

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 2 Kinematics in one dimension

### Exercise C, Question 11

#### Question:

A ball is thrown vertically upwards from the top of a cliff which is 50 m high. The initial velocity of the ball is  $25 \text{ m s}^{-1}$ . Calculate the time taken to reach the bottom of the cliff and the speed of the ball at that instant.

#### Solution:

$$s = ut + \frac{1}{2}at^2, \uparrow$$

$$-50 = 25t_1 + \frac{1}{2}(-9.8)t_1^2$$

$$\therefore 4.9t_1^2 - 25t_1 - 50 = 0$$

$$\therefore t_1 = \frac{-(-25) \pm \sqrt{(-25)^2 - 4(4.9)(-50)}}{2(4.9)}$$

$$t_1 = 6.6390... \text{ or } t = -1.5369 \text{ but time can't be negative}$$

$$\therefore t_1 = 6.63 \text{ s (3 s.f.)}$$

$$v^2 = u^2 + 2as, \uparrow$$

$$(-v_1)^2 = (25)^2 + 2(-9.8)(-50)$$

$$v_1^2 = 1605$$

$$v_1 = \sqrt{1605} = 40.062...$$

$$v_1 = 40.1 \text{ m s}^{-1} \text{ (3 s.f.)}$$

