

Activity**Working With Forces**

Solve the following problems. Show all your work. Remember to include the correct units.

1. What is the force on a 1-kg ball that is falling freely due to the pull of gravity? (Neglect air resistance.)

$$F = ma \rightarrow (1\text{ kg})(9.8\text{ m/s}^2) = \boxed{9.8\text{ N}}$$

2. A man has a mass of 66 kg on the Earth. What is his weight?

$$F = ma$$

$$W = mg \rightarrow (66\text{ kg})(9.8\text{ m/s}^2) = \boxed{647\text{ N}}$$

3. A girl on roller skates accelerates at a rate of 2 m/sec/sec with a force of 100 N. What is her mass?

$$F = ma \rightarrow \text{solve for } m = \frac{F}{a} \rightarrow \frac{100\text{ N}}{2\text{ m/s}^2} = \boxed{50\text{ kg}}$$

units kg-m/s²

4. A person weighs 540 N on the Earth. What is the person's mass? What would the person weigh on the moon where the acceleration due to gravity is 1.67 N/kg?

$$\textcircled{A} m = \frac{F}{g} \rightarrow \frac{540\text{ N}}{9.8\text{ m/s}^2} = \boxed{55.1\text{ kg}}$$

$$\textcircled{B} W = mg$$

$$(55.1\text{ kg})(1.67\text{ N/kg}) = \boxed{92\text{ N}}$$

5. An elevator has a mass of 1000 kg.

- a. What is the tension force on its cables when it is stationary?

$$F = mg \rightarrow (1000\text{ kg})(9.8\text{ m/s}^2) = \boxed{9,800\text{ N}}$$

- b. What force is needed to accelerate it upward at a rate of 2 m/sec/sec?

$$F = ma \rightarrow (1000\text{ kg})(2\text{ m/s}^2) = \boxed{2000\text{ N}}$$

- c. What force is needed to accelerate it downward at a rate of 2 m/sec/sec?

$$F = ma \rightarrow (1000\text{ kg})(2\text{ m/s}^2) = \boxed{2000\text{ N}}$$