

Write your name here			
Surname		Other names	
<b>Edexcel</b>		Centre Number	
<b>International GCSE</b>		Candidate Number	
<h1 style="margin: 0;">Further Pure Mathematics</h1> <h2 style="margin: 0;">Paper 2</h2>			
Thursday 22 January 2015 – Morning		Paper Reference	
<b>Time: 2 hours</b>		<b>4PM0/02</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 ►

**P44030A**

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PEARSON

Answer all TEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1

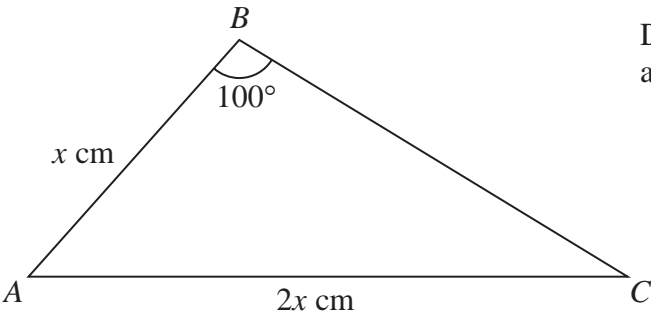


Diagram **NOT**  
accurately drawn

Figure 1

In triangle  $ABC$ ,  $AB = x$  cm,  $AC = 2x$  cm and  $\angle ABC = 100^\circ$ , as shown in Figure 1.

(a) Find, in degrees to the nearest  $0.1^\circ$ , the size of  $\angle BAC$ .

(4)

Given that the area of triangle  $ABC$  is  $16\text{ cm}^2$ ,

(b) find, to 3 significant figures, the value of  $x$ .

(3)

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- (a) Show that  $S = \frac{2V}{r} + 2r^2$

Verify that the value you have found is a minimum.

(7)

[illegible]



(a) Find the value of  $c$ .

(2)

(b) Solve the equation.

(2)

**(Total for Question 3 is 4 marks)**



$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

- Given that  $\sin \theta = \frac{\sqrt{5}}{2\sqrt{2}}$  and  $\cos \theta = \frac{\sqrt{3}}{2\sqrt{2}}$

- (c) Find the exact value of  $\cos(45^\circ + \theta)$

- (d) Show that  $\sin(45^\circ + \theta) \times \cos(45^\circ + \theta) = -\frac{1}{8}$  (2)

[illegible]



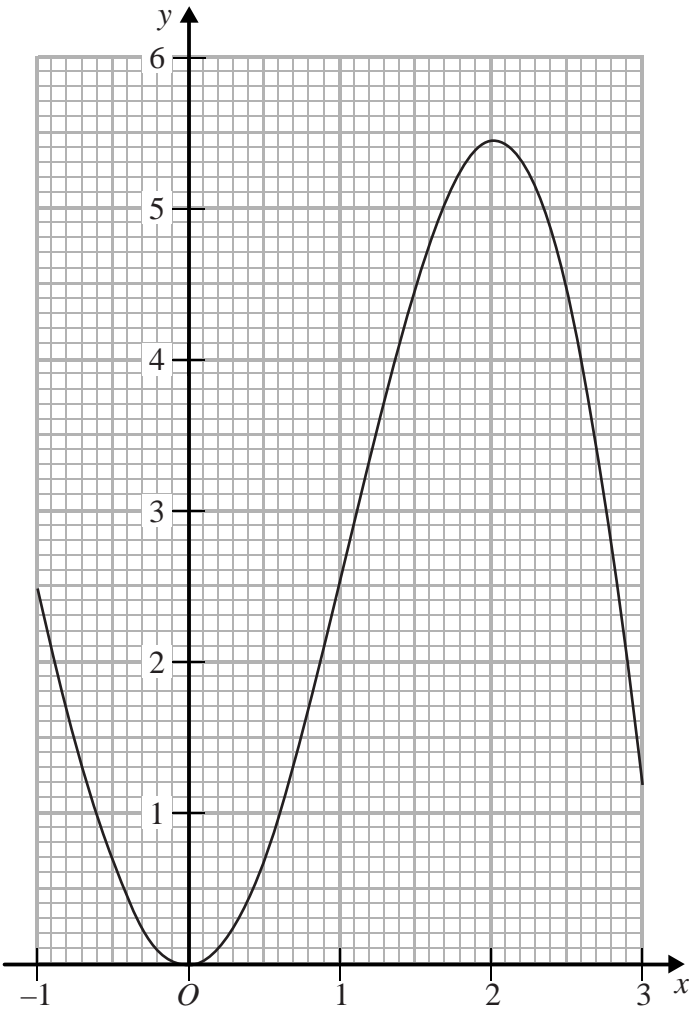
(Total for Question 1 is 7 marks)



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Question 5 continued

Graph for Question 5



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(Total for Question 5 is 8 marks)





(i)  $\alpha\beta$

$$\text{(ii)} \quad \left(\alpha + \frac{1}{\beta}\right) \left(\beta + \frac{1}{\alpha}\right) \quad (4)$$

(i)  $\alpha + \beta$

$$\text{(ii)} \quad \left(\alpha + \frac{1}{\beta}\right) + \left(\beta + \frac{1}{\alpha}\right) \tag{4}$$

Given that  $\left(\alpha + \frac{1}{\beta}\right) + \left(\beta + \frac{1}{\alpha}\right) = 2\left(\alpha + \frac{1}{\beta}\right)\left(\beta + \frac{1}{\alpha}\right)$

(c) find the value of  $p$ . (1)

coefficients, which has roots  $\left(\alpha + \frac{1}{\beta}\right)$  and  $\left(\beta + \frac{1}{\alpha}\right)$ . (2)

[illegible]









- (2)

- (3)

(5)









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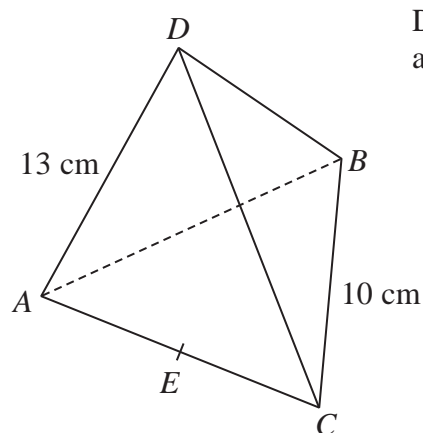
Diagram **NOT**  
accurately drawn**Figure 2**

Figure 2 shows a triangular pyramid  $ABCD$ .  
 $AB = BC = CA = 10$  cm and  $DA = DB = DC = 13$  cm.  
 The point  $E$  is the midpoint of  $AC$ .

(a) Find the exact length of

(i)  $DE$

(ii)  $BE$

(4)

(b) Find, in degrees to 1 decimal place, the size of the angle between the line  $BD$  and the line  $DE$ .

(3)

(c) Find, in degrees to 1 decimal place, the size of the angle between the line  $BD$  and the plane  $ABC$ .

(3)

(d) Find, in degrees to 1 decimal place, the size of the angle between the plane  $ADC$  and the plane  $ABC$ .

(2)

(e) Find, to 3 significant figures, the volume of the pyramid  $ABCD$ .

(3)

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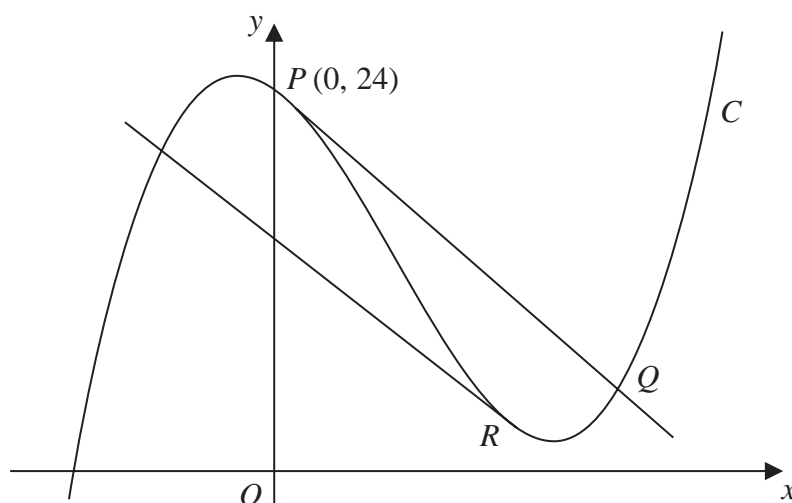
Diagram **NOT**  
accurately drawn**Figure 3**

Figure 3 shows the curve  $C$  with equation  $y = 9x^3 - 18x^2 - 8x + 24$

The curve cuts the  $y$ -axis at the point  $P$  with coordinates  $(0, 24)$ .

The point  $Q$  lies on  $C$  and the line  $PQ$  is the tangent to  $C$  at  $P$ .

(a) Find an equation of  $PQ$ .

(4)

(b) Find the coordinates of  $Q$ .

(5)

The point  $R$  lies on  $C$  and  $S$  is the point such that  $PQRS$  is a parallelogram.

Given that  $RS$  is the tangent to  $C$  at  $R$ ,

(c) find the coordinates of  $R$ ,

(4)

(d) find the coordinates of  $S$ .

(2)

(e) Show that  $S$  lies on  $C$ .

(2)

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**TOTAL FOR PAPER IS 100 MARKS**