Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

2 Kinematics in one dimension

Exercise A, Question 9

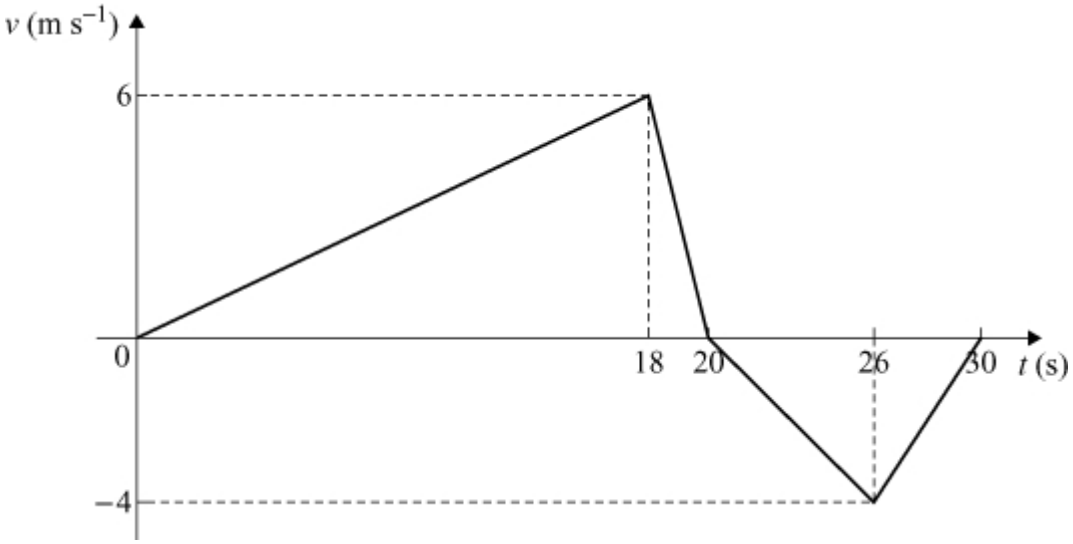
Question:

The velocity-time graph is for a train moving on a set of tracks over a 30-second period.

(a) Find the total distance travelled by the train.

(b) Calculate the average speed of the train.

(c) Calculate the average velocity of the train.



Solution:

(a) Distance

$$= \left[\frac{1}{2} \times 18 \times 6 \right] + \left[\frac{1}{2} \times (20 - 18) \times 6 \right] + \left[\frac{1}{2} \times (26 - 20) \times 4 \right] + \left[\frac{1}{2} \times (30 - 26) \times 4 \right]$$

$$= 80 \text{ m}$$

(b) $$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}} = \frac{80 \text{ m}}{30 \text{ s}} = 2\frac{2}{3} \text{ m s}^{-1}$$

(c) $$\text{Total displacement} = \left[\frac{1}{2} \times 18 \times 6 \right] + \left[\frac{1}{2} \times (20 - 18) \times 6 \right] + \left[\frac{1}{2} \times (26 - 20) \times (-4) \right] + \left[\frac{1}{2} \times (30 - 26) \times (-4) \right]$$

$$= 40 \text{ m}$$

$$\therefore \text{ Average velocity } = \frac{\text{total displacement}}{\text{total time}} = \frac{40 \text{ m}}{30 \text{ s}} = 1\frac{1}{3} \text{ m s}^{-1}$$