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Surname

Other names

**Pearson Edexcel
International GCSE**

Centre Number

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Candidate Number

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Mathematics B

Paper 2



Thursday 7 June 2018 – Morning
Time: 2 hours 30 minutes

Paper Reference

4MB0/02

You must have: Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- **Calculators may be used.**

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.
- Without sufficient working, correct answers may be awarded no marks.

Turn over ►

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Pearson

Answer ALL TWELVE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 (a) Find the size of each interior angle of a regular 10-sided polygon.

(2)

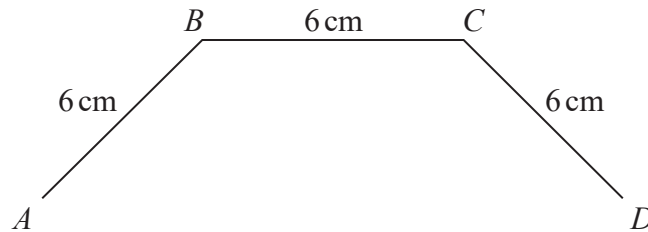


Diagram NOT accurately drawn

Figure 1

In Figure 1, A , B , C and D are vertices of the regular 10-sided polygon $ABCDEFGHIJ$.

$AB = BC = CD = 6$ cm and BC is parallel to AD .

- (b) Calculate the length, in cm to 3 significant figures, of AD .

(3)

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[Sum of interior angles of polygon = $(2n - 4)$ right angles]



Question 1 continued

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(Total for Question 1 is 5 marks)



2 All the people at a musical party did at least one activity chosen from singing (S), playing the guitar (G) and playing the piano (P).

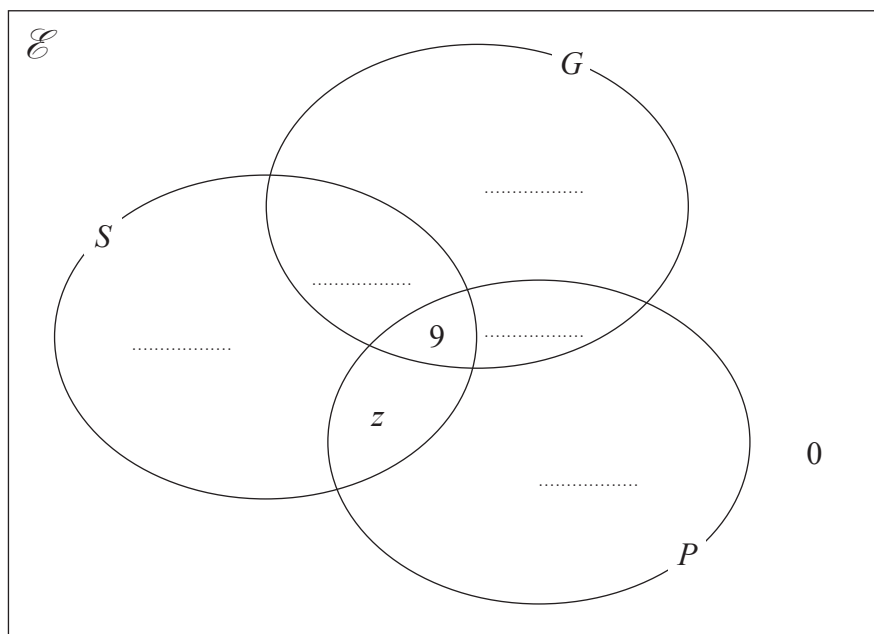
Of these people

- 21 sang
- 15 played a guitar
- 20 played the piano
- 9 did all three activities

Letting $n(S \cap G \cap P') = x$
 $n(S' \cap G \cap P) = y$
 $n(S \cap G' \cap P) = z$

(a) complete the Venn diagram with all this information.

(2)



Of the people at the party, 11 did exactly two of the three activities.

(b) Find the number of people at the party.

(3)

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Question 2 continued

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(Total for Question 2 is 5 marks)



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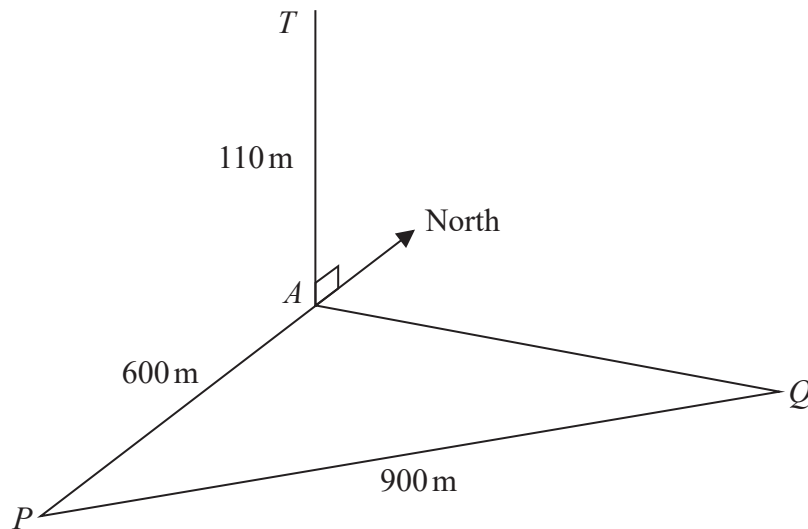
Diagram NOT
accurately drawn

Figure 2

Figure 2 shows a vertical tower AT of height 110 m and a horizontal triangle PAQ . The base A of the tower is 600 m due north of a point P .

- (a) Calculate the size, in degrees to one decimal place, of the angle of elevation of T from P . (2)

The point Q is 900 m on a bearing of 065° from P .

- (b) Calculate the distance, in metres to 3 significant figures, of A from Q . (3)
- (c) Calculate the bearing, in degrees to the nearest degree, of A from Q . (3)

$$\left(\begin{array}{l} \text{Sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \\ \text{Cosine rule: } a^2 = b^2 + c^2 - 2bc \cos A \end{array} \right)$$

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Question 3 continued

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Handwriting practice area with 25 horizontal dotted lines.



Question 3 continued

Area with horizontal dotted lines for writing.

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Question 3 continued

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(Total for Question 3 is 8 marks)



Question 4 continued

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Area with horizontal dotted lines for writing.

(Total for Question 4 is 7 marks)



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5 The points with coordinates (3, 1), (4, 3), (6, 3) and (6, 1) are the vertices of a quadrilateral Q .

(a) On the grid, draw and label quadrilateral Q . (1)

Quadrilateral R is the image of quadrilateral Q under a reflection in the line with equation $y = x$

(b) On the grid, draw and label quadrilateral R . (3)

Quadrilateral S is the image of quadrilateral R under the transformation given by the matrix L where

$$L = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$$

(c) On the grid, draw and label quadrilateral S . (3)

(d) Find the matrix that represents the transformation that maps quadrilateral S onto quadrilateral Q . (2)

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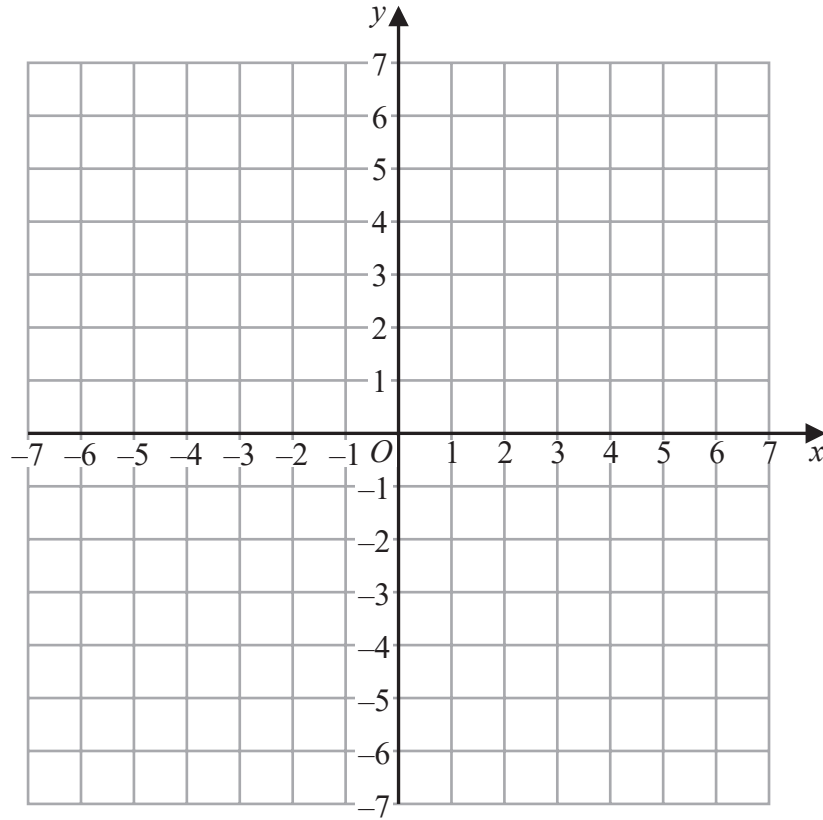
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Question 5 continued



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Question 5 continued

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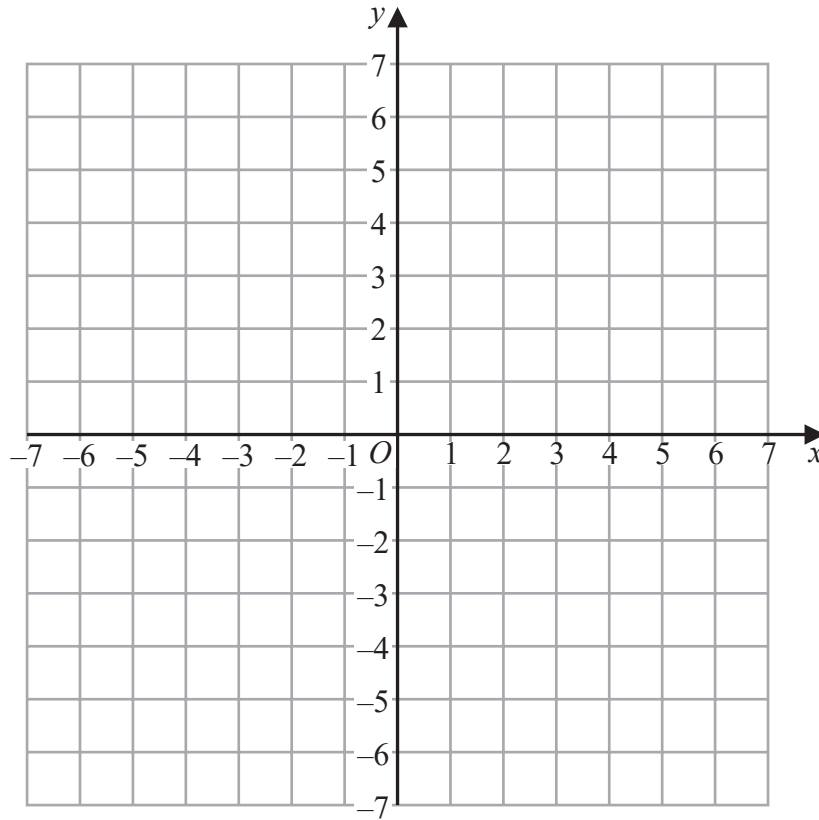
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Question 5 continued

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(Total for Question 5 is 9 marks)



Question 6 continued

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Handwriting practice area consisting of 25 horizontal dotted lines.

(Total for Question 6 is 8 marks)



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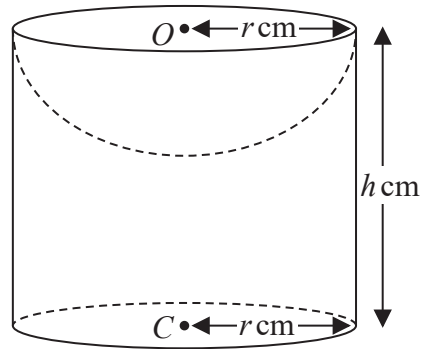
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Figure 3

Figure 3 shows a solid S formed by removing a hemisphere of radius r cm from a right circular cylinder of radius r cm and height h cm.

The centre O of the hemisphere and the centre C of the lower circular face of the cylinder are such that OC is the axis of symmetry of S and $OC = h$ cm.

The volume of S is V cm³ and the total surface area of S is A cm²

(a) Show that $A = 3\pi r^2 + 2\pi r h$ (1)

Given that $A = 1300\pi$

(b) show that $V = 650\pi r - \frac{13}{6}\pi r^3$ (4)

(c) Using calculus, find the value of r for which V has a stationary value. (2)

(d) Find the stationary value of V , giving your answer in terms of π . (2)

$$\left[\begin{array}{l} \text{Area of circle} = \pi r^2 \\ \text{Curved surface area of a right circular cylinder} = 2\pi r h \\ \text{Surface area of sphere} = 4\pi r^2 \\ \text{Volume of sphere} = \frac{4}{3}\pi r^3 \end{array} \right]$$

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Question 7 continued

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Question 7 continued

Handwriting practice area with 25 horizontal dotted lines.

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Question 7 continued

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(Total for Question 7 is 9 marks)



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Question 8 continued

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Area with horizontal dotted lines for writing.

(Total for Question 8 is 9 marks)



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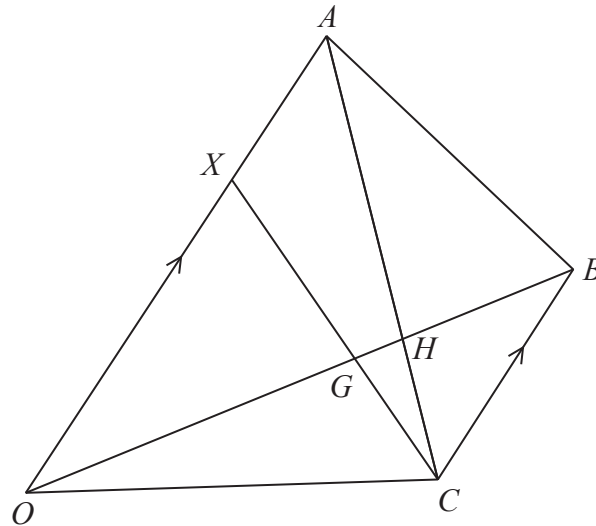
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Figure 4

Figure 4 shows quadrilateral $OABC$ with CB parallel to OA .

$$\vec{OA} = 12\mathbf{a} \quad \vec{OB} = 6\mathbf{b} \quad \text{and} \quad CB = \frac{1}{2}OA$$

(a) Write down in terms of \mathbf{a} or \mathbf{b} or \mathbf{a} and \mathbf{b}

(i) \vec{BC} (ii) \vec{OC}

(2)

The point X on OA is such that $OX:OA = 3:4$

CX and OB intersect at G .

CA and OB intersect at H .

Given that $\vec{XG} = k\vec{XC}$ where k is a scalar,

(b) show that $\vec{OG} = 6k\mathbf{b} + (9 - 15k)\mathbf{a}$.

(2)

(c) Hence find \vec{OG} in terms of \mathbf{b} only.

(2)

Given that $OG:GH:HB = m:1:n$ where m and n are integers,

(d) find the value of m and the value of n .

(4)

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Question 9 continued

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Question 9 continued

Handwriting practice area with 25 horizontal dotted lines.

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Question 9 continued

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Area with horizontal dotted lines for writing.

(Total for Question 9 is 10 marks)



10

Time taken (T seconds)	Frequency
$20 < T \leq 30$	70
$30 < T \leq 40$	130
$40 < T \leq 50$	210
$50 < T \leq 60$	160
$60 < T \leq 70$	130
$70 < T \leq 80$	100

The table gives information about the times, in seconds, taken by 800 women to do a puzzle.

(a) Calculate an estimate for the mean time taken by the 800 women.

(4)

The table below gives information about the times, in seconds, taken by some children to do the same puzzle.

Time taken (T seconds)	Frequency
$20 < T \leq 30$	30
$30 < T \leq 50$	64
$50 < T \leq 55$	24
$55 < T \leq 60$	35
$60 < T \leq 70$	30
$70 < T \leq 100$	15

(b) On the grid opposite, draw a histogram to show this information.

(3)

One of the children is to be chosen at random.

(c) Calculate an estimate for the probability that this child took 35 seconds or less to do the puzzle.

(2)

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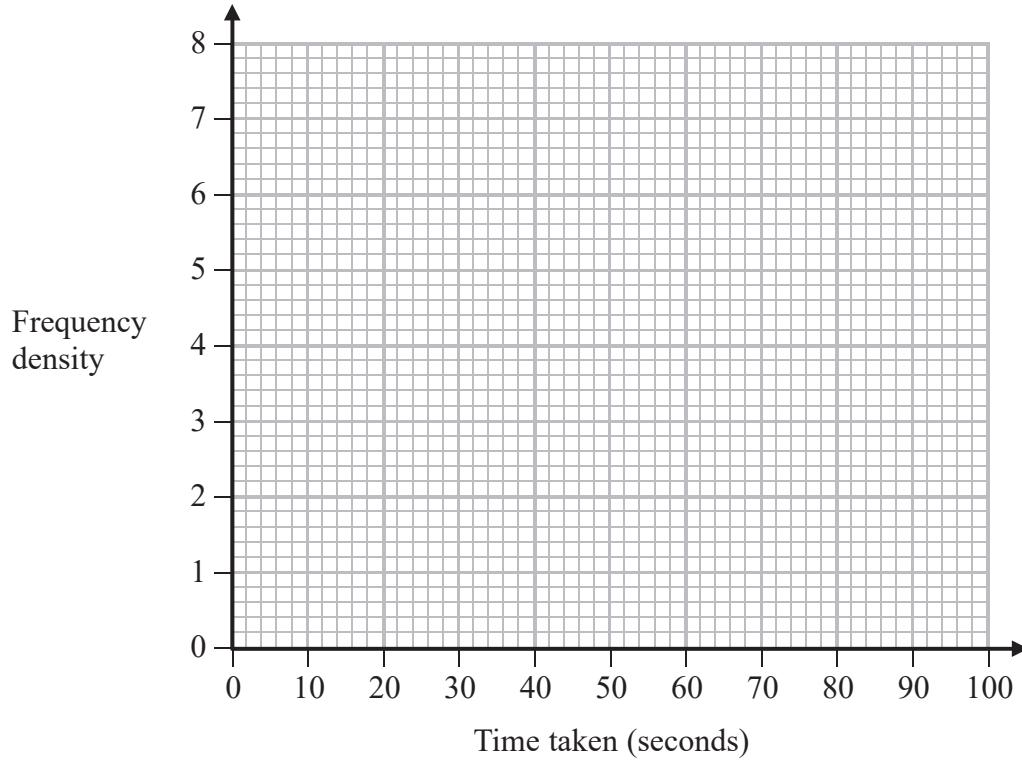
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Question 10 continued



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Turn over for a spare grid if you need to redraw your histogram.



Question 10 continued

Handwriting practice area with 25 horizontal dotted lines.

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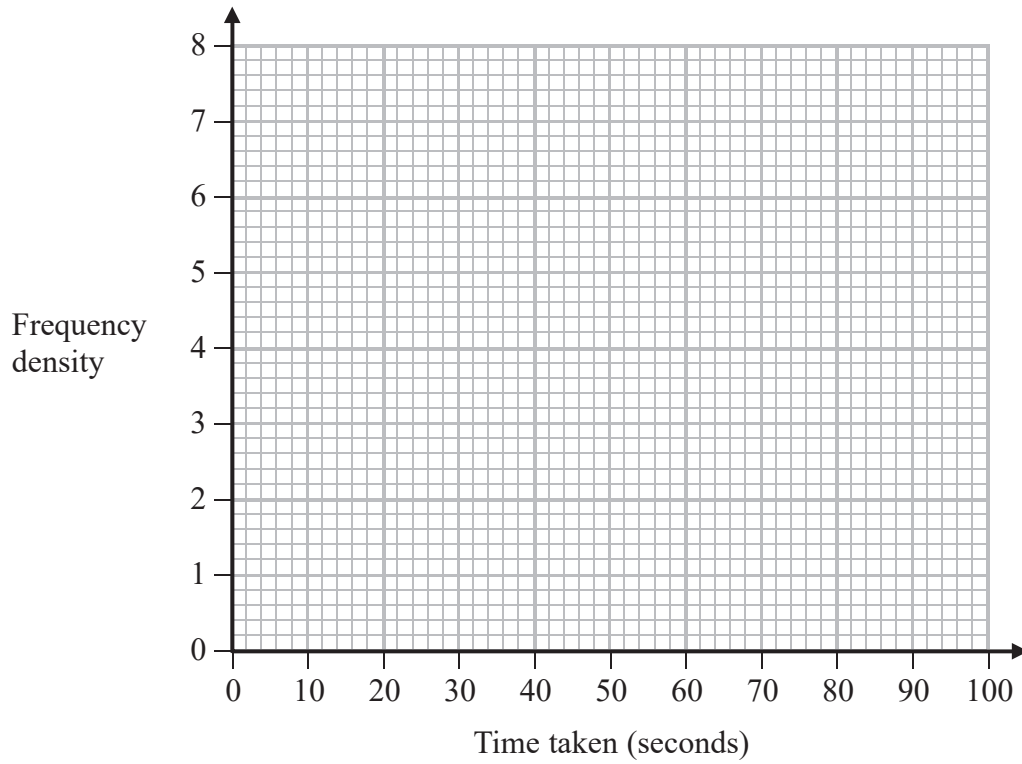
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Question 10 continued

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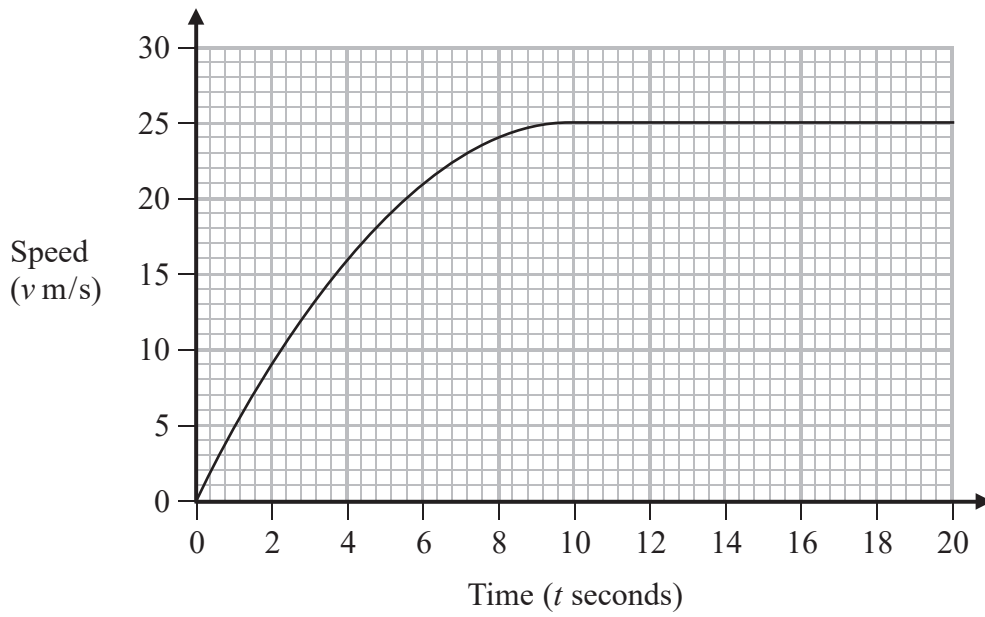
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(Total for Question 10 is 9 marks)



11 At time $t = 0$, a car was at rest at the point P . The car then travelled along a straight road. Here is the speed-time graph for the first 20 seconds of this journey.



- (a) Find the greatest speed, in km/h, of the car during the 20 seconds. (2)
- (b) Calculate an estimate of the acceleration, in m/s^2 , of the car at the instant when $t = 4$ (3)

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Question 11 continues on page 34.



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Question 11 continued

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Question 11 continued

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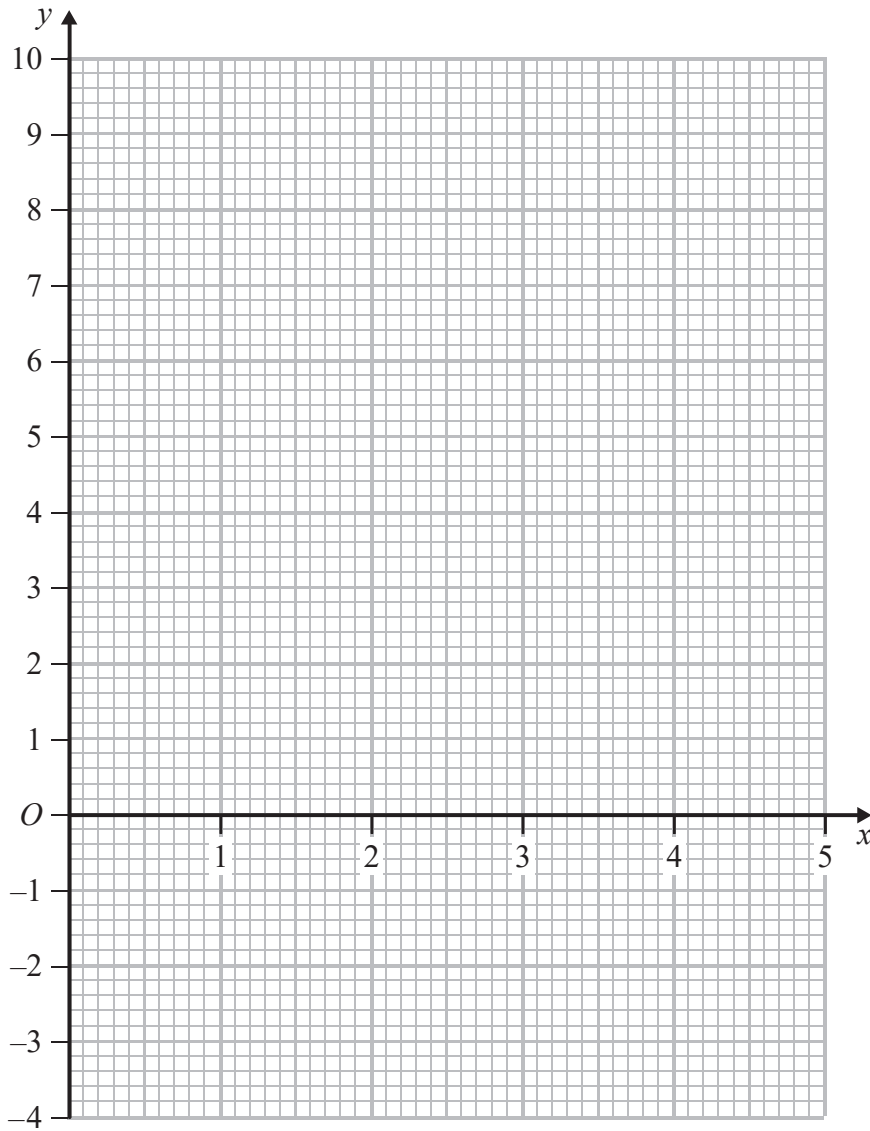
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(Total for Question 11 is 10 marks)



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Question 12 continued



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Question 12 continued

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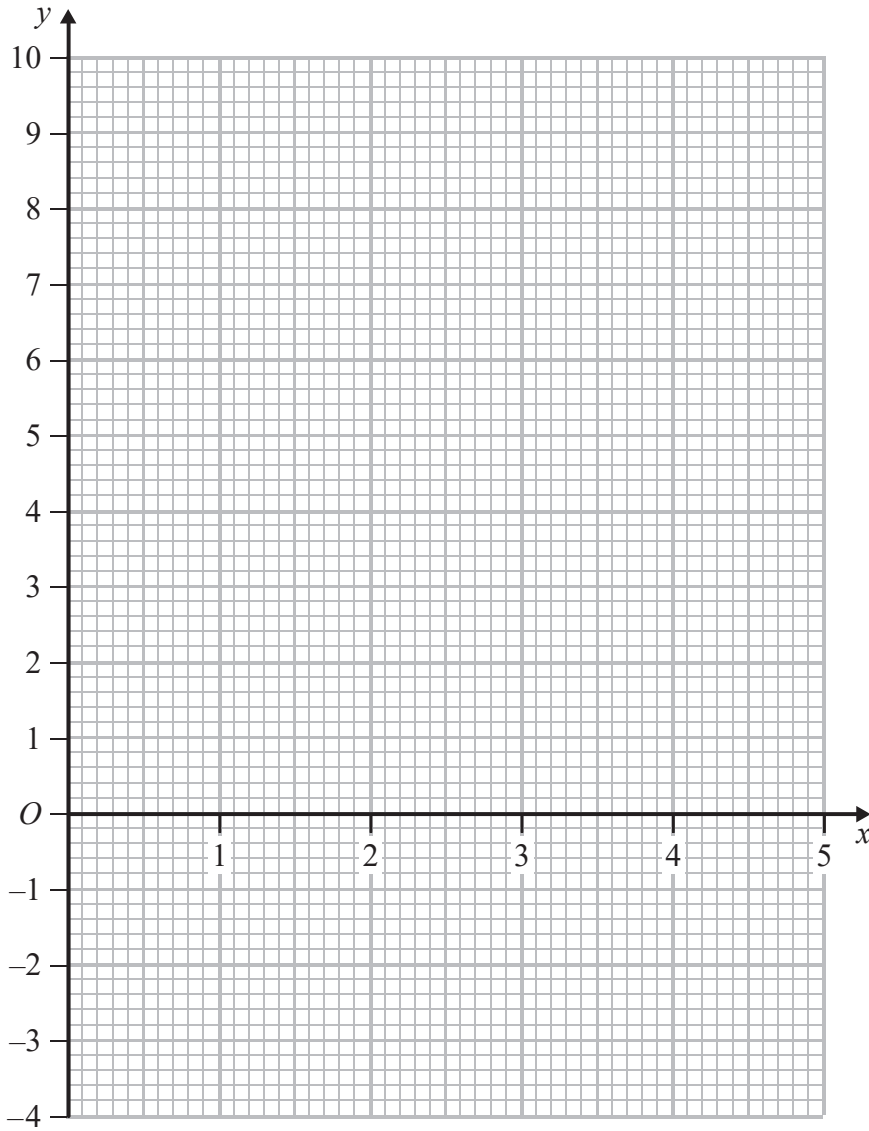
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Question 12 continued

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(Total for Question 12 is 11 marks)

TOTAL FOR PAPER IS 100 MARKS



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