

Solutions

Each answer shows the steps, then the **result**.

2.1

- Newton's second law, rearranged for a :

$$a = \frac{F_{\text{net}}}{m} = \frac{18 \text{ N}}{6 \text{ kg}}$$

- $a = \mathbf{3 \text{ m s}^{-2}}$

2.2

- Newton's second law:

$$F_{\text{net}} = ma = (3 \text{ kg})(4 \text{ m s}^{-2})$$

- $F_{\text{net}} = \mathbf{12 \text{ N}}$

2.3

- Newton's second law, rearranged for m :

$$m = \frac{F_{\text{net}}}{a} = \frac{10 \text{ N}}{2 \text{ m s}^{-2}}$$

- $m = \mathbf{5 \text{ kg}}$

2.4

- friction opposes the push, so subtract to get the net force:

$$F_{\text{net}} = F_{\text{push}} - F_f = 25 \text{ N} - 10 \text{ N} = 15 \text{ N}$$

- Newton's second law:

$$a = \frac{F_{\text{net}}}{m} = \frac{15 \text{ N}}{5 \text{ kg}}$$

- $a = \mathbf{3 \text{ m s}^{-2}}$

3.1 B

- $a = F/m$, so doubling m halves a

3.2 B

- Newton's second law:

$$a = \frac{F_{\text{net}}}{m} = \frac{6 \text{ N}}{2 \text{ kg}} = 3 \text{ m s}^{-2}$$

3.3

(a)

- Newton's second law:

$$F_{\text{net}} = ma = (1200 \text{ kg})(2.5 \text{ m s}^{-2})$$

- $F_{\text{net}} = \mathbf{3000 \text{ N}}$

(b)

- It decreases (more mass, less acceleration for the same force)

3.4

(a)

- take right as positive:

$$F_{\text{net}} = 12 \text{ N} - 4 \text{ N}$$

- $F_{\text{net}} = \mathbf{8 \text{ N}}$ to the right

(b)

- Newton's second law:

$$a = \frac{F_{\text{net}}}{m} = \frac{8 \text{ N}}{2 \text{ kg}}$$

- $a = \mathbf{4 \text{ m s}^{-2}}$ to the right