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Surname	Other names
<b>Pearson Edexcel</b> <b>International GCSE</b>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">           Centre Number  <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> </div> <div style="text-align: center;">           Candidate Number  <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> </div> </div>
<h1 style="margin: 0;">Further Pure Mathematics</h1> <h2 style="margin: 0;">Paper 1</h2>	
Tuesday 12 June 2018 – Morning <b>Time: 2 hours</b>	Paper Reference <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**

Answer all ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1

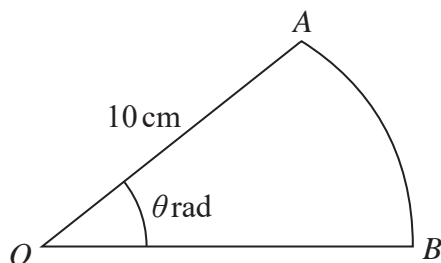


Diagram **NOT**  
accurately drawn

Figure 1

Figure 1 shows a sector  $OAB$  of a circle. The circle has centre  $O$  and radius 10 cm. The area of the sector is  $25 \text{ cm}^2$  and angle  $AOB = \theta$  radians.

Find

(a) the value of  $\theta$ ,

(2)

(b) the length of the arc  $AB$ .

(2)

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**Question 1 continued****(Total for Question 1 is 4 marks)**

P 5 3 3 9 1 A 0 3 3 6

- 2 The equation  $3x^2 - 5x + 4 = 0$  has roots  $\alpha$  and  $\beta$ .

Without solving this equation, form a quadratic equation with integer coefficients that has roots

$$\alpha + \frac{1}{2\beta} \text{ and } \beta + \frac{1}{2\alpha}$$

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**Question 2 continued****(Total for Question 2 is 7 marks)**

P 5 3 3 9 1 A 0 5 3 6

3 In triangle  $ABC$ ,  $AB = 12$  cm,  $BC = 9$  cm and angle  $BAC = 42^\circ$

(a) Find, in degrees to the nearest  $0.1^\circ$ , each of the two possible sizes of angle  $ABC$ .

(5)

(b) Find, to 2 significant figures, the smaller of the two possible areas of triangle  $ABC$ .

(3)

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**Question 3 continued****(Total for Question 3 is 8 marks)**

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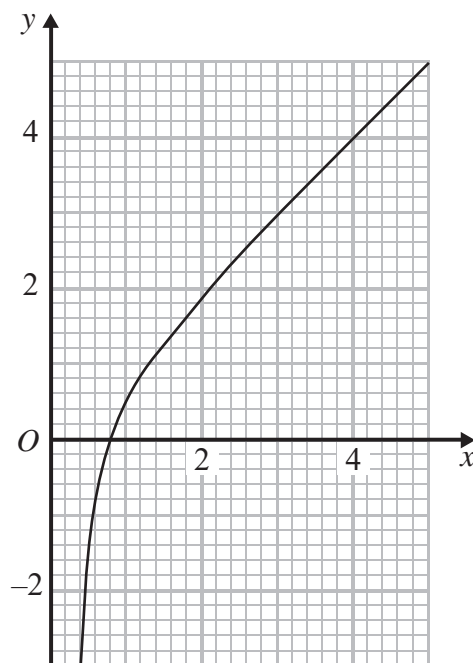


Figure 2

Figure 2 shows the graph of  $y = x - \frac{1}{2x^2}$  for  $0.4 \leq x \leq 5$  drawn on a grid.

(a) (i) Express  $x - \frac{1}{2x^2}$  as a single fraction.

(ii) Hence use the graph to obtain, to one significant figure, an estimate for the value of  $\sqrt[3]{0.5}$

(3)

(b) By drawing a suitable straight line on the grid, find an estimate to 2 significant figures, for the root of the equation

$$4 - 2x + \frac{1}{2x^2} = 0$$

in the interval  $0.4 \leq x \leq 5$

(3)

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**Question 4 continued**

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**(Total for Question 4 is 6 marks)**



5 (a) (i) Find  $\int \left( 3 - x + \frac{1}{x^3} \right) dx$

(ii) Hence evaluate  $\int_1^2 \left( 3 - x + \frac{1}{x^3} \right) dx$  (4)

(b) (i) Find  $\int 6 \sin 3x \, dx$

(ii) Hence evaluate  $\int_{\frac{\pi}{9}}^{\frac{\pi}{6}} 6 \sin 3x \, dx$  (4)

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**Question 5 continued**

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**(Total for Question 5 is 8 marks)**



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- (3)

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**Question 6 continued**

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Question 6 continued

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**Question 6 continued****(Total for Question 6 is 7 marks)**

P 5 3 3 9 1 A 0 1 5 3 6

- 7 A particle  $P$  moves along the  $x$ -axis so that at time  $t$  seconds,  $t \geq 0$ , the velocity of  $P$ ,  $v$  m/s, is given by  $v = 5 \cos 2t$

(a) Find the value of  $t$  when  $P$  first comes to instantaneous rest.

(2)

(b) Find the magnitude of the maximum acceleration of  $P$ .

(3)

When  $t = 0$ ,  $P$  is at the point  $A$ , where  $OA = 0.2$  m.

When  $P$  first comes to instantaneous rest,  $P$  is at the point  $B$ .

(c) Find the distance  $OB$ .

(4)

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**Question 7 continued**

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Question 7 continued

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**Question 7 continued****(Total for Question 7 is 9 marks)**

P 5 3 3 9 1 A 0 1 9 3 6

8 The line  $l$  has equation  $y + 7x = 15$  and the curve  $C$  has equation  $y = x^2 - 6x + 9$

(a) Use algebra to find the coordinates of the points where  $l$  intersects  $C$ .

(5)

(b) Use algebraic integration to find the exact area of the finite region bounded by  $l$  and  $C$ .

(5)

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**Question 8 continued**

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Question 8 continued

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

P 5 3 3 9 1 A 0 2 3 3 6

9 The 4th term of an arithmetic series is 108 and the 11th term is 80

Find

- (a) (i) the common difference of the series,  
(ii) the first term of the series.

(4)

The sum of the first  $n$  terms of the series is  $S_n$

- (b) Show that  $S_n = 2n(61 - n)$

(3)

Given that  $S_n = 1100$

- (c) find the two possible values of  $n$ .

(4)

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**Question 9 continued**

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Question 9 continued

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**Question 9 continued****(Total for Question 9 is 11 marks)**

P 5 3 3 9 1 A 0 2 7 3 6

10 The points  $A$ ,  $B$ ,  $C$  and  $D$  are such that

$$\overrightarrow{AB} = 5\mathbf{i} + 5\mathbf{j} \quad \overrightarrow{AC} = -2\mathbf{i} + 15\mathbf{j} \quad \overrightarrow{AD} = -7\mathbf{i} + 10\mathbf{j}$$

(a) (i) Find  $\overrightarrow{DC}$  as a simplified expression in terms of  $\mathbf{i}$  and  $\mathbf{j}$ .

(ii) Hence show that  $ABCD$  is a parallelogram.

(4)

(b) Find a unit vector parallel to  $\overrightarrow{BD}$  as a simplified expression in terms of  $\mathbf{i}$  and  $\mathbf{j}$ .

(4)

The point  $E$  lies on  $BD$  and  $BE:ED = 3:10$

(c) Find  $\overrightarrow{AE}$  as a simplified expression in terms of  $\mathbf{i}$  and  $\mathbf{j}$ .

(2)

The point  $F$  is such that  $DCF$  and  $AEF$  are both straight lines.

(d) Find  $DC:CF$

(6)

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**Question 10 continued**

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Question 10 continued

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**Question 10 continued****(Total for Question 10 is 16 marks)**

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11

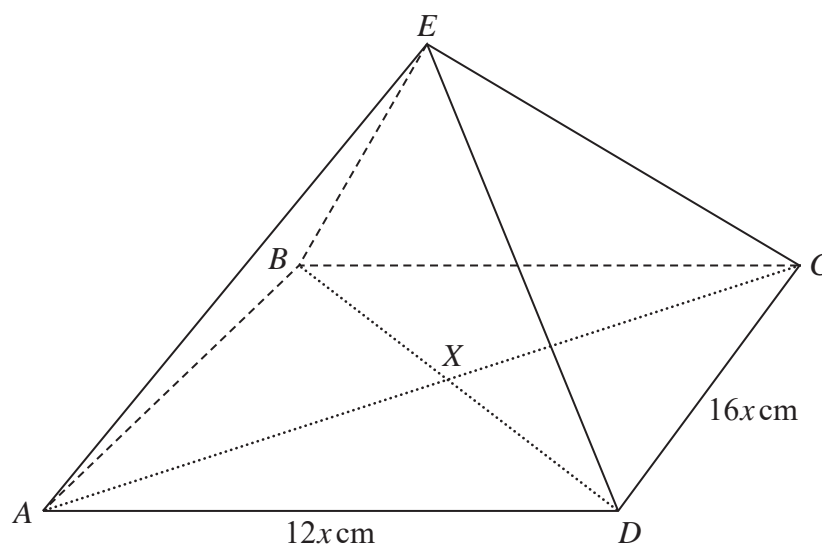


Figure 3

Figure 3 shows the right pyramid  $ABCDE$ . The base of the pyramid,  $ABCD$ , is a rectangle with  $CD = 16x$  cm and  $AD = 12x$  cm. The diagonals of the base intersect at the point  $X$ . The edges  $EA$ ,  $EB$ ,  $EC$  and  $ED$  are all of equal length. The size of the angle between  $EA$  and the base  $ABCD$  is  $45^\circ$

Find, in terms of  $x$ ,

(a) the height,  $EX$ , of the pyramid, (3)

(b) the length of  $EA$ . (2)

Find, in degrees to the nearest  $0.1^\circ$ , the size of

(c) the acute angle between the planes  $AEB$  and  $ABCD$ , (3)

(d) the acute angle between the planes  $BED$  and  $AEC$ . (3)

The area of triangle  $AED$  is  $250 \text{ cm}^2$

(e) Find, to 4 significant figures, the value of  $x$ . (3)





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**Question 11 continued**

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Question 11 continued

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**Question 11 continued**

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**Question 11 continued**

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

**TOTAL FOR PAPER IS 100 MARKS**

