Multi-stage Velocity–Time Problems

Specification: AQA 7357: Q1, Q2 · Edexcel 9MA0: 7.1, 7.2

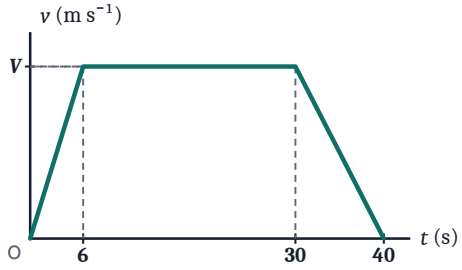
HOMEWORK Consolidation

1 A car accelerates uniformly from rest to 14 m s^{-1} in 7 s, travels at 14 m s^{-1} for T s, then decelerates uniformly to rest in 10 s. It travels 959 m. Find T.

AQA Q2 · Edexcel 7.2

2 The graph shows the velocity of a cyclist. She travels 480 m. Find V.

AQA Q2 · Edexcel 7.2



3 A particle accelerates uniformly from u m s^{-1} to 20 m s^{-1} in 8 s, then moves at 20 m s^{-1} for 12 s. It travels 368 m.

(a) Find u.

(b) Find its acceleration.

AQA Q2 · Edexcel 7.2

4 A tram starts from rest and accelerates uniformly to 15 m s^{-1} in 30 s. It travels at 15 m s^{-1} for T minutes, then decelerates uniformly to rest in 20 s. It travels 2.175 km. Find T.

AQA P1, Q2 · Edexcel 6.1, 7.2

5 A car accelerates uniformly from rest to 10 m s^{-1} in 8 s. It travels at 10 m s^{-1} for 6 times as long as it then takes to decelerate uniformly to rest. It travels 690 m. Find the total time.

AQA Q2 · Edexcel 7.2

6 A lift accelerates uniformly from rest to 10 m s^{-1} in T s. It moves at 10 m s^{-1} for $4T$ s, then decelerates uniformly to rest in T s. It travels 1000 m. Find T and the total time.

AQA Q2 · Edexcel 7.2

7 A bus passes a stop at a constant 8 m s^{-1}. At that moment a car starts from rest at the stop and accelerates uniformly at 2 m s^{-2} until its speed is 20 m s^{-1}.

(a) Find the greatest distance between them before the car catches up.

(b) Find when and where the car overtakes the bus.

AQA Q2 · Edexcel 7.2 (graphical solution)

8 Car A starts from rest at a junction and accelerates uniformly to 12 m s^{-1} in 6 s, then keeps this speed. Car B starts from rest at the junction 3 s later and accelerates uniformly to 18 m s^{-1} in 6 s, then keeps this speed. Find when and where B catches A.

AQA Q2 · Edexcel 7.2 (graphical solution)

9 A particle passes a point with velocity 4 m s^{-1}. It accelerates uniformly to V m s^{-1} in 6 s, then decelerates uniformly to rest in 10 s. It travels 92 m. Find V.

AQA Q2 · Edexcel 7.2

10 A car starts from rest and accelerates uniformly at 3 m s^{-2} for T s. It then decelerates uniformly at 1.5 m s^{-2} to rest. It travels 450 m. Show that $T = 10$.

AQA Q2 · Edexcel 7.2

11 *AQA-style*. A van passes a point O travelling at a constant 18 m s^{-1}. At the same moment a car at O starts from rest and accelerates uniformly at 1.2 m s^{-2} until its speed is 24 m s^{-1}; it then keeps this speed.

(a) Sketch the velocity–time graphs of the van and the car on one diagram. [2 marks]

(b) Find the greatest distance between the van and the car before the car catches up. [2 marks]

(c) Find the time when the car overtakes the van, and its distance from O. [3 marks]

AQA Q2 · Edexcel 7.2 (graphical solution) · AQA-style

12 *Edexcel-style*. A particle moves along a straight line. It accelerates uniformly from rest to 12 m s^{-1} in 8 s. It then moves at 12 m s^{-1} for a period of time, and then decelerates uniformly to rest. The time for which it moves at constant velocity is 3 times the time for which it is decelerating. Its displacement from the start, when it comes to rest, is 552 m.

(a) Sketch a velocity–time graph for the motion. (3)

(b) Find the total time for which the particle is moving. (3)

AQA Q2 · Edexcel 7.2 · Edexcel-style