

Solutions

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

2.1

- the horizontal component is adjacent to the 60° angle, the vertical one opposite it:

$$F_x = F \cos \theta = (80 \text{ N}) \cos 60^\circ = \mathbf{40 \text{ N}}$$

$$F_y = F \sin \theta = (80 \text{ N}) \sin 60^\circ = \mathbf{69 \text{ N}}$$

2.2

- vertically the ball starts with $v_{0y} = 0$, so $h = \frac{1}{2}gt^2$, rearranged:

$$t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2(1.25 \text{ m})}{10 \text{ m s}^{-2}}}$$

- $t = \mathbf{0.50 \text{ s}}$

2.3

- horizontally the velocity is constant:

$$x = v_x t = (3.0 \text{ m s}^{-1})(0.50 \text{ s}) = \mathbf{1.5 \text{ m}}$$

2.4

- the time of flight (both motions last the same time)

3.1 C

- stays constant.

3.2 B

- zero.

3.3

(a)

$$v_{0y} = v_0 \sin \theta = (20 \text{ m s}^{-1}) \sin 30^\circ = \mathbf{10 \text{ m s}^{-1}}$$

(b)

- at the top $v_y = 0$, so $0 = v_{0y} - gt$:

$$t = \frac{v_{0y}}{g} = \frac{10 \text{ m s}^{-1}}{10 \text{ m s}^{-2}} = \mathbf{1.0 \text{ s}}$$

(c)

- set $v_y = 0$ in $v_y^2 = v_{0y}^2 - 2gh$, rearranged:

$$h = \frac{v_{0y}^2}{2g} = \frac{(10 \text{ m s}^{-1})^2}{2(10 \text{ m s}^{-2})}$$

- $h = \mathbf{5.0 \text{ m}}$