**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.

\[
F_{applied} = 10 \text{ lbf}
\]

\[
m = 50 \text{ lb}
\]

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

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

\[
F_{applied} - F_{grav} = ma
\]

\[
F_{grav} = mg
\]

\[
a = \frac{F_{applied} - F_{grav}}{m} = \frac{F_{applied} - mg}{m} = \frac{F_{applied}}{m} - g
\]

\[
a = \frac{10 \text{ lbf}}{50 \text{ lb}} \left( \frac{32.2 \text{ ft} \cdot \text{lb}}{s^2} \right) - \frac{32.2 \text{ ft}}{s^2}
\]

\[
a = -25.8 \frac{\text{ft}}{s^2} \text{ downward}
\]

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**Problem 1.17**

\[
F_{grav,E} = m \frac{g}{E} \quad \text{(on Earth)}
\]

\[
F_{grav,S} = m \frac{g}{S} \quad \text{(on Space Station)}
\]

Mass remains the same. So,

\[
\frac{F_{grav,S}}{F_{grav,E}} = \frac{\frac{g}{S}}{\frac{g}{E}}
\]

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

\[
= 428.1 \text{ N}
\]

Also,

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

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