

Solutions

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

2.1

- $25 \sin 40^\circ = 25 \times 0.643 = 16.1 \text{ m s}^{-1}$

2.2

- $\frac{u^2 \sin 2\alpha}{g}$

3.1 B

- $x = 15 \times 2 = 30 \text{ m}$

3.2

(a)

- at greatest height the vertical velocity is 0: $0 = 30 \sin 60^\circ - 10t \Rightarrow t = \frac{25.98}{10} = 2.60 \text{ s}$

(b)

- height = $\frac{u^2 \sin^2 \alpha}{2g} = \frac{900 \times 0.75}{20} = 33.75 \text{ m}$

3.3

(a)

- horizontal: $50 = 20 \cos 45^\circ t = 14.14t \Rightarrow t = 3.54 \text{ s}$

(b)

- take up positive with launch at $y = 0$; at landing $y = -h$: $-h = 20 \sin 45^\circ (3.54) - 5(3.54)^2$; $= 50.0 - 62.5 = -12.5$, so the cliff is $h = 12.5 \text{ m}$ above the sea