Write your name here

Surname	Other names

Pearson Edexcel International GCSE

Centre Number | Candidate Number

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 ▶

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)

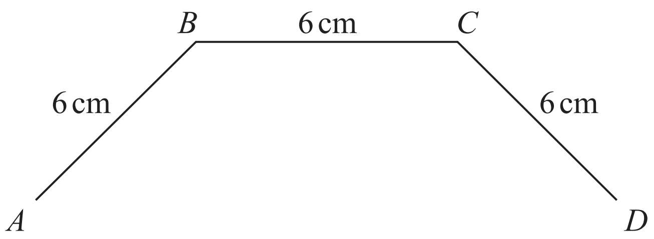


Diagram **NOT** accurately drawn

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)

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

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

P 5 3 3 4 8 A 0 2 4 0

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 1 continued

(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).

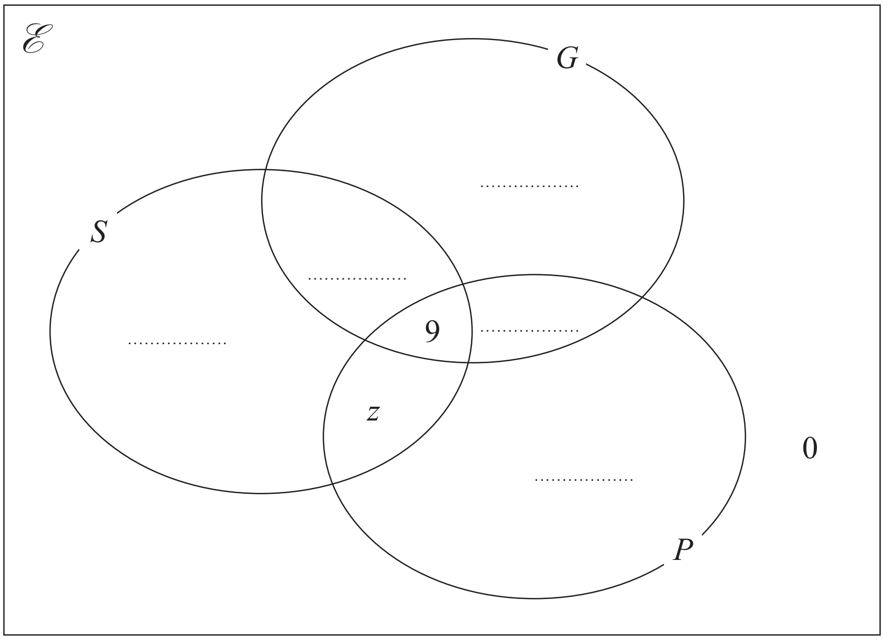
Of these people

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)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 2 continued

(Total for Question 2 is 5 marks)

3

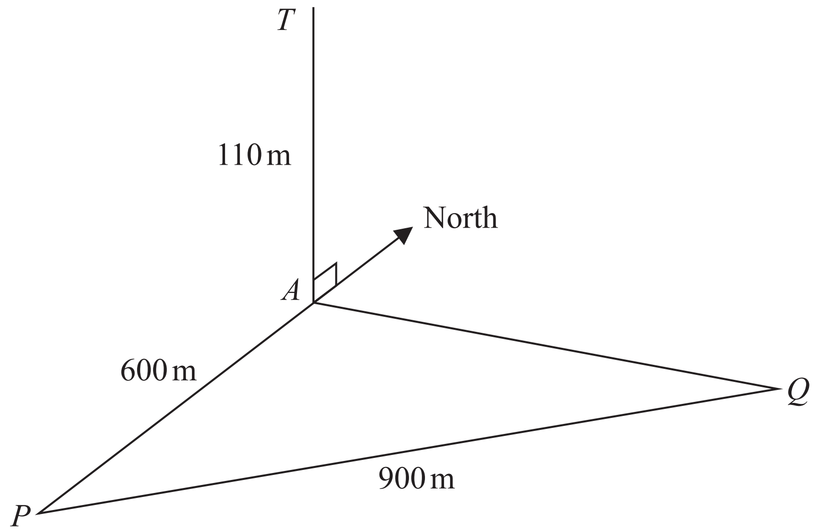


Figure 2

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)

$$\text{Sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{Cosine rule: } a^2 = b^2 + c^2 - 2bc\cos A$$

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

P 5 3 3 4 8 A 0 6 4 0

Question 3 continued

Question 3 continued

Question 3 continued

(Total for Question 3 is 8 marks)

4 Given that y is proportional to the square of T such that $y = 1600$ when $T = 2.5$

(a) find the value of y when $T = 4.5$

(3)

Given also that y is proportional to the cube of r such that $y = 12.5$ when $r = \frac{1}{2}$

(b) find the value of r when $T = 5000$

(4)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 4 continued

(Total for Question 4 is 7 marks)

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 $\mathbf{L}$ where

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

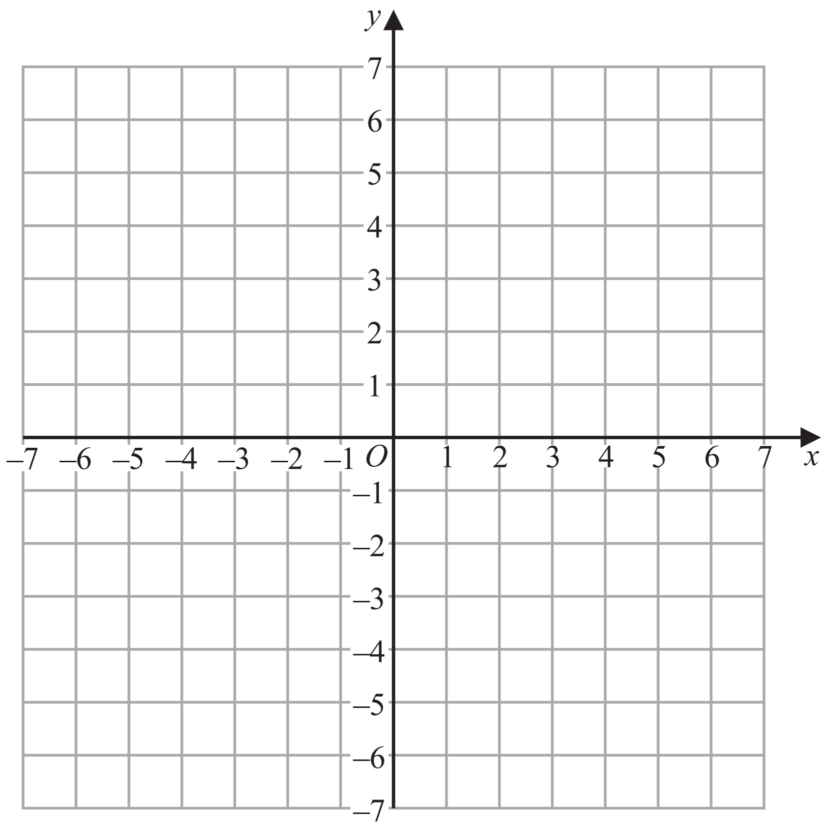
(c) On the grid, draw and label quadrilateral S.

(3)

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

(2)

Question 5 continued



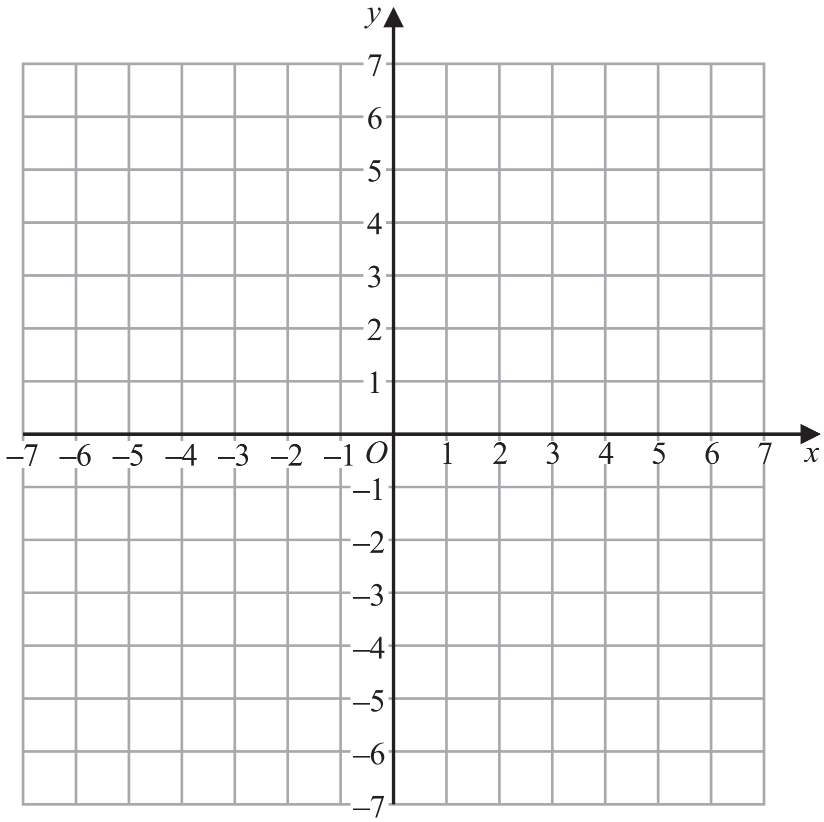
Turn over for a spare grid if you need to redraw your quadrilaterals.

Turn over

Question 5 continued

Question 5 continued

Only use this grid if you need to redraw your quadrilaterals.



(Total for Question 5 is 9 marks)

6 Chen buys watches in America to sell in England.

Chen borrowed \$800 000 for two years from a bank in America.
He used all this money to buy watches at \$200 each.

In the first year, Chen sold 62% of the watches in England for £270 each.

(a) Calculate how many watches Chen sold in the first year.

(2)

In the second year, Chen sold in England 70% of the watches that he had left at £220 each.
He then sold in England all the remaining watches by the end of the second year at £150 each.

At the end of the second year, Chen paid back to the bank in America \$800 000 plus interest of 8% of this money.

At the end of the two years the exchange rate was £1 = \$1.30

(b) Calculate the total profit in dollars (\$) that Chen made.

(6)

Question 6 continued

(Total for Question 6 is 8 marks)

7

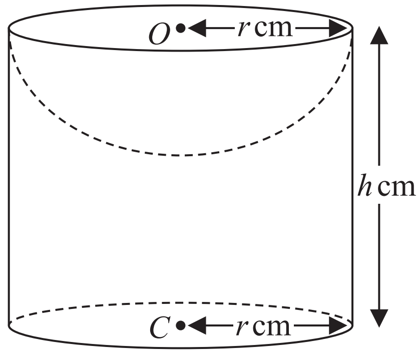


Diagram **NOT** accurately drawn

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 cm^3 and the total surface area of S is A cm^2

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

(1)

Given that $A = 1300\pi$

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

(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)

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

Question 7 continued

Question 7 continued

Question 7 continued

(Total for Question 7 is 9 marks)

8 The functions f and g are defined as

$$f(x) = 2x - 5 \text{ for all values of } x$$

$$g(x) = x^2 \text{ for all } x \geqslant 0$$

(a) Find $f(2)$

(1)

(b) Find the positive value of x for which $gf(x) = 36$

(3)

(c) (i) Solve for x, the equation $f^{-1}(x) = \lambda f(x)$ giving your answer in terms of λ.

(ii) State any values of λ for which the equation $f^{-1}(x) = \lambda f(x)$ has no solution.

(5)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 8 continued

(Total for Question 8 is 9 marks)

9

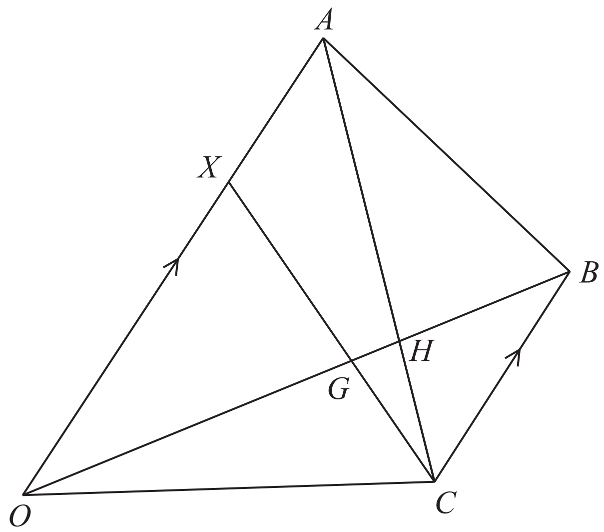


Diagram **NOT** accurately drawn

Figure 4

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

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

(a) Write down in terms of **a** or **b** or **a** and **b**

(i) $\overrightarrow{BC}$ (ii) $\overrightarrow{OC}$

(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 $\overrightarrow{XG} = k\overrightarrow{XC}$ where k is a scalar,

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

(2)

(c) Hence find $\overrightarrow{OG}$ in terms of **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)

....

....

....

....

....

Question 9 continued

Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 9 continued

(Total for Question 9 is 10 marks)

10

Time taken (T seconds)	Frequency
$20 < T \leqslant 30$	70
$30 < T \leqslant 40$	130
$40 < T \leqslant 50$	210
$50 < T \leqslant 60$	160
$60 < T \leqslant 70$	130
$70 < T \leqslant 80$	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
$20 < T \leqslant 30$	30
$30 < T \leqslant 50$	64
$50 < T \leqslant 55$	24
$55 < T \leqslant 60$	35
$60 < T \leqslant 70$	30
$70 < T \leqslant 100$	15

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

(3)

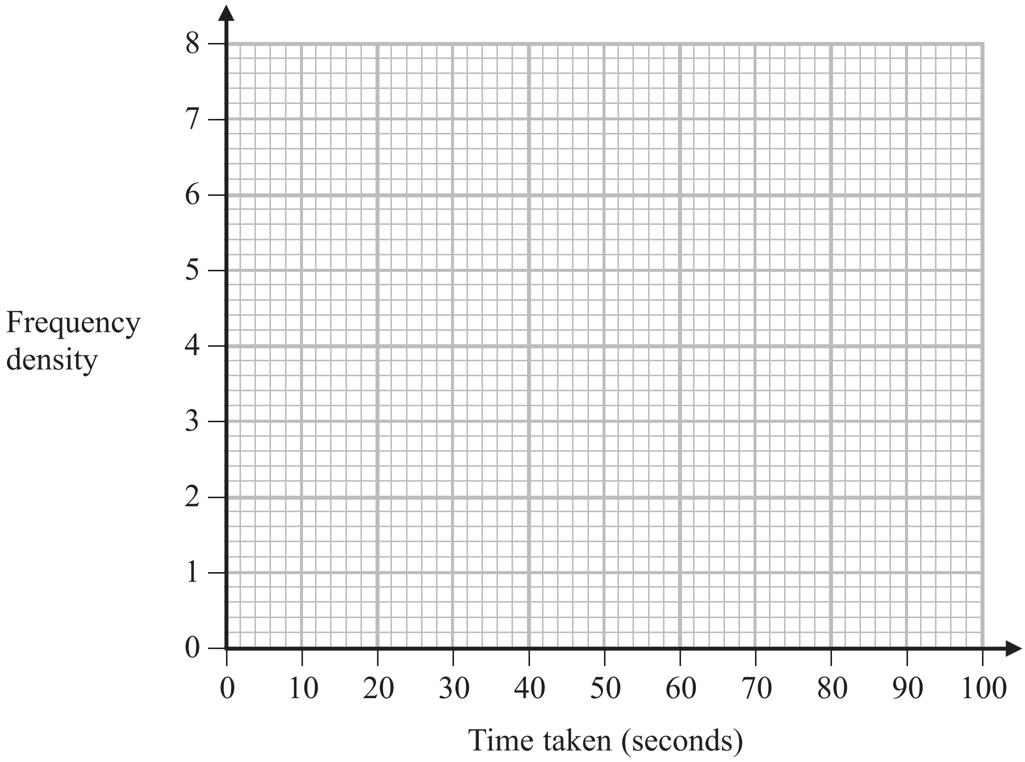
One of the children is to be chosen at random.

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

(2)

P 5 3 3 4 8 A 0 2 8 4 0

Question 10 continued



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

Turn over

Question 10 continued

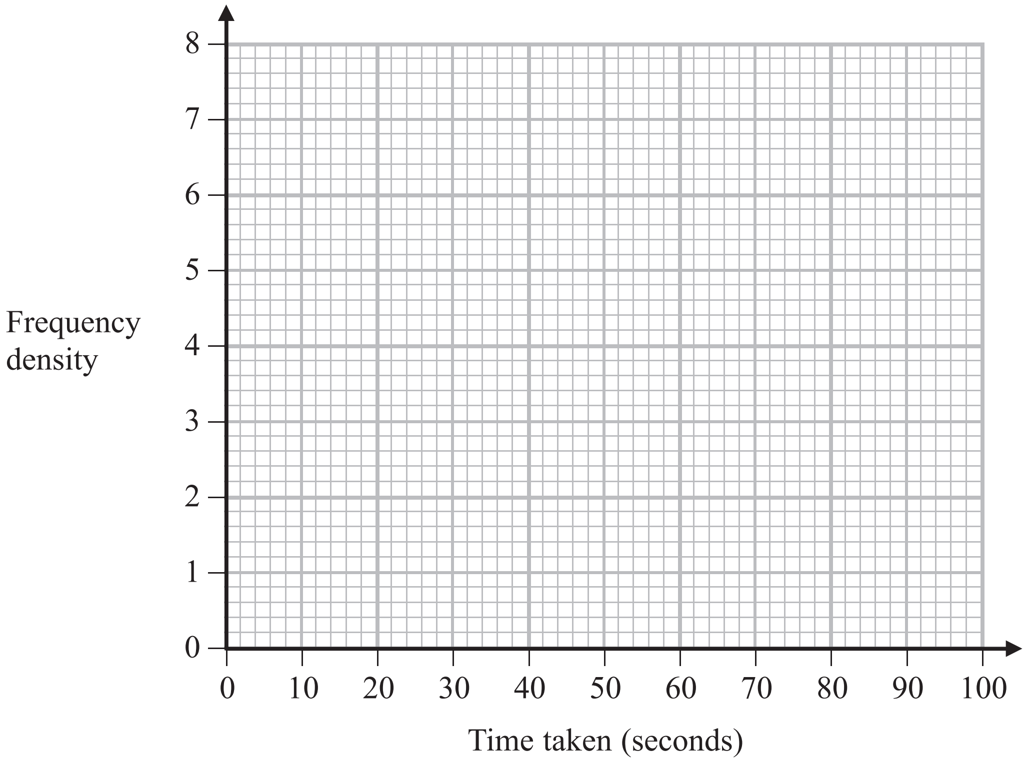
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

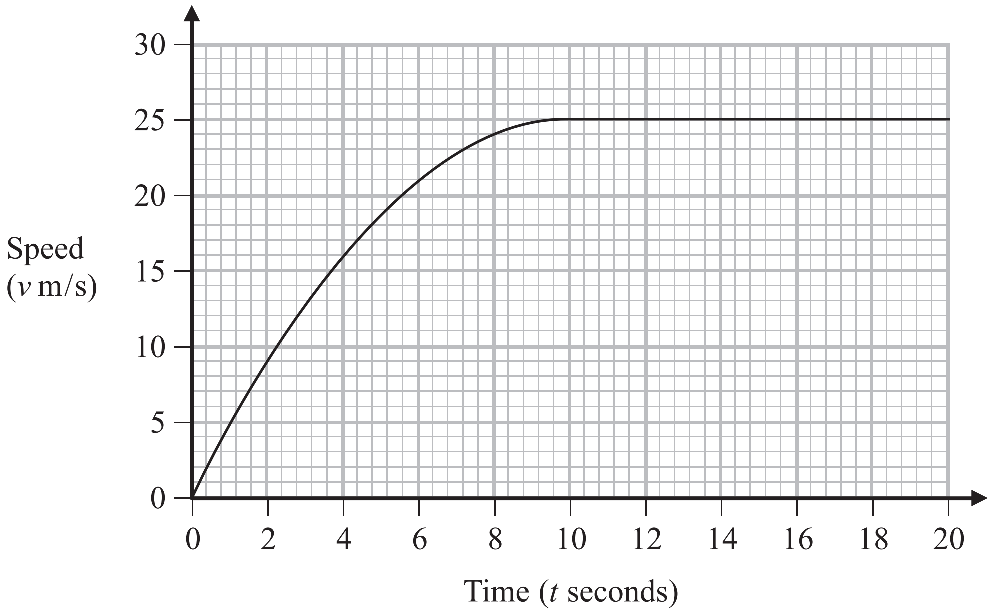
Question 10 continued

Only use this grid if you need to redraw your histogram.



(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)

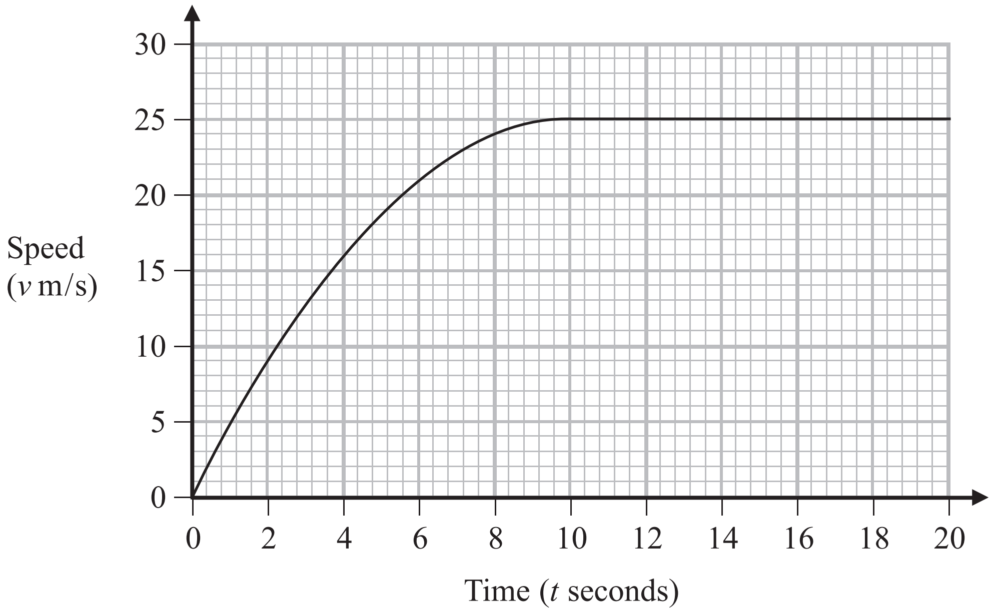
Question 11 continues on page 34.

Question 11 continued

Question 11 continued

A van travelled along the same road in the same direction as the car. The van passed the point P at time $t = 2$
From the point P the van travelled at a constant speed of 10 m/s for 4 seconds and then travelled with constant acceleration to reach a speed of 20 m/s in 14 seconds.

(c) On the grid below, draw a speed-time graph for the van's journey from P.



(2)

The car travelled a distance of $416\frac{2}{3}$ m during the 20 seconds.

(d) Calculate how far the car was ahead of the van at time $t = 20$

(3)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

Question 11 continued

(Total for Question 11 is 10 marks)

12 The equation of a curve is $y = x^2 - 8 + \dfrac{5}{x}$

(a) Complete the table of values for $y = x^2 - 8 + \dfrac{5}{x}$

Give your values of y correct to one decimal place where necessary.

x	0.5	1	1.5	2	2.5	3	3.5	4
y	2.3		–2.4		0.3	2.7		9.3

(3)

(b) On the grid opposite, plot the points from your completed table and join them to form a smooth curve.

(3)

(c) Using your curve, find an estimate of the minimum value, to one decimal place, of $x^2 - 8 + \dfrac{5}{x}$ in the interval $0.5 \leqslant x \leqslant 4$

(1)

(d) By drawing a suitable straight line on the grid, find estimates, to one decimal place, of the two solutions of the equation $x^3 - 2x^2 - 6x + 5 = 0$ in the interval $0.5 \leqslant x \leqslant 4$

(4)

....

....

....

....

....

....

....

....

....

....

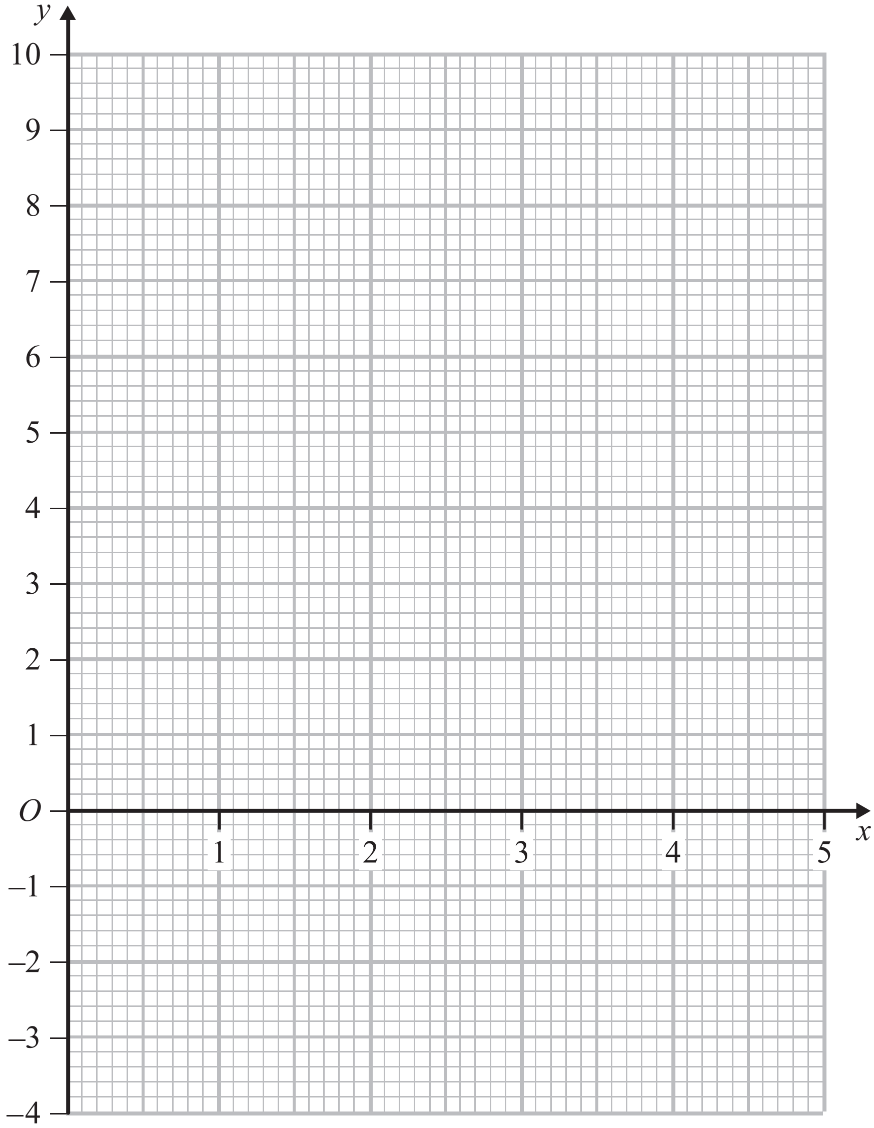
....

....

....

....

Question 12 continued

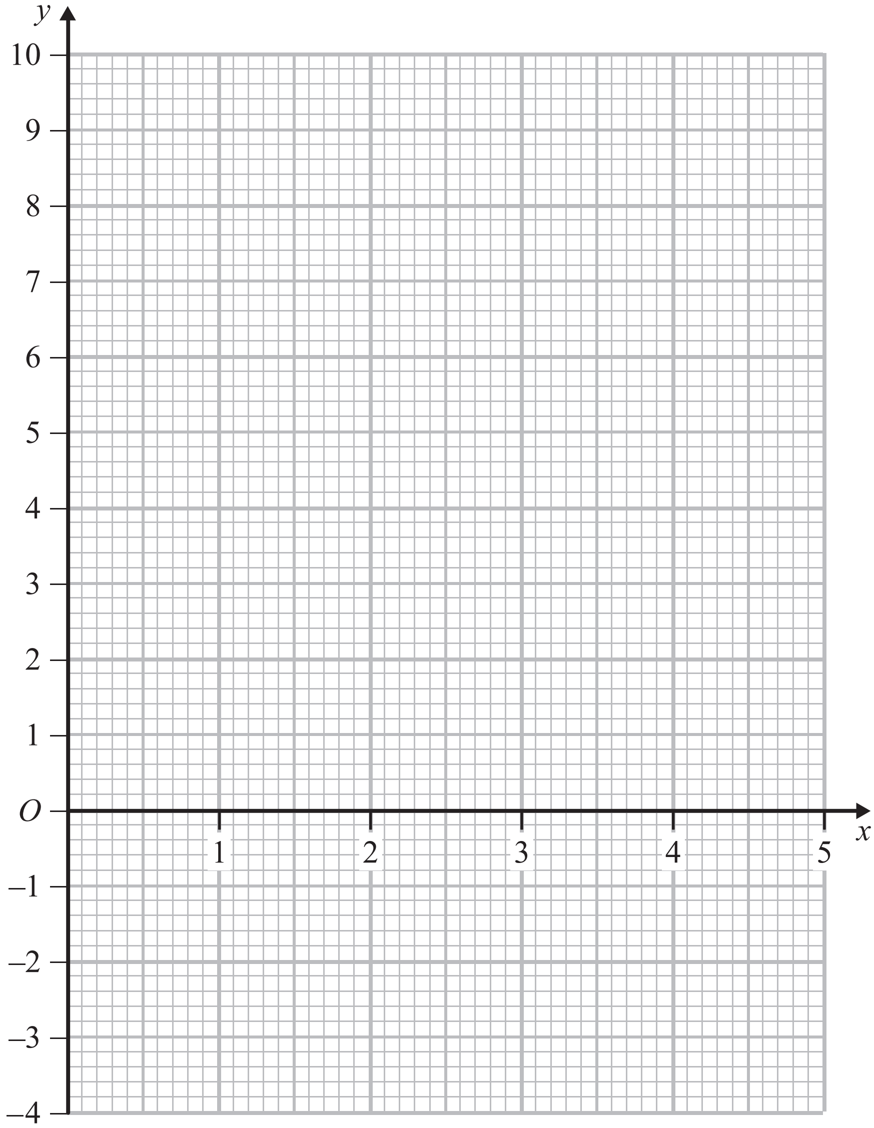


Turn over for a spare grid if you need to redraw your graph.

Question 12 continued

Question 12 continued

Only use this grid if you need to redraw your graph.



(Total for Question 12 is 11 marks)

TOTAL FOR PAPER IS 100 MARKS

BLANK PAGE

Do NOT write in this space.