Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE

Centre Number | Candidate Number

Friday 11 January 2019

Morning (Time: 2 hours) | Paper Reference **4PM0/01**

Further Pure Mathematics
Paper 1

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 ▶

Pearson

Answer all TEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1

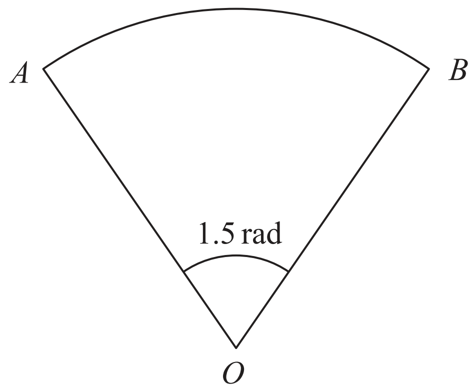

Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows a sector *OAB* of a circle, centre *O*.
The area of the sector is 27 cm^2
The size of angle *AOB* is 1.5 radians.

Find the perimeter of the sector.

(4)

Question 1 continued

(Total for Question 1 is 4 marks)

2 The sum of the first n terms of an arithmetic series is S_n

Given that $S_n = \sum_{r=1}^{n}(4r + 1)$

(a) show that $S_n = n(3 + 2n)$

(4)

The rth term of this arithmetic series is t_r

Given that $S_{n+3} = S_n + 3t_{15}$

(b) find the value of n.

(4)

Question 2 continued

Question 2 continued

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Question 2 continued

(Total for Question 2 is 8 marks)

P 5 5 8 8 7 A 0 7 3 6

Turn over

3 $$f(x) = (2x + 1)(x^2 + 5x - 3)$$

(a) Show that $f(x) = 2x^3 + 11x^2 - x - 3$

(2)

(b) Hence use algebra to solve the equation $2x^3 + 11x^2 - x - 3 = 0$

Give your roots to 3 decimal places where appropriate.

(3)

Question 3 continued

(Total for Question 3 is 5 marks)

4

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

$$\tan A = \frac{\sin A}{\cos A}$$

(a) Show that the equation $a \sin(x - 30)° = b \sin(x + 30)°$

can be written in the form $\tan x° = \dfrac{a + b}{\sqrt{3}(a - b)}$

(5)

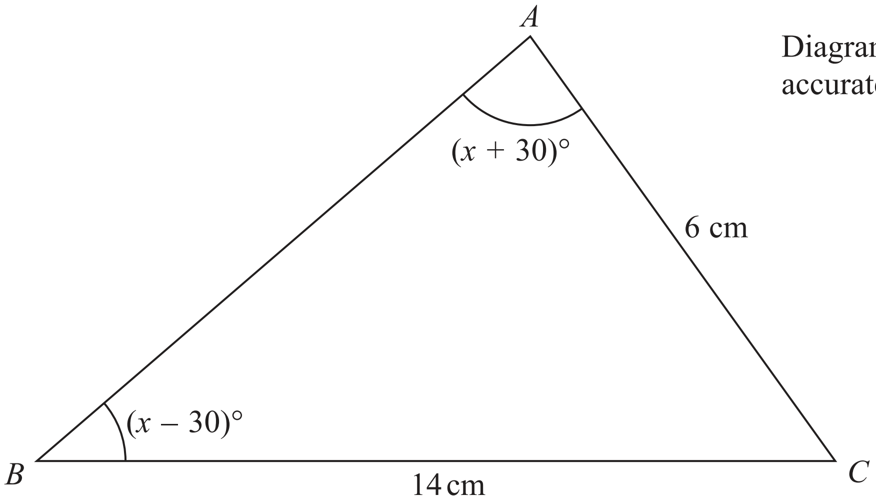

Diagram **NOT** accurately drawn

Figure 2

In triangle ABC, $AC = 6$ cm, $BC = 14$ cm, $\angle ABC = (x - 30)°$ and $\angle BAC = (x + 30)°$ as shown in Figure 2.

(b) Find, in degrees to 1 decimal place, the size of $\angle ACB$.

(4)

(c) Find, to 3 significant figures, the area of triangle ABC.

(2)

Question 4 continued

Question 4 continued

Question 4 continued

(Total for Question 4 is 11 marks)

5 $$f(x) = 2x^2 + 7x - 4$$

Given that f(x) can be written in the form $A(x + B)^2 + C$

(a) find the value of A, the value of B and the value of C.

(3)

(b) Write down

(i) the minimum value of f(x),

(ii) the value of x at which this minimum occurs.

(2)

The equation $f(x) = px - 6$ has unequal real roots.

(c) Find the set of possible values of p.

(5)

Question 5 continued

Turn over

Question 5 continued

Question 5 continued

(Total for Question 5 is 10 marks)

6 Given that $y = x^2\sqrt{(2x-3)}$

(a) show that $\dfrac{dy}{dx} = \dfrac{x(5x-6)}{\sqrt{(2x-3)}}$

(4)

(b) find the value of $\dfrac{dy}{dx}$ when $x = 2$

(1)

The curve C has equation $y = x^2\sqrt{(2x-3)}$

(c) Find an equation of the normal to C at the point on C where $x = 2$
Give your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(5)

Question 6 continued

Question 6 continued

Question 6 continued

(Total for Question 6 is 10 marks)

7

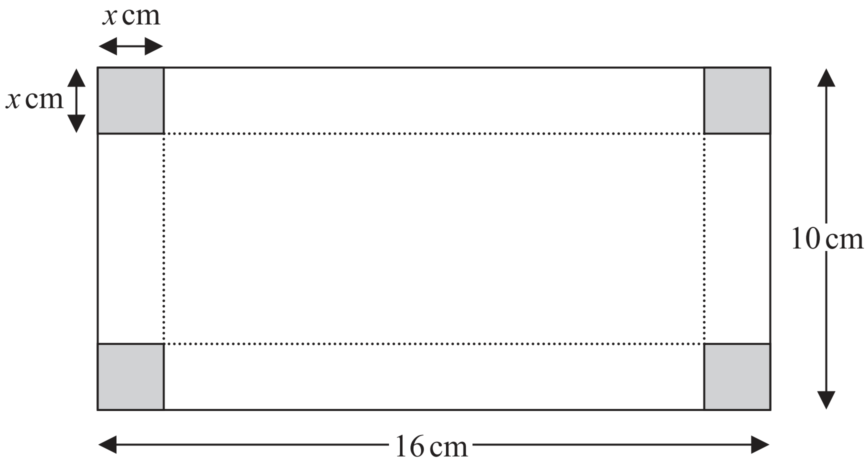

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Figure 3

Figure 3 shows a rectangular sheet of metal 10 cm by 16 cm. A square of side x cm is cut away from each corner of the sheet. The sheet is then folded along the dotted lines to form an open box.

The volume of the box is V cm^3

(a) Show that $V = 4x^3 - 52x^2 + 160x$

(3)

(b) Using calculus, find the value of x for which V is a maximum, justifying that this value of x gives a maximum value of V.

(5)

(c) Find the maximum value of V.

(2)

Question 7 continued

Question 7 continued

Question 7 continued

(Total for Question 7 is 10 marks)

8 A curve C has equation $y = \dfrac{5x - 3}{2x - 1} \qquad x \neq \dfrac{1}{2}$

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

(i) parallel to the y-axis,

(ii) parallel to the x-axis.

(2)

(b) Find the coordinates of the points of intersection of C with the coordinate axes.

(2)

(c) Using calculus show that at every point on the curve, the gradient of C is positive.

(4)

(d) Using the axes on the opposite page, sketch C, showing clearly the asymptotes and the coordinates of the points of intersection of C with the coordinate axes.

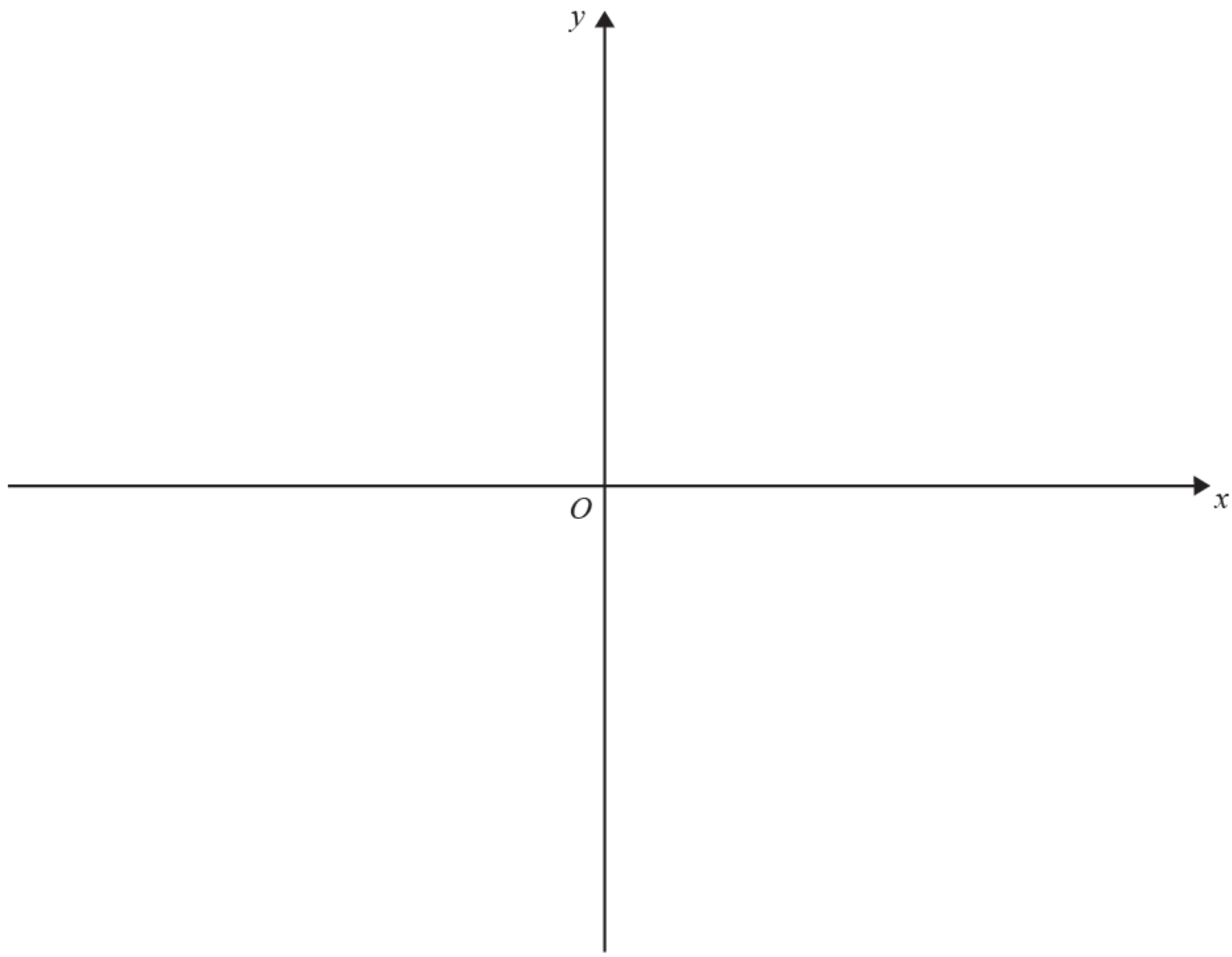
(3)

The line l is the tangent to C at the point on the curve where $x = 1$

(e) Find an equation of l, giving your answer in the form $y = mx + c$

(4)

Question 8 continued



Question 8 continued

Question 8 continued

(Total for Question 8 is 15 marks)

9 The point A has coordinates $(-3, -6)$ and the point B has coordinates $(5, -2)$

The line l passes through the point A and the point B.

(a) Find an equation of l, giving your answer in the form $y = mx + c$

(3)

The point P has coordinates $(k, -2)$. The line through A and P is perpendicular to l.

(b) Show that $k = -5$

(3)

The point Q has coordinates (e, f). The line through B and Q is also perpendicular to l.

Given that the length of PQ is $\sqrt{85}$ and that $f > 0$

(c) find the coordinates of Q.

(6)

(d) Calculate the area of quadrilateral $ABQP$.

(4)

Question 9 continued

Question 9 continued

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Question 9 continued

(Total for Question 9 is 16 marks)

10 (a) Expand $(1-2x)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^3, simplifying each term as far as possible.

(3)

(b) Write down the range of values of x for which your expansion is valid.

(1)

$$\mathrm{f}(x) = \frac{2 - x^2}{\sqrt{(1-2x)}}$$

(c) Find the series expansion of $\mathrm{f}(x)$ in ascending powers of x up to and including the term in x^3, simplifying each term as far as possible.

(3)

The region R is bounded by the curve with equation $y = \mathrm{f}(x)$, the positive x-axis, the positive y-axis and the line with equation $x = 0.2$

(d) Using your expansion of $\mathrm{f}(x)$ and algebraic integration, find an estimate for the area of R, giving your answer to 4 decimal places.

(4)

Question 10 continued

Question 10 continued

(Total for Question 10 is 11 marks)

TOTAL FOR PAPER IS 100 MARKS