

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 2 Kinematics in one dimension

### Exercise B, Question 12

#### Question:

A sprinter starts from rest, and accelerates at  $2 \text{ m s}^{-2}$  for the first 4 seconds of a race. Assume that the sprinter moves along a straight line.

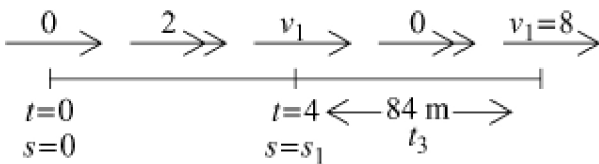
- (a) Find the distance travelled by the sprinter in the first 4 seconds.
- (b) Find the speed of the sprinter at the end of the first 4 seconds.
- (c) The sprinter then travels at this speed for the remainder of the race. He travels a total distance of 100 metres. Find the total time that he takes to complete the race. [A]

#### Solution:

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

$$(a) s_1 = 0 \times 4 + \frac{1}{2} \times 2 \times 4^2$$

$$s_1 = 16 \text{ m}$$



$$v = u + at$$

$$(b) v_1 = 0 + 2 \times 4$$

$$v_1 = 8 \text{ m s}^{-1}$$

In final part,  $s = ut$

$$(c) 84 = 8 \times t_3, \quad \therefore t_3 = \frac{84}{8} = 10.5 \text{ s}$$

$$\therefore \text{total time} = 4 + 10.5 = 14.5 \text{ seconds}$$