Write your name here

Surname	Other names

Pearson Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Further Pure Mathematics

Paper 1

Tuesday 12 June 2018 – Morning
Time: 2 hours

Paper Reference
4PM0/01

Calculators 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.
- 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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P 5 3 3 9 1 A 0 1 3 6

Pearson

Answer all ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1

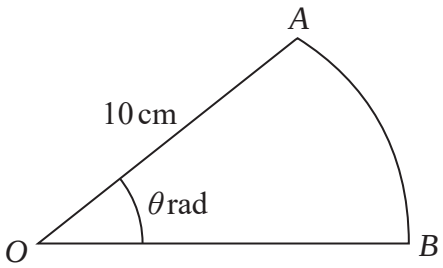

Diagram **NOT** accurately drawn

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 cm^2 and angle $AOB = \theta$ radians.

Find

(a) the value of θ,

(2)

(b) the length of the arc AB.

(2)

Question 1 continued

(Total for Question 1 is 4 marks)

2 The equation $3x^2 - 5x + 4 = 0$ has roots α and β.

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

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

(7)

Question 2 continued

(Total for Question 2 is 7 marks)

3 In triangle ABC, $AB = 12\,\text{cm}$, $BC = 9\,\text{cm}$ and angle $BAC = 42°$

(a) Find, in degrees to the nearest 0.1°, 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)

Question 3 continued

(Total for Question 3 is 8 marks)

4

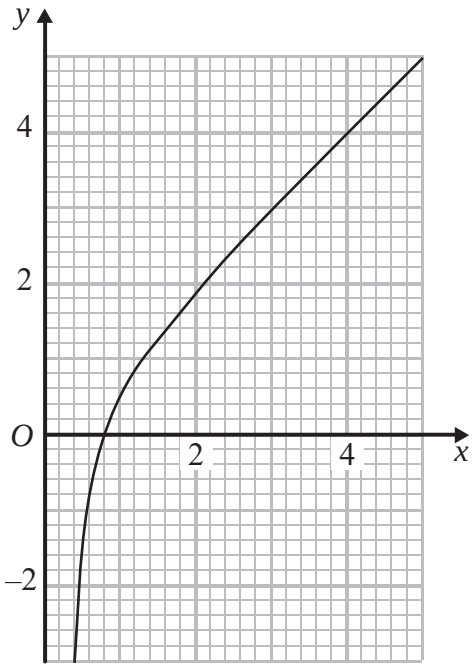

Figure 2

Figure 2 shows the graph of $y = x - \frac{1}{2x^2}$ for $0.4 \leqslant x \leqslant 5$ 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 $0.4 \leqslant x \leqslant 5$

(3)

Question 4 continued

(Total for Question 4 is 6 marks)

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

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

(4)

(b) (i) Find $\int 6\sin 3x\,\mathrm{d}x$

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

(4)

Question 5 continued

(Total for Question 5 is 8 marks)

6 The curve C has equation $y = \dfrac{2x - 4}{x - 3}$ $\quad x \neq 3$

(a) Write down an equation of the asymptote to C which is parallel to

(i) the x-axis, (ii) the y-axis.

(2)

(b) Find the coordinates of the point where C crosses

(i) the x-axis, (ii) the y-axis.

(2)

(c) Sketch C, showing clearly the asymptotes and the coordinates of the points where C crosses the coordinate axes.

(3)

Question 6 continued

Question 6 continued

Question 6 continued

(Total for Question 6 is 7 marks)

7 A particle P moves along the x-axis so that at time t seconds, $t \geqslant 0$, 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)

Question 7 continued

Question 7 continued

Question 7 continued

(Total for Question 7 is 9 marks)

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)

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 10 marks)

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)

Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 11 marks)

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

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

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

(4)

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

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

(2)

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

(d) Find $DC : CF$

(6)

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 16 marks)

11

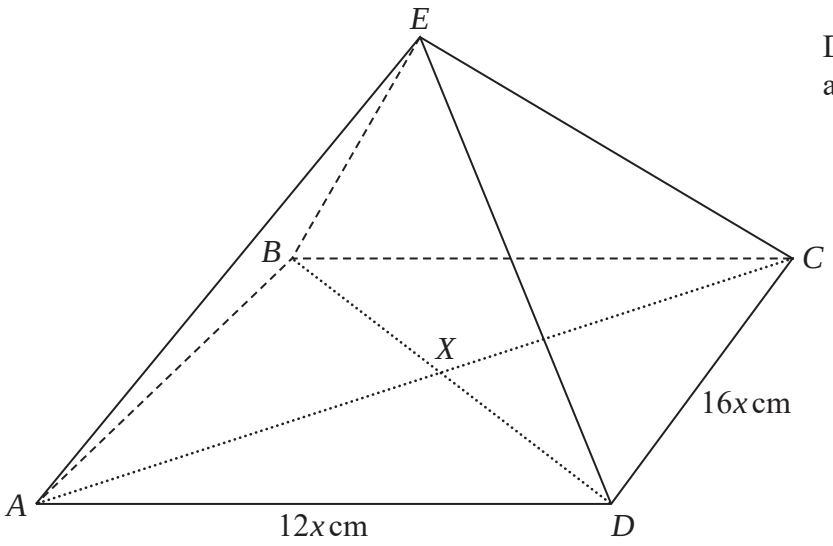

Diagram **NOT** accurately drawn

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°

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°, 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 cm^2

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

(3)

Question 11 continued

Question 11 continued

Question 11 continued

Question 11 continued

(Total for Question 11 is 14 marks)

TOTAL FOR PAPER IS 100 MARKS