

Write your name here	
Surname	Other names
<b>Edexcel</b>	Centre Number
<b>International GCSE</b>	Candidate Number
<b>Further Pure Mathematics</b>	
<b>Paper 1</b>	
Thursday 19 January 2012 – Morning	Paper Reference
<b>Time: 2 hours</b>	<b>4PM0/01</b>
<b>Calculators may be used.</b>	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.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*

### 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.

Turn over ►

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**PEARSON**





3 Solve the inequality  $6x^2 - 19x - 7 < 0$

(4)

A series of horizontal dotted lines for writing the solution to the inequality.

(Total for Question 3 is 4 marks)



- 4 Find the coefficient of  $x^7$  in the expansion of  $\left(1 + \frac{x}{\sqrt{3}}\right)^{10}$ , giving your answer in the form  $a\sqrt{3}$ , where  $a$  is a rational number.

(4)

(Total for Question 4 is 4 marks)

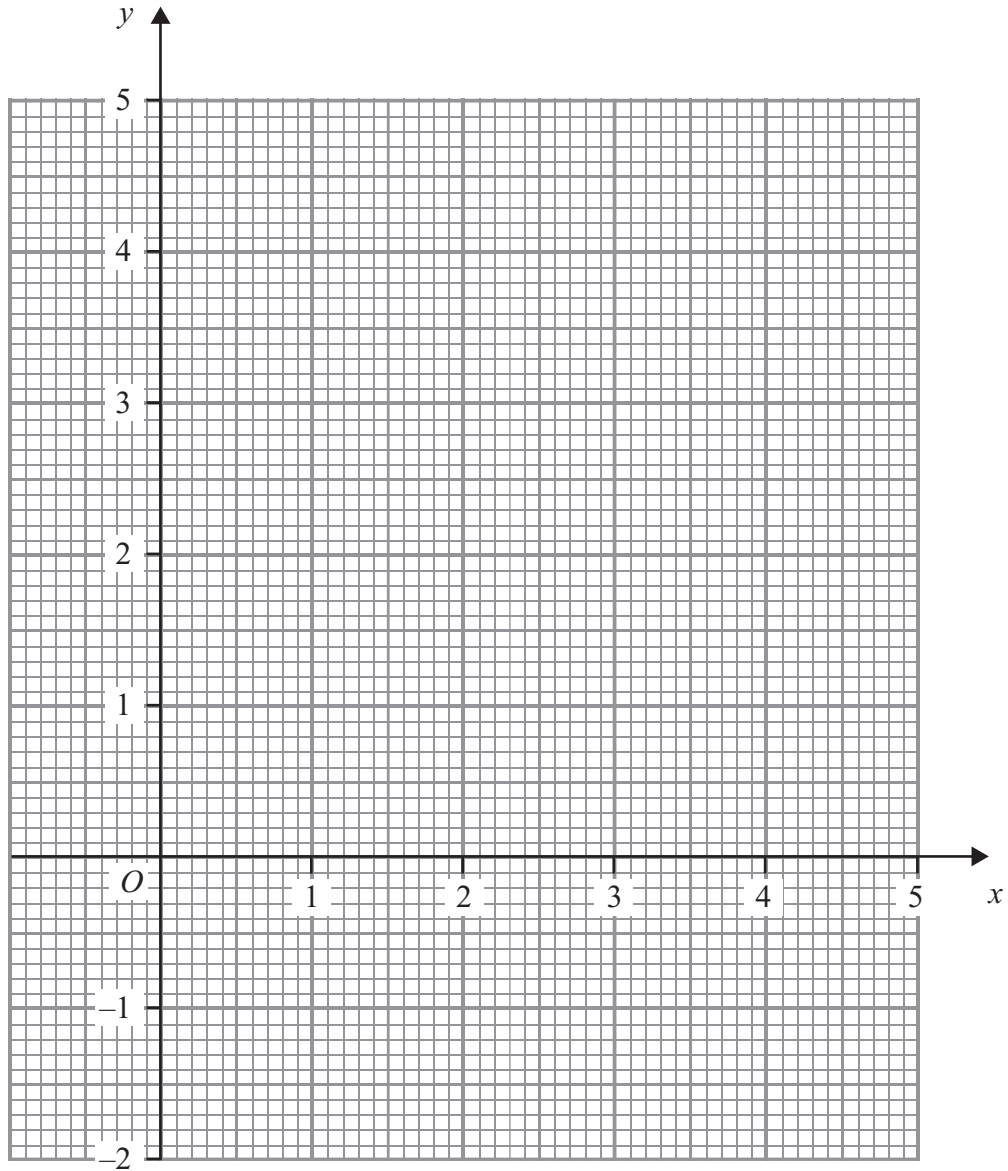








**Question 6 continued**



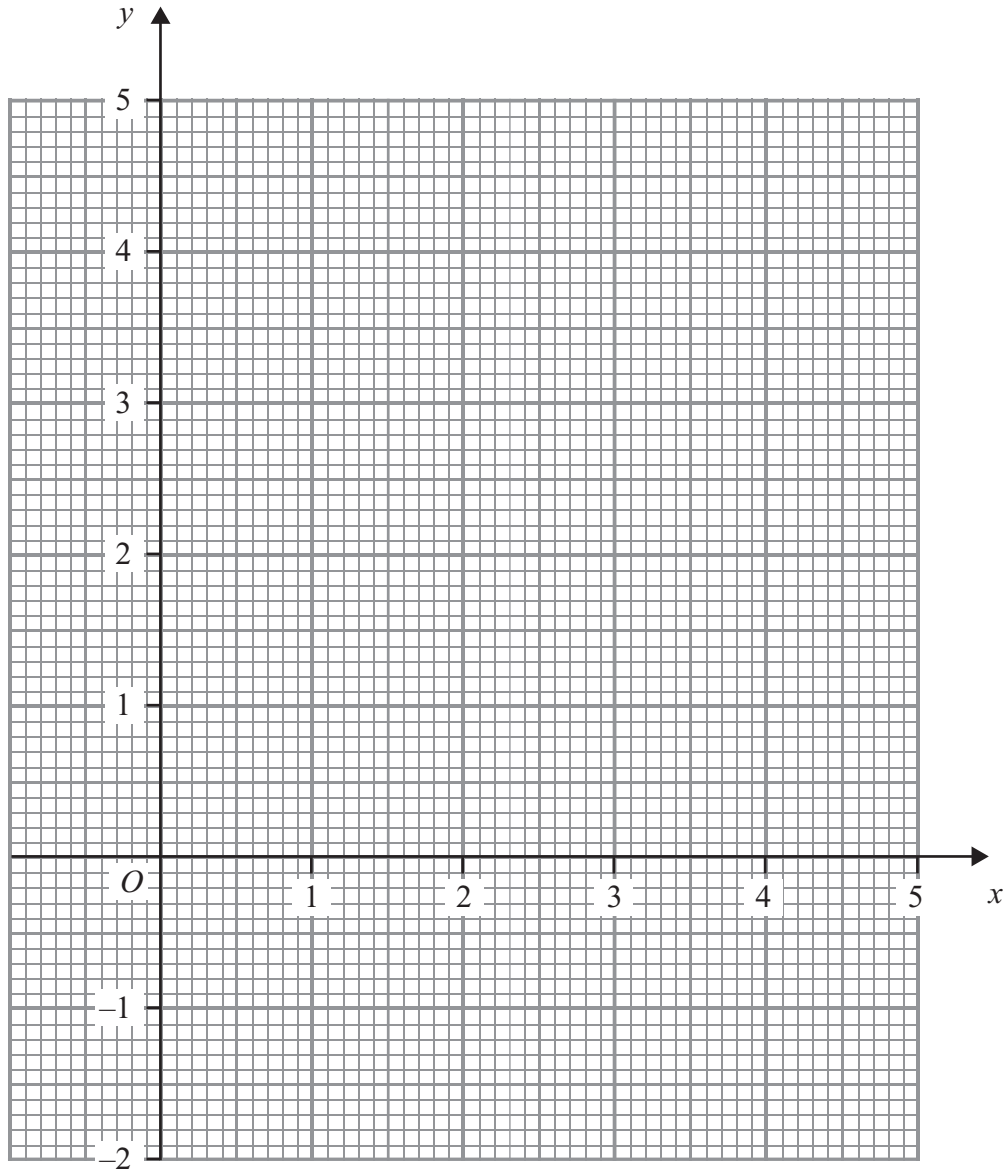
**Question 6 continued**

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**Question 6 continued**

**Use this page only if you need to redraw your graph.**



**(Total for Question 6 is 8 marks)**







**Question 7 continued**

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**Question 8 continued**

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**Question 9 continued**

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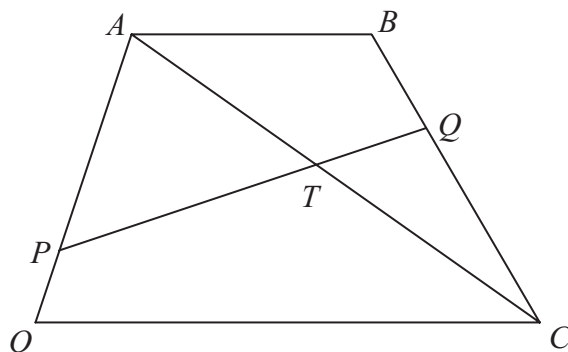


Figure 2

Figure 2 shows a trapezium  $OABC$  in which  $AB$  is parallel to  $OC$  and  $AB = \frac{1}{2} OC$ . The point  $P$  divides  $OA$  in the ratio  $1:3$  and the point  $Q$  divides  $BC$  in the ratio  $1:2$

The line  $AC$  intersects the line  $PQ$  at the point  $T$ .

$\vec{OA} = \mathbf{a}$  and  $\vec{OC} = \mathbf{c}$

(a) Find, as simplified expressions in terms of  $\mathbf{a}$  and  $\mathbf{c}$

(i)  $\vec{BC}$

(ii)  $\vec{PQ}$

(5)

(b) (i) Given that  $\vec{PT} = \lambda \vec{PQ}$ , find an expression for  $\vec{AT}$  in terms of  $\lambda$ ,  $\mathbf{a}$  and  $\mathbf{c}$

(ii) Given also that  $\vec{AT} = \mu \vec{AC}$ , find an expression for  $\vec{AT}$  in terms of  $\mu$ ,  $\mathbf{a}$  and  $\mathbf{c}$

(2)

(c) Use your answers from part (b) to find the value of  $\lambda$  and hence write down the ratio  $PT : TQ$

(6)

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**Question 10 continued**

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11

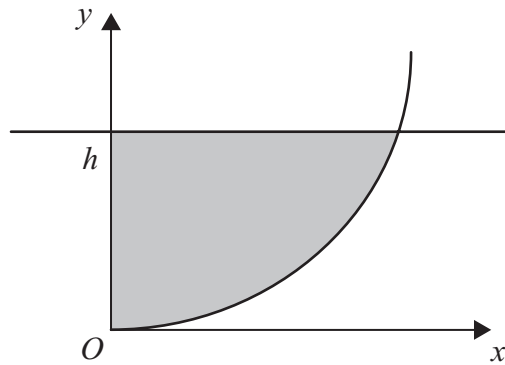


Figure 3

The centre of the circle  $C$ , with equation  $x^2 + y^2 - 10y = 0$ , has coordinates  $(0, 5)$ . The circle passes through the origin  $O$ . The region bounded by the circle, the positive  $y$ -axis and the line  $y = h$ , where  $h < 5$ , is shown shaded in Figure 3. The shaded region is rotated through  $2\pi$  radians about the  $y$ -axis.

(a) Show that the volume of the solid formed is  $\frac{1}{3}\pi h^2(15 - h)$ .

(5)

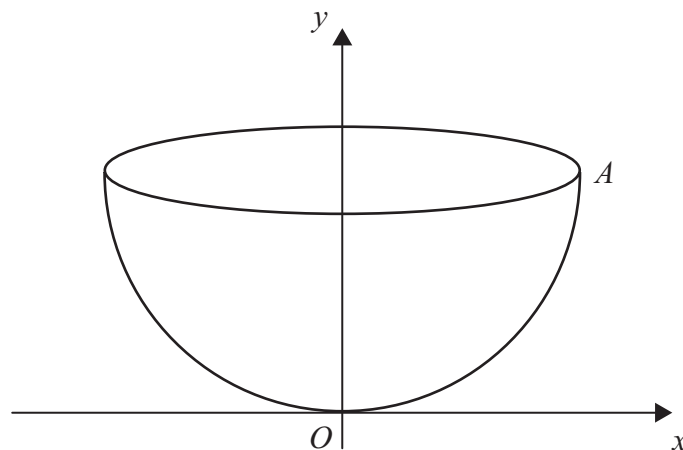


Figure 4

The point  $A$  with coordinates  $(5, 5)$  lies on  $C$ . A bowl is formed by rotating the arc  $OA$  through  $2\pi$  radians about the  $y$ -axis, as shown in Figure 4. Water is poured into the bowl at a constant rate of  $6 \text{ cm}^3/\text{s}$ . The volume of water in the bowl is  $V \text{ cm}^3$  when the depth of water above  $O$  is  $h \text{ cm}$ .

(b) Use the formula given in part (a) to find an expression for  $\frac{dV}{dh}$  in terms of  $h$ .

(1)

(c) Find, to 3 significant figures, the rate at which  $h$  is changing when the water above  $O$  is  $1.5 \text{ cm}$  deep.

(4)

The area of the surface of the water is  $W \text{ cm}^2$  when the depth of water above  $O$  is  $h \text{ cm}$ .

(d) Show that, for  $0 < h < 5$ , the rate of change of the depth of water above  $O$  is  $\frac{k}{W}$ , stating the value of  $k$ .

(3)





**Question 11 continued**

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