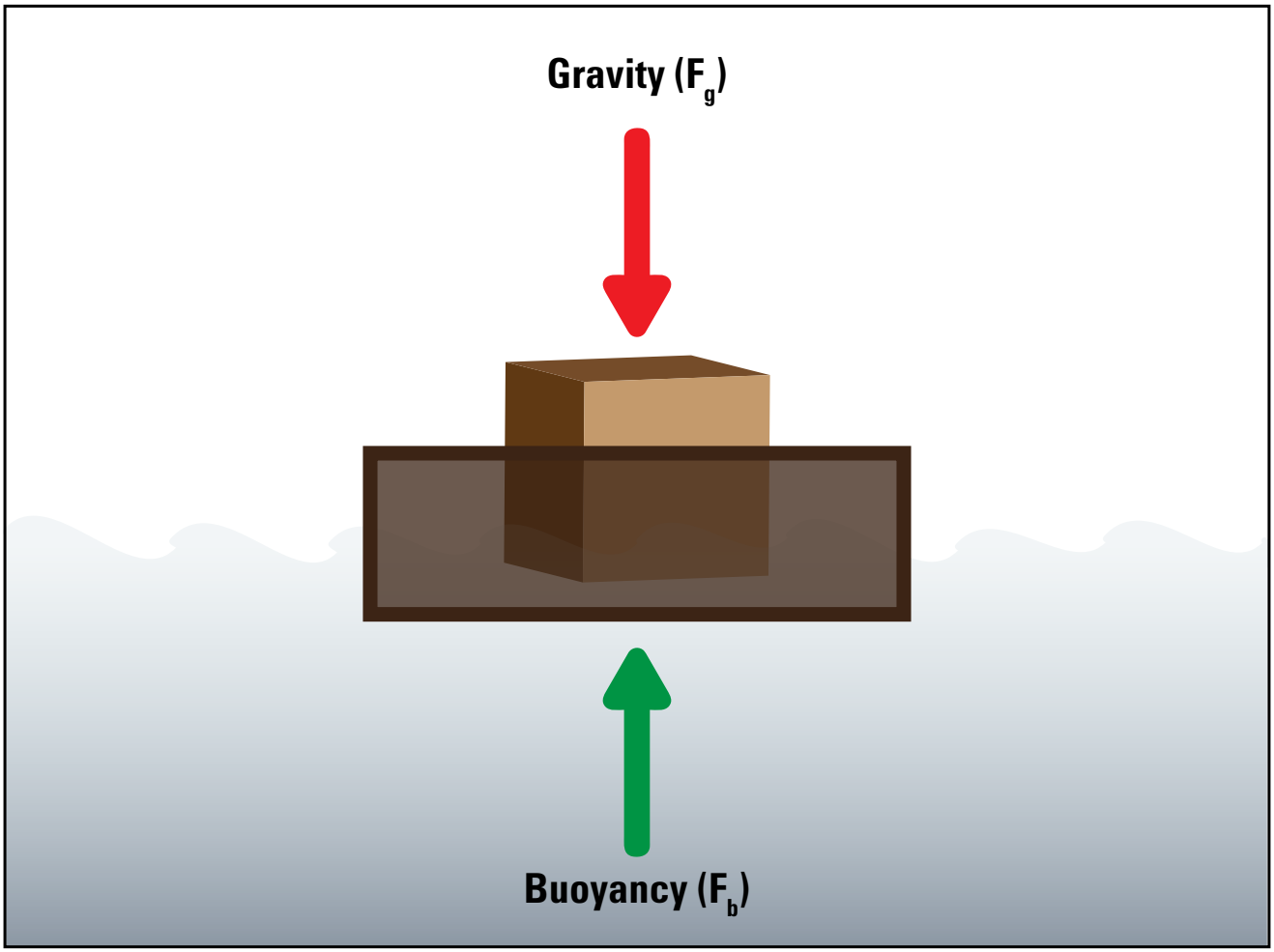
Negative Buoyancy Body Will Sink if Released From Scales



Archimedes' Principle explains why steel ships float



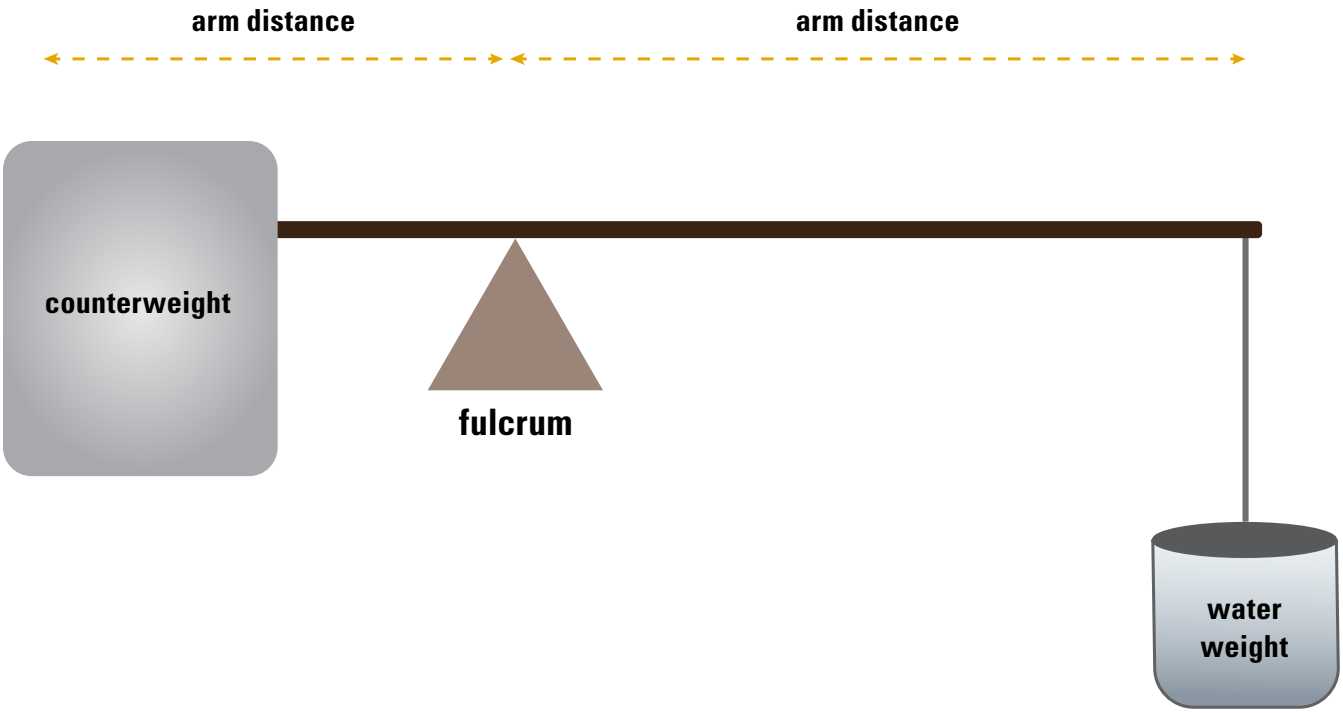
In my theory, the barges used for stone transport are not wooden planks roped together with a flat top surface. Instead, the barges were built from wood, similar to an open rectangular box, with a specific depth and flat bottom for better stability on the water. All barges were built to meet certain specifications, keeping the sluices' dimensions to a minimum.



2. Shaduf

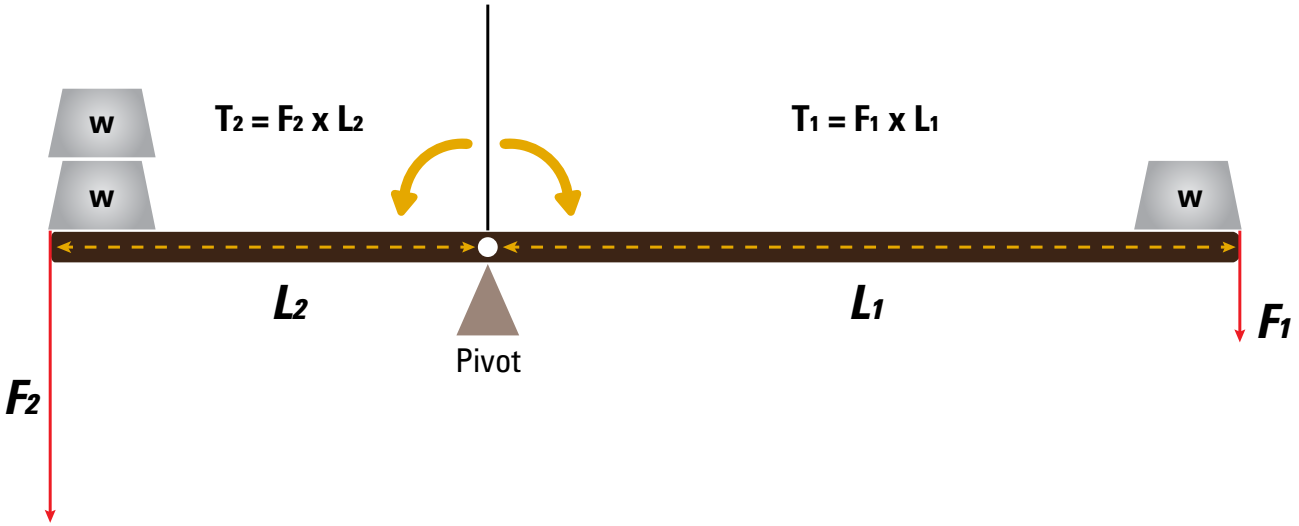
- A shaduf operates on the same principle as a lever.

Lever



Torque (Moment)

Torque equals Force times distance



In equilibrium (balance) $T_1 = T_2$

$F_1 \times L_1 = F_2 \times L_2$

3. Bernoulli's Equation

Bernoulli's Equation

Formula:

$$P_1 + \tfrac{1}{2}pv_1^2 + pgh_1 = P_2 + \tfrac{1}{2}pv_2^2 + pgh_2$$

p = fluid density
g = acceleration due to gravity
P_1 = pressure at elevation 1
v_1 = velocity at elevation 1
h_1 = height of elevation 1
P_2 = pressure at elevation 2
v_2 = velocity at elevation 2
h_2 = height of elevation 2

Water in a steady state flow along a single streamline has

1.) Pressure potential energy,
2.) Kinetic energy
3.) Gravitational potential energy.

Water has a constant total energy per volume:

Bernoulli's Equation

$$\frac{\text{energy}}{\text{volume}} = \frac{\text{pressure potential energy}}{\text{volume}} + \frac{\text{kinetic energy}}{\text{volume}} + \frac{\text{gravitational potential energy}}{\text{volume}}$$

$$= \text{pressure} + \tfrac{1}{2}\ \text{density} \cdot \text{speed}^2 + \text{density} \cdot \text{acceleration due to gravity} \cdot \text{height} = \text{constant}$$

$$\boldsymbol{P + \tfrac{1}{2}p \cdot v^2 + p \cdot g \cdot h = constant}$$

Water can exchange energies through pressure, speed, and height.

For a clear explanation watch this Video Demonstration.