


Please check the examination details below before entering your candidate information

Candidate surname					Other names									
<b>Pearson Edexcel</b>					Centre Number					Candidate Number				
<b>International GCSE</b>					<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
<b>Thursday 6 June 2019</b>														
Morning (Time: 2 hours 30 minutes)							Paper Reference <b>4MB1/02</b>							
<b>Mathematics B</b>														
<b>Paper 2</b>														
<b>You must have:</b> 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** Malcolm is investigating the ages of the 200 members of a theatre company.

The table below gives information about the age group of each member of the company.

Age ( $t$ years)	Frequency
$10 < t \leq 20$	23
$20 < t \leq 30$	47
$30 < t \leq 40$	56
$40 < t \leq 50$	48
$50 < t \leq 60$	26

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

(a) Calculate the size, in degrees, of the angle of the sector in the pie chart for those members of the company whose age group is  $40 < t \leq 50$  (2)

(b) Calculate an estimate for the mean age, to the nearest year, of the members of the theatre company. (4)

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**Question 1 continued**

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Area with horizontal dotted lines for writing.

**(Total for Question 1 is 6 marks)**



2 In 2017, country *A* had a population of  $2.35 \times 10^7$  people.

Of these people, 48% were male.

(a) Calculate the number of males in country *A* in 2017 (2)

Country *A* is divided into three regions. These three regions are called East Region, Central Region and West Region.

In 2017, the ratio of the number of males in the East Region to the number of males in the Central Region to the number of males in the West Region was 5 : 3 : 2

(b) Calculate the number of males in the Central Region in 2017  
Give your answer in standard form. (2)

In 2017, the number of females in the Central Region was 12.5% greater than the number of males in the Central Region.

(c) Calculate the number of females in the Central Region in 2017 (2)

In 2010, country *B* had a population of  $2.5 \times 10^7$  people.

From 2010 to 2014, the population of country *B* increased by 2.4%  
From 2014 to 2018, the population of country *B* decreased by 2.4%

(d) Calculate the population of country *B* in 2018 (2)

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**Question 2 continued**

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**(Total for Question 2 is 8 marks)**



3

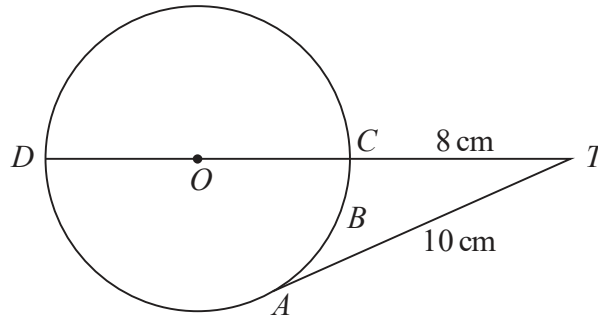


Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows the circle  $ABCD$  with centre  $O$  and diameter  $DC$ .

The point  $T$  is such that  $TCOD$  is a straight line and  $TA$  is the tangent to the circle at  $A$ .

$$AT = 10 \text{ cm} \qquad TC = 8 \text{ cm}$$

(a) Calculate the radius, in cm, of the circle. (3)

(b) Calculate the length, in cm to 3 significant figures, of the arc  $ABC$ . (3)

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**Question 3 continued**

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Handwriting practice area with horizontal dotted lines.

**(Total for Question 3 is 6 marks)**



4 Triangle *A* is drawn on the grid opposite.

The points (1, 2), (3, -2) and (1, 4) are the vertices of triangle *B*.

(a) On the grid, draw and label triangle *B*. (1)

(b) Describe fully the single transformation that maps triangle *A* onto triangle *B*. (2)

Triangle *C* is the image of triangle *B* under an enlargement with scale factor 2 and centre of enlargement the origin.

(c) On the grid, draw and label triangle *C*. (3)

Triangle *D* is the image of triangle *C* under the transformation with matrix **M** where

$$\mathbf{M} = \begin{pmatrix} -\frac{1}{2} & 0 \\ \frac{1}{2} & -1 \end{pmatrix}$$

(d) On the grid, draw and label triangle *D*. (3)

Triangle *C* is the image of triangle *D* under the transformation with matrix **N**.

(e) Find the matrix **N**. (3)

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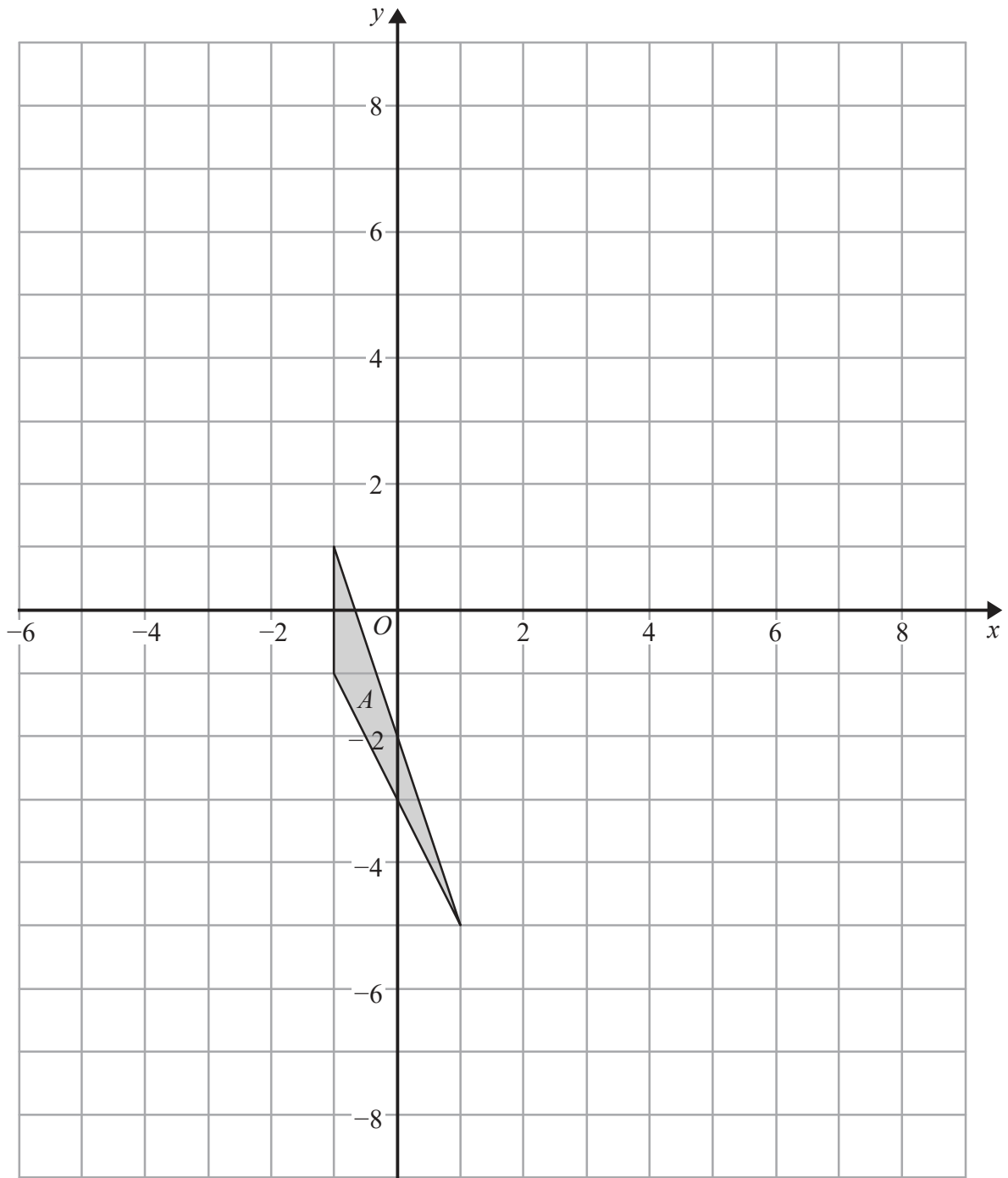
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$$\left[ \text{The inverse of matrix } \begin{pmatrix} a & b \\ c & d \end{pmatrix} \text{ is } \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix} \right]$$





Question 4 continued



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



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**Question 4 continued**

Handwriting practice area with 20 horizontal dotted lines.

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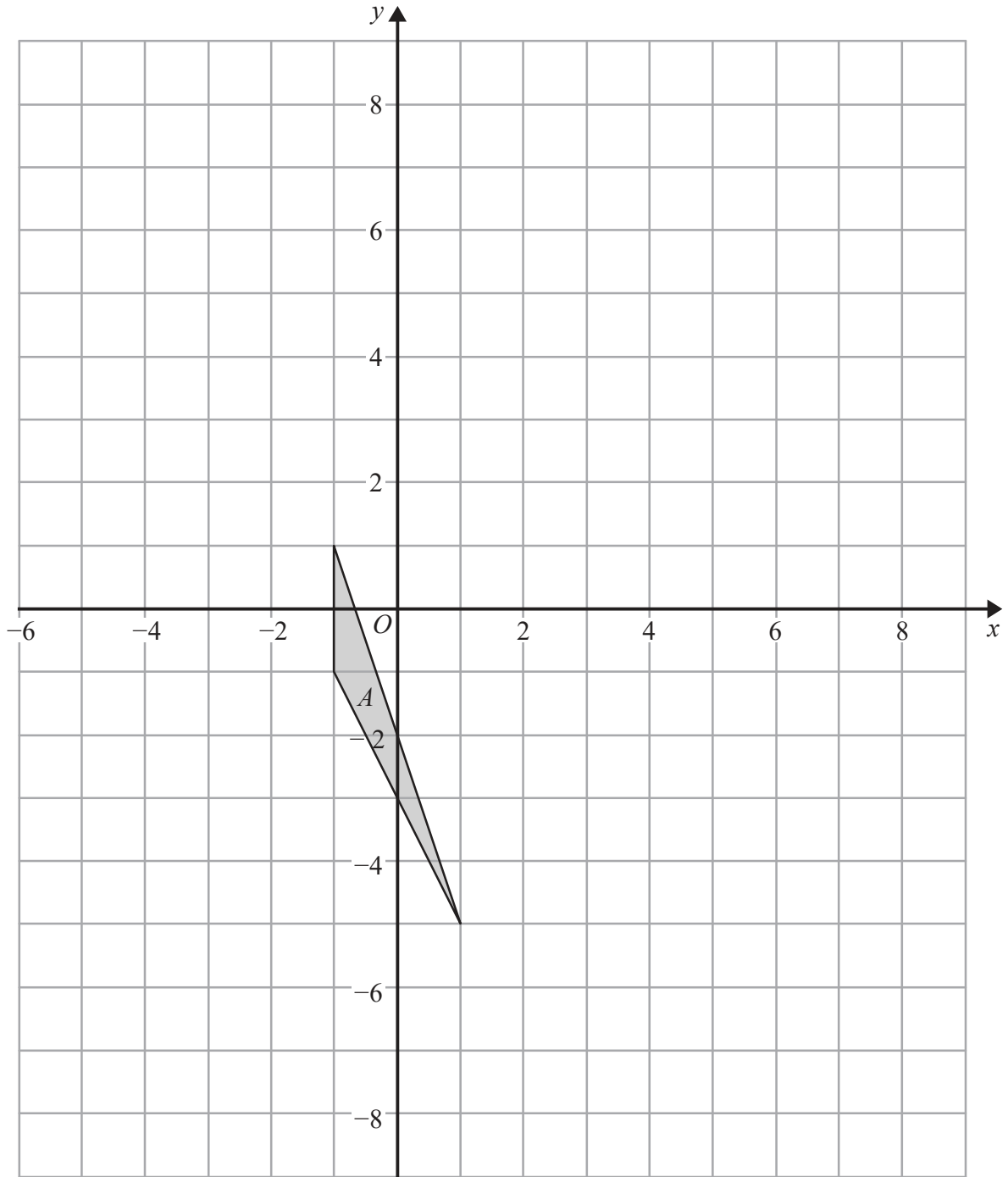
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Question 4 continued

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



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(Total for Question 4 is 12 marks)



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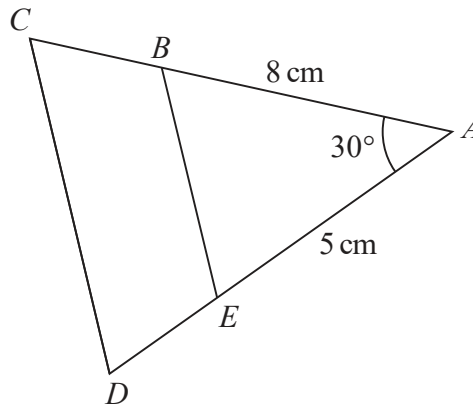


Diagram NOT  
accurately drawn

**Figure 2**

Figure 2 shows the triangles  $ABE$  and  $ACD$  where  $B$  lies on  $AC$  and  $E$  lies on  $AD$ .  
The triangles are similar with  $\angle ABE = \angle ACD$ .

$$AB = 8 \text{ cm} \quad AE = 5 \text{ cm} \quad \angle BAE = 30^\circ$$

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

(b) Calculate the size, in degrees to 3 significant figures, of  $\angle ABE$ . (3)

The area of quadrilateral  $BCDE$  is  $18.9 \text{ cm}^2$

(c) Calculate the length, in cm to 3 significant figures, of  $CD$ . (4)

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



**Question 5 continued**

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Handwriting practice area with horizontal dotted lines.



P 6 0 2 5 7 A 0 1 3 3 6

Question 5 continued

A large rectangular area with horizontal dotted lines for writing.

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**(Total for Question 5 is 10 marks)**



6

$$A = \{a, b, c, d\}$$

Write down all the subsets of  $A$  that contain the element  $b$ .

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Handwriting practice area with horizontal dotted lines.

(Total for Question 6 is 4 marks)



P 6 0 2 5 7 A 0 1 5 3 6

7 To pass a course, Preety has to pass two tests, test **A** and test **B**.

Each test only has to be passed once.

Passing test **A** and passing test **B** are independent events.

Preety has three attempts to pass test **A**.

The probability that she passes test **A** on her first attempt is  $\frac{3}{5}$

If she fails on her first attempt, the probability that she passes on her second attempt is  $\frac{2}{5}$

If she fails on her second attempt, the probability that she passes on her third attempt is  $\frac{3}{8}$

(a) Calculate the probability she passes test **A**.

(3)

Preety has two attempts to pass test **B**.

The probability that she passes test **B** on her first attempt is  $\frac{3}{5}$

The probability that she passes test **B** is  $\frac{3}{4}$

(b) Calculate the probability that Preety passes test **B** on her second attempt, given that she fails test **B** on her first attempt.

(3)

Preety decides to take the two tests only if the probability that she passes the course is greater than 0.5

(c) State whether or not Preety should take the two tests.  
Give a reason for your answer.

(2)

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**Question 7 continued**

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Handwriting practice area with horizontal dotted lines.



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**Question 7 continued**

Handwriting practice area with 20 horizontal dotted lines.

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**Question 7 continued**

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Handwriting practice area with horizontal dotted lines.

**(Total for Question 7 is 8 marks)**



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8

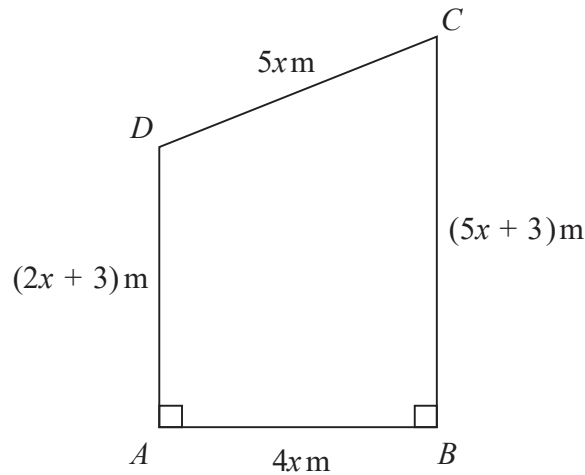
Diagram NOT  
accurately drawn

Figure 3

Figure 3 shows the plan for a lawn that is in the shape of a trapezium  $ABCD$  in which

$$AB = 4x \text{ metres} \quad BC = (5x + 3) \text{ metres} \quad CD = 5x \text{ metres} \quad DA = (2x + 3) \text{ metres}$$

The perimeter of the lawn is  $P$  metres.

(a) Find and simplify an expression for  $P$  in terms of  $x$ .

(2)

The area of the lawn is  $A \text{ m}^2$

(b) Show that  $A = 14x^2 + 12x$

(2)

The owner of the lawn wants the perimeter of the lawn to be greater than 52 m.

He also wants the area of the lawn to be at most  $162 \text{ m}^2$

(c) Find the range of possible values of  $x$ .  
Show clear algebraic working.

(6)

$$\left[ \text{Area of trapezium} = \frac{1}{2} (a + b)h \right]$$



**Question 8 continued**

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Handwriting practice area with horizontal dotted lines.



P 6 0 2 5 7 A 0 2 1 3 6

**Question 8 continued**

Handwriting practice area consisting of 30 horizontal dotted lines for writing.

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**Question 8 continued**

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Area with horizontal dotted lines for writing.

**(Total for Question 8 is 10 marks)**



P 6 0 2 5 7 A 0 2 3 3 6

9

$$\mathbf{p} = \begin{pmatrix} 2x - 1 \\ y \end{pmatrix} \quad \mathbf{q} = \begin{pmatrix} y + 3 \\ -y \end{pmatrix}$$

The vectors  $\mathbf{p}$  and  $\mathbf{q}$  are such that  $|\mathbf{p}| = \sqrt{98}$  and  $\mathbf{p} + \mathbf{q} = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$

(a) Show that  $x^2 - 3x - 9 = 0$  (5)

Given that  $x > 0$

(b) (i) find the exact value of  $x$ , (2)

(ii) show that  $y = 2 - 3\sqrt{5}$  (2)

(c) Find the exact value of  $|\mathbf{q}|^2$   
Show your working clearly. (3)

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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 9 continued**

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Handwriting practice area with horizontal dotted lines.



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**Question 9 continued**

Multiple horizontal dotted lines for writing answers.

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**Question 9 continued**

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Ruled area for writing answers, consisting of multiple horizontal dotted lines.

**(Total for Question 9 is 12 marks)**



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10 The curve  $C$  has equation  $y = 2x^3 + ax^2 + bx + 10$  where  $a$  and  $b$  are constants.

The point  $A$ , with coordinates  $(1, 3)$ , lies on  $C$ .

(a) Write down an equation in  $a$  and  $b$ .

(1)

The tangent to  $C$  at the point  $A$  has gradient  $-8$

(b) Show that  $2a + b = -14$

(3)

(c) Hence find the value of  $a$  and the value of  $b$ .  
Show clear algebraic working.

(3)

Using the value of  $a$  and the value of  $b$  found in part (c),

(d) find the  $x$  coordinate of each of the points on  $C$  where the tangent to  $C$  is parallel to the line with equation  $y = 7 - 4x$ .  
Show clear algebraic working.

(3)

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**Question 10 continued**

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Area with horizontal dotted lines for writing.



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**Question 10 continued**

A large rectangular area with rounded corners, containing 30 horizontal dotted lines for writing.

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**Question 10 continued**

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Area with horizontal dotted lines for writing.

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



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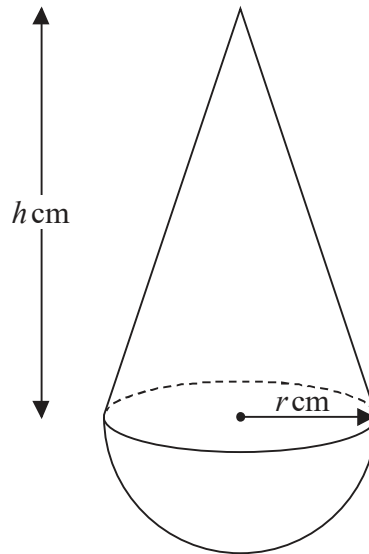


Diagram **NOT**  
accurately drawn

Figure 4

A child's toy is made by fixing a solid right circular cone, with base radius  $r$  cm and height  $h$  cm, on the flat circular face of a solid hemisphere of radius  $r$  cm. The centre of the base of the cone coincides with the centre of the hemisphere, as shown in Figure 4

Given that  $h + 6r = 15$

- (a) find the upper bound for the value of  $r$ .  
Give a reason for your answer.

(2)

The volume of the toy is  $V$  cm<sup>3</sup>

- (b) Show that  $V = \frac{1}{3}\pi r^2(15 - 4r)$

(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 11 continued**

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Area with horizontal dotted lines for writing.

**Question 11 continues on the next page**



**Question 11 continued**

- (c) Complete the following table of values for  $V = \frac{1}{3}\pi r^2(15 - 4r)$

Give your values of  $V$  to one decimal place.

**(3)**

$r$	0	0.4	0.8	1.2	1.6	2.0	2.4
$V$	0		7.9			29.3	32.6

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

**(2)**

The volume of one particular toy is  $26\text{ cm}^3$

- (e) Use your curve to find, to one decimal place, the value of  $r$ .

**(1)**

The manufacturer of the toy decides that the value of  $V$  should be twice the value of  $h$ .

- (f) By drawing a suitable straight line on the grid, find an estimate, to the nearest integer, for the value of  $V$ .

**(3)**

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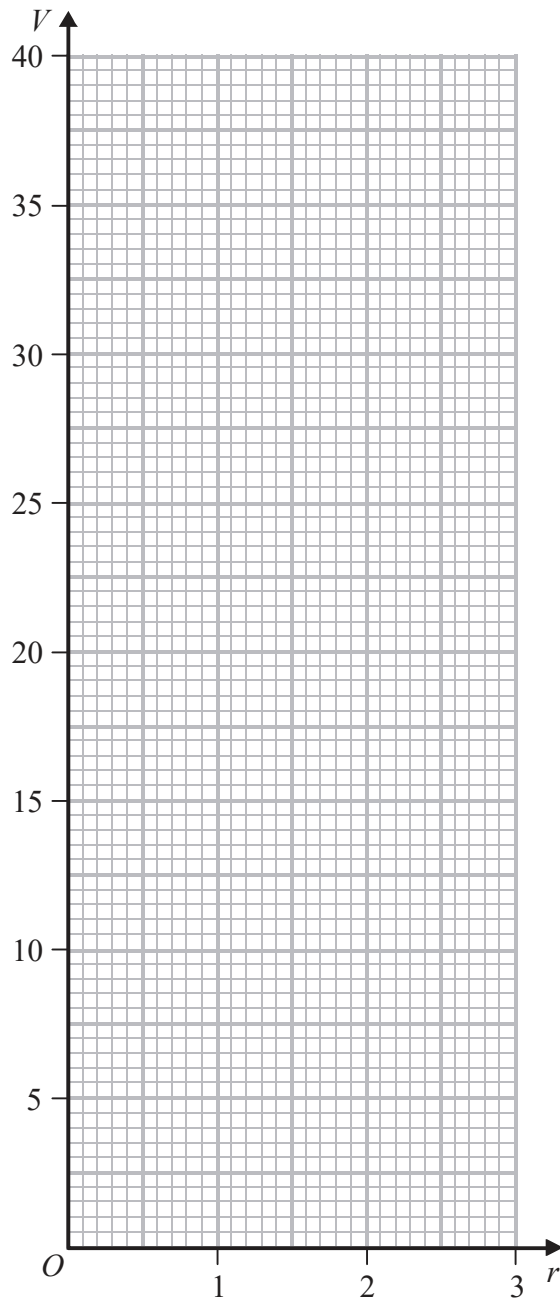
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Question 11 continued



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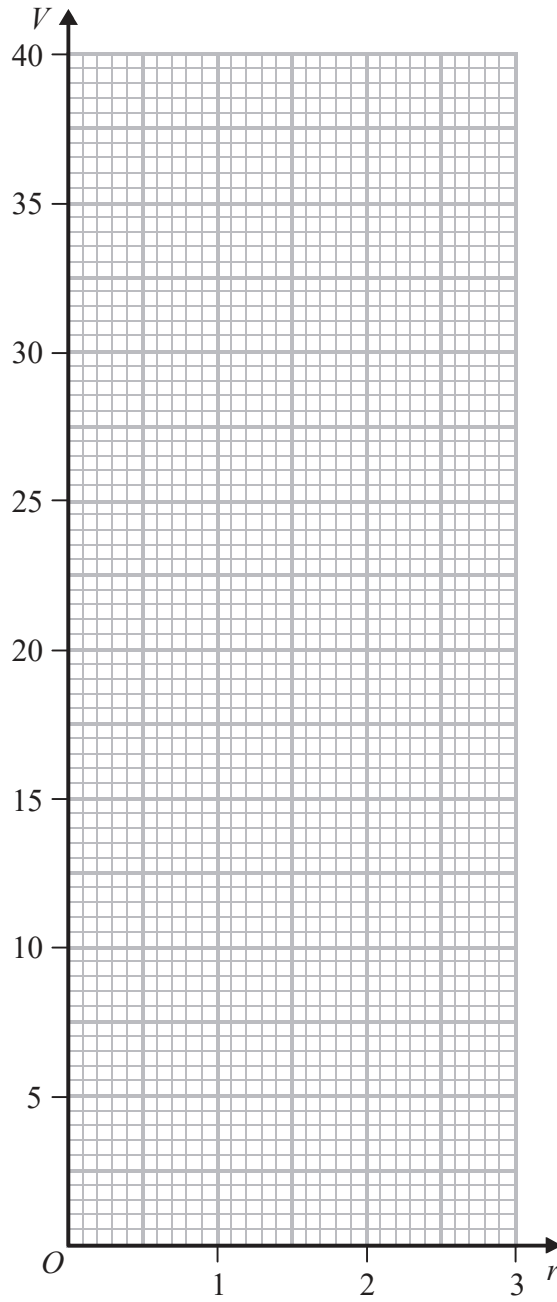
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**Question 11 continued**

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



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**(Total for Question 11 is 14 marks)**

**TOTAL FOR PAPER IS 100 MARKS**



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