

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

7 Projectiles

Exercise B, Question 9

Question:

A bowler releases a cricket ball from a height of 2.25 m above the ground so that initially its velocity is horizontal. Find the speed of delivery if it is to hit the ground a horizontal distance of 16 m from the point of release.

Solution:

The position of the ball, relative to its point of release, is given by

$$x = vt$$

$$y = -\frac{1}{2}gt^2$$

When the ball hits the ground,

$$x = 16 \quad \Rightarrow \quad 16 = vt \quad [1]$$

$$\text{and } y = -2.25 \quad \Rightarrow \quad 2.25 = \frac{1}{2}gt^2 \quad [2]$$

$$[2] \Rightarrow t = \sqrt{\frac{4.5}{g}}$$

$$= 0.6776 \text{ s}$$

$$[1] \Rightarrow v = \frac{16}{0.6776}$$

$$= 23.6 \text{ m s}^{-1}$$

\therefore The speed of delivery is 23.6 m s^{-1} .