Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

2 Kinematics in one dimension

Exercise B, Question 19

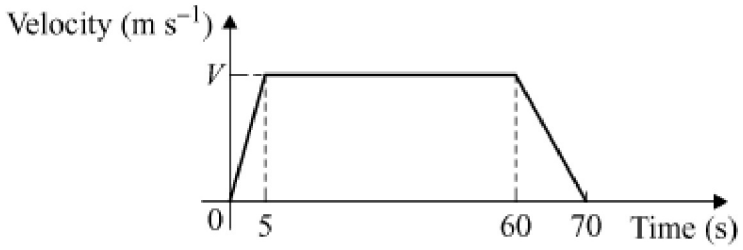
Question:

A cyclist sets off from rest and moves along a straight horizontal road until she again comes to rest. The motion of the cyclist can be modelled as **three** separate stages.
In the first stage she accelerates uniformly from rest for 5 seconds until she reaches a velocity V m s^{-1}. She then moves with constant velocity V m s^{-1} for 55 seconds. Finally she moves with a constant retardation for 10 seconds until coming to rest.

(a) Sketch a velocity-time graph to show the motion of the cyclist.

(b) Given that the total length of the journey is 300 m, find the value of V. [A]

Solution:



(b) Using distance is the area under the graph:

$$\left[\tfrac{1}{2} \times 5 \times V\right] + \left[55 \times V\right] + \left[\tfrac{1}{2} \times 10 \times V\right] = 300$$

$$\therefore 2.5V + 55V + 5V = 300$$

$$62.5V = 300$$

$$V = \frac{300}{62.5}$$

$$V = 4.8 \text{ m s}^{-1}$$