Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Thursday 6 June 2019

Morning (Time: 2 hours 30 minutes) | Paper Reference **4MB1/02R**

Mathematics B

Paper 2R

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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P 6 0 2 5 8 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.

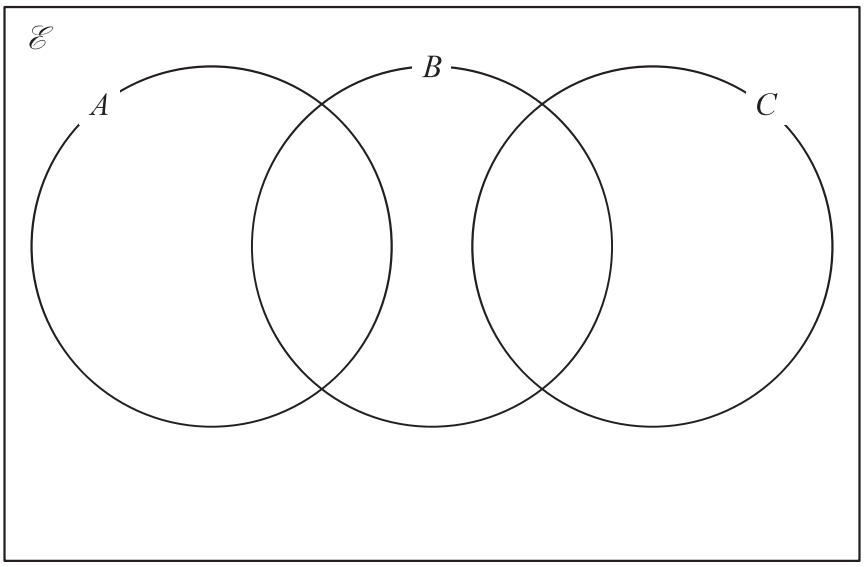
1 $\mathscr{E}$ is the universal set and A, B and C are three sets where

$\mathscr{E}$ = {positive integers less than 13}
A = {multiples of 5}
B = {even numbers}
C = {factors of 8}

The Venn diagram below can be used to show these sets.

(a) Complete the Venn diagram for the sets $\mathscr{E}$, A, B and C.

(3)



List the elements of the sets

(b) $B \cap C$

(1)

(c) $A \cup B$

(1)

(d) $(A \cup B \cup C)'$

(1)

Find

(e) $n(B \cup C)$

(1)

(f) $n(B' \cap C')$

(1)

Question 1 continued

(Total for Question 1 is 8 marks)

2 (a) (i) Solve the inequality $6x + 10 \geqslant 2x + 2$

(2)

(ii) Represent your solution on the number line on the next page.

(1)

(b) (i) Solve the inequality $(4x + 3)(2x - 1) < (6x + 5)(x - 2)$

(5)

(ii) Represent your solution on the same number line.

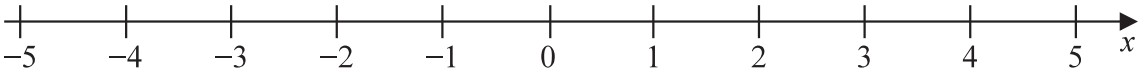
(1)

(c) Write down the set of values for which

both $6x + 10 \geqslant 2x + 2$ **and** $(4x + 3)(2x - 1) < (6x + 5)(x - 2)$

(1)

Question 2 continued

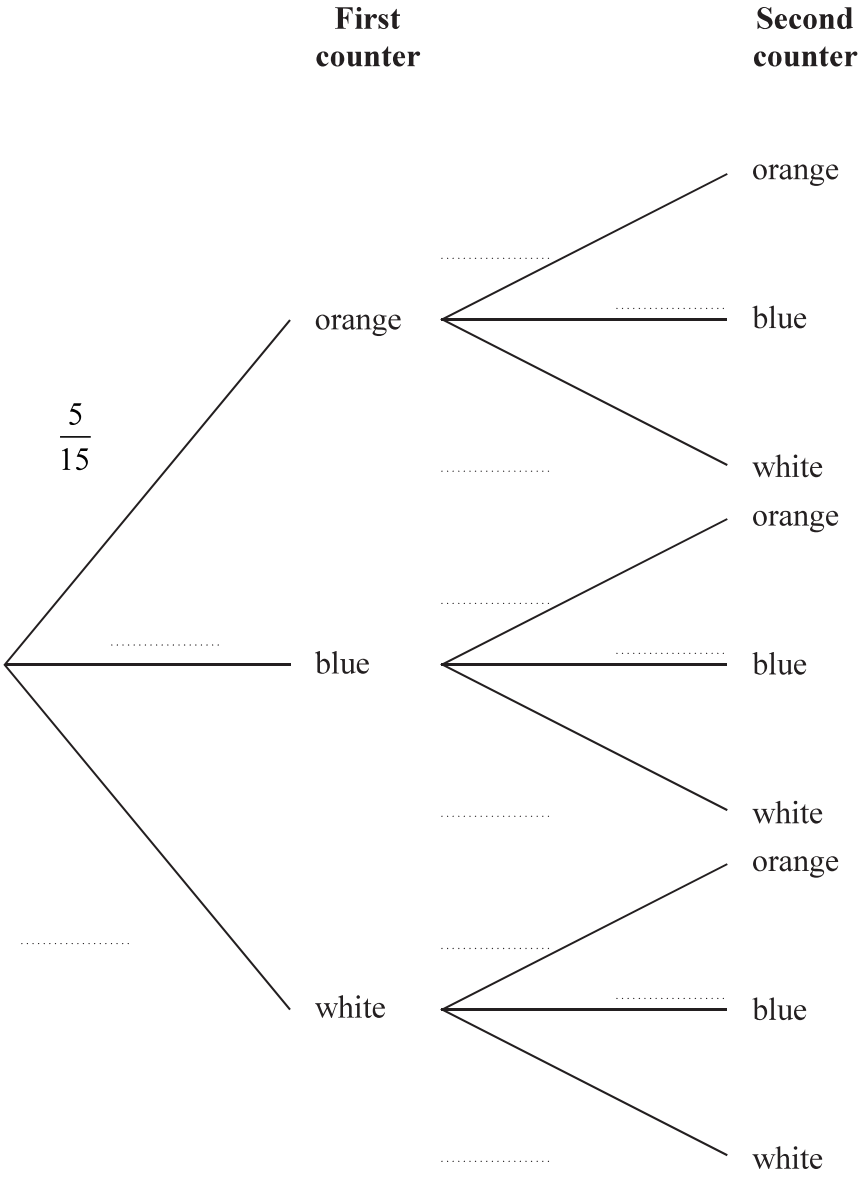


(Total for Question 2 is 10 marks)

3 A bag contains 15 counters.
There are
5 orange counters
3 blue counters
7 white counters.

Priya takes at random 2 counters from the bag.

(a) Complete the probability tree diagram.



(3)

(b) Calculate the probability that Priya takes 2 white counters.

(2)

(c) Calculate the probability that the counters Priya takes are not of the same colour.

(3)

Question 3 continued

(Total for Question 3 is 8 marks)

4 The total amount of money that was spent last March by Marco's family was $4200

The table below gives information about the amount Marco's family spent on each of four items last March.

Item	Amount
healthcare	$336
insurance	$504
food	$546
travel	$630
housing	
entertainment	
other items	

(a) Calculate the percentage of the total amount that was spent on healthcare.

(2)

The amount spent on travel was divided between Marco's car, his wife's car and other transport in the ratios 4 : 3 : 2

(b) Calculate the amount, in $, that was spent on Marco's car.

(2)

The amount that was spent on food last March was 12% more than was spent on food last February.

(c) Calculate the amount, in $, that was spent on food last February.

(3)

The amount of money spent on entertainment last March was 12.5% of the total amount of money that was **not** spent on healthcare, insurance, food and travel.

(d) Calculate the amount, in $, that was spent on entertainment.

(3)

Marco draws a pie chart for the amounts his family spent on all the items last March.

(e) Calculate the size of the angle, in degrees, for insurance.

(2)

The angle in the pie chart for housing is 114°

(f) Calculate the amount, in $, that was spent on housing.

(2)

Question 4 continued

Question 4 continued

Question 4 continued

(Total for Question 4 is 14 marks)

5 Triangles A and B are drawn on the grid opposite.

(a) Describe fully the single transformation that maps triangle A onto triangle B.

(3)

Triangle A is reflected in the y-axis to give triangle C.

(b) On the grid, draw and label triangle C.

(1)

Triangle D is the image of triangle C under the transformation with matrix $\mathbf{M}$ where

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

(c) On the grid, draw and label triangle D.

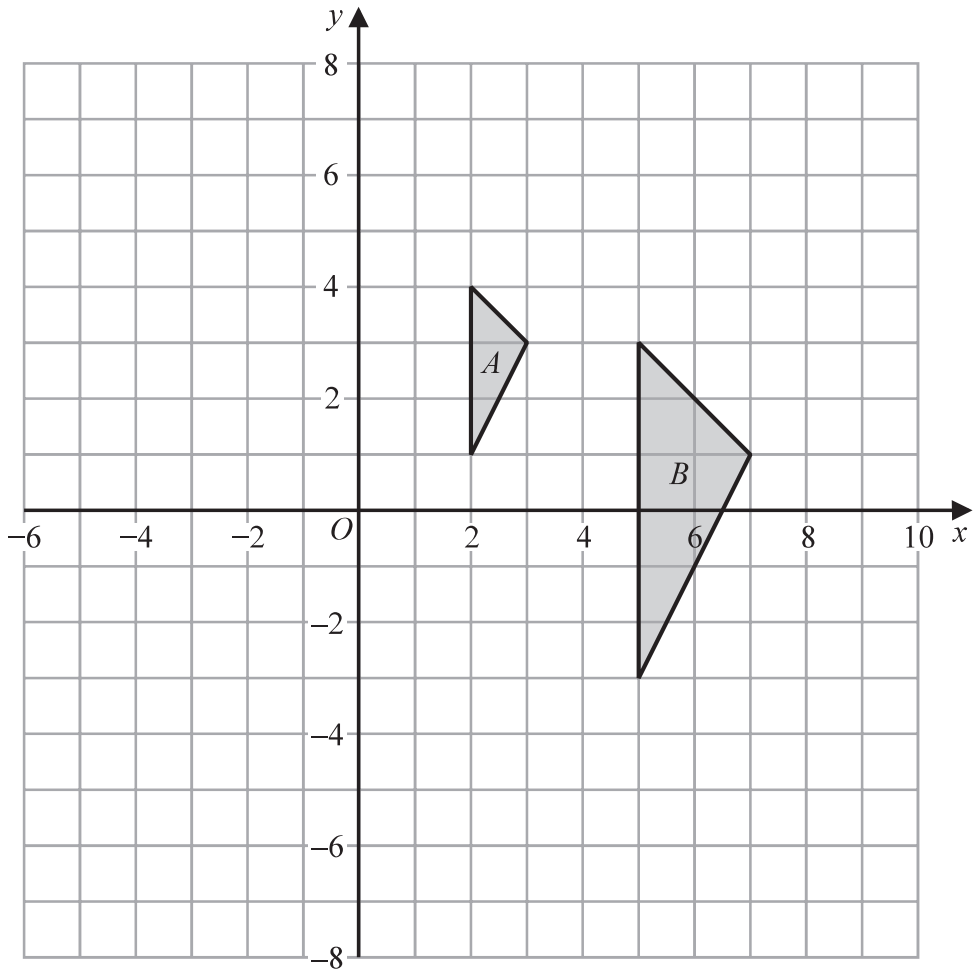
(3)

Triangle D is the image of triangle A under the transformation with matrix $\mathbf{N}$.

(d) Find the matrix $\mathbf{N}$.

(3)

Question 5 continued

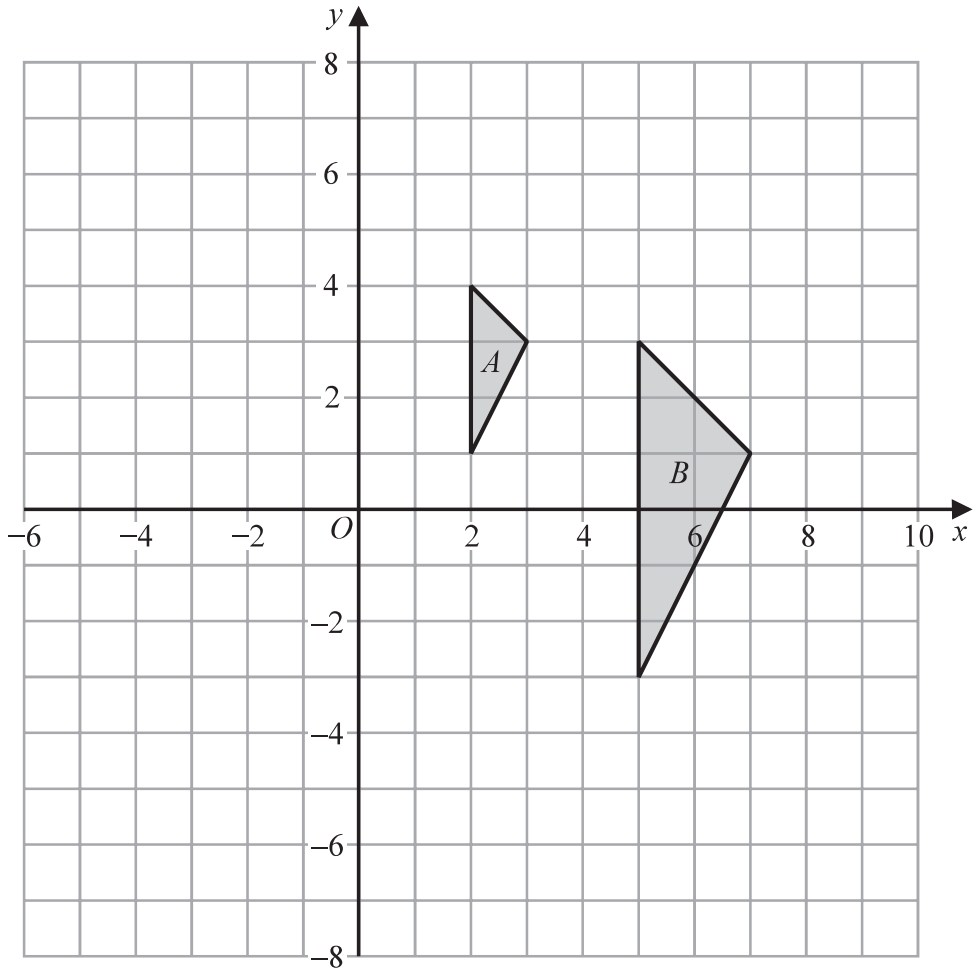


Turn over for a spare grid if you need to redraw your triangles.

Question 5 continued

Question 5 continued

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



(Total for Question 5 is 10 marks)

6

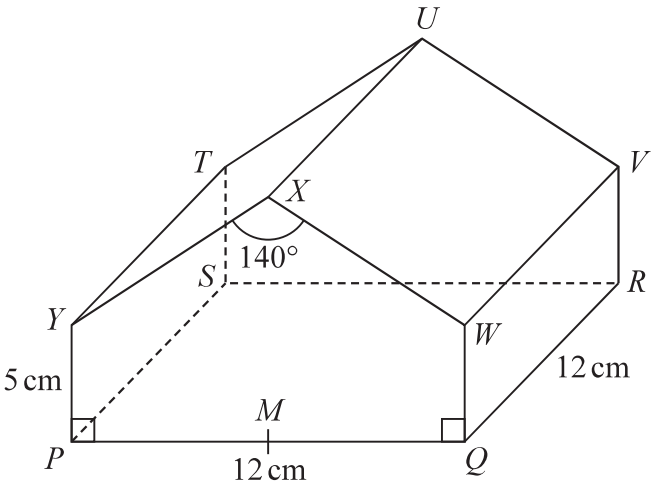


Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows a right pentagonal prism, with a horizontal square base $PQRS$ of side 12 cm.

$YP = WQ = 5$ cm

$\angle WXY = 140°$

$\angle YPQ = \angle WQP = 90°$

M is the midpoint of PQ so that XM is an axis of symmetry of the pentagon.

(a) Calculate the size, in degrees to one decimal place, of $\angle VMR$.

(3)

(b) Calculate the length, in cm to one decimal place, of PU.

(4)

Question 6 continued

Question 6 continued

Question 6 continued

(Total for Question 6 is 7 marks)

7 The equation of a curve is $y = 5 - \frac{x}{2} - x^2$

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

x	−4	−3	−2	−1	0	1	2	3
y	−9		2	4.5		3.5	0	

(2)

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

(2)

(c) Using your curve, find an estimate of the maximum value, to one decimal place, of $y = 5 - \frac{x}{2} - x^2$

(1)

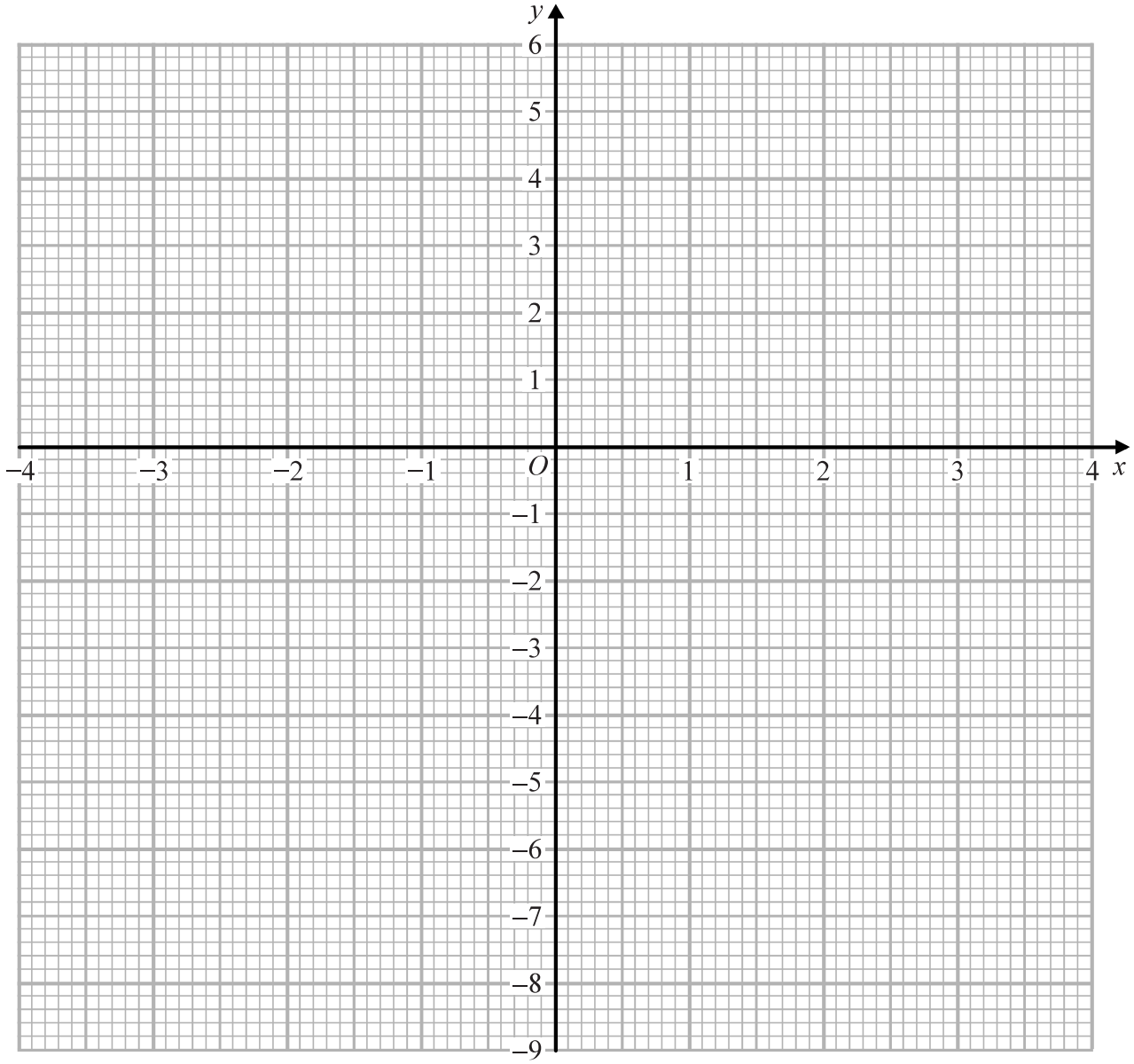
(d) Use your curve to find the range of values of x, to one decimal place, for which $5 - \frac{x}{2} - x^2 \geqslant 3$

(2)

(e) By drawing a suitable straight line on the grid, find estimates, to one decimal place, for the solutions of the equation $3 - x - x^2 = 0$

(3)

Question 7 continued

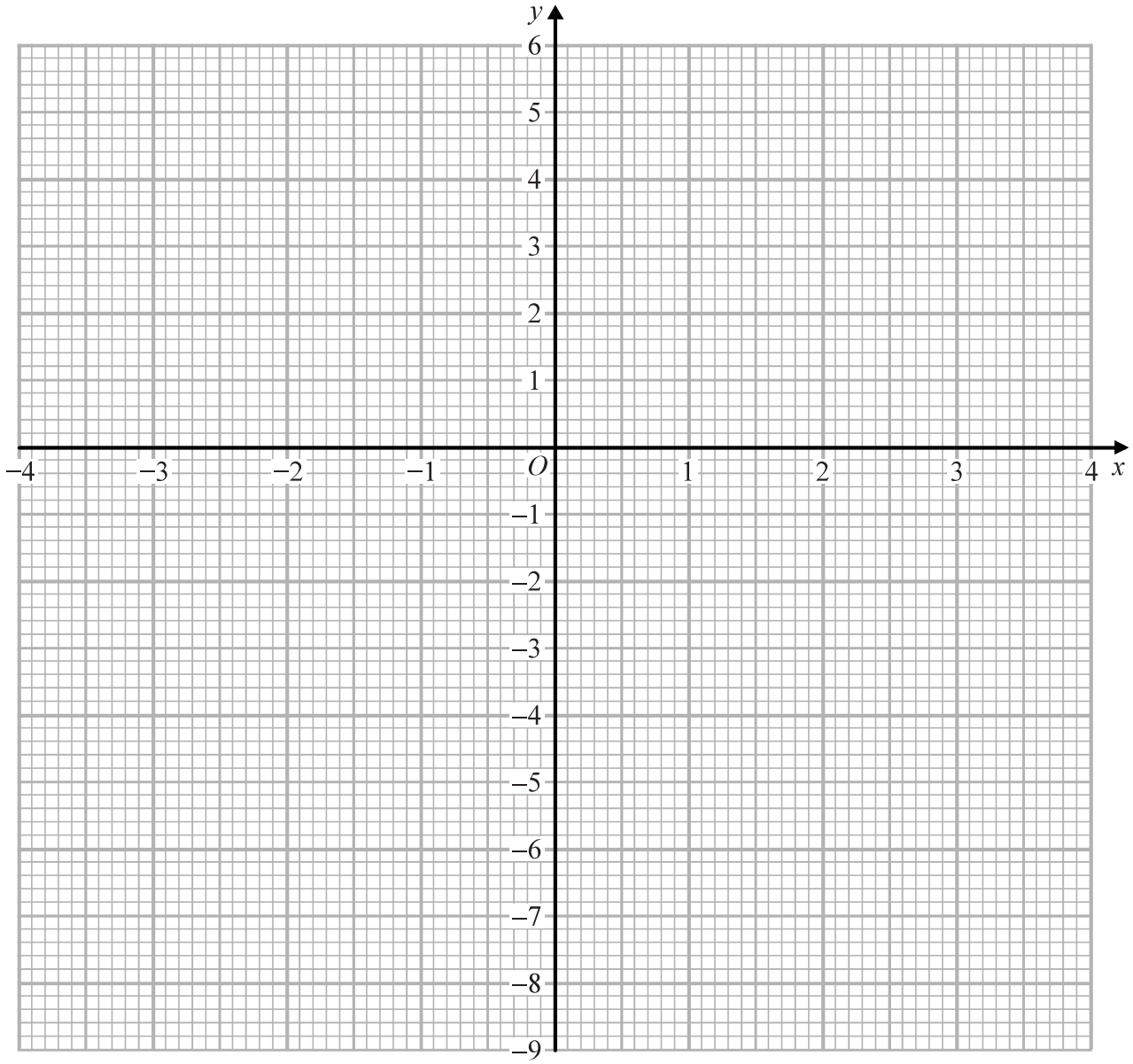


Turn over for a spare grid if you need to redraw your curve.

Question 7 continued

Question 7 continued

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



(Total for Question 7 is 10 marks)

8 The functions f and g are defined as

$$f : x \mapsto 3x - 5$$

$$g : x \mapsto \frac{1}{2x - 3}$$

(a) State the value of x that must be excluded from any domain of g.

(1)

(b) Find gf(4)

(2)

The function h is defined as

$$h : x \mapsto \frac{2x}{x - 3} \text{ where } x \neq 3$$

(c) Solve $fh(x) = 7$

(3)

(d) Express the inverse function h^{-1} in the form $h^{-1} : x \mapsto \ldots$

(3)

(e) Solve the equation $g(x) + h(x) = 1$
Show your working clearly.

Give your solutions in the form $a \pm \sqrt{b}$ where a and b are integers.

(5)

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

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 14 marks)

9

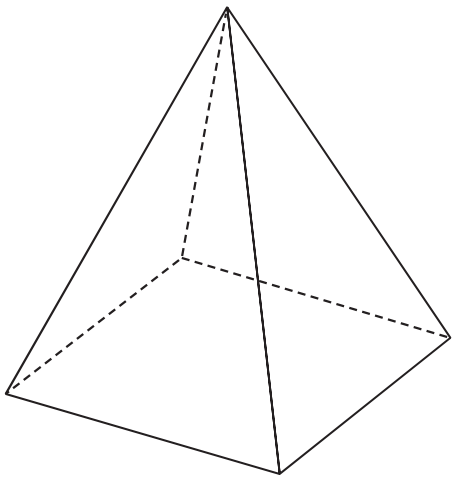


Diagram **NOT** accurately drawn

Figure 2

Figure 2 shows a solid right square-based pyramid with height 20 cm.
The volume of the pyramid is 960 cm^3

The pyramid is standing with its square base on a horizontal table.

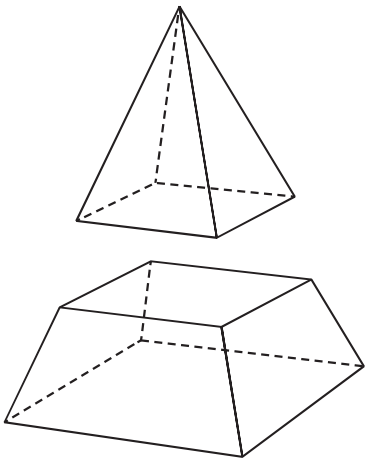


Diagram **NOT** accurately drawn

Figure 3

The pyramid is divided into a smaller right square-based pyramid of height 10 cm and a frustum of the pyramid, as shown in Figure 3, by a horizontal cut.

(a) Calculate the volume, in cm^3, of the smaller pyramid.

(3)

(b) Calculate the total surface area, in cm^2 to 3 significant figures, of the frustum of the pyramid.

(5)

Question 9 continued

$$\left(\text{Volume of pyramid} = \frac{1}{3} \times \text{base area} \times \text{height}\right)$$

Question 9 continued

Question 9 continued

(Total for Question 9 is 8 marks)

10 A particle, P, is moving along a straight line through the fixed point O.

The displacement, s metres, of P from O at time t seconds is given by

$$s = t^3 - 7t^2 - 5t + 121 \qquad t \geqslant 0$$

Find the displacement, in metres, of P from O when P is instantaneously at rest.

Question 10 continued

(Total for Question 10 is 5 marks)

11

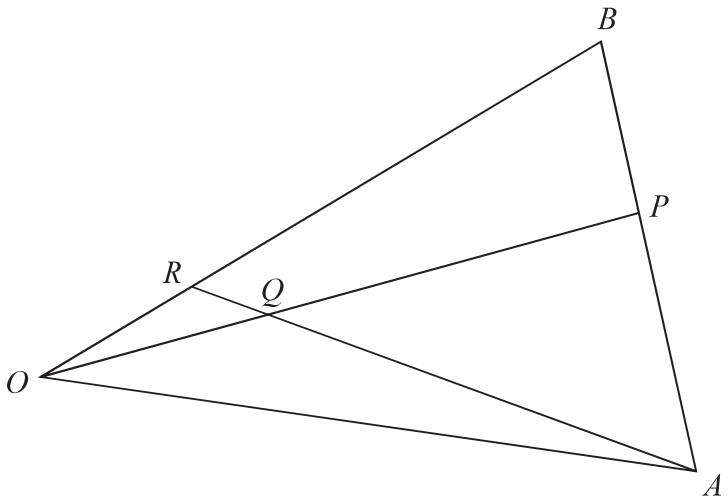


Diagram **NOT** accurately drawn

Figure 4

Figure 4 shows triangle OAB in which $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$

P is the point on AB such that $AP : PB = 2 : 1$
Q is the point on OP such that $OQ : QP = 1 : 3$

R is the point on OB such that RQA is a straight line.

Calculate, in its simplest form, the ratio $OR : RB$

Question 11 continued

Question 11 continued

(Total for Question 11 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS