Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE

Thursday 21 November 2024

Morning (Time: 2 hours 30 minutes)

Paper reference **4MB1/02**

Mathematics B
PAPER 2

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of 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 ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Solve the simultaneous equations

$$3x + 5y = 7.5$$
$$7x + 6y = 3.9$$

Show clear algebraic working.

(4)

(Total for Question 1 is 4 marks)

2 The line **L** with equation $y = -2x - 2$ is drawn on the grid opposite.

(a) On the grid opposite, draw the graph with equation $x - y = 4$ for values of x from -4 to 6

(2)

(b) On the grid opposite, draw the graph with equation $3y + x = -3$ for values of x from -4 to 6

(2)

(c) Show, by shading on the grid opposite, the region **R** defined by all of the inequalities

$$x - y \leqslant 4 \qquad y \geqslant -2x - 2 \qquad 3y + x \leqslant -3$$

Label the region **R**

(1)

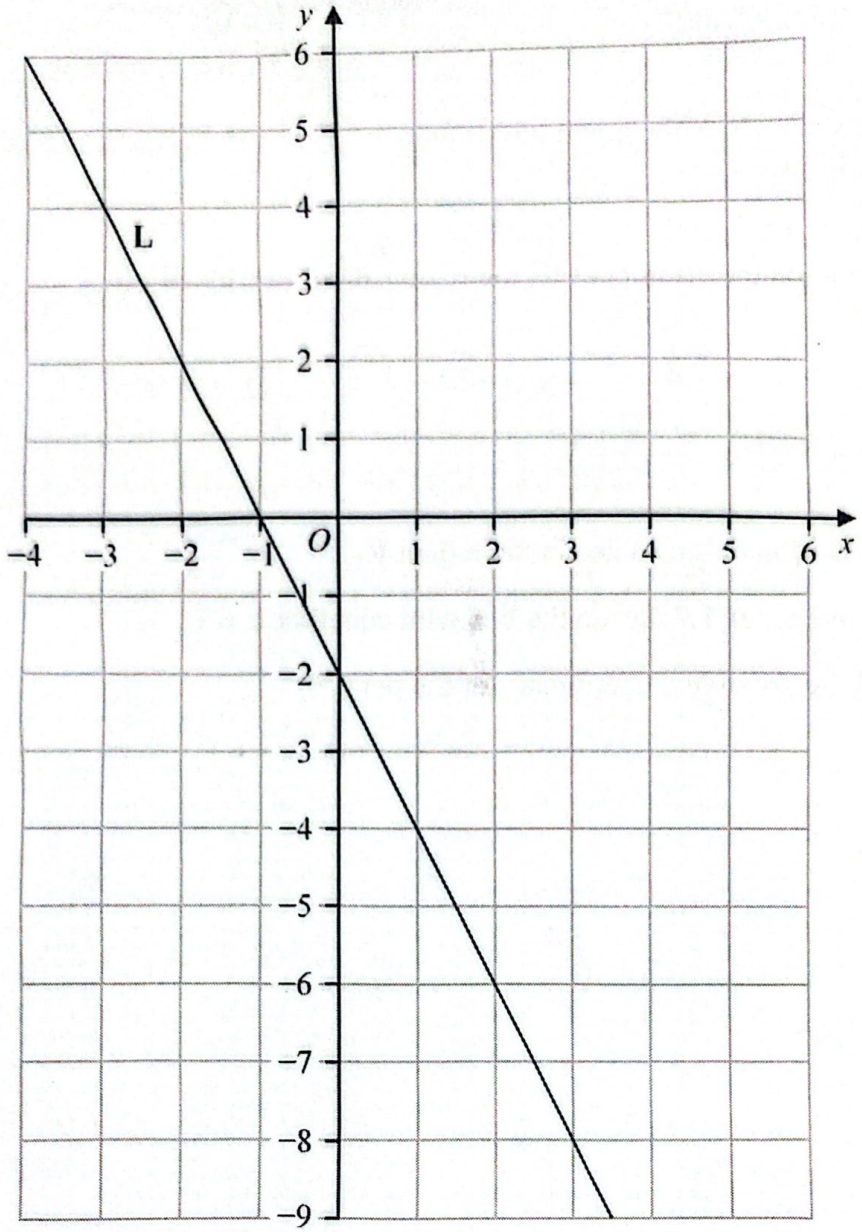
The point P with coordinates (x, y) lies in the region **R**

Given that y is an integer and P lies on the line with equation $x = 1$

(d) write down all the possible y coordinates of the point P

(1)

Question 2 continued



(Total for Question 2 is 6 marks)

3 $\mathscr{E}$ = {2, 3, 4, 5, 6, 7, 8, 9, 10}
P = {prime numbers}
E = {even numbers}
F = {factors of 36}

(a) Write down all the elements of

(i) E'

(1)

(ii) $P \cap F'$

(1)

(iii) $E \cup F$

(1)

70 children were asked which flavours of ice cream they like from chocolate (C), vanilla (V) and strawberry (S).

5 children like chocolate and vanilla and strawberry
15 like strawberry only
12 like chocolate only
8 like none of the flavours
6 like strawberry and vanilla
11 like chocolate and vanilla
21 like strawberry
35 like vanilla

(b) Show all of this information on the Venn diagram opposite, giving the number of students in each appropriate subset.

(3)

(c) Find

(i) $\mathrm{n}(C)$

(1)

(ii) $\mathrm{n}(C \cap V \cap S')$

(1)

One of the 70 children is chosen at random.

Given that this child likes vanilla

(d) find the probability that this child also likes chocolate.

(2)

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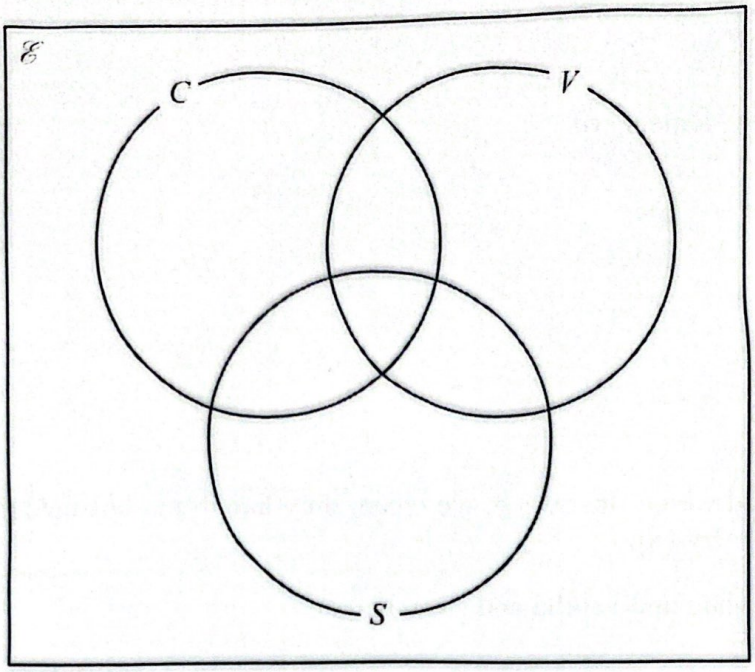
.....

Question 3 continued



Question 3 continued

Question 3 continued

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(Total for Question 3 is 10 marks)

4

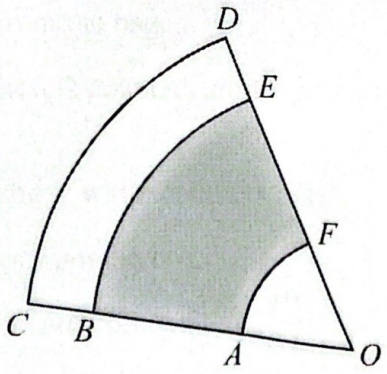

Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows 3 sectors, OAF, OBE and OCD

The three sectors have the same centre O

$OABC$ and $OFED$ are straight lines.

$\angle DOC = 80°$ and $OD = 6.6$ cm

(a) Calculate the length, in cm to 3 significant figures, of the arc CD

(2)

The area of the shaded region $ABEF$ is $\frac{5}{12}$ of the area of sector OCD

(b) Calculate the area, in cm^2 to 3 significant figures, of the shaded region $ABEF$

(2)

Given that $OA = 1.1$ cm

(c) calculate the length, in cm, of AB

(3)

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Question 4 continued

(Total for Question 4 is 7 marks)

5 A bag contains 8 red counters and 5 blue counters only.

Imran takes at random 2 counters from the bag.

(a) Calculate the probability that these 2 counters are the same colour.

(3)

A box contains 11 black counters and w white counters only.

Nathalie takes at random 2 counters from the box.

The probability that these 2 counters are both white is $\frac{10}{21}$

(b) Calculate the value of w
Show all your working.

(5)

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

Question 5 continued

(Total for Question 5 is 8 marks)

6

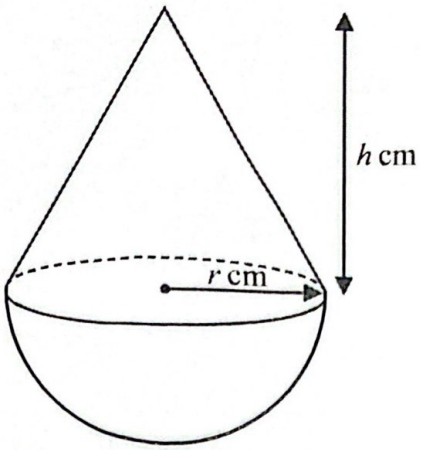

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Figure 2

Figure 2 shows a solid shape **S**, made by fixing a solid right circular cone to the flat circular face of a solid hemisphere.

The centre of the base of the cone coincides with the centre of the hemisphere.

The base radius of the cone and the radius of the hemisphere are each r cm
The height of the cone is h cm

The total volume of **S** is $1660\,\text{cm}^3$

the volume of the hemisphere : the total volume of **S** = 8 : 25

(a) Find, in cm to 3 significant figures, the value of r

(4)

(b) Find, in cm to 3 significant figures, the value of h

(3)

$$\left[\begin{array}{l}\text{Volume of cone } \frac{1}{3}\pi r^2 h \\ \text{Volume of sphere } \frac{4}{3}\pi r^3\end{array}\right]$$

Question 6 continued

(Total for Question 6 is 7 marks)

7

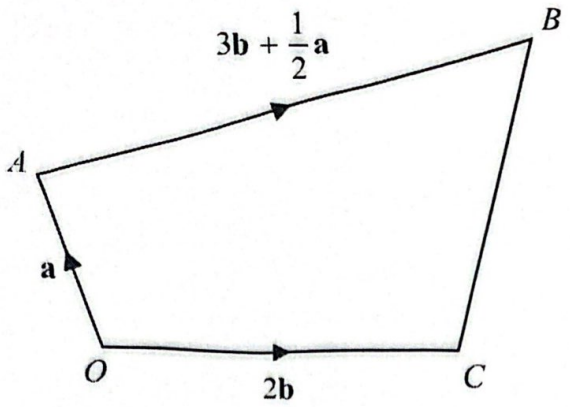

Diagram **NOT** accurately drawn

Figure 3

Figure 3 shows quadrilateral $OABC$

$\overrightarrow{OA} = \mathbf{a}$ $\quad$ $\overrightarrow{AB} = 3\mathbf{b} + \frac{1}{2}\mathbf{a}$ $\quad$ $\overrightarrow{OC} = 2\mathbf{b}$

The point D lies on OB such that $\overrightarrow{OD} = \frac{3}{5}\overrightarrow{OB}$

(a) Find a simplified expression for $\overrightarrow{AD}$ in terms of **a** and **b**

(3)

The point E lies on CB such that $\overrightarrow{CE} = k\overrightarrow{CB}$

Given that ADE is a straight line

(b) (i) find the value of k

(4)

(ii) find the ratio $AD : DE$ in the form $x : y$ where x and y are integers.

(2)

Question 7 continued

Question 7 continued

(Total for Question 7 is 9 marks)

8 Chetan owns a fruit shop.

In January, Chetan sold 560 kg of citrus fruit.
In February, Chetan sold 518 kg of citrus fruit.

(a) Calculate the percentage decrease in the weight of citrus fruit sold.

(2)

The table below shows the weight of citrus fruit, the weight of berries and the weight of tropical fruit Chetan sold in March.

Fruit type	Weight sold
citrus	508 kg
berries	126 kg
tropical	86 kg

Chetan is going to draw a pie chart for this information.

(b) Calculate the size, in degrees, of the angle of the sector in the pie chart for the weight of berries sold in March.

(2)

The table below gives information about the weight, in kg, of berries sold on each of the 30 days in April.

Weight (w kg)	Frequency
$0 < w \leqslant 5$	10
$5 < w \leqslant 10$	7
$10 < w \leqslant 15$	6
$15 < w \leqslant 20$	5
$20 < w \leqslant 25$	2

(c) Find the class interval that contains the median weight.

(1)

(d) Calculate an estimate for the mean weight, in kg, of berries sold on each day in April.

(4)

Question 8 continued

Chetan wants to buy 60 kg of apples for his shop from one of the following online traders.

US traders	**French traders**
12 kg box of apples for $29.50 Free delivery Buy 4 boxes and get a 5th box **free**	1.72 euros per kg of apples Total delivery cost of 22.80 euros Special offer of 15% off the cost of apples and the cost of delivery

Using an exchange rate of

$1 = 0.92 euros

(e) compare the cost, including delivery, of 60 kg of apples bought from US traders with the cost of 60 kg of apples bought from French traders.
State which of the traders is the cheaper when buying 60 kg of apples.
Show all your working.

(5)

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Question 8 continued

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9 The ... defined for all values of x by

$$f: x \mapsto 3x^2 - 8 \qquad x \geqslant 0$$

(a) Write down the range of f

(1)

(b) Find $f(2)$

(1)

The function g is defined by

$$g: x \mapsto 2x^2 + 4x - 3 \text{ where } x \geqslant -1$$

The function h is defined by

$$h: x \mapsto 3x^2 + 6x - 2 \text{ where } x \geqslant -1$$

Given that $hg^{-1}(x) = 6.1$

(c) find the value of x
Show all your working.

(7)

Question 9 continued

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Question 9 continued

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Question 9 continued

(Total for Question 9 is 9 marks)

10 (a) Complete the table of values for $y = 2x^3 - 5x + 3$

x	−2.5	−2	−1.5	−1	−0.5	0	0.5	1	1.5	2	2.5
y	−15.75		3.75		5.25	3	0.75		2.25		21.75

(3)

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

(3)

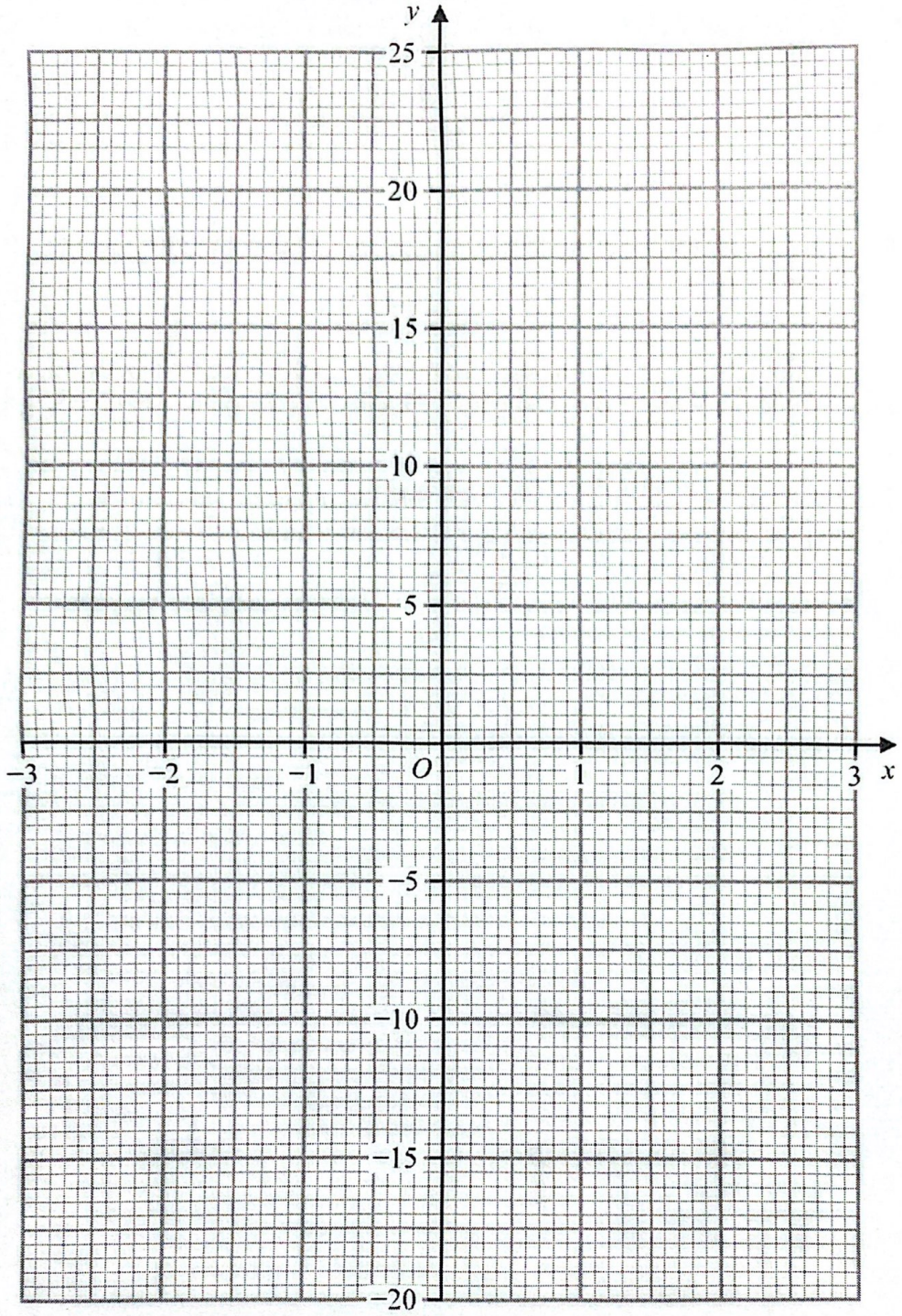
(c) By drawing a suitable straight line (at least 3 cm long) on the grid, find an estimate to the nearest whole number, of the gradient of the curve at the point where $x = -2$

(2)

(d) By drawing a suitable straight line on the grid, find the range of values of x, to one decimal place, in the interval $-2.5 \leqslant x \leqslant 2.5$ for which $2x^3 - 5x + 3 > 1$

(3)

Question 10 continued



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

Question 10 continued

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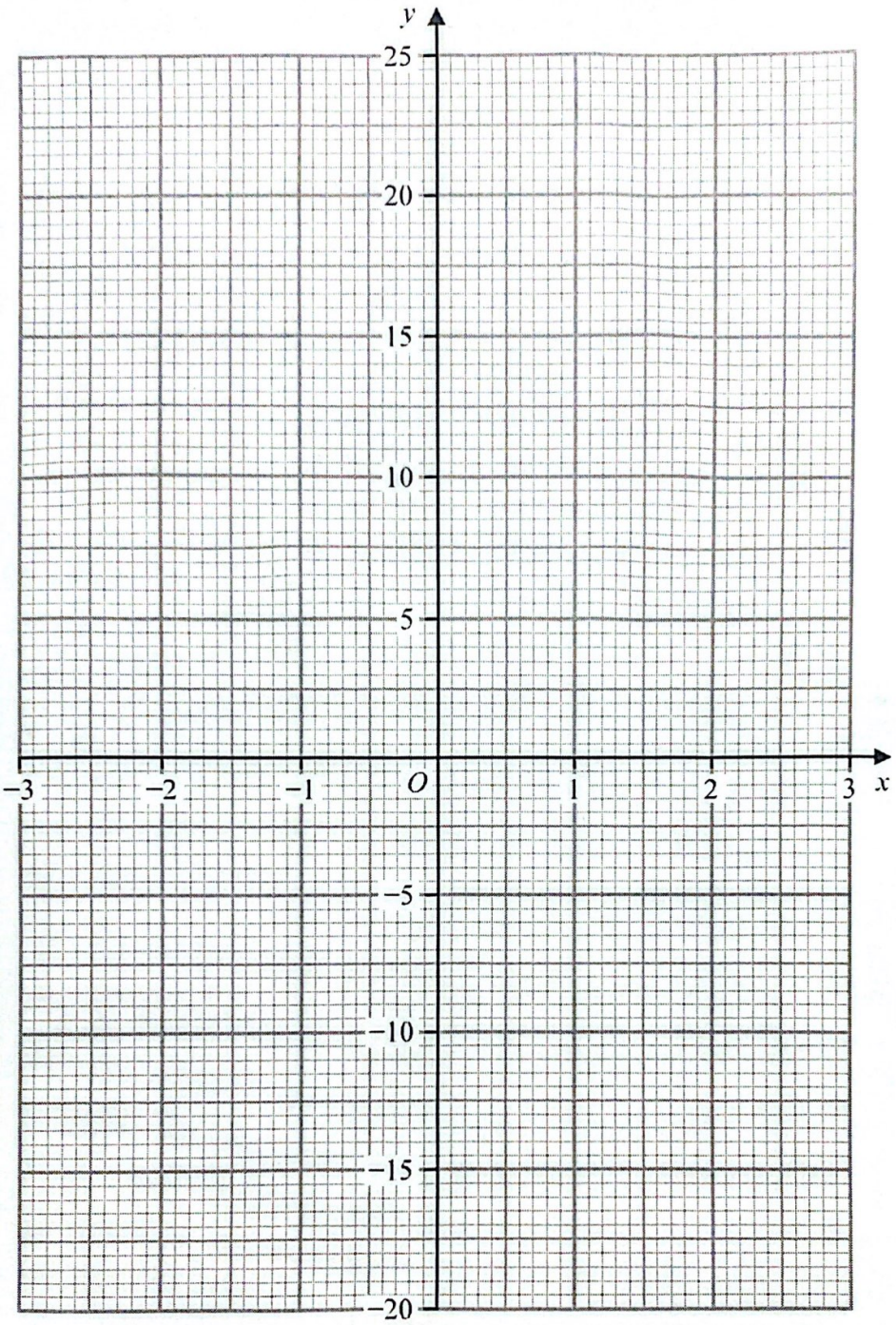
Question 10 continued

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



(Total for Question 10 is 11 marks)

11 Triangle A and triangle D are drawn on the grid opposite.

Triangle A is transformed to triangle B under a rotation of 180° about the point with coordinates (3, 1)

(a) On the grid, draw and label triangle B

(2)

Triangle A is transformed to triangle C under a reflection in the line with equation $y = -0.5$

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

(2)

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

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

(c) On the grid, draw and label triangle E

(3)

(d) Describe fully the single transformation that maps triangle A onto triangle E

(3)

Triangle A is transformed to triangle F under a rotation of 90° anticlockwise about the origin.

Triangle F is transformed to triangle G under the matrix $\begin{pmatrix} 7-2k & 2 \\ 2 & 4 \end{pmatrix}$

Triangle G is the image of triangle A under the matrix $\mathbf{N}$

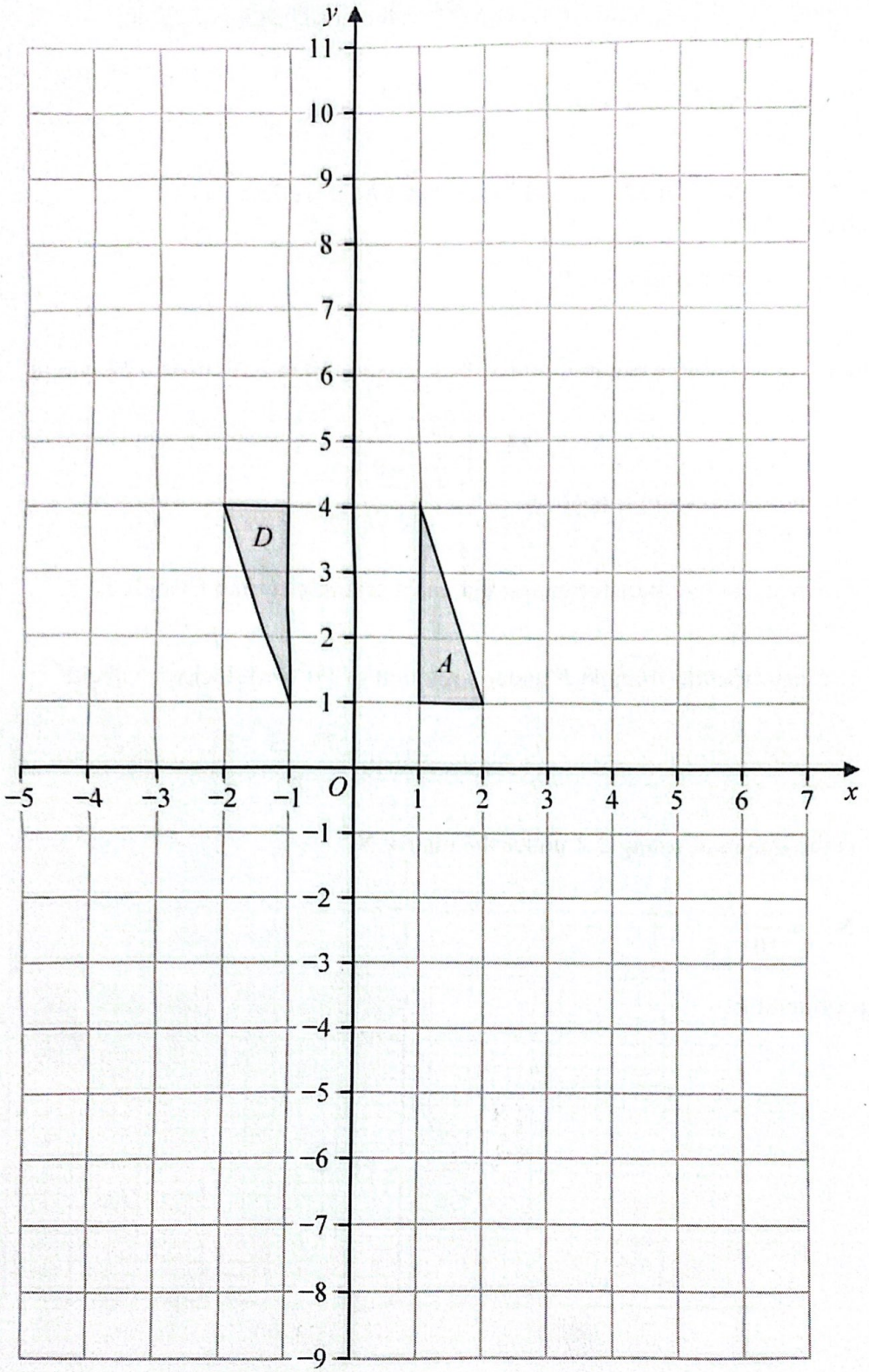
Given that $\mathbf{N}^{-1} = \frac{1}{10}\begin{pmatrix} -1 & 3 \\ -2 & 1 \end{pmatrix}$

(e) find the value of k

(5)

[Inverse of matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is $\frac{1}{ad-bc}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$]

Question 11 continued



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Question 11 continued

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Question 11 continued

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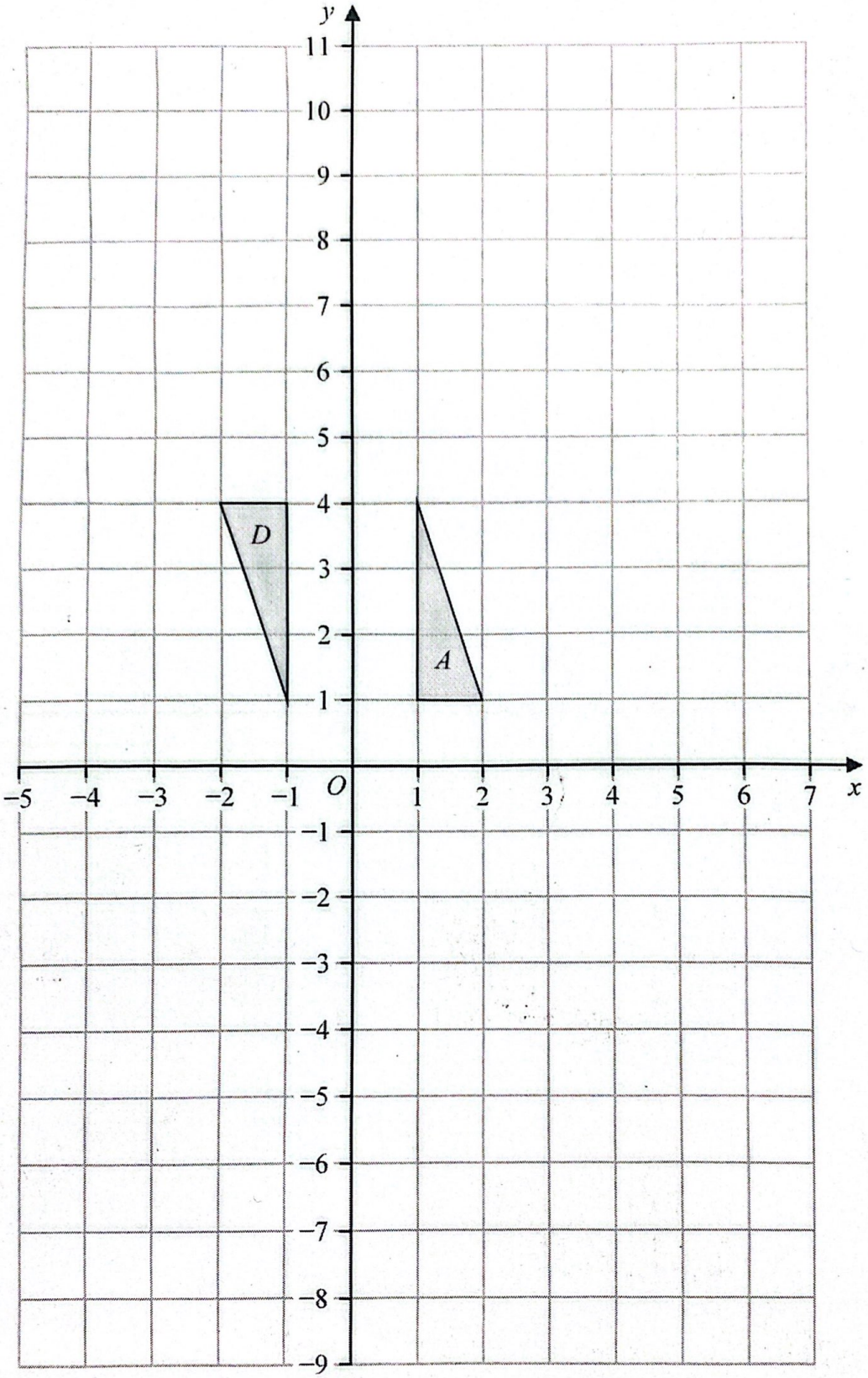

(Total for Question 11 is 15 marks)

TOTAL FOR PAPER IS 100 MARKS