

Simple Projectiles

Question Paper 8

Level	A Level
Subject	Maths
Exam Board	AQA
Module	Mechanics 1
Topic	Projectiles
Sub Topic	Simple Projectiles
Booklet	Question Paper - 8

Time Allowed: 47 minutes

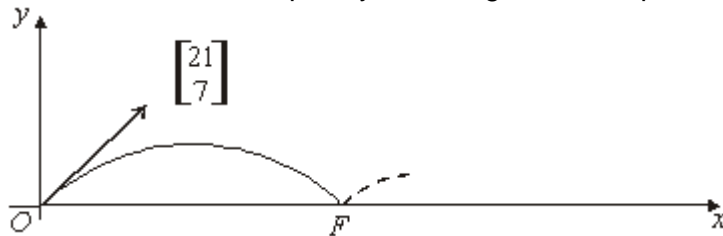
Score: /39

Percentage: /100

Grade Boundaries:

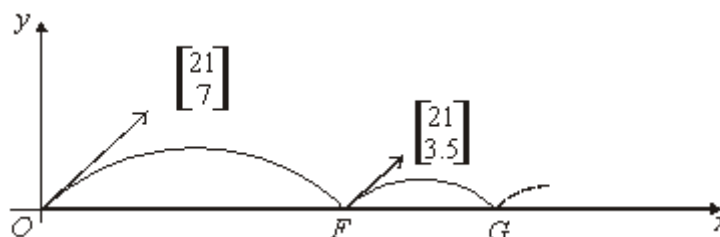
A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

- Q1.** A ball is kicked from a point O on horizontal ground with velocity $\begin{bmatrix} 21 \\ 7 \end{bmatrix}$ m s⁻¹. The ball subsequently hits the ground at a point F , as shown in the diagram.



- (a) (i) Find the time between the ball being kicked and reaching F . (3)
- (ii) Find the distance OF . (2)

- (b) The ball rebounds from F with velocity $\begin{bmatrix} 21 \\ 3.5 \end{bmatrix}$ m s⁻¹. It subsequently hits the ground again at G and then rebounds, as shown in the diagram below.

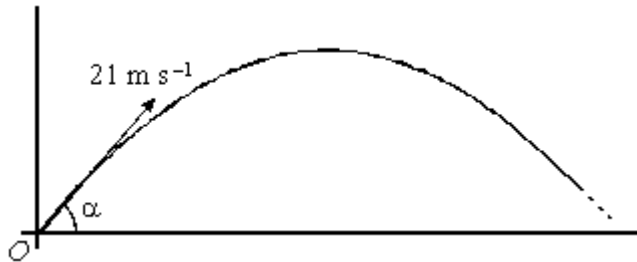


- Find the distance FG . (4)

- (c) After bouncing at G , the ball rebounds with velocity $\begin{bmatrix} 21 \\ 1.75 \end{bmatrix}$ m s⁻¹, so that the vertical component of the velocity is halved again, and then subsequently bounces next at H . Find the total distance OH . (3)

(Total 12 marks)

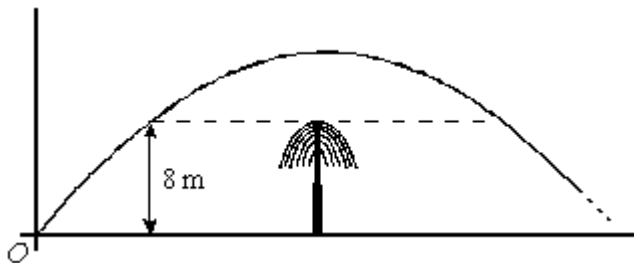
- Q2.** Paul throws a ball from point O with a velocity 21 m s^{-1} at an angle of α to the horizontal, where $\sin \alpha = 0.7$. The ball subsequently moves freely under gravity in a vertical plane, as shown in the diagram.



- (a) Show that the time taken for the ball to reach its greatest height above O is 1.5 seconds.

(3)

- (b) When the ball reaches its greatest height, it passes over a tree of vertical height 8 metres, as shown in the diagram below.



- (i) Find the vertical distance between the ball and the top of the tree at this time.

(4)

- (ii) Find the time between the ball leaving O and first reaching the horizontal level of the top of the tree. Give your answer to two decimal places.

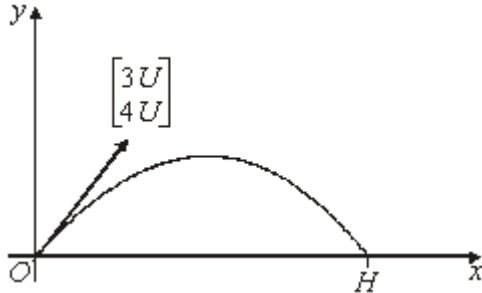
(5)

- (iii) Find the length of time for which the ball is above the horizontal level of the top of the tree.

(2)

(Total 14 marks)

- Q3.** George throws a ball from a point O , with velocity $\begin{bmatrix} 3U \\ 4U \end{bmatrix}$. The ball subsequently lands at a point H , which is at the same horizontal level as O , as shown in the diagram.



- (a) Show that the time taken by the ball to travel from O to H is $\frac{8U}{g}$. (3)
- (b) Find, in terms of g and U , the distance OH . (2)
- (c) Find, in terms of U , the initial speed of the ball. (2)
- (d) Find, in terms of g and U , the two times during the flight from O to H when the ball is moving with speed $\sqrt{18}U$. (6)

(Total 13 marks)