

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

2 Kinematics in one dimension

Exercise C, Question 10

Question:

A stone is thrown vertically downwards from a high building with an initial velocity of 4 m s^{-1} . Calculate the time required for the stone to travel 30 m and its speed at this time.

Solution:

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

$$30 = 4t_1 + \frac{1}{2}(9.8)t_1^2$$

$$\therefore 0 = 4.9t_1^2 + 4t_1 - 30$$

$$\therefore t_1 = \frac{- (4) \pm \sqrt{(4)^2 - 4(4.9)(-30)}}{2(4.9)}$$

$$t_1 = 2.09963... \text{ or } t = -2.9159 \text{ but time can't be negative}$$

$$\text{i.e. } t_1 = 2.10 \text{ s (3 s.f.)}$$

$$v^2 = u^2 + 2as$$

$$v_1^2 = 4^2 + 2(9.8)(30)$$

$$v_1^2 = 604$$

$$\therefore v_1 = \sqrt{604} = 24.576...$$

$$v_1 = 24.6 \text{ m s}^{-1} \text{ (3 s.f.)}$$

