

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 2 Kinematics in one dimension

### Exercise C, Question 8

#### Question:

(a) A stone is released from rest and falls vertically through a distance of 10 metres before hitting the ground.

(i) Calculate the speed at which the stone hits the ground.

(ii) Calculate the time between the stone being released and hitting the ground.

(b) The same stone is released from a height of 10 metres above the surface of the Moon. On the Moon the acceleration due to gravity is much lower than on the Earth.

If the calculations in (a)(i) and (a)(ii) were carried out for the motion of the stone on the Moon instead of the motion on the Earth, explain how your answers would be affected. [A]

#### Solution:

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

$$v_1^2 = 0^2 + 2(9.8)(10)$$

$$(a) (i) v_1^2 = 196$$

$$\therefore v_1 = \sqrt{196} = 14$$

$$\text{i.e. } v_1 = 14.0 \text{ m s}^{-1} \text{ (3 s.f.)}$$

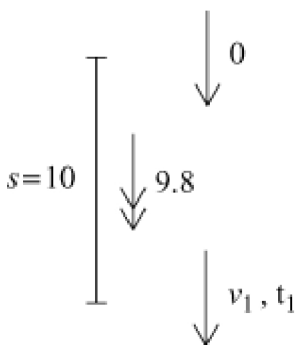
$$s = ut + \frac{1}{2}at^2$$

$$10 = 0 \times t_1 + \frac{1}{2} \times 9.8 \times t_1^2$$

$$(ii) \frac{10}{4.9} = t_1^2, \text{ i.e. } t_1^2 = 2.0408\dots$$

$$\therefore t_1 = \sqrt{2.0408\dots} = 1.4285\dots$$

$$t_1 = 1.43 \text{ s (3 s.f.)}$$



(b) (i) speed reduced, (ii) time increased.