

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

7 Projectiles

Exercise A, Question 5

Question:

A stunt motorcyclist takes off at a speed of 35 m s^{-1} up a ramp of 30° to the horizontal to clear a river 50 m wide. Does the cyclist succeed in doing this? Does the motorcyclist have to worry about air resistance?

Solution:

Equations of motion for a particle give

$$x = 35 \cos 30^\circ t$$

$$y = 35 \sin 30^\circ t - \frac{1}{2}gt^2$$

$$y = 0 \Rightarrow t = 0 \text{ (not required) or } \frac{35 \sin 30^\circ}{\frac{1}{2}g} = 3.571 \text{ s}$$

$$\begin{aligned} \text{The horizontal distance, } x &= 35 \cos 30^\circ \times 3.571 \\ &= 108 \text{ m} \end{aligned}$$

Yes; the model predicts 108 m.

Air resistance is unlikely to cause a problem as the range is so much greater than 50 m.