Unit Review

Specification: AQA 7357: P1, Q1, Q2, Q3, R3, OT3 · Edexcel 9MA0: 6.1, 7.1, 7.2, 7.3, 8.3, OT3

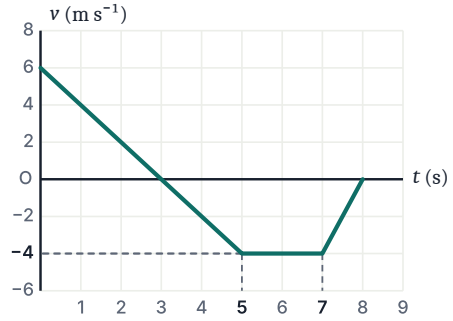
HOMEWORK Consolidation

1 A cyclist passes a point A with speed 3 m s^{-1} and accelerates uniformly. She passes a point B, 50 m further on, 10 s later. Find
(a) her speed at B
(b) her acceleration.
AQA Q3 · Edexcel 7.3

2 A bus leaves O and travels 1.2 km along a straight road at constant velocity in 2 min. It stops for 1 min, then returns to O at constant velocity in 3 min.
(a) Sketch the displacement–time graph.
(b) Find its velocity on the way back, in m s^{-1}.
(c) Find its average speed for the whole journey, in km h^{-1}.
AQA Q1, Q2 · Edexcel 7.1, 7.2

3 A stone is dropped from rest at the top of a well. It hits the water 2.2 s later. Use $g = 9.81$ m s^{-2} and give your answers to 3 s.f.
(a) Find how far below the top of the well the water surface is.
(b) Find the speed of the stone as it hits the water.
(c) State one modelling assumption. Is the real depth likely to be more or less than your answer?
AQA R3 (g to varying accuracy), OT3 · Edexcel 8.3, OT3

4 The graph shows the velocity of a particle that starts at O.
(a) Find its acceleration in the first 5 s.
(b) Find its displacement from O after 8 s.
(c) Find the total distance it travels in the 8 s.
AQA Q2 · Edexcel 7.2



5 Car P passes a point O with speed 2 m s^{-1} and accelerates at 1 m s^{-2} along a straight road. Two seconds later car Q passes O, moving in the same direction at a constant 8 m s^{-1}. Time t is measured from when P passes O.
(a) Show that the cars are level when $t^2 - 12t + 32 = 0$.
(b) Find both times and the distance from O at the second.
(c) Which car is ahead between these times?
AQA Q3, B3 · Edexcel 7.3, 2.3

6 A train passes a signal at 24 m s^{-1} and slows down uniformly, stopping 360 m beyond the signal. Find
(a) its deceleration
(b) the time it takes to stop.
AQA Q3 · Edexcel 7.3

7 A car waits at traffic lights. When they turn green it accelerates uniformly at 2 m s^{-2} for 10 s, then moves at a constant 20 m s^{-1}. At the instant the car starts, a van passes it moving at a constant 15 m s^{-1}.

(a) Sketch the velocity–time graphs of both on one set of axes.

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

(c) Find the greatest distance between them before the car overtakes.

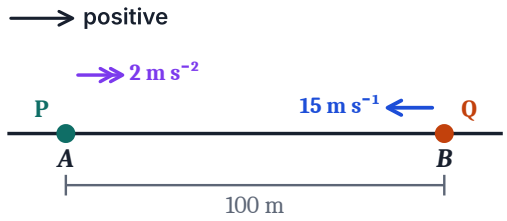
AQA Q2 · Edexcel 7.2 (graphical solution)

8 A ball is projected vertically upwards from the ground with speed 21 m s^{-1}. Find the total time for which it is more than 19.6 m above the ground.

AQA R3, Q3 · Edexcel 8.3, 7.3

9 Points A and B are 100 m apart. Particle P starts from rest at A and moves towards B with acceleration 2 m s^{-2}. At the same instant particle Q passes B, moving towards A at a constant 15 m s^{-1}. Find when and where they meet.

AQA Q3, B3 · Edexcel 7.3, 2.3



10 A driver travelling at 90 km h^{-1} sees a hazard. Her reaction time is 0.6 s, then she brakes with constant deceleration 6.25 m s^{-2}.

(a) Show that her stopping distance is 65 m.

(b) Find her stopping distance from 72 km h^{-1}, with the same reaction time and deceleration.

AQA P1, Q3 · Edexcel 6.1, 7.3

11 *AQA-style*. A particle P moves along a straight line with constant acceleration. At time $t = 0$ it passes a point O with velocity 6 m s^{-1}. At $t = 4$ its velocity is -2 m s^{-1}.

(a) Find the acceleration of P. [2 marks]

(b) Find the time at which P is momentarily at rest, and its displacement from O then. [3 marks]

(c) Find the total distance travelled by P in the first 4 s. [2 marks]

AQA Q3 · Edexcel 7.3 · AQA-style

12 *Edexcel-style*. A ball is released from rest at a point 3.6 m above a horizontal floor. It hits the floor and rebounds vertically with speed 4.2 m s^{-1}. The ball is modelled as a particle moving freely under gravity. Take upwards as positive.

(a) Find the speed with which the ball hits the floor. (2)

(b) Sketch a velocity–time graph from release until the ball reaches its greatest height after the bounce. (2)

(c) Use your graph to find the greatest height reached after the bounce. (2)

AQA R3, Q3 · Edexcel 8.3, 7.3, 7.2 · Edexcel-style