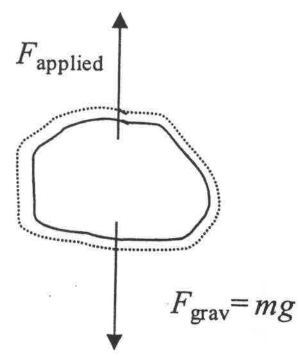
PROBLEM 1.16

The FBD of the object is as shown with an upward applied force of 10 lbf and the force downward due to gravity where $F_{grav} = mg$ and g is given as 32.2 ft/s^2. Summing forces yields the following equation that can be rearranged to solve for acceleration. It is assumed that up is positive.



$$F_{\text{applied}} = 10 \text{ lbf}$$

$$m = 50 \text{ lb}$$

$$g = 32.2 \frac{\text{ft}}{\text{s}^2}$$

$$a = ? \frac{\text{ft}}{\text{s}^2}$$

$$F_{\text{applied}} - F_{\text{grav}} = ma$$

$$F_{\text{grav}} = mg$$

$$a = \frac{F_{\text{applied}} - F_{\text{grav}}}{m} = \frac{F_{\text{applied}} - mg}{m} = \frac{F_{\text{applied}}}{m} - g$$

$$a = \frac{10 \text{ lbf}}{50 \text{ lb}} \left| \frac{32.2 \ \text{ft} \cdot \text{lb}/\text{s}^2}{1 \text{lbf}} \right| - 32.2 \frac{\text{ft}}{\text{s}^2}$$

$$a = -25.8 \frac{\text{ft}}{\text{s}^2} \quad \text{downward}$$

PROBLEM 1.17

$$F_{grav,E} = m\, g_E \quad \text{(on Earth)}$$

$$F_{grav,S} = m\, g_S \quad \text{(in Space station)}$$

Mass remains the same. So,

$$\frac{F_{grav,S}}{F_{grav,E}} = \frac{g_S}{g_E}$$

$$\Rightarrow \quad F_{grav,S} = F_{grav,E} \left(\frac{g_S}{g_E} \right) = 700\text{N} \left(\frac{6 \text{ m/s}^2}{9.81 \text{ m/s}^2} \right)$$

$$= 428.1 \text{ N}$$

$F_{grav,S}$

Also,

$$F_{grav,E} = 700 \text{ N} \left| \frac{0.22481 \text{ lbf}}{1 \text{ N}} \right| = 157.4 \text{ lbf}$$

In lbf.

$$F_{grav,S} = 428.1 \text{ N} \left| \frac{0.22481 \text{ lbf}}{1 \text{ N}} \right| = 96.2 \text{ lbf}$$