Vertical Motion Under Gravity 1

Specification: AQA 7357: R3, Q3, OT3 · Edexcel 9MA0: 8.3, 7.3, OT3

HOMEWORK Consolidation

1 A stone is dropped from rest from the top of a cliff 50 m high. Find
(a) the time it takes to reach the bottom
(b) its speed when it gets there.
AQA R3, Q3 · Edexcel 8.3, 7.3

2 A ball is thrown vertically downwards with speed 4 m s^{-1} from a window. It hits the ground 1.2 s later. Find
(a) the height of the window above the ground
(b) the speed with which the ball hits the ground.
AQA R3, Q3 · Edexcel 8.3, 7.3

3 A ball is projected vertically upwards from the ground with speed 22.4 m s^{-1}. Find
(a) the greatest height
(b) the time taken to reach it
(c) the time of flight.
AQA R3, Q3 · Edexcel 8.3, 7.3

4 A ball is thrown vertically upwards with speed 13 m s^{-1} from a point 6 m above the ground. Find
(a) the greatest height above the ground
(b) the speed with which it hits the ground.
AQA R3, Q3 · Edexcel 8.3, 7.3

5 A stone is thrown vertically upwards with speed 9 m s^{-1} from the top of a cliff 40 m above the sea. Find the time it takes to reach the sea.
AQA R3, Q3 · Edexcel 8.3, 7.3

6 A ball is projected vertically upwards from a point O. Two seconds later it is moving downwards with speed 1.4 m s^{-1}. Find
(a) the speed of projection
(b) the greatest height above O.
AQA R3, Q3 · Edexcel 8.3, 7.3

7 Take $g = 9.81$ m s^{-2}. A stone is dropped from rest from a height of 60 m. Find, to 3 s.f.,
(a) the time it takes to reach the ground
(b) its speed when it lands.
AQA R3 (g to varying accuracy) · Edexcel 8.3

8 A ball is thrown vertically upwards with speed 15 m s^{-1}. Find
(a) its speed when it is 8 m above the point of projection
(b) its greatest height above the point of projection.
AQA R3, Q3 · Edexcel 8.3, 7.3

9 A ball is thrown vertically upwards with speed 10 m s^{-1} from a point h metres above the ground. It hits the ground 3 s later. Find
(a) h
(b) the speed with which it hits the ground.
AQA R3, Q3 · Edexcel 8.3, 7.3

10 A stone dropped from rest from a height of h metres takes T seconds to reach the ground.
(a) Show that $T = \sqrt{(2h/g)}$.
(b) From what height must the stone be dropped to take $2T$ seconds?
AQA R3, Q3 · Edexcel 8.3, 7.3 (show that)

11 *AQA-style*. A ball is thrown vertically upwards with speed 11 m s^{-1} from a point P, which is 1.5 m above the ground. Use $g = 9.81$ m s^{-2} and give your answers to 3 s.f.
(a) Find the greatest height above the ground reached by the ball. [3 marks]
(b) Find the time from when the ball is thrown until it hits the ground. [3 marks]
(c) State one modelling assumption you have made. [1 mark]
AQA R3 (g to varying accuracy) · Edexcel 8.3 · AQA-style

12 *Edexcel-style*. A ball is projected vertically upwards from a point A, which is 19.6 m above the ground. The ball hits the ground 4 s later. Modelling the ball as a particle moving freely under gravity, find
(a) the speed of projection, (3)
(b) the greatest height above the ground reached by the ball. (3)
AQA R3, Q3 · Edexcel 8.3, 7.3 · Edexcel-style