Write your name here

Surname	Other names

Pearson Edexcel International GCSE

Centre Number	Candidate Number

Mathematics B

Paper 2R

Wednesday 15 January 2014 – 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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PEARSON

Answer ALL ELEVEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1

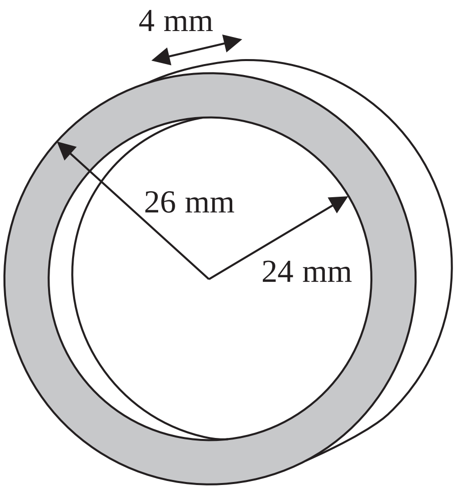

Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows a ring. The inner radius of the ring is 24 mm and the outer radius is 26 mm. Given that the ring is 4 mm thick, calculate the volume, in mm^3, of the ring. Give your answer to 3 significant figures.

[Area of a circle = πr^2]

(Total for Question 1 is 4 marks)

2 In an election for a town mayor there were three candidates, A, B and C. The votes were shared between the three candidates A, B and C in the ratio 5 : 2 : 1 respectively.

Candidate B received 6186 votes.

(a) Find the number of votes received by candidate A.

(2)

(b) Find the total number of votes received by the three candidates.

(2)

One quarter of the people who could have voted did not vote.

(c) Find the total number of people who could have voted.

(2)

(Total for Question 2 is 6 marks)

3 Given that $(x - 2)$ is a factor of $x^3 - 4x^2 + px + q$,

(a) write down an equation in p and q.

(1)

Given that $(x + 3)$ is also a factor of $x^3 - 4x^2 + px + q$,

(b) write down a second equation in p and q.

(1)

(c) Solve your two equations to find the value of p and the value of q.

(3)

Question 3 continued

(Total for Question 3 is 5 marks)

4

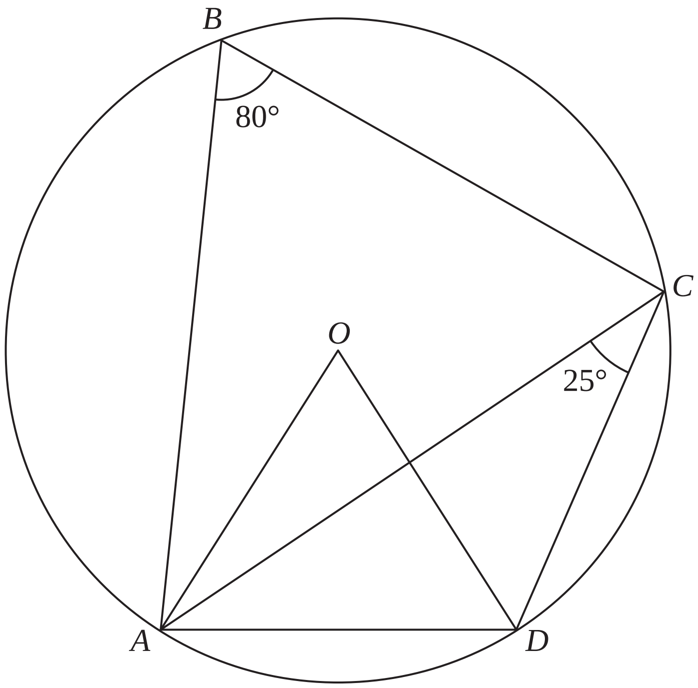

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Figure 2

In Figure 2, *ABCD* is a circle, centre *O*.

$\angle ACD = 25°$ and $\angle ABC = 80°$

Giving reasons, calculate the size, in degrees, of

(a) $\angle AOD$,

(2)

(b) $\angle ADO$,

(2)

(c) $\angle ODC$.

(2)

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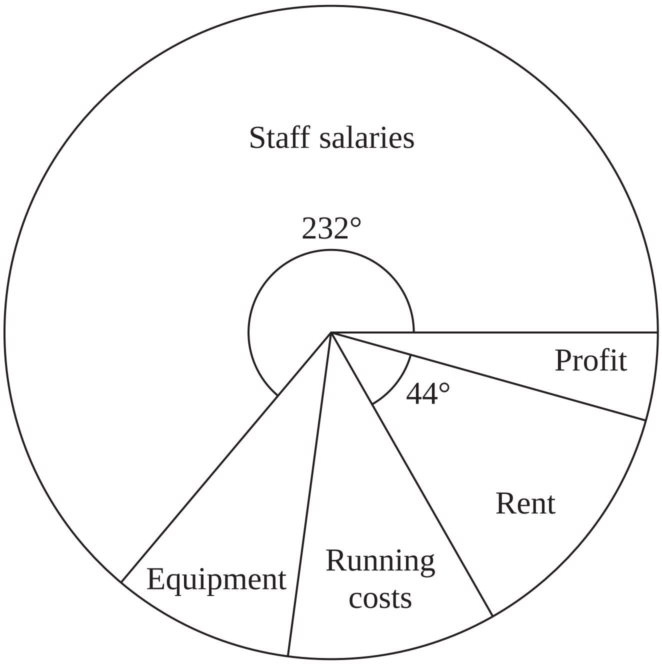
Question 4 continued

(Total for Question 4 is 6 marks)

5 The income for an engineering company in one year was £1 800 000

The pie chart shows information about how this money was used.

Diagram **NOT** accurately drawn



(a) Calculate, in £, the amount of money used for Staff salaries in the year.

(2)

Equipment and Running costs together used 17.5% of the income.

(b) Express the Profit as a percentage of the income for the year.

Give your answer to 3 significant figures.

(4)

Question 5 continued

(Total for Question 5 is 6 marks)

6

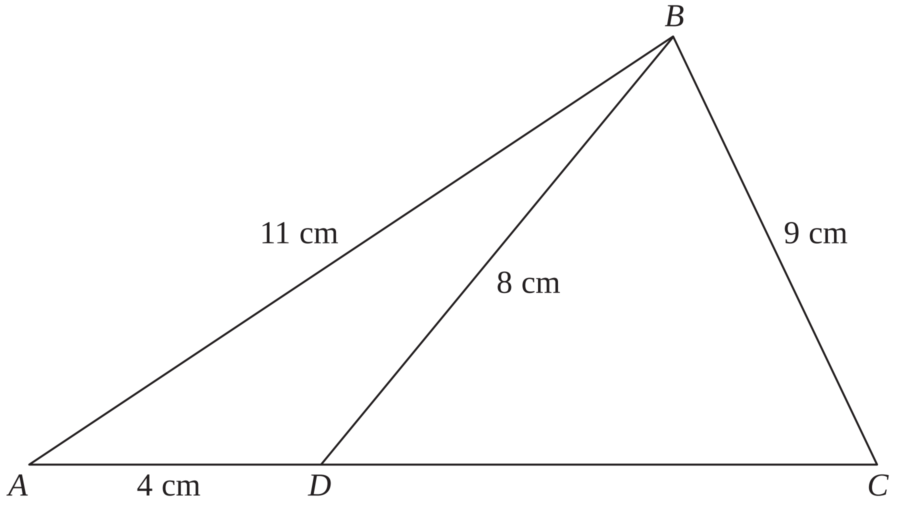


Diagram **NOT** accurately drawn

Figure 3

In Figure 3, ABC is a triangle with $AB = 11$ cm and $BC = 9$ cm.

The point D is on AC such that $AD = 4$ cm and $BD = 8$ cm.

Calculate, to 3 significant figures,

(a) the size, in degrees, of $\angle BDC$, **(4)**

(b) the size, in degrees, of $\angle BCD$, **(3)**

(c) the area, in cm^2, of triangle BDC. **(3)**

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

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

Area of a triangle $= \dfrac{1}{2}bc\sin A$]

Question 6 continued

Question 6 continued

Question 6 continued

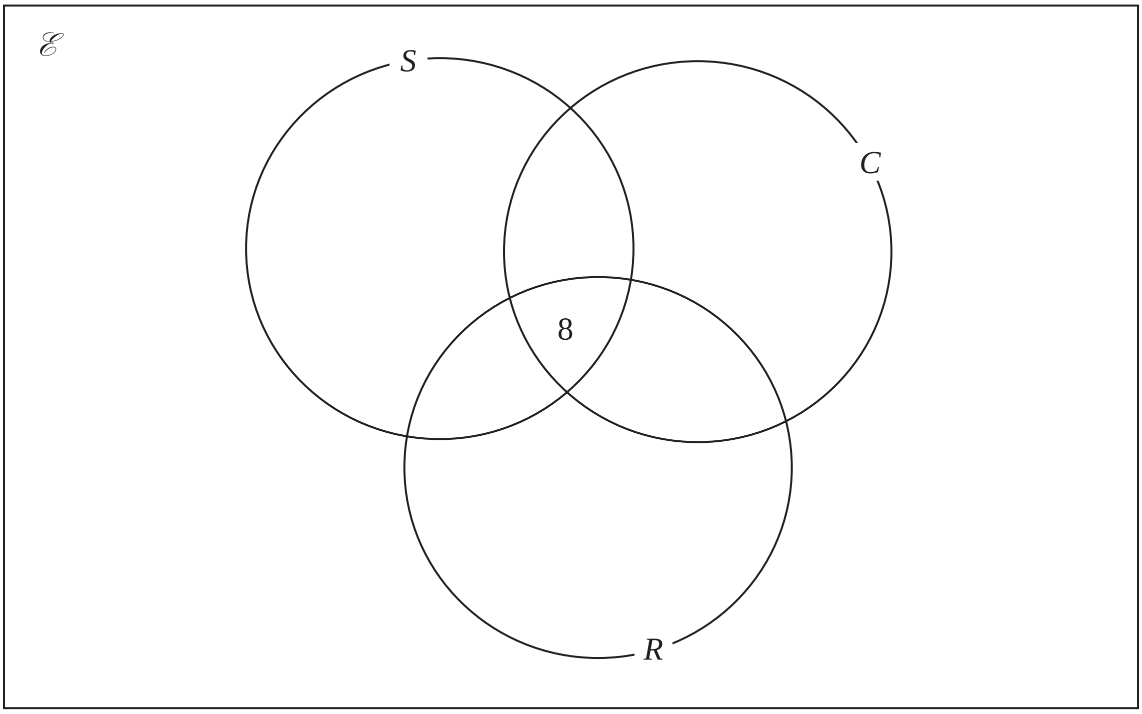
(Total for Question 6 is 10 marks)

7 A sports club has 80 members.
For the three activities Swimming (S), Cycling (C) and Running (R),

8 members take part in all three activities,
3 members do not take part in any of the three activities,
22 members take part in only Swimming,
23 members take part in Swimming and Cycling,
19 members take part in Swimming and Running,
14 members take part in Cycling and Running.

(a) Using this information place the number of members in the appropriate subsets of the Venn diagram.

(3)



The number of members who take part in only Cycling is twice the number of members who take part in only Running.

Let the number of members who take part in only Running be x and, using all the given information,

(b) form an equation in x.

(1)

(c) Solve your equation to find the value of x.

(2)

Question 7 continued

Manuel is in the set $(R \cup C)' \cap S$.

(d) Write down which of the three activities Manuel takes part in.
(1)

(e) Write down

(i) $n(C)$,

(ii) $n[S \cap (R \cup C)]$.
(2)

A member of the sports club is to be chosen at random. Given that this member takes part in Cycling,

(f) find the probability that this member also takes part in both Swimming and Running.
(2)

Question 7 continued

Question 7 continued

(Total for Question 7 is 11 marks)

8 The points A (–3, 4), B (–1, 5) and C (–1, 4) are the vertices of a triangle ABC.

(a) On the grid, draw and label triangle ABC.

(1)

The matrix $\mathbf{R} = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$

(b) Calculate the matrix product $\mathbf{R}\begin{pmatrix} -3 & -1 & -1 \\ 4 & 5 & 4 \end{pmatrix}$

(2)

Triangle $A'B'C'$ is the image of triangle ABC, where A', B' and C' are respectively the images of A, B and C, under the transformation with matrix $\mathbf{R}$.

(c) On the grid, draw and label triangle $A'B'C'$

(2)

(d) Describe fully the single transformation which maps triangle ABC onto triangle $A'B'C'$

(2)

Triangle $A''B''C''$ is the image of triangle $A'B'C'$, where A'', B'' and C'' are respectively the images of A', B' and C', under the enlargement centre (–1.5, 1.5) with scale factor –1

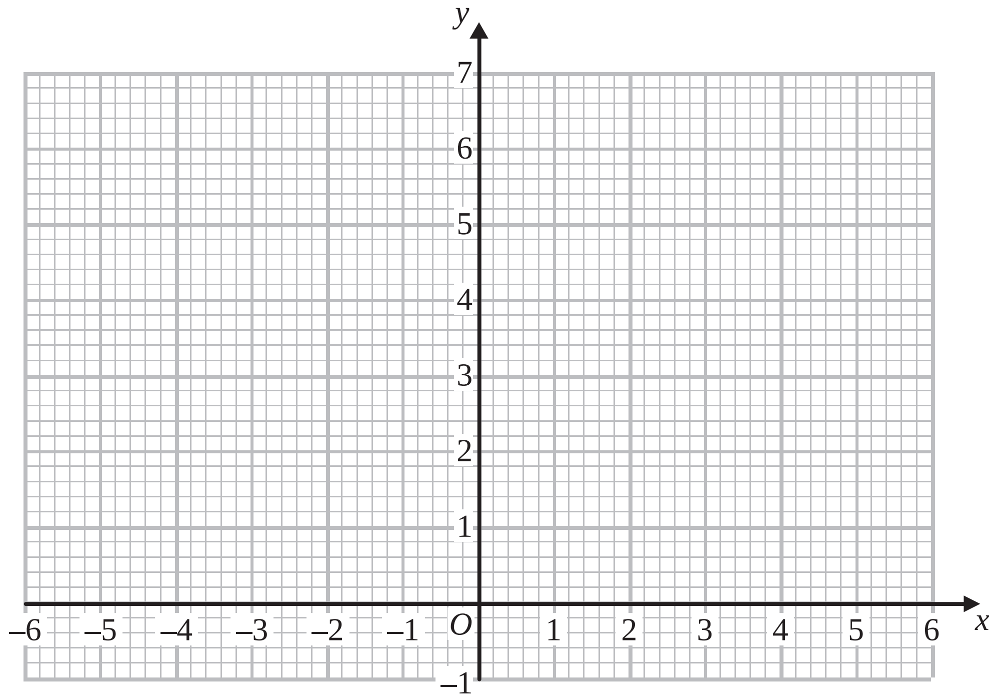
(e) On the grid, draw and label triangle $A''B''C''$

(2)

(f) Describe fully the single transformation which maps triangle $A''B''C''$ onto triangle ABC.

(2)

Question 8 continued

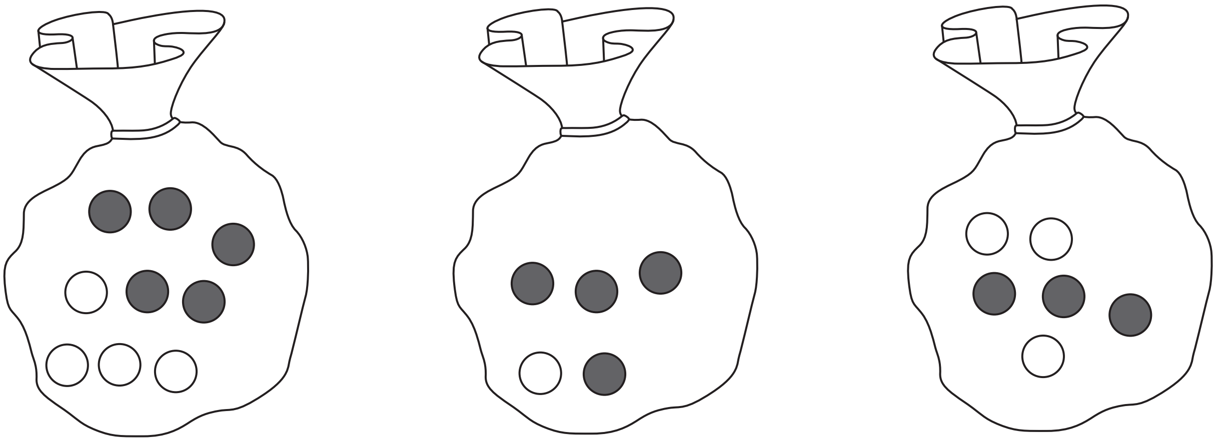


Question 8 continued

Question 8 continued

(Total for Question 8 is 11 marks)

9



Bag *A* Bag *B* Bag *C*

Three bags of counters are used in a game.
At the start of the game

Bag *A* contains 5 red counters and 4 white counters.
Bag *B* contains 4 red counters and 1 white counter.
Bag *C* contains 3 red counters and 3 white counters.

The game begins by taking at random a counter from Bag *A*.
If the counter is red, a counter is then taken at random from Bag *B*.
If the counter taken from Bag *A* is white, a counter is taken at random from Bag *C*.

(a) Complete the probability tree diagram.

(3)

(b) Show that the probability that the second counter taken is red is twice the probability that the second counter taken is white.

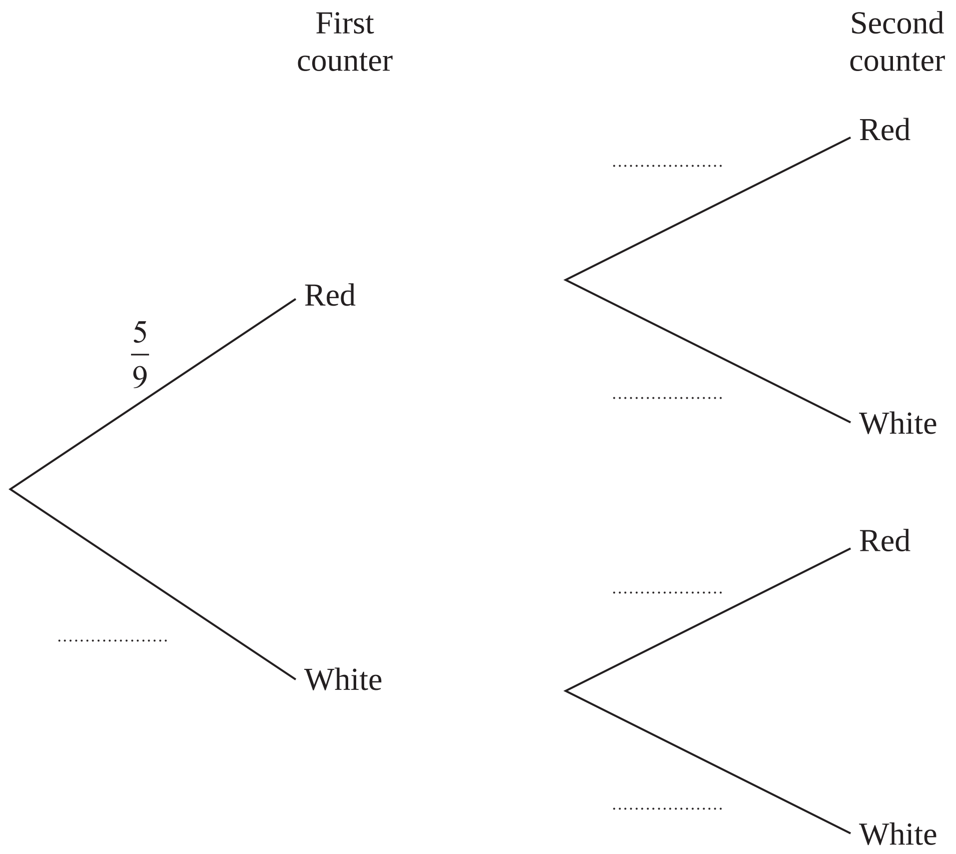
(5)

Given that the second counter taken is red,

(c) find the probability that the first counter taken is white.

(3)

Question 9 continued



Question 9 continued

Question 9 continued

(Total for Question 9 is 11 marks)

10

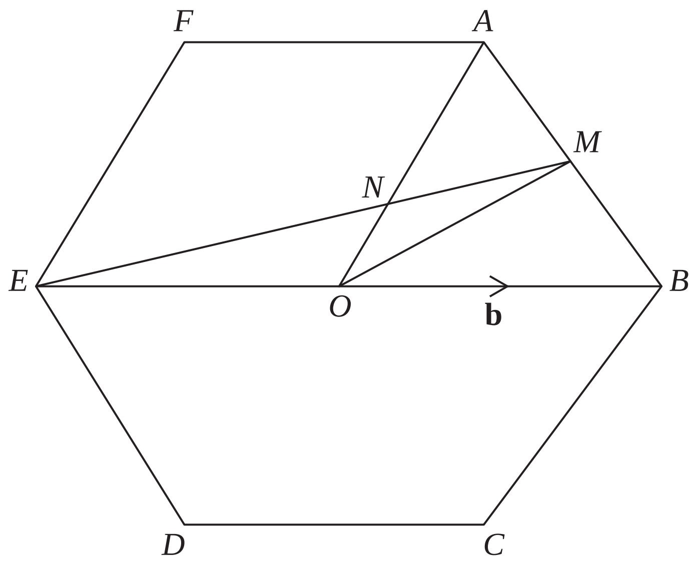


Diagram **NOT** accurately drawn

Figure 4

In Figure 4, O is the centre of a regular hexagon $ABCDEF$. The point M is the midpoint of AB.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$

(a) Express in terms of **a** or **b** or **a** and **b**, simplifying your answer where possible,

(i) $\overrightarrow{AB}$, (ii) $\overrightarrow{OE}$, (iii) $\overrightarrow{OM}$, (iv) $\overrightarrow{EM}$.

(6)

The point of intersection of OA and EM is N so that $\overrightarrow{ON} = \lambda\mathbf{a}$ and $\overrightarrow{EN} = \mu\overrightarrow{EM}$.

(b) Show that $\overrightarrow{ON} = \frac{1}{2}\mu\mathbf{a} + (\frac{3}{2}\mu - 1)\mathbf{b}$

(2)

(c) Hence find the value of μ and the value of λ.

(4)

The area of triangle ENO is 6 square units.

(d) Find the area of the hexagon $ABCDEF$.

(3)

P 4 3 1 3 3 A 0 2 6 3 2

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 15 marks)

11 (a) Complete the table of values for $y = 2 + 10x - 3x^3$, giving your values of y to 1 decimal place where necessary.

x	–3	–2.5	–2	–1	0	1	2	2.5
2	2	2	2	2	2	2	2	2
$10x$	–30		–20		0	10		25
$-3x^3$	81		24		0	–3		–46.9
y	53		6		2	9		–19.9

(3)

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

(3)

(c) **By drawing a suitable tangent** to the curve, find an estimate of the gradient of the curve at the point where $x = -2$

(3)

(d) By drawing a suitable straight line on your grid, find an estimate, to 1 decimal place, of the solution of the equation $17 + 10x - 3x^3 = 0$

(2)

(e) On your grid, draw the straight line with equation $y = -7x + 9$

(1)

(f) Use your graphs to find the range of values of x for which

$$2 + 10x - 3x^3 > -7x + 9$$

(3)

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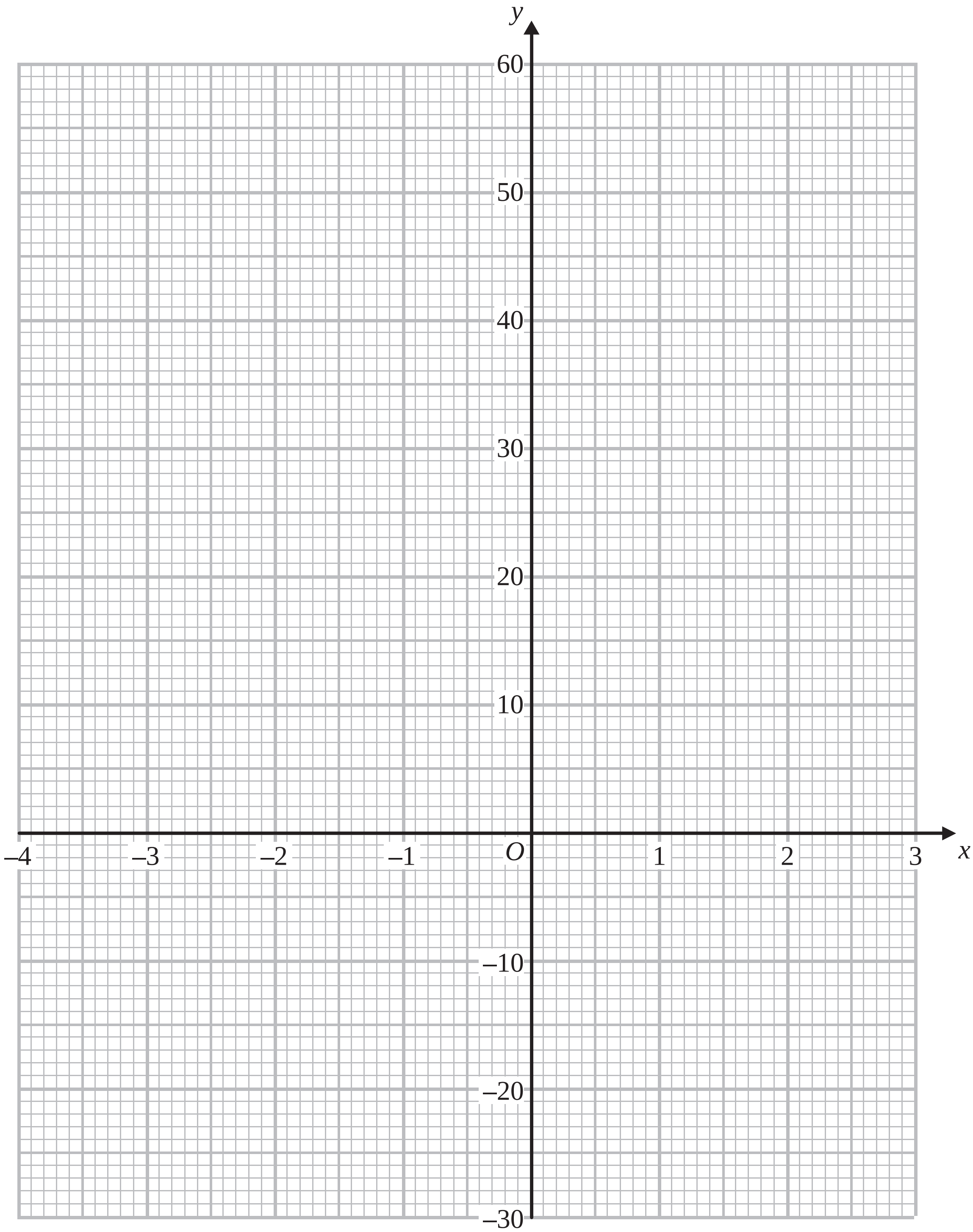
Question 11 continued



Question 11 continued

(Total for Question 11 is 15 marks)

TOTAL FOR PAPER IS 100 MARKS