

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

Exam style practice papers

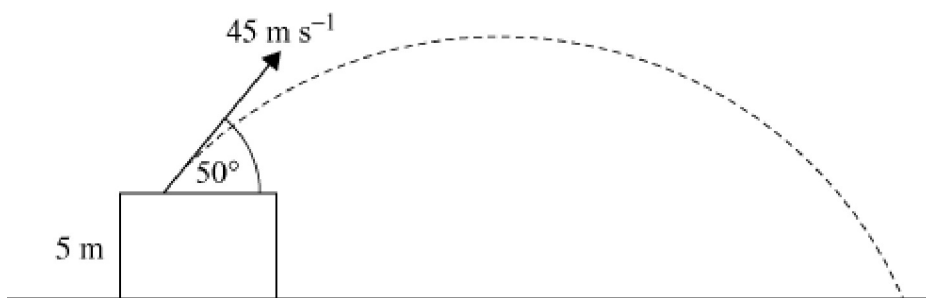
Exercise MM1A, Question 6

Question:

A golfer hits a ball from a raised platform. The ball initially moves at 45 m s^{-1} and at an angle of 50° above the horizontal. The ball lands on a horizontal surface that is 5 m lower than the platform. The diagram shows the path of the ball.

(a) Show that the time that the ball is in the air is 7.18 seconds, correct to three significant figures. (5 marks)

(b) Find the horizontal distance travelled by the ball. (2 marks)



Solution:

(a) The position of the ball relative to its point of projection is given by

$$x = 45 \cos 50^\circ t$$

$$y = 45 \sin 50^\circ t - \frac{1}{2}gt^2$$

When the particle hits the ground, $y = -5$

$$\therefore -5 = 45 \sin 50^\circ t - \frac{1}{2}gt^2$$

$$4.9t^2 - 34.47t - 5 = 0$$

$$t = \frac{34.47 \pm \sqrt{34.47^2 + 4 \times 4.9 \times 5}}{2 \times 4.9}$$

$$t = 7.177 \text{ s}$$

Time that the ball is in the air is 7.18 s (to 3 s.f.)

(b) Horizontal distance, x is $45 \cos 50^\circ \times 7.177$
 $= 207.59 \text{ m}$

\therefore Horizontal distance is 208 m.