

Write your name here

Surname

Other names

**Pearson Edexcel
International GCSE**

Centre Number

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Candidate Number

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Mathematics B

Paper 2

Monday 12 January 2015 – Afternoon
Time: 2 hours 30 minutes

Paper Reference

4MB0/02**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 the stages in your working.

- 1 A supermarket was open for 24 hours a day on all 365 days of 2014

On average, the supermarket made a sale every 30 minutes of each day of 2014

- (a) Calculate the number of sales made in 2014

(2)

The number of sales in 2014 was 20% more than the number of sales in 2013

- (b) Calculate the number of sales made in 2013

(2)

In 2013, the supermarket was open for x hours each day, where $x < 24$

On average, the supermarket made a sale every 27 minutes of each day of 2013

- (c) Calculate the value of x .

(2)

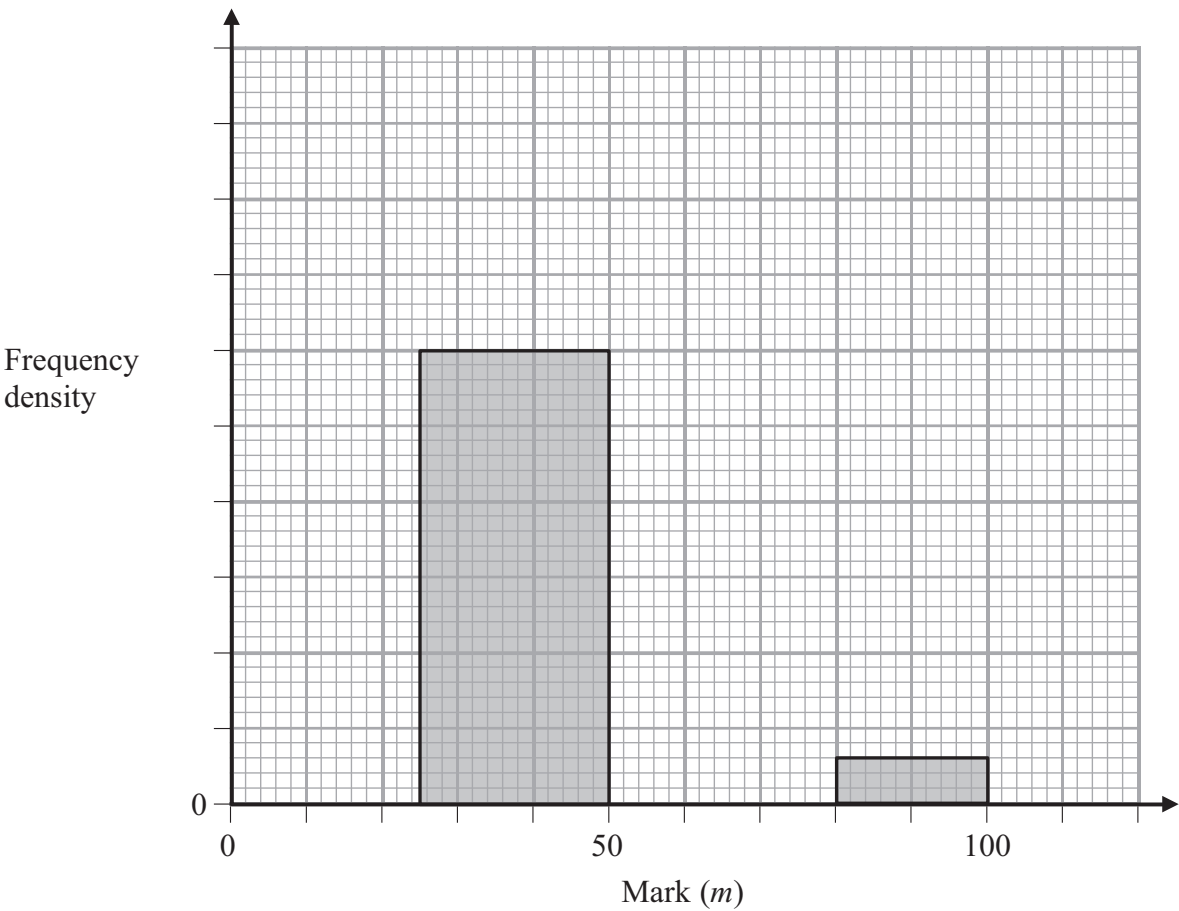


(Total for Question 1 is 6 marks)



- | Mark (m) range | Frequency |
|--------------------|-----------|
| $0 < m \leq 25$ | 25 |
| $25 < m \leq 50$ | 75 |
| $50 < m \leq 70$ | |
| $70 < m \leq 80$ | 44 |
| $80 < m \leq 100$ | |

Question 2 continued



(Total for Question 2 is 5 marks)



3 (i) Express $\frac{3x}{x+2} - \frac{6}{2x-5}$ as a single fraction.

Give your answer in its simplest form.

(ii) Hence solve $\frac{3x}{x+2} - \frac{6}{2x-5} = 0$



Question 3 continued

(Total for Question 3 is 7 marks)



Diagram illustrating the function $f(x) = x^2$. The domain set x contains elements -1 and 4 . The codomain set $f(x)$ contains elements 1 and 16 . Arrows show the mapping: $-1 \mapsto 1$ and $4 \mapsto 16$.

The mapping $f : x \mapsto ax + b$ is represented by the diagram shown in Figure 1.

(Total for Question 4 is 9 marks)

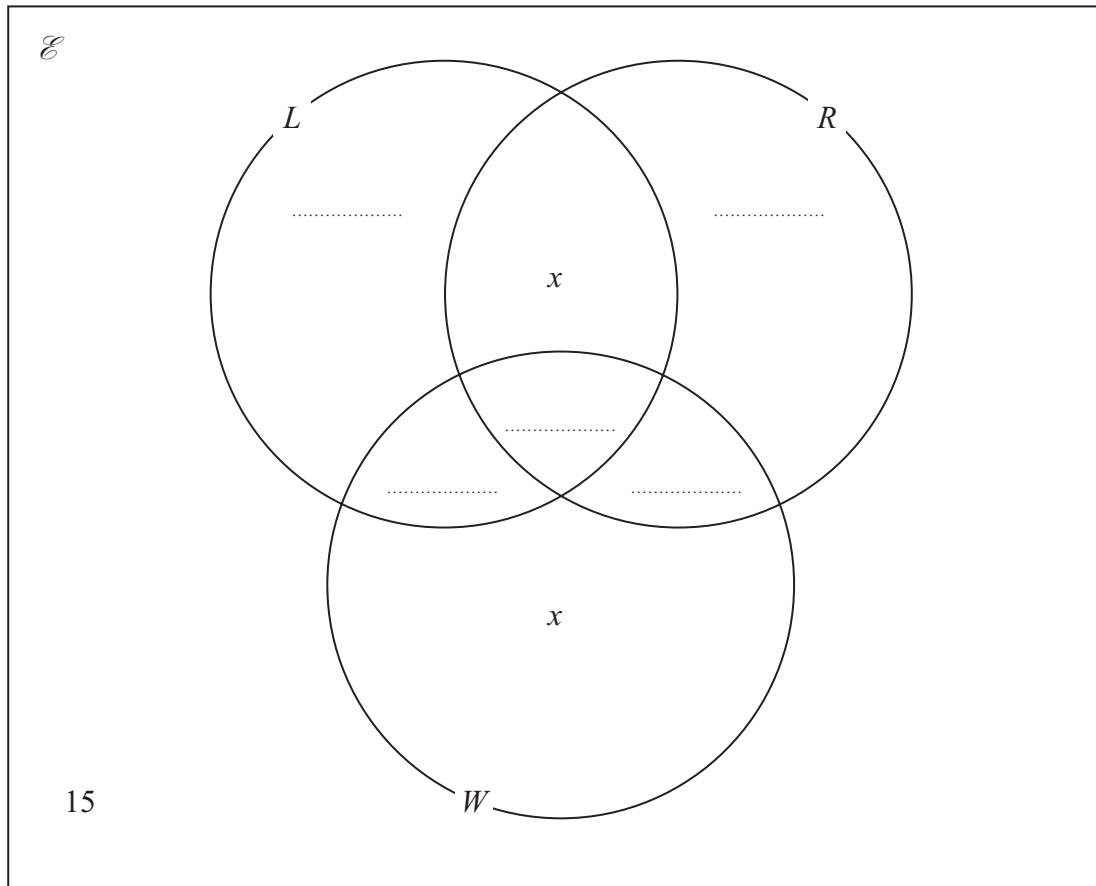


- 5 In a survey, 100 people were asked to say which of three activities they enjoyed doing. The three activities were listening to music (L), reading (R) and walking (W).

The results showed that

$$\begin{aligned} n(L \cap R \cap W) &= 7, \quad n(W \cap R \cap L') = 25, \quad n(W \cap L \cap R') = 20, \\ n(R \cap L' \cap W') &= 4, \quad n(L \cap [R \cup W]') = 9, \\ n(R \cap L \cap W') &= x = n(W \cap [R \cup L]'). \end{aligned}$$

The information from the survey is to be shown in a Venn diagram. The Venn diagram has been started below.



- (a) Explain what the number 15 in the Venn diagram represents. (1)
- (b) Complete the Venn diagram. (2)
- (c) Work out the value of x . (2)
- (d) Find the number of people in the survey who
- (i) enjoy reading,
 - (ii) enjoy only one of the three activities,
 - (iii) enjoy reading and walking but do not enjoy listening to music.
- (3)

Question 5 continued

(Total for Question 5 is 8 marks)



6

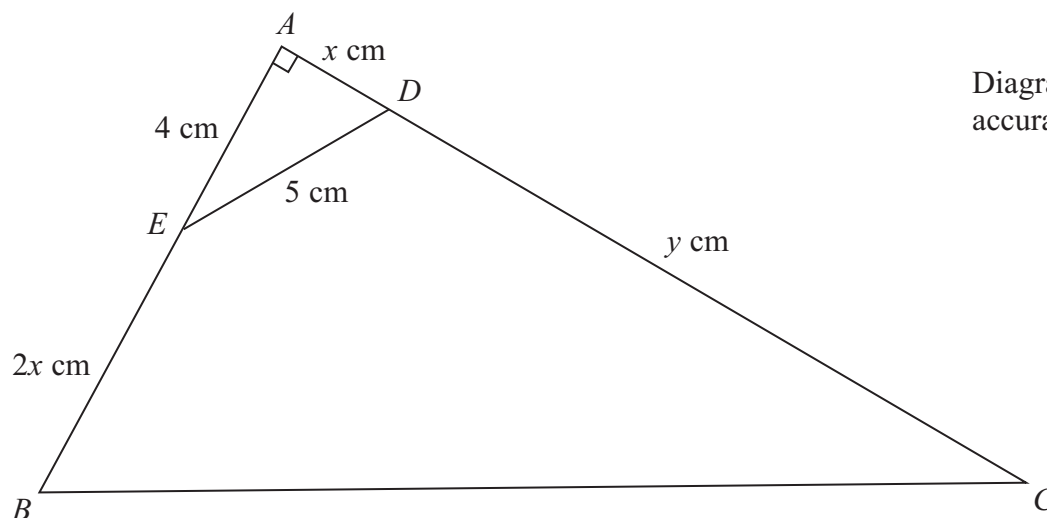


Figure 2

Figure 2 shows $\triangle ABC$ which is right-angled at A .

The point D lies on AC such that $AD = x$ cm and $DC = y$ cm.

The point E lies on AB such that $AE = 4$ cm and $EB = 2x$ cm.

$ED = 5$ cm.

(a) Calculate the length, in cm, of AD .

(2)

Given that the area of $\triangle ABC$ is 10 times the area of $\triangle AED$,

(b) calculate the length, in cm, of DC ,

(4)

(c) calculate the area, in cm^2 , of $EBCD$.

(2)

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(Total for Question 6 is 8 marks)



- 7 There are 50 books on a bookshelf.

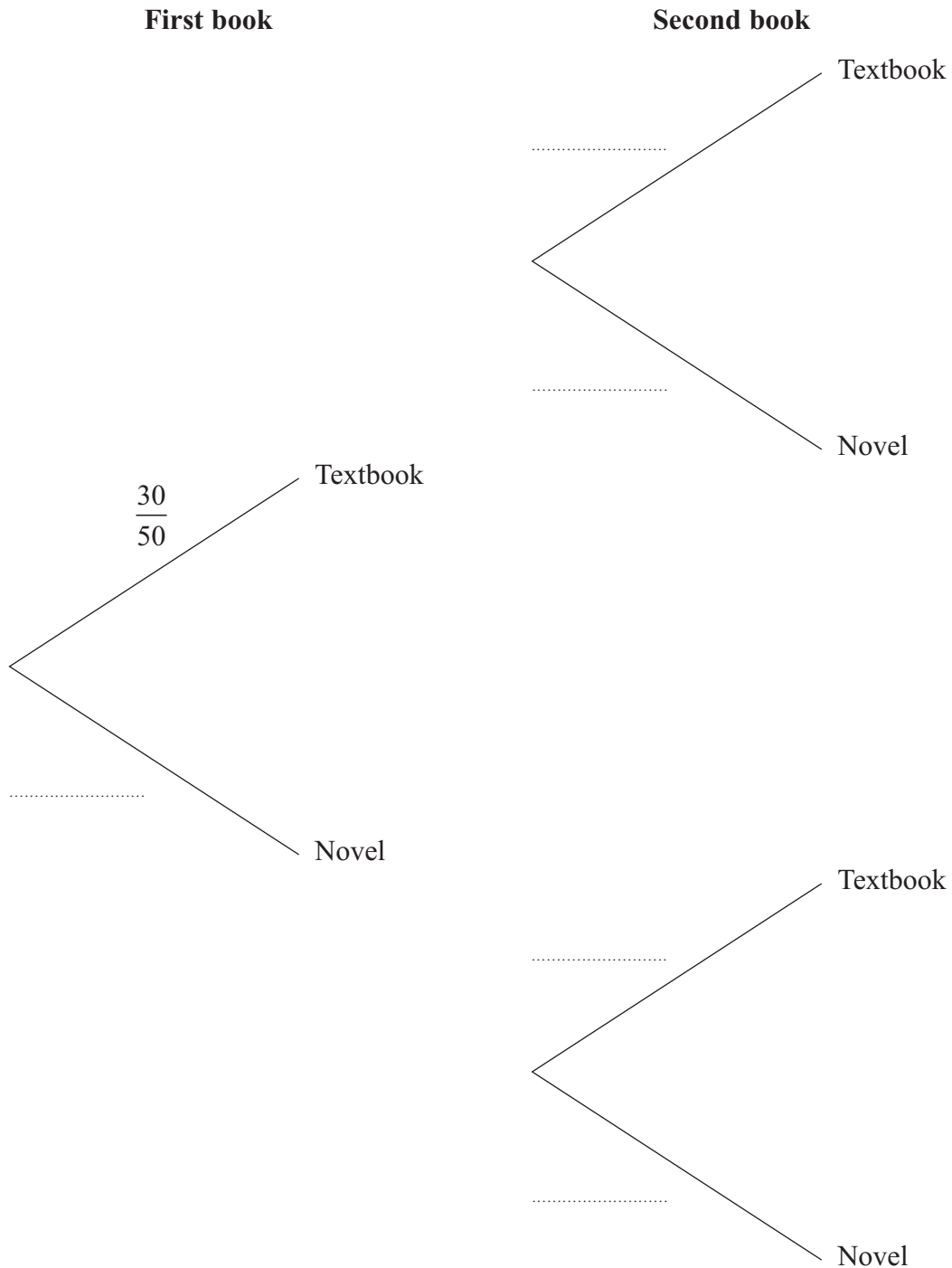
These books are either textbooks or novels.

30 of these books are textbooks and the rest are novels.

Fatima takes at random a book from the bookshelf and does not return it to the bookshelf.

Fatima then takes at random another book from the bookshelf.

- (a) Complete the tree diagram that represents these two events.



(3)



Question 7 continued

- (b) Calculate the probability that both of the books taken from the bookshelf are textbooks.

(2)

Fatima returns both books to the bookshelf.

5 more novels are added to the bookshelf.

Fatima takes at random two books from the bookshelf, one after the other without replacement.

- (c) Calculate the probability that at least one of the two books removed from the bookshelf is a novel.

(3)



Question 7 continued

(Total for Question 7 is 8 marks)



- 8** The points $(2, 1)$, $(6, 3)$ and $(6, 1)$ are the vertices of triangle A .

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

(1)

Triangle A is transformed to triangle B under the transformation with matrix $\mathbf{N}$ where

$$\mathbf{N} = \begin{pmatrix} \frac{1}{2} & -2 \\ -\frac{1}{2} & 1 \end{pmatrix}$$

- (b) Find the coordinates of the vertices of B .

(2)

- (c) On the grid, draw and label B .

(1)

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

$$\mathbf{M} = \begin{pmatrix} 1 & 1 \\ 2 & 4 \end{pmatrix}$$

- (d) Find the coordinates of the vertices of C .

(2)

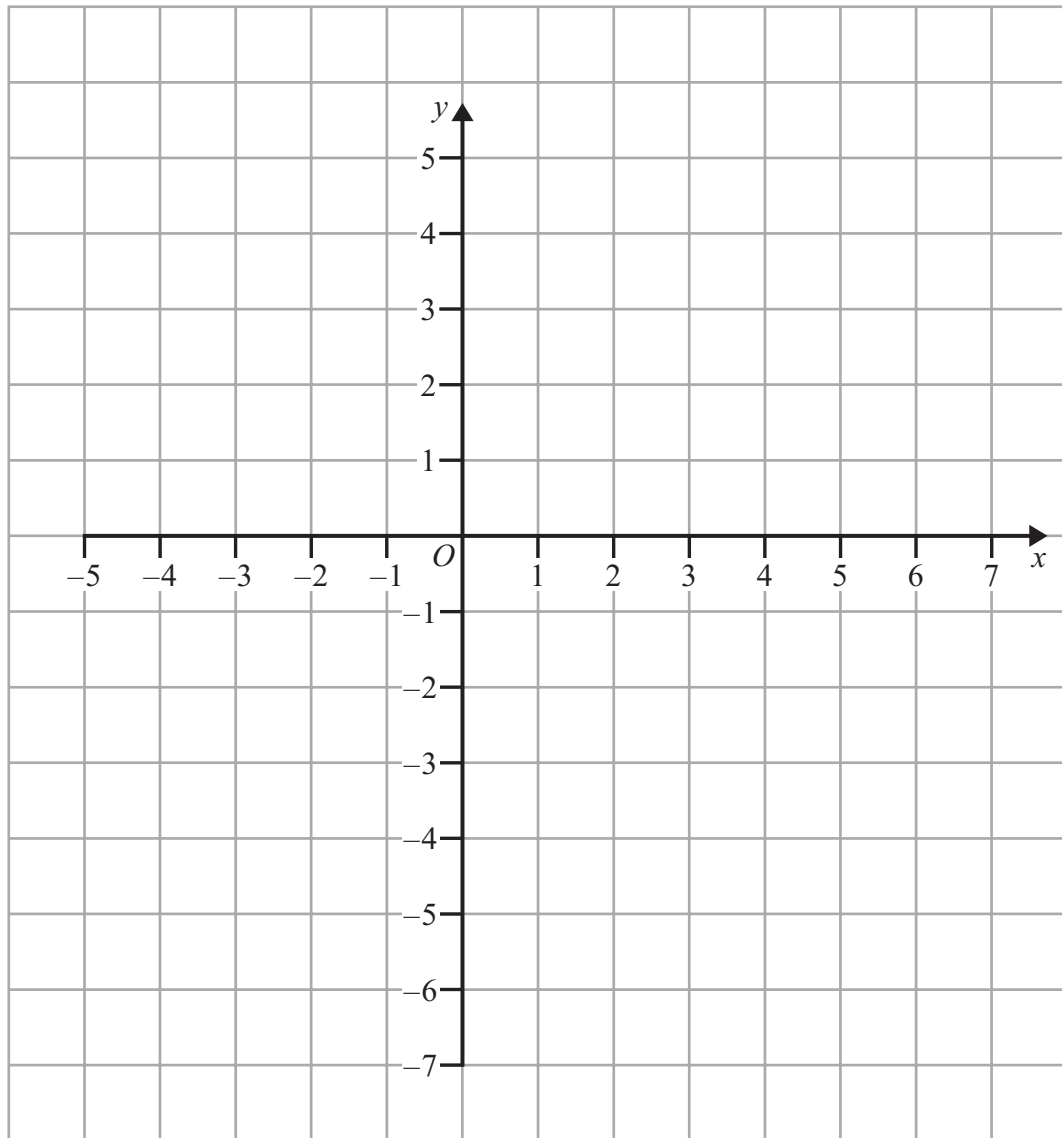
- (e) On the grid, draw and label C .

(1)

- (f) Describe fully the single transformation which maps triangle A onto triangle C .

(2)



Question 8 continued

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(Total for Question 8 is 9 marks)



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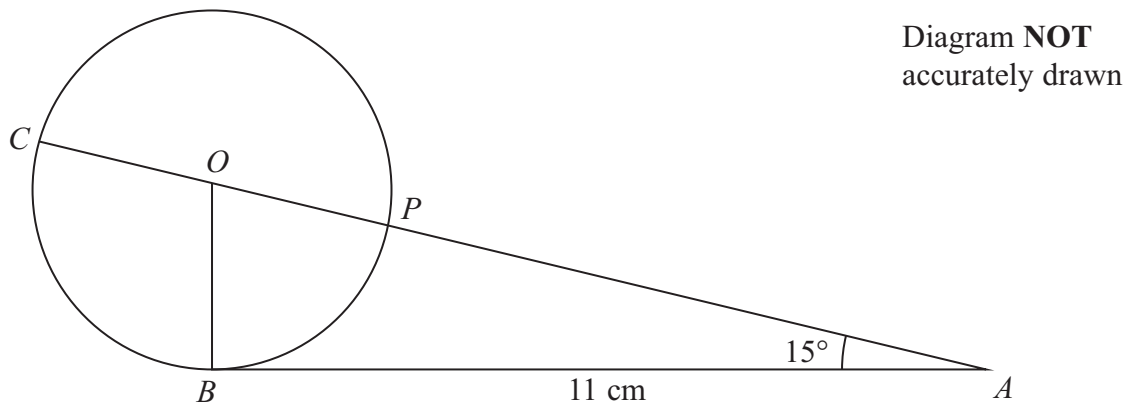
**Figure 3**

Figure 3 shows a circle PBC with centre O and diameter CP .

The point A is such that $AB = 11$ cm and AB is a tangent to the circle.

$APOC$ is a straight line and $\angle OAB = 15^\circ$

Calculate the length, in cm to 3 significant figures, of

(a) OA , (2)

(b) AP , (3)

(c) BC . (3)

The tangent to the circle PBC at P intersects AB at the point Q .

(d) Calculate the area, in cm^2 to 3 significant figures, of $BCPQ$. (5)

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

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

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



Question 9 continued



Question 9 continued

(Total for Question 9 is 13 marks)



A solid S is made by removing a hemisphere of radius $\frac{h}{2}$ cm from each end of a rectangular prism of length l cm, depth h cm and width h cm, as shown in Figure 4.

(a) Find and simplify an expression for V in terms of h , l and π .

(b) show that $V = h^2 \left[10 - h \left(1 + \frac{\pi}{6} \right) \right]$

26



Question 10 continued

Continued on page 28



Question 10 continued

(c) For $V = h^2 \left[10 - h \left(1 + \frac{\pi}{6} \right) \right]$, complete the table, giving the values of V to 1 decimal place.

h	0	1	2	3	4	5
V	0		27.8		62.5	

(3)

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

(3)

(e) Hence find the maximum value, to the nearest integer, of V .

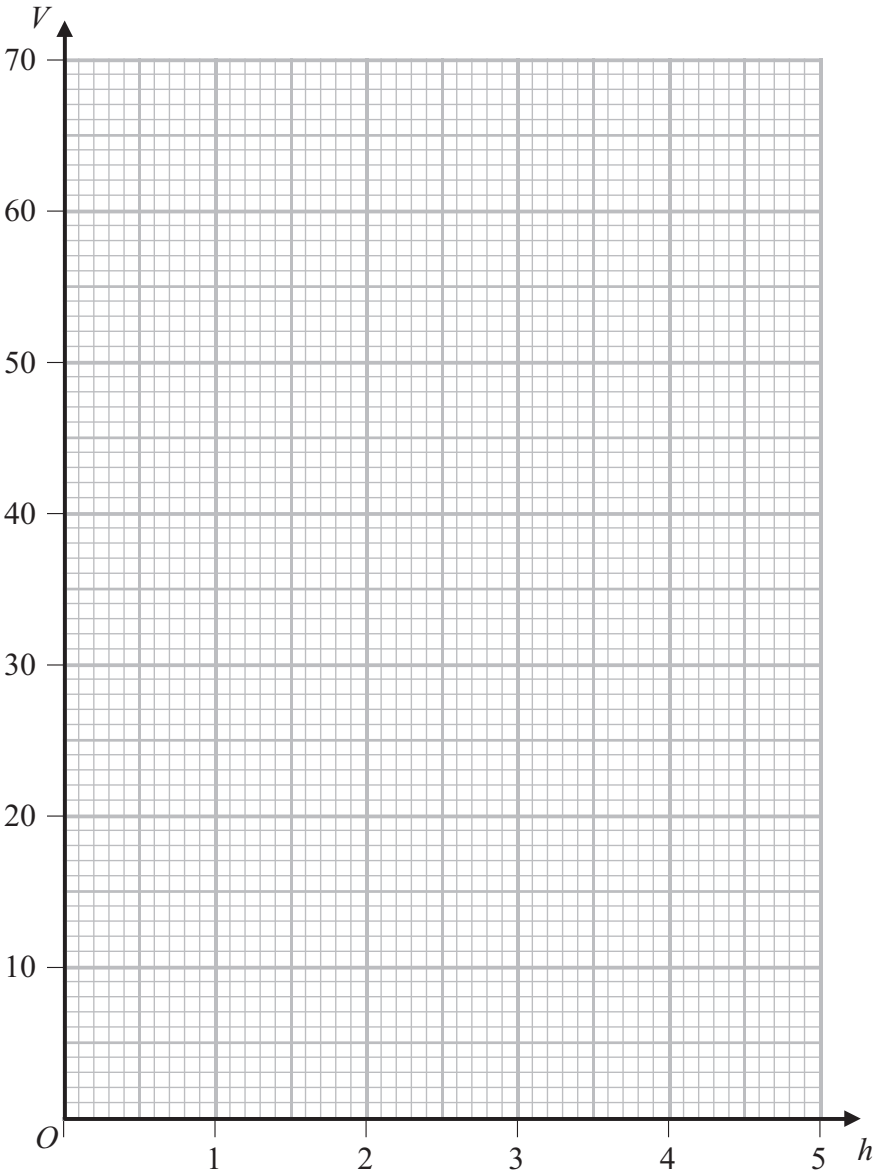
(1)

(f) Use your graph to find the range of values, to 1 decimal place, of l for which $V > 60$

(5)



Question 10 continued



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(Total for Question 10 is 16 marks)

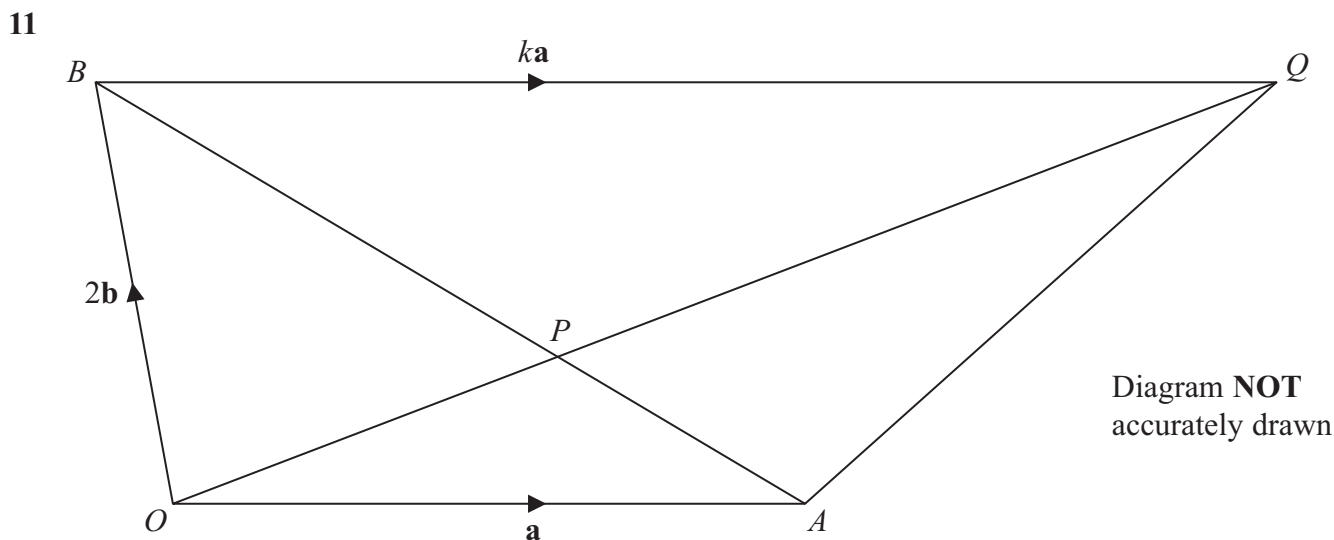


Figure 5

In Figure 5, $OAQB$ is a trapezium with $\vec{OA} = \mathbf{a}$ and $\vec{OB} = 2\mathbf{b}$ and $\vec{BQ} = k\mathbf{a}$, where k is a positive constant.

The diagonals AB and OQ of the trapezium intersect at the point P .

(a) (i) Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, $\vec{AB}$.

(ii) Find, in terms of $\mathbf{a}$, $\mathbf{b}$ and k , $\vec{OQ}$.

(2)

The point P is such that $AP : AB = 1 : 3$

(b) Write down an expression for $\vec{AP}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.

(1)

The point P is such that $OP : OQ = 1 : \mu$

(c) (i) Write down an expression for $\vec{OA}$ in terms of $\mathbf{a}$, $\mathbf{b}$, μ and k .

(ii) Hence find the value of μ and the value of k .

(6)

(d) Given that the area of $\triangle BPQ$ is 12 cm^2 , find the area, in cm^2 , of $\triangle OPA$.

(2)

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TOTAL FOR PAPER IS 100 MARKS