

Motion of a Projectile

Question Paper 1

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Motion of a Projectile
Sub Topic	
Booklet	Question Paper 1

Time Allowed: 57 minutes

Score: /47

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

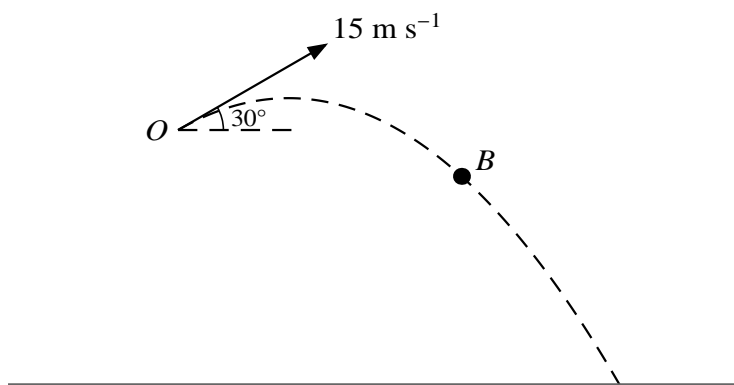
- 1 A stone is projected from a point O on horizontal ground. The equation of the trajectory of the stone is

$$y = 1.2x - 0.15x^2,$$

where x m and y m are respectively the horizontal and vertically upwards displacements of the stone from O . Find

- (i) the greatest height of the stone, [2]
- (ii) the distance from O of the point where the stone strikes the ground. [2]

2



A small ball B is projected from a point O above horizontal ground, with initial speed 15 m s^{-1} at an angle of projection of 30° above the horizontal (see diagram). The ball strikes the ground 3 s after projection.

- (i) Calculate the speed and direction of motion of the ball immediately before it strikes the ground. [5]
- (ii) Find the height of O above the ground. [2]

3

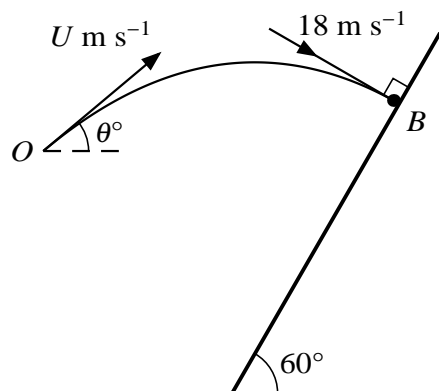


Fig. 1

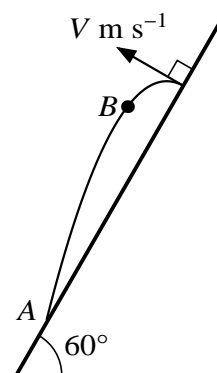


Fig. 2

A small ball B is projected with speed $U \text{ m s}^{-1}$ at an angle of θ° above the horizontal from a point O . At time 2 s after the instant of projection, B strikes a smooth wall which slopes at 60° to the horizontal. The speed of B is 18 m s^{-1} and its direction of motion is perpendicular to the wall at the instant of impact (see Fig. 1). B bounces off the wall with speed $V \text{ m s}^{-1}$ in a direction perpendicular to the wall. At time 0.8 s after B bounces off the wall, B strikes the wall again at a lower point A (see Fig. 2).

(i) Find U and θ . [5]

(ii) By considering the motion of B after it bounces off the wall, calculate V . [4]

4 A particle P is projected with speed $V \text{ m s}^{-1}$ at an angle of 60° above the horizontal from a point O on horizontal ground. P is moving at an angle of 45° above the horizontal at the instant 1.5 s after projection.

(i) Find V . [3]

(ii) Hence calculate the horizontal and vertical displacements of P from O at the instant 1.5 s after projection. [2]

5 A small ball B is projected from a point 1.5 m above horizontal ground with initial speed 29 m s^{-1} at an angle of 30° above the horizontal.

(i) Show that B strikes the ground 3 s after projection. [2]

(ii) Find the speed and direction of motion of B immediately before it strikes the ground. [4]

6 A particle P is projected with speed $V \text{ m s}^{-1}$ at an angle of 30° above the horizontal from a point O on horizontal ground. At the instant 2 s after projection, OP makes an angle of 15° above the horizontal. Calculate V . [4]

7 The equation of the trajectory of a small ball B projected from a fixed point O is

$$y = -0.05x^2,$$

where x and y are, respectively, the displacements in metres of B from O in the horizontal and vertically upwards directions.

(i) Show that B is projected horizontally, and find its speed of projection. [3]

(ii) Find the value of y when the direction of motion of B is 60° below the horizontal, and find the corresponding speed of B . [6]

8 A golf ball B is projected from a point O on horizontal ground. B hits the ground for the first time at a point 48 m away from O at time 2.4 s after projection. Calculate the angle of projection. [3]