

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

7 Projectiles

Exercise B, Question 8

Question:

A stone is thrown with speed 10 m s^{-1} at an angle of projection of 30° from the top of a cliff and hits the sea 2.5 s later.

- (a) How high is the cliff?
 (b) How far from the base of the cliff does the stone hit the water?

Solution:

- (a) The position of the stone, relative to the top of the cliff, is given by

$$\begin{aligned} x &= 10 \cos 30^\circ t \\ y &= 10 \sin 30^\circ t - \frac{1}{2}gt^2 \end{aligned}$$

$$\begin{aligned} \text{The stone hits the sea when } t = 2.5 \text{ and } y &= 10 \sin 30^\circ \times 2.5 - \frac{1}{2}g(2.5)^2 \\ &= -18\frac{1}{8} \text{ m} \end{aligned}$$

The height of the cliff is $18\frac{1}{8} \text{ m}$.

- (b) The distance from the base of the cliff, x is $10 \cos 30^\circ \times 2.5 = 21.7 \text{ m}$.

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