

Write your name here

Surname

Other names

**Pearson Edexcel  
International GCSE**

Centre Number

Candidate Number

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# 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 ▶

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**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)



**Question 1 continued**

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(Total for Question 1 is 7 marks)



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- 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.

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



**Question 2 continued**

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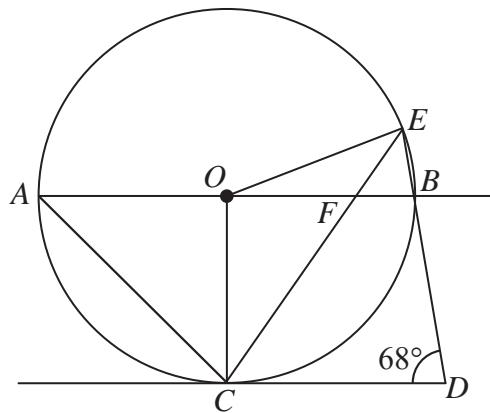
(Total for Question 2 is 6 marks)



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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)

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**Question 3 continued**

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(Total for Question 3 is 9 marks)



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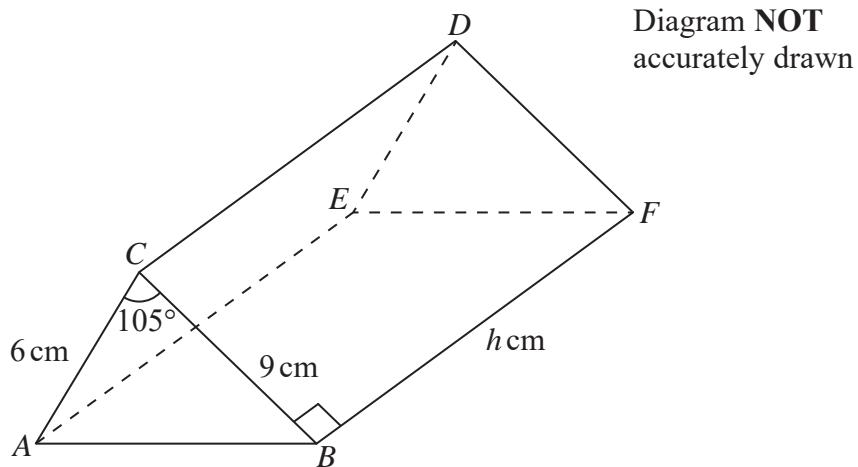
**Figure 2**

Figure 2 shows a solid triangular prism  $ABCDEF$ .

$AC = 6 \text{ cm}$ ,  $BC = 9 \text{ cm}$  and angle  $ACB = 105^\circ$

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

(3)

- (b) Calculate the area, in  $\text{cm}^2$  to 3 significant figures, of triangle  $ABC$ .

(2)

$BF = h \text{ cm}$  and angle  $CBF = 90^\circ$

The volume of the prism is  $352 \text{ cm}^3$

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

(2)

- (d) Calculate the total surface area, in  $\text{cm}^2$  to 3 significant figures, of the prism.

(2)

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



**Question 4 continued**

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## **Question 4 continued**

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**Question 4 continued**

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(Total for Question 4 is 9 marks)



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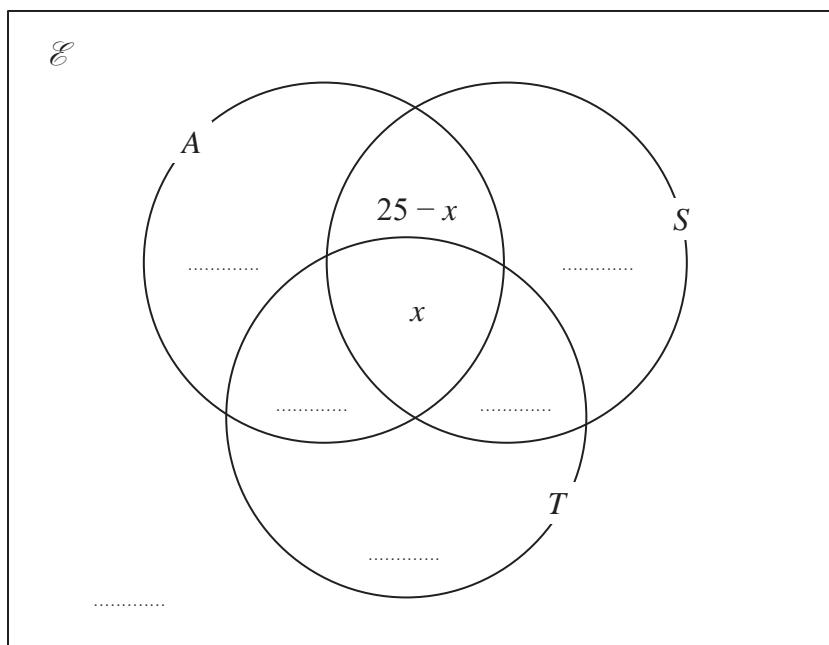
- 5 A travel agent asked each person in a random sample of 100 people if they have visited any of Australia ( $A$ ), Sri Lanka ( $S$ ) and Thailand ( $T$ ).

Here is some information about their answers.

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

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

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)

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**Question 5 continued**

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(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.

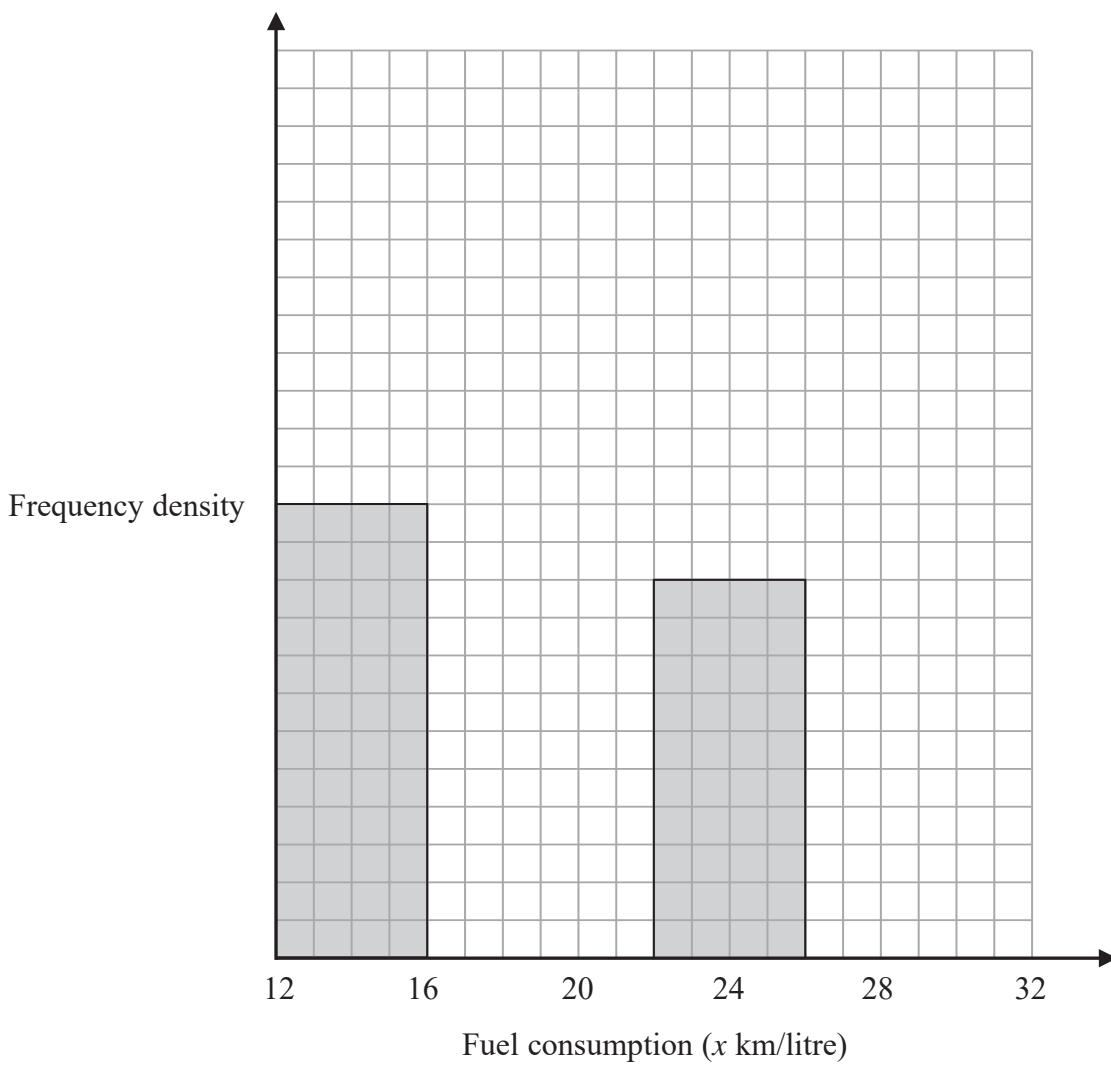
Fuel consumption ( $x$ km/litre)	Number of cars
$12 < x \leqslant 16$	24
$16 < x \leqslant 18$	22
$18 < x \leqslant 22$	28
$22 < x \leqslant 26$	20
$26 < x \leqslant 32$	6

- (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)



**Question 6 continued**

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



## **Question 6 continued**

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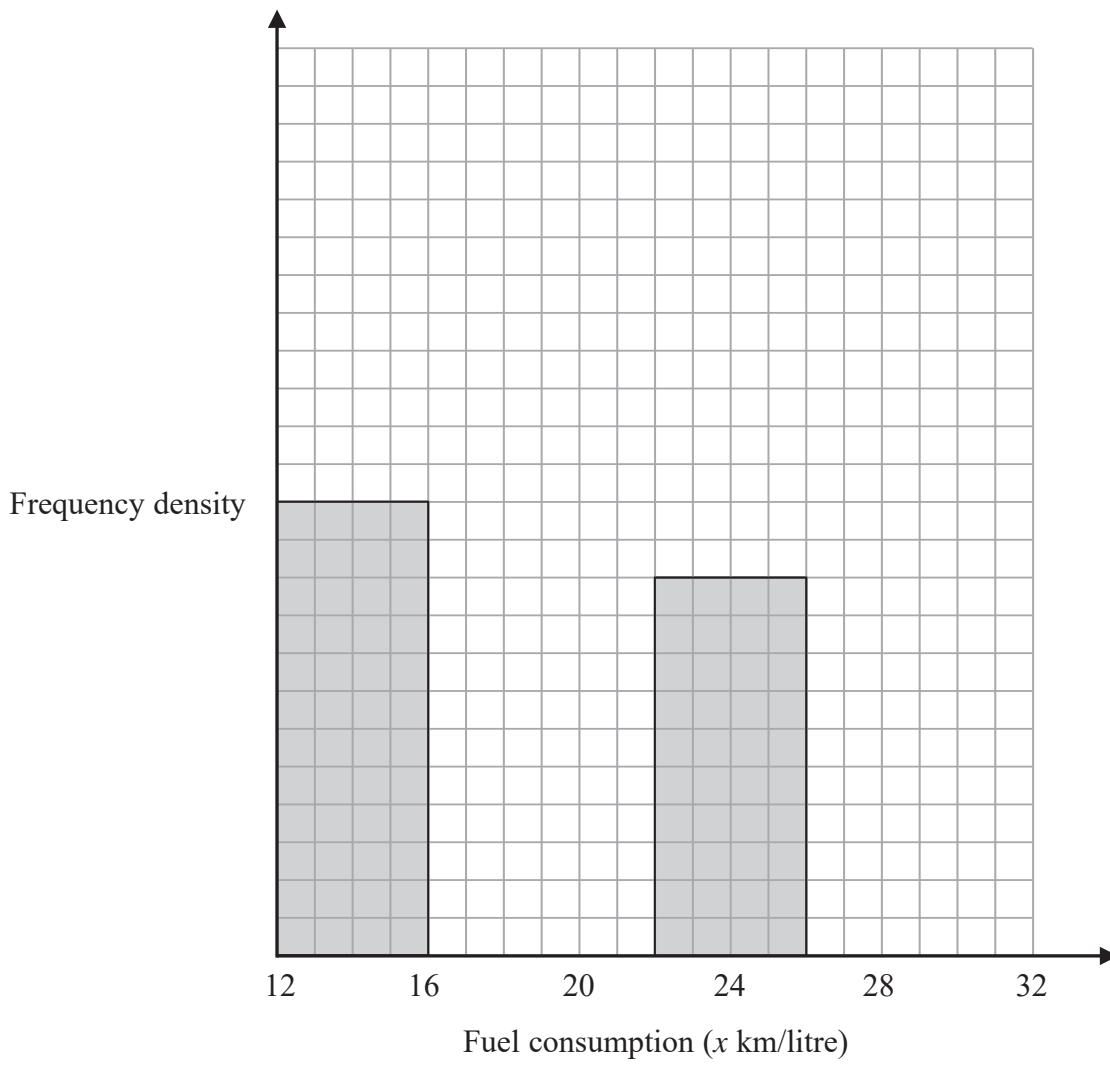
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**Question 6 continued**

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



**(Total for Question 6 is 9 marks)**



- 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)



**Question 7 continued**

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### **Question 7 continued**

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**Question 7 continued**

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(Total for Question 7 is 11 marks)



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- 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)

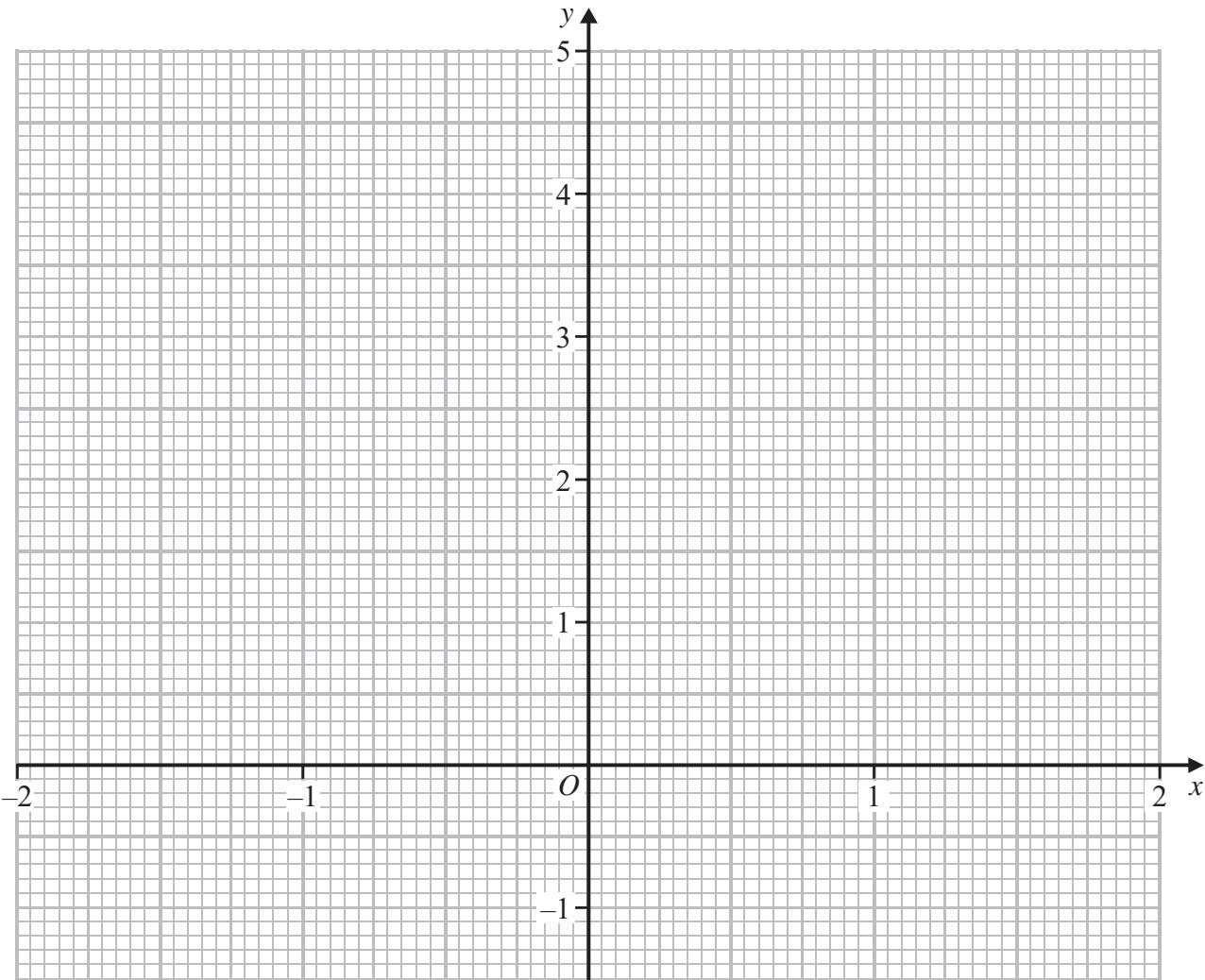
- (d) By drawing a suitable straight line on your grid, find an estimate, to 1 decimal place, for the range of values of  $x$  for which  $2x^3 + x + 1 > 0$

(4)

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**Question 8 continued**

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



### **Question 8 continued**

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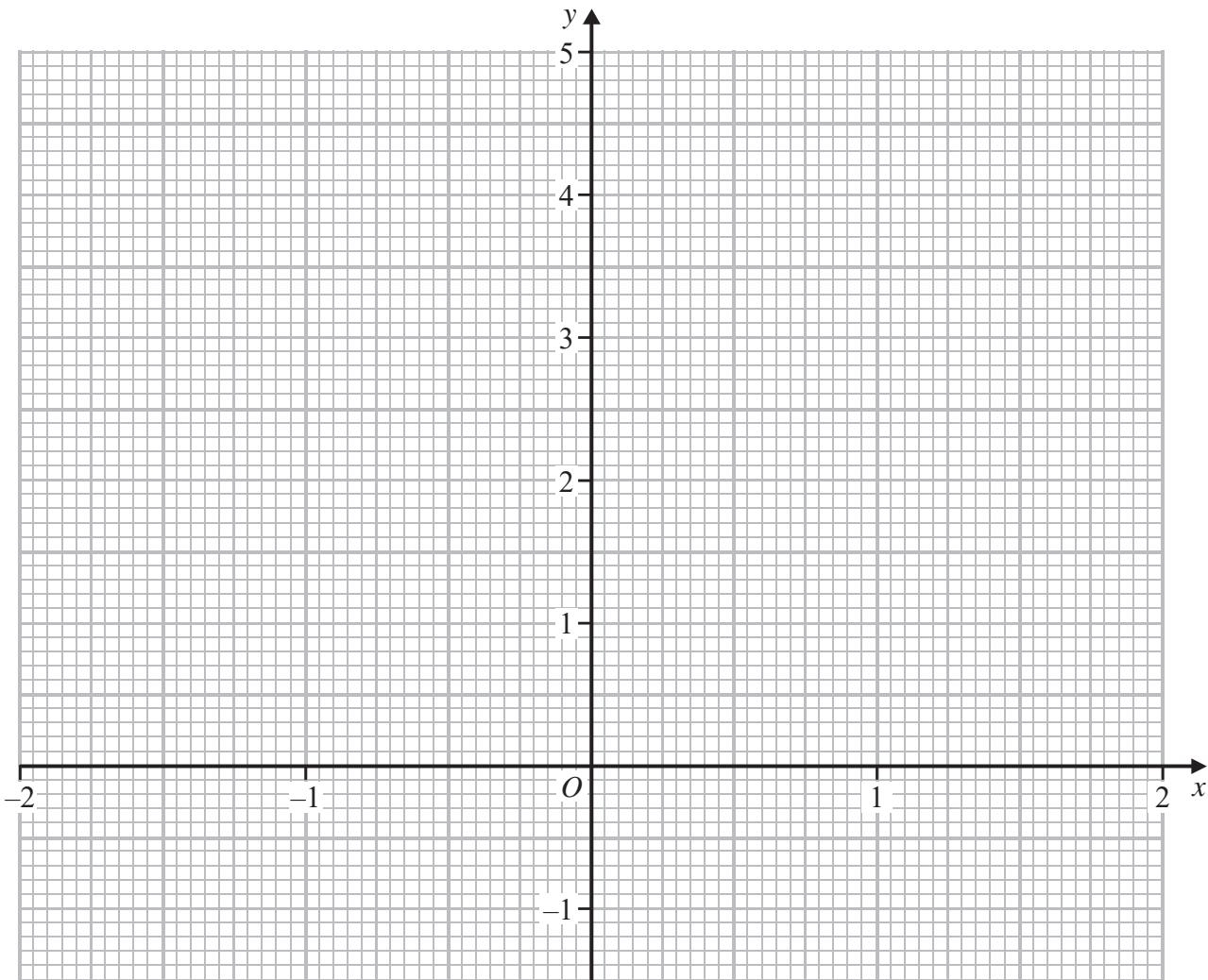
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**Question 8 continued**

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



**(Total for Question 8 is 12 marks)**



9

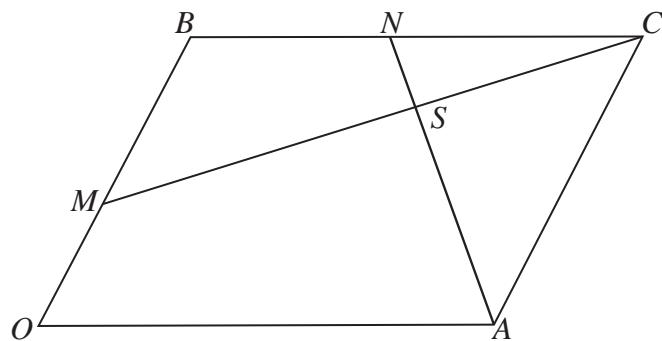


Diagram NOT  
accurately drawn

**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  $\mathbf{a}$  or  $\mathbf{b}$ , or  $\mathbf{a}$  and  $\mathbf{b}$ ,

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

(3)

The lines  $MC$  and  $AN$  intersect at the point  $S$ .

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

- (b) find, in terms of  $\lambda$ ,  $\mathbf{a}$  and  $\mathbf{b}$ ,

- (i)  $\xrightarrow{NS}$       (ii)  $\xrightarrow{MS}$

(2)

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

- (c) write down an expression for  $\vec{MS}$  in terms of  $\mu$ ,  $\mathbf{a}$  and  $\mathbf{b}$

(1)

- (d) Hence find the value of  $\lambda$  and the value of  $\mu$ .

(5)

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

- (e) Find the area of

- (i) triangle  $CAN$ ,
  - (ii) triangle  $CNS$ .

(2)



**Question 9 continued**

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### **Question 9 continued**

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**Question 9 continued**

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**(Total for Question 9 is 13 marks)**



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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)

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**Question 10 continued**

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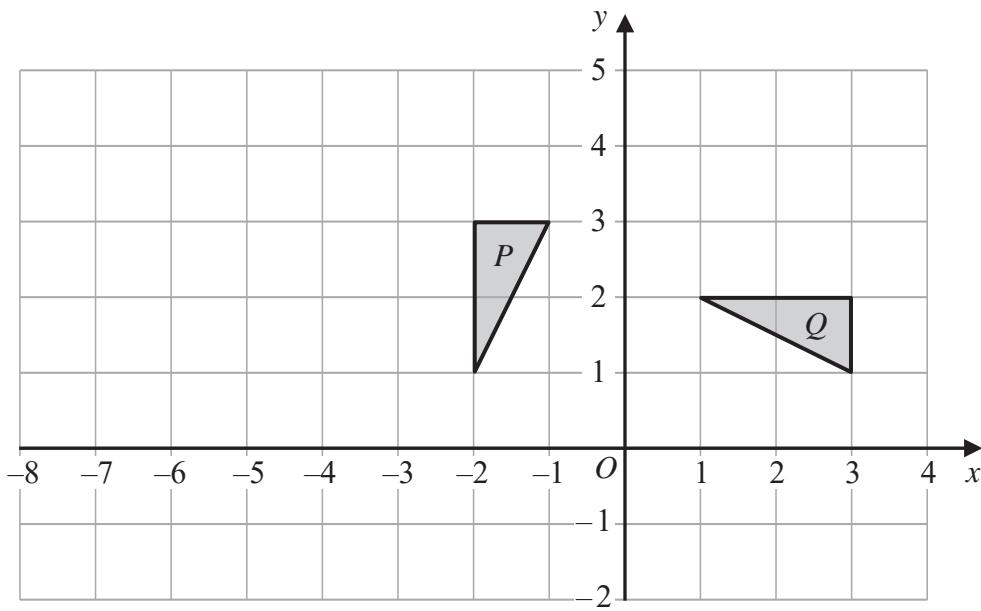
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**(Total for Question 10 is 6 marks)**



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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)
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**Question 11 continued**

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**Question 11 continued**

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**(Total for Question 11 is 10 marks)**

**TOTAL FOR PAPER IS 100 MARKS**

