Write your name here

Surname	Other names

Pearson Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Mathematics B

Paper 2R

Thursday 8 June 2017 – Morning
Time: 2 hours 30 minutes

Paper Reference
4MB0/02R

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 ▶

P48467A

©2017 Pearson Education Ltd.

1/1/1/

P 4 8 4 6 7 A 0 1 3 6

Pearson

Answer ALL ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Helen saves £P for her holidays.
She divides this money into three parts, £x, £y and £z, such that $x : y : z = 2 : 3 : 5$

Given that $x = 360$

(a) calculate the value of P.

(2)

Helen changes £y to euros and £z to dollars.
The exchange rates are £1 = 1.25 euros and 1 euro = 1.20 dollars.

(b) (i) Calculate the number of euros she should receive.

(ii) Calculate the number of dollars she should receive.

(5)

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

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 7 marks)

2 Rectangle A has length $(2x + 3)$ cm and width $(x + 1)$ cm.
Rectangle B has length $(3x - 5)$ cm and width $(x + 2)$ cm.
The area of rectangle A is equal to the area of rectangle B.

Calculate the value of x
Give your answer to 3 significant figures.
Show your working clearly.

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

$$\left[\text{Solutions of } ax^2 + bx + c = 0 \text{ are } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\right]$$

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 6 marks)

3

Diagram **NOT** accurately drawn

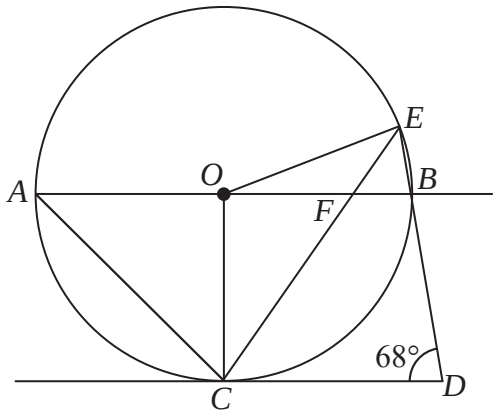


Figure 1

Figure 1 shows a circle with centre O. The points A, C, B and E lie on the circle.
AOB is a diameter of the circle and DC is the tangent to the circle at C.
CFE and DBE are straight lines.
AB is parallel to CD and $\angle CDE = 68^\circ$

(a) Write down the size of $\angle OCD$

(1)

(b) Find the size of $\angle OAC$

(1)

(c) Giving reasons, find the size in degrees of

(i) $\angle FBE$

(2)

(ii) $\angle CEB$

(2)

(iii) $\angle EFB$

(2)

(d) Find the size, in degrees, of the obtuse angle AOE.

(1)

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

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

Question 3 continued

(Total for Question 3 is 9 marks)

4

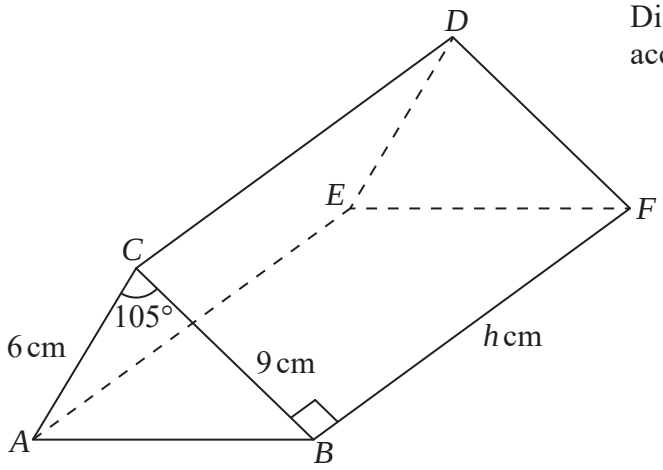


Diagram **NOT** accurately drawn

Figure 2

Figure 2 shows a solid triangular prism *ABCDEF*.
AC = 6 cm, *BC* = 9 cm and angle *ACB* = 105°

(a) Calculate the length, in cm to 3 significant figures, of *AB*.

(3)

(b) Calculate the area, in cm^2 to 3 significant figures, of triangle *ABC*.

(2)

BF = *h* cm and angle *CBF* = 90°
The volume of the prism is 352 cm^3

(c) Calculate the value, to 3 significant figures, of *h*.

(2)

(d) Calculate the total surface area, in cm^2 to 3 significant figures, of the prism.

(2)

$$\left[\begin{array}{c}\text{Area of triangle} = \frac{1}{2}ab\sin C \\ \text{Cosine rule: } a^2 = b^2 + c^2 - 2bc\cos A\end{array}\right]$$

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

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

Question 4 continued

Question 4 continued

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

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 9 marks)

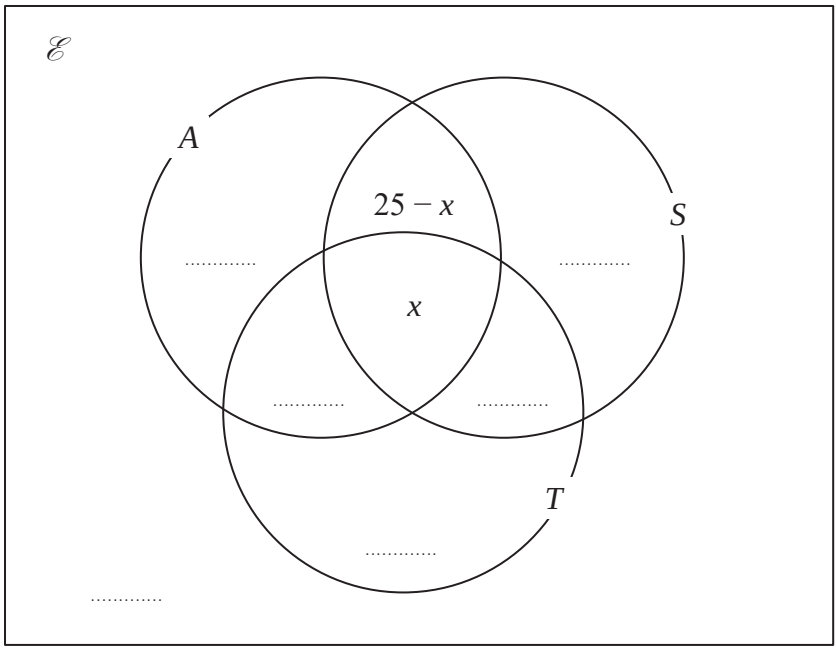
5 A travel agent asked each person in a random sample of 100 people if they have visited any of Australia (A), Sri Lanka (S) and Thailand (T).

Here is some information about their answers.

$n(\mathscr{E}) = 100,\ n(A) = 55,\ n(S) = 48,\ n(T) = 43,\ n(A \cap S) = 25,\ n(S \cap T) = 21,$

$n(A \cap T) = 23,\ n\left([A \cup S \cup T]'\right) = 7,\ n(A \cap S \cap T) = x$

This information is to be shown in a Venn diagram. The Venn diagram has been started below.



(a) Complete the Venn diagram to show the number of elements in each appropriate subset.

(3)

(b) Calculate the value of x

(2)

(c) Find $n([A \cup S] \cap T)$

(2)

One person is selected at random from the 100 people in the sample.
Given that this person has visited Australia,

(d) find the probability that this person has also visited Sri Lanka.

(1)

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

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

Question 5 continued

(Total for Question 5 is 8 marks)

6 A fuel consumption test is carried out on 100 cars. The table shows information about the results.

Fuel consumption (x km/litre)	Number of cars
$12 < x \leqslant 16$	24
$16 < x \leqslant 18$	22
$18 < x \leqslant 22$	28
$22 < x \leqslant 26$	20
$26 < x \leqslant 32$	6

(a) Calculate an estimate for the mean fuel consumption of the 100 cars.

(4)

(b) On the grid opposite, draw a histogram to represent the information in the table.
Two bars have been drawn for you.

(3)

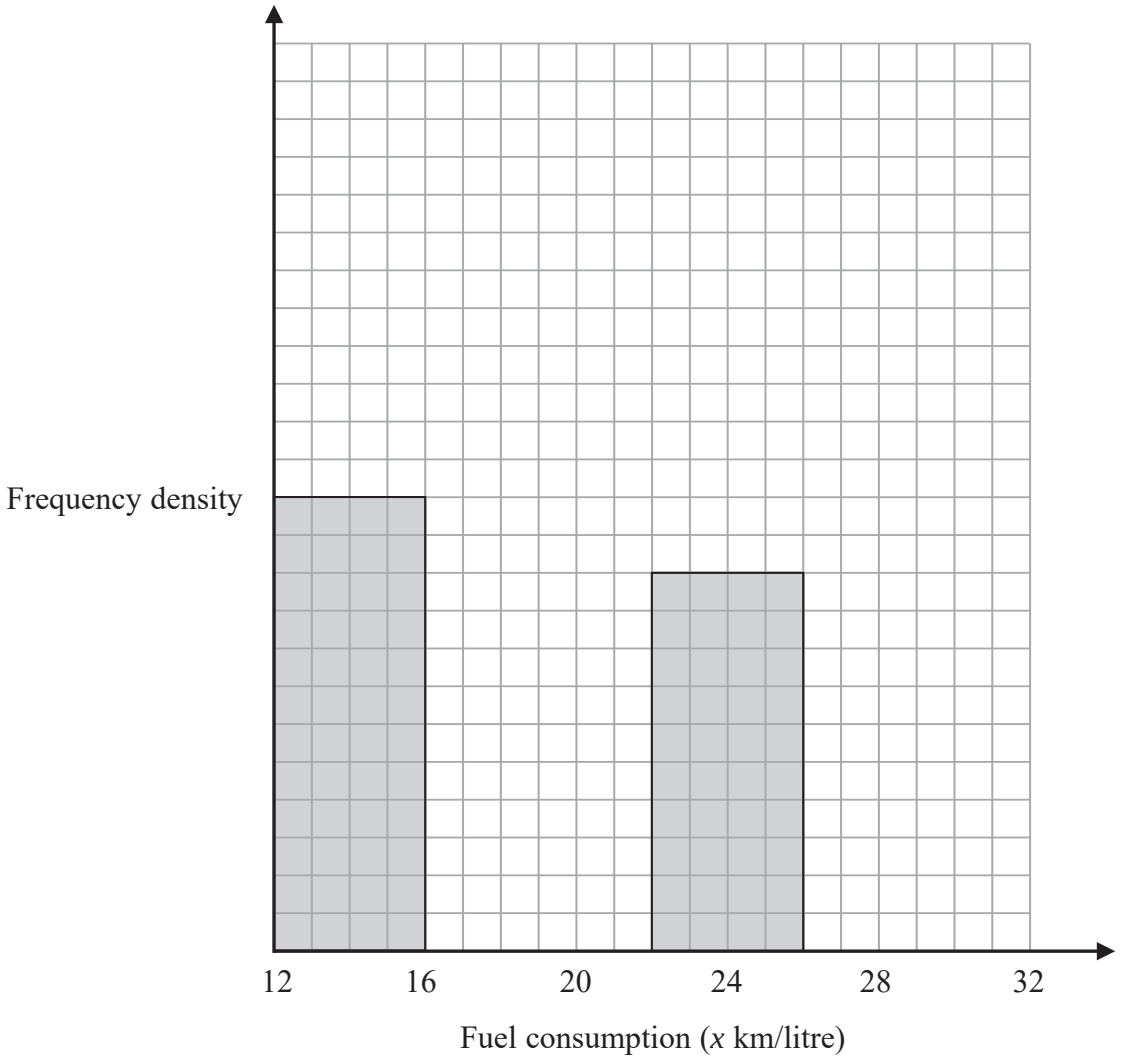
(c) Calculate an estimate for the number of the 100 cars that have a fuel consumption of more than 25 km/litre.

(2)

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

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

Question 6 continued



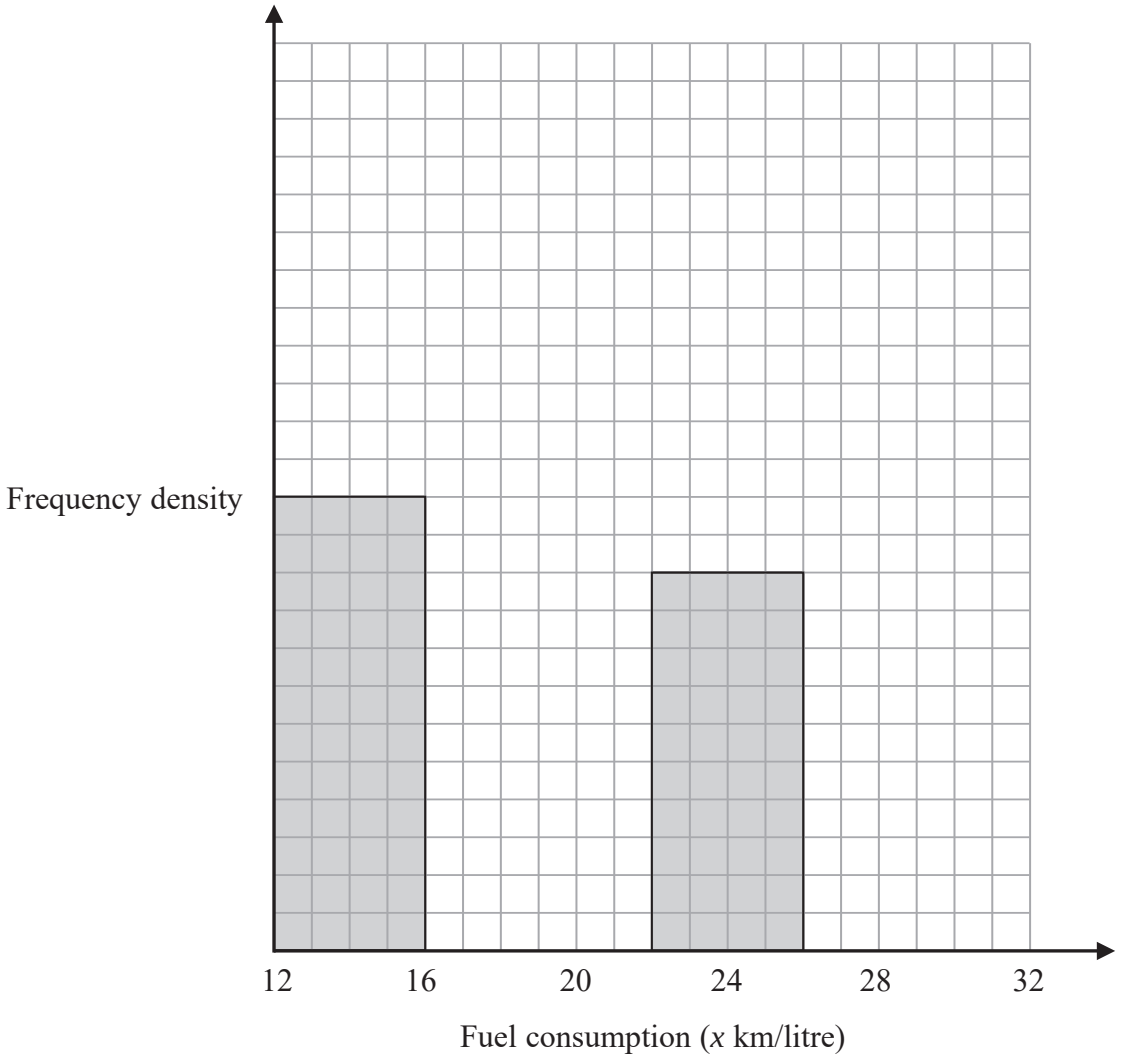
Turn over for a spare grid if you need to redraw your histogram.

Question 6 continued

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

Question 6 continued

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



(Total for Question 6 is 9 marks)

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

7 The entrance fee for a museum is 8 dollars.
One day the number of visitors to the museum was 250

(a) Calculate the total entrance fees paid for this day.

(1)

The entrance fee is increased from 8 dollars by 20%
The day after this increase the number of visitors to the museum decreased from 250 by 10%

(b) Calculate the total entrance fees paid on the day after the price increase.

(3)

The museum estimates that the number of visitors in a day will decrease from 250 by r% when the entrance fee is increased from 8 dollars by $(2r)$%
After the entrance fee is increased from 8 dollars by $(2r)$%, the total entrance fees paid in a day is T dollars.

(c) Using the museum's estimate, show that

$$T = 2000 + 20r - 0.4r^2$$

(4)

(d) Find the value of r for which T is a maximum.
Show clear algebraic working.

(3)

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

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

Question 7 continued

Question 7 continued

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

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

Question 7 continued

(Total for Question 7 is 11 marks)

8 (a) Complete the table of values for $y = 2x^3 - 3x + 2$

x	−1.5	−1	−0.5	0	0.5	1	1.5
y	−0.25		3.25	2		1	4.25

(2)

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

(3)

(c) Using your curve, find estimates, to 1 decimal place, of the solutions of the equation $4x^3 - 6x + 1 = 0$

(3)

(d) By drawing a suitable straight line on your grid, find an estimate, to 1 decimal place, for the range of values of x for which $2x^3 + x + 1 > 0$

(4)

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

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

Question 8 continued

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

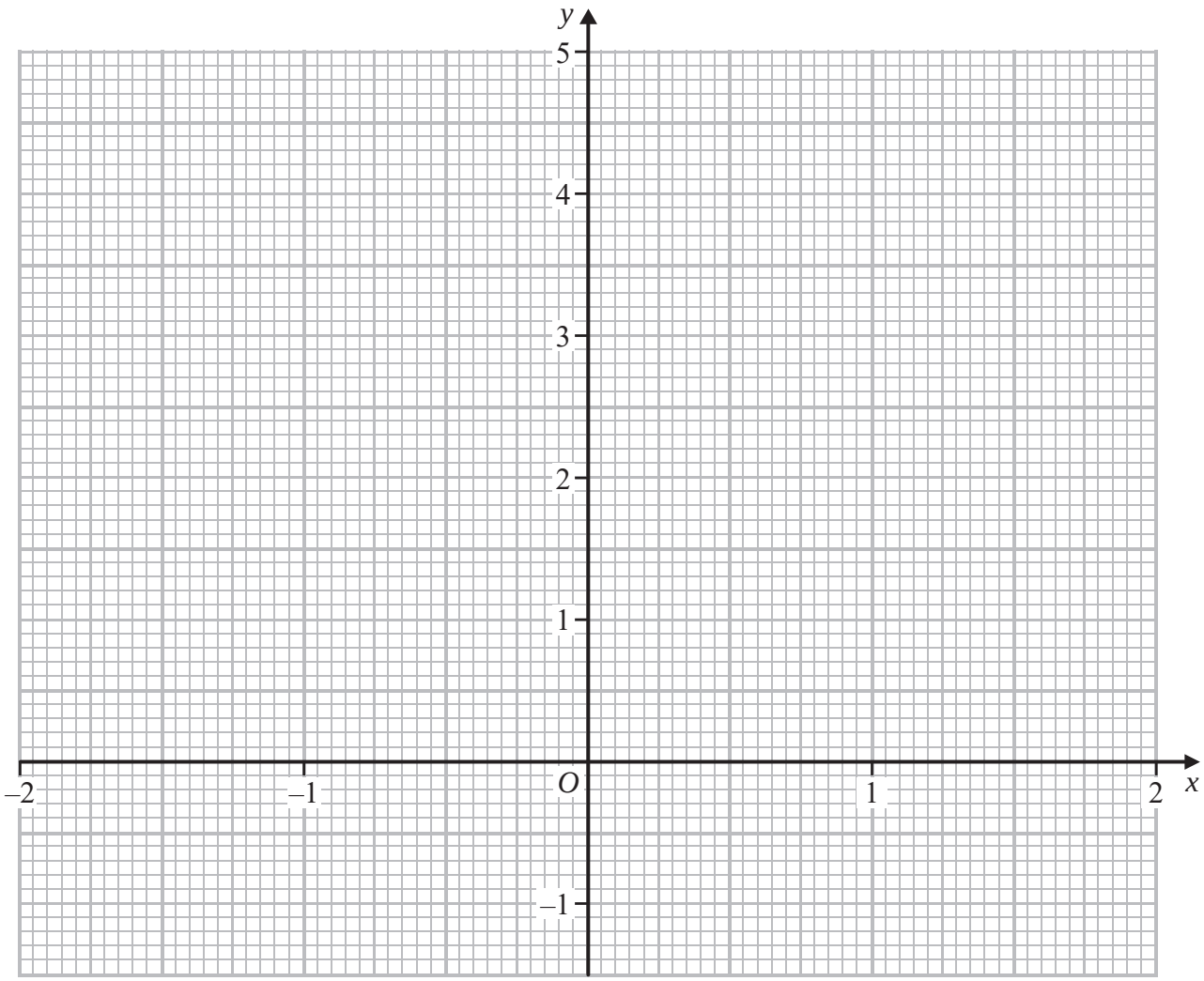
Question 8 continued

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

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

Question 8 continued

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



(Total for Question 8 is 12 marks)

9

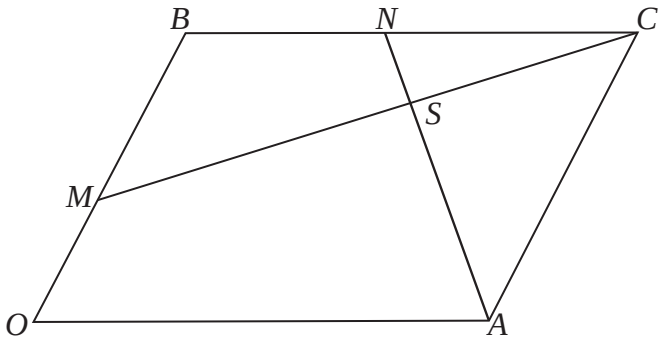


Diagram **NOT** accurately drawn

Figure 3

Figure 3 shows a parallelogram $OACB$ in which $\overrightarrow{OA} = 8\mathbf{a}$ and $\overrightarrow{OB} = 6\mathbf{b}$
The point M lies on OB such that $OM : MB = 1 : 2$
N is the midpoint of BC.

(a) Find, in terms of **a** or **b**, or **a** and **b**,

(i) $\overrightarrow{MB}$ (ii) $\overrightarrow{MC}$ (iii) $\overrightarrow{NA}$

(3)

The lines MC and AN intersect at the point S.

Given that $\overrightarrow{NS} = \lambda \overrightarrow{NA}$, where λ is a scalar,

(b) find, in terms of λ, **a** and **b**,

(i) $\overrightarrow{NS}$ (ii) $\overrightarrow{MS}$

(2)

Given also that $\overrightarrow{MS} = \mu \overrightarrow{MC}$, where μ is a scalar,

(c) write down an expression for $\overrightarrow{MS}$ in terms of μ, **a** and **b**.

(1)

(d) Hence find the value of λ and the value of μ

(5)

The area of parallelogram $OACB$ is 80 square units.

(e) Find the area of

(i) triangle CAN,

(ii) triangle CNS.

(2)

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

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

Question 9 continued

Question 9 continued

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

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 13 marks)

10 Given that $\frac{12(2^{3x})^{x-2}6^{2x-1}}{9^x}$ can be written in the form 2^n

(a) show that $n = 3x^2 - 4x + 1$

(3)

(b) Hence solve the equation $\frac{12(2^{3x})^{x-2}6^{2x-1}}{9^x} = 32$

(3)

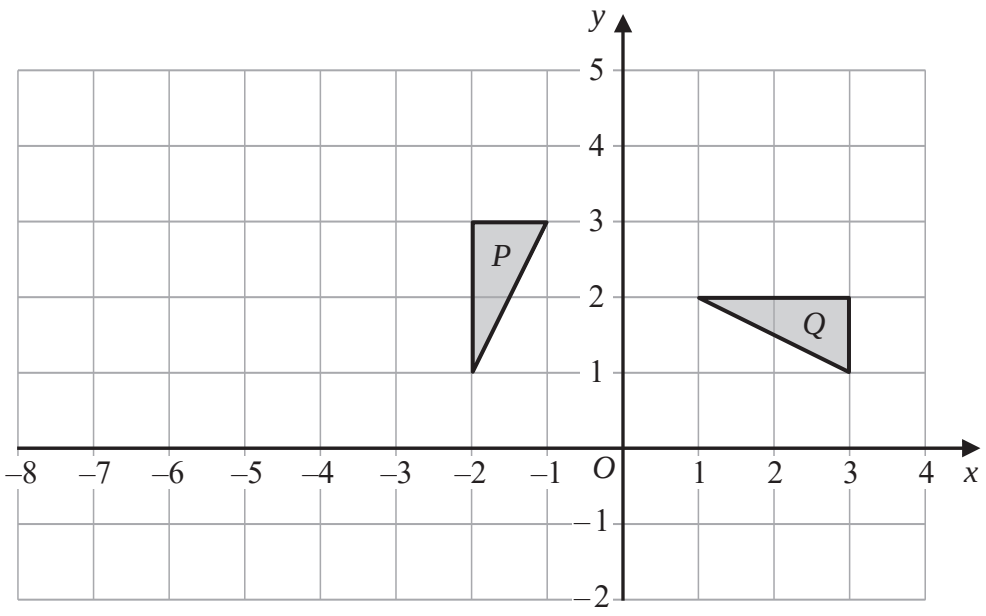
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

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

Question 10 continued

(Total for Question 10 is 6 marks)

11



Triangles P and Q are shown on the grid.

(a) Write down the coordinates of the vertices of triangle Q.

(1)

(b) Describe fully the **single** transformation that maps triangle P onto triangle Q.

(3)

(c) Find the matrix that represents the transformation that maps triangle P onto triangle Q.

(1)

Triangle Q is transformed to triangle R under the transformation with matrix $\mathbf{M}$ where

$$\mathbf{M} = \begin{pmatrix} -1 & -2 \\ 0 & 2 \end{pmatrix}$$

(d) Find the coordinates of the vertices of R.

(2)

(e) Find the matrix of the transformation that maps triangle P onto triangle R.

(3)

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

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

Question 11 continued

Question 11 continued

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

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

Question 11 continued

Question 11 continued

(Total for Question 11 is 10 marks)

TOTAL FOR PAPER IS 100 MARKS

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