

Force and acceleration

1. What is the net force needed to accelerate a 1400 kg car at 1.5 m/s^2 ?

$$m = 1400 \text{ kg}$$

$$a = 1.5 \text{ m/s}^2$$

$$F_{\text{net}} = m \cdot a$$

$$F_{\text{net}} = 1400 \text{ kg} \cdot 1.5 \text{ m/s}^2 \Rightarrow$$

$$F_{\text{net}} = ?$$

$$F_{\text{net}} = 2100 \text{ N}$$

2. When a boy exerts a force of 18 N on a rock, the rock accelerates forward at 17 m/s^2 . What is the mass of the rock?

$$F = 18 \text{ N}$$

$$a = 17 \text{ m/s}^2$$

$$a = \frac{F_{\text{net}}}{m}$$

$$m = \frac{F_{\text{net}}}{a}$$

$$m = ?$$

$$m = \frac{18 \text{ N}}{17 \text{ m/s}^2} = 1.0588 \text{ kg} = 1.1 \text{ kg}$$

$$m = 1.1 \text{ kg}$$

3. A constant forward net force of 870 N is applied to a motorcycle and rider with a total mass of 310 kg. How far will the motorcycle travel in the first 16 s, starting from rest?

$$F_{\text{net}} = 870 \text{ N}$$

$$m = 310 \text{ kg}$$

$$t = 16 \text{ s}$$

$$d = \frac{1}{2} a t^2$$

$$d_2 = d_1 + v_1 \cdot t + \frac{1}{2} a t^2$$

$$d = ?$$

$$a = \frac{F_{\text{net}}}{m} = \frac{870 \text{ N}}{310 \text{ kg}} = 2.81 \text{ m/s}^2$$

$$d = \frac{1}{2} \cdot 2.81 \text{ m/s}^2 \cdot (16 \text{ s})^2 = 358.4 \text{ m} = 360 \text{ m}$$