

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

7 Projectiles

Exercise A, Question 4

Question:

A ball is thrown with initial speed 20 m s^{-1} at an angle of 60° to the horizontal. Assume that the ball is initially at ground level. How high does it rise? How far has it then travelled horizontally?

Solution:

Equations of motion for a projectile give

$$x = 20 \cos 60^\circ t$$

$$y = 20 \sin 60^\circ t - \frac{1}{2}gt^2$$

At maximum height, vertical speed is zero,

$$v = u + at \text{ (vertically) gives}$$

$$0 = 20 \sin 60^\circ - gt$$

$$\therefore t = \frac{20 \sin 60^\circ}{g}$$

$$= 1.767 \text{ s}$$

$$\text{Vertical distance, } y = 20 \sin 60^\circ \times 1.767 - \frac{1}{2}g \times 1.767^2$$

$$= 15.3 \text{ m}$$

$$\text{Horizontal distance, } x = 20 \cos 60^\circ \times 1.767$$

$$= 17.7 \text{ m .}$$