

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

7 Projectiles

Exercise B, Question 7

Question:

Karen is standing 4 m away from a wall which is 2.5 m high. She throws a ball at 10 m s^{-1} at an angle of 40° to the horizontal from a height of 1 m above the ground. Will the ball pass over the wall?

Solution:

The position of the ball, relative to the point of throwing it, is given by

$$\begin{aligned}x &= 10 \cos 40^\circ t \\y &= 10 \sin 40^\circ t - \frac{1}{2}gt^2\end{aligned}$$

$$\begin{aligned}\text{When } x = 4, t &= \frac{4}{10 \cos 40^\circ} \\&= 0.52216 \text{ s}\end{aligned}$$

At this time, the ball's height relative to the point of throwing it,

$$\begin{aligned}y &= 10 \sin 40^\circ \times 0.52216 - \frac{1}{2}g (0.52216)^2 \\&= 2.02 \text{ m}\end{aligned}$$

\therefore The ball will pass over the wall (at a height of 3.02 m above the ground).