

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 2 Kinematics in one dimension

### Exercise B, Question 11

#### Question:

Telegraph poles, 40 m apart stand alongside a straight railway line. The time taken for a locomotive to pass the two gaps between three consecutive poles are 2.5 seconds and 2.3 seconds, respectively. Assume that the acceleration of the train is constant. Calculate the acceleration of the train and the speed past the first post.

#### Solution:

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

$$\text{to 1st post } 40 = u \times 2.5 + \frac{1}{2} \times a \times 2.5^2$$

$$\text{to 2nd post } 80 = u \times 4.8 + \frac{1}{2} \times a \times 4.8^2 \quad \{$$

$$\therefore 4.8 \times 40 = (u \times 2.5 + 3.125a) \times 4.8$$

$$2.5 \times 80 = (u \times 4.8 + 11.52a) \times 2.5$$

$$\therefore 192 = 12u + 15a \quad \{ \text{subtract}$$

$$200 = 12u + 28.8a$$

$$8 = 13.8a$$

$$\therefore a = \frac{8}{13.8} = 0.57971\dots = 0.580 \text{ m s}^{-2} \text{ (3 s.f.)}$$

$$\text{then } 40 = 2.5u + 3.125 \times 0.57971\dots$$

$$\therefore 40 - 3.125 \times 0.57971\dots = 2.5u$$

$$u = \frac{[40 - 3.125 \times 0.57971\dots]}{2.5} = 15.3 \text{ m s}^{-1} \text{ (3 s.f.)}$$

