

Weight vs. Mass

1. Define mass and weight:

Mass: **The amount of matter an object has**

Weight: **The force due to gravity based on two objects' attraction due to their masses**

2. What is another name for weight?

Force due to gravity/Gravitational Force

3. Why does mass for a given object remain constant, but its weight can change?

- **Weight depends on the acceleration due to gravity an object experiences which can vary depending on its location and the other object it is attracted to.**
 - **Mass is a measurement of the amount of matter an object has and won't change based on its location.**
4. A 150. lb person wants to know what their mass and weight (in Newtons).

- A) Convert their weight (in lbs) to Newtons (1 N = 0.22 pounds)

$$150 \text{ lb} \times \frac{1 \text{ N}}{0.22 \text{ lb}} = \boxed{682 \text{ N}}$$

- B) Determine their mass.

$$F_g = mg \rightarrow m = \frac{F_g}{g} = \frac{682 \text{ N}}{9.81 \text{ m/s}^2} = \boxed{69.5 \text{ kg}}$$

5. A person has a mass of 90.0 kg on Earth. If the person goes to Planet Mellon, where is the acceleration due to gravity is 3.50 m/s/s, what is the person's weight? What is the person's mass on Planet Mellon?

$$m = 90.0 \text{ kg}$$

$$g = 3.50 \frac{\text{m}}{\text{s}^2}$$

WEIGHT

$$F_g = mg = (90 \text{ kg})(3.5 \frac{\text{m}}{\text{s}^2}) = \boxed{315 \text{ N}}$$

MASS
MASS IS CONSTANT
so $\boxed{90.0 \text{ kg}}$

6. An astronaut has a mass of 85.0 kg. The astronaut goes to the moon and has a weight of 136. N. What is the acceleration due to gravity on the moon?

$$m = 85.0 \text{ kg}$$

$$F_g = 136 \text{ N}$$

$$g = \frac{F_g}{m} = \frac{136 \text{ N}}{85.0 \text{ kg}} = \boxed{1.60 \text{ m/s}^2}$$

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