

**Kinematics – A2 Mathematics P2**1. [June/2022/Paper\\_7357/02/No.12](#)

A car is travelling along a straight horizontal road with initial velocity  $u \text{ m s}^{-1}$

The car begins to accelerate at a constant rate  $a \text{ m s}^{-2}$  for 5 seconds, to reach a final velocity of  $4u \text{ m s}^{-1}$

Express  $a$  in terms of  $u$ .

Circle your answer.

[1 mark]

$$a = 0.2u$$

$$a = 0.4u$$

$$a = 0.6u$$

$$a = 0.8u$$

## 2. June/2022/Paper\_7357/02/No.13

In this question use  $g = 9.8 \text{ m s}^{-2}$

A ball is projected from a point on horizontal ground with an initial velocity of  $7 \text{ m s}^{-1}$  at an angle  $\theta$  above the horizontal.

The ball reaches a maximum vertical height of  $h$  metres above the ground.

(a) Show that

$$h = 2.5 \sin^2 \theta$$

[3 marks]

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(b) Hence, given that  $0^\circ \leq \theta \leq 60^\circ$ , find the maximum value of  $h$ .

[2 marks]

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(c) Nisha claims that the larger the size of the ball, the greater the maximum vertical height will be.

State whether Nisha is correct, giving a reason for your answer.

[1 mark]

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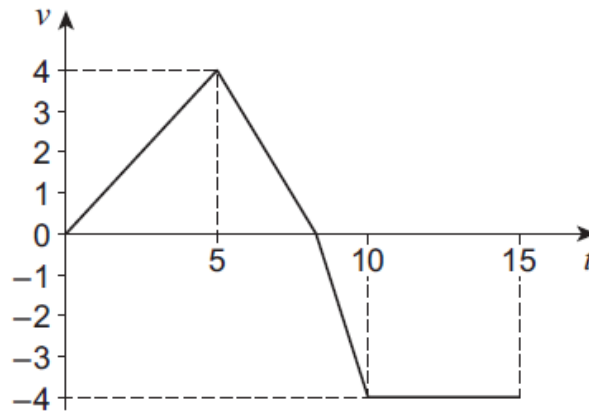


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## 3. June/2022/Paper\_7357/02/No.15

A car is moving in a straight line along a horizontal road.

The graph below shows how the car's velocity  $v \text{ m s}^{-1}$  changes with time,  $t$  seconds.



Over the period  $0 \leq t \leq 15$  the car has a total displacement of  $-7$  metres.

Initially the car has velocity  $0 \text{ m s}^{-1}$

Find the next time when the velocity of the car is  $0 \text{ m s}^{-1}$

[4 marks]

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4. June/2022/Paper\_7357/02/No.17

A particle is moving such that its position vector,  $r$  metres, at time  $t$  seconds, is given by

$$\mathbf{r} = e^t \cos t \mathbf{i} + e^t \sin t \mathbf{j}$$

Show that the **magnitude** of the acceleration of the particle,  $a \text{ m s}^{-2}$ , is given by

$$a = 2e^t$$

Fully justify your answer.

[7 marks]

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