

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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Pearson Edexcel International GCSE

Time 2 hours

Paper
reference

4PM1/01

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.*
- You must **NOT** write anything on the formulae page.
Anything you write on the formulae page will gain NO credit.

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 7 1 8 1 7 A 0 1 3 2

Pearson

International GCSE in Further Pure Mathematics Formulae sheet

Mensuration

$$\text{Surface area of sphere} = 4\pi r^2$$

$$\text{Curved surface area of cone} = \pi r \times \text{slant height}$$

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

Series**Arithmetic series**

$$\text{Sum to } n \text{ terms, } S_n = \frac{n}{2}[2a + (n-1)d]$$

Geometric series

$$\text{Sum to } n \text{ terms, } S_n = \frac{a(1-r^n)}{(1-r)}$$

$$\text{Sum to infinity, } S_\infty = \frac{a}{1-r} \quad |r| < 1$$

Binomial series

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \dots + \frac{n(n-1)\dots(n-r+1)}{r!}x^r + \dots \quad \text{for } |x| < 1, n \in \mathbb{Q}$$

Calculus**Quotient rule (differentiation)**

$$\frac{d}{dx} \left(\frac{f(x)}{g(x)} \right) = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}$$

Trigonometry**Cosine rule**

$$\text{In triangle } ABC: a^2 = b^2 + c^2 - 2bc \cos A$$

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

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

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

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

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

$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Logarithms

$$\log_a x = \frac{\log_b x}{\log_b a}$$

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Question 2 continued

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Question 2 continued

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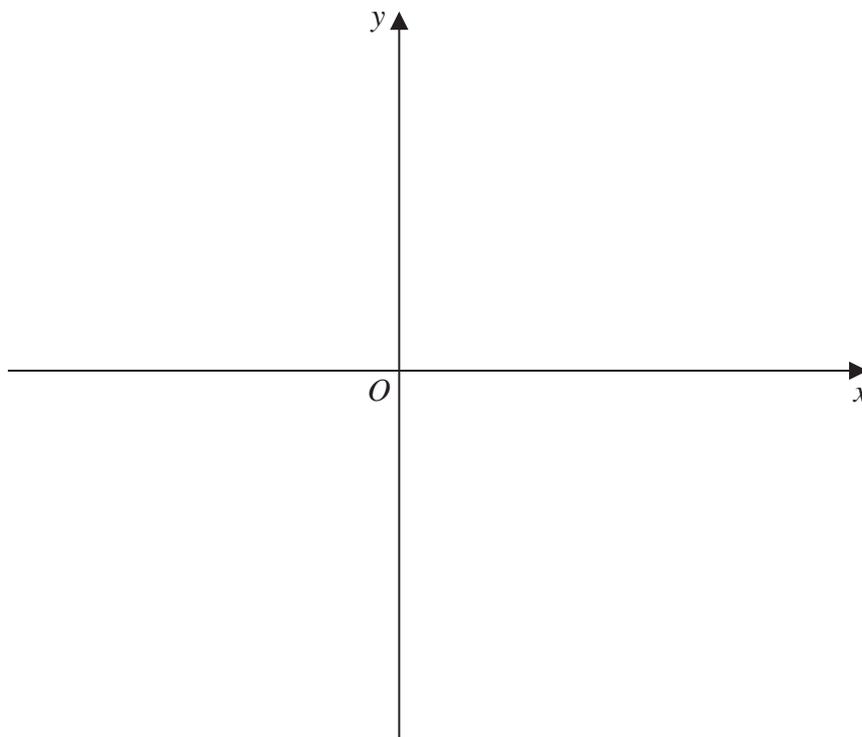
(Total for Question 2 is 13 marks)



3 Curve C has equation $y = \frac{ax + 3}{1 - 2x}$ where $x \neq \frac{1}{2}$ and a is a constant.

The asymptote to C that is parallel to the x -axis has equation $y = 4$

- (a) Find the value of a (2)
- (b) Write down the equation of the asymptote to C that is parallel to the y -axis. (1)
- (c) Find the coordinates of the point where C crosses
 - (i) the x -axis, (ii) the y -axis. (2)
- (d) Using the axes below, sketch C , showing clearly the asymptotes and the coordinates of the points where C crosses the coordinate axes. (4)



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Question 3 continued

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(Total for Question 3 is 9 marks)



Question 4 continued

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(Total for Question 4 is 9 marks)



Question 5 continued

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(Total for Question 5 is 8 marks)



Question 6 continued

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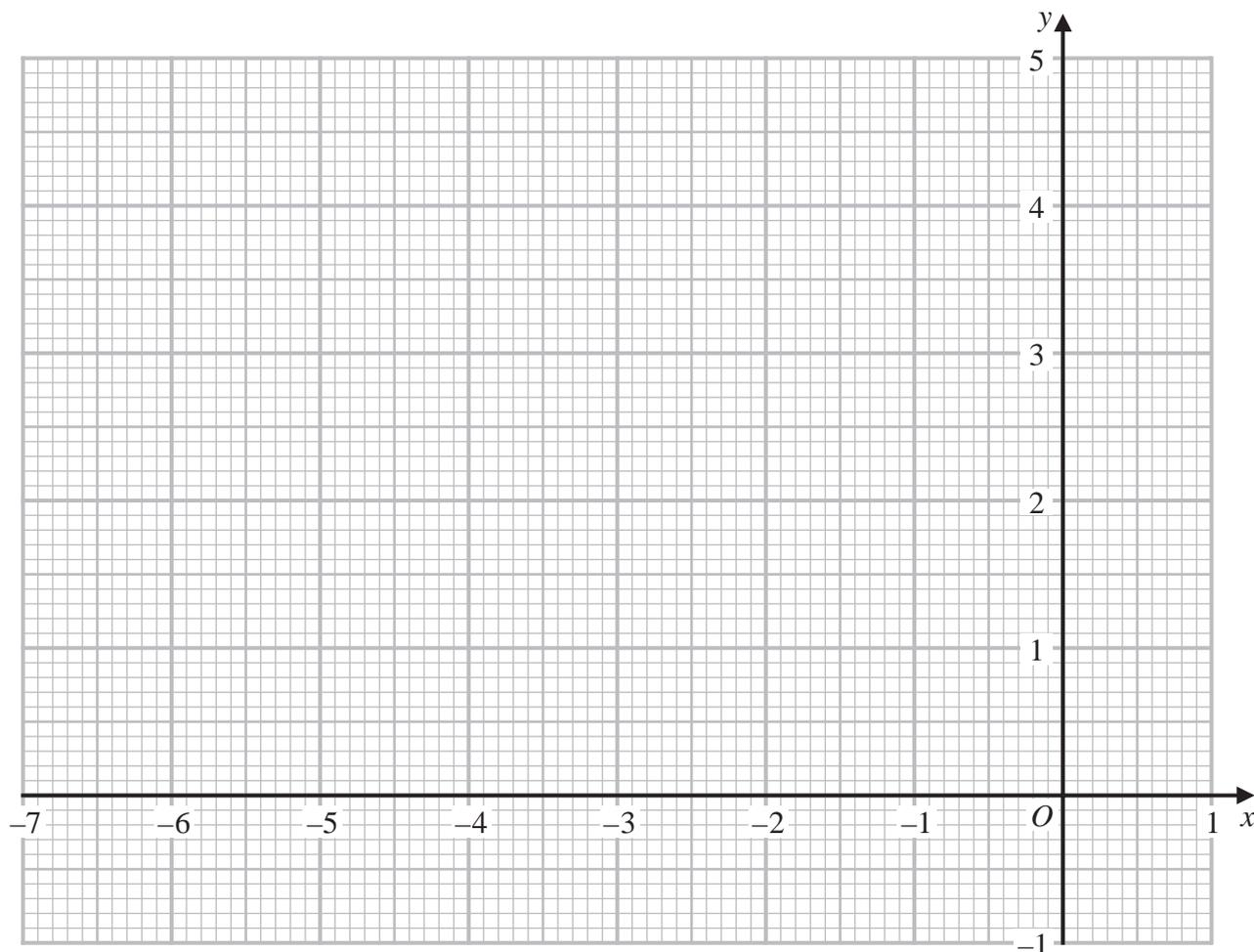
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(Total for Question 6 is 7 marks)



Question 7 continued



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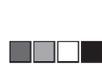
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Turn over for a spare grid if you need to redraw your graph.



Question 7 continued

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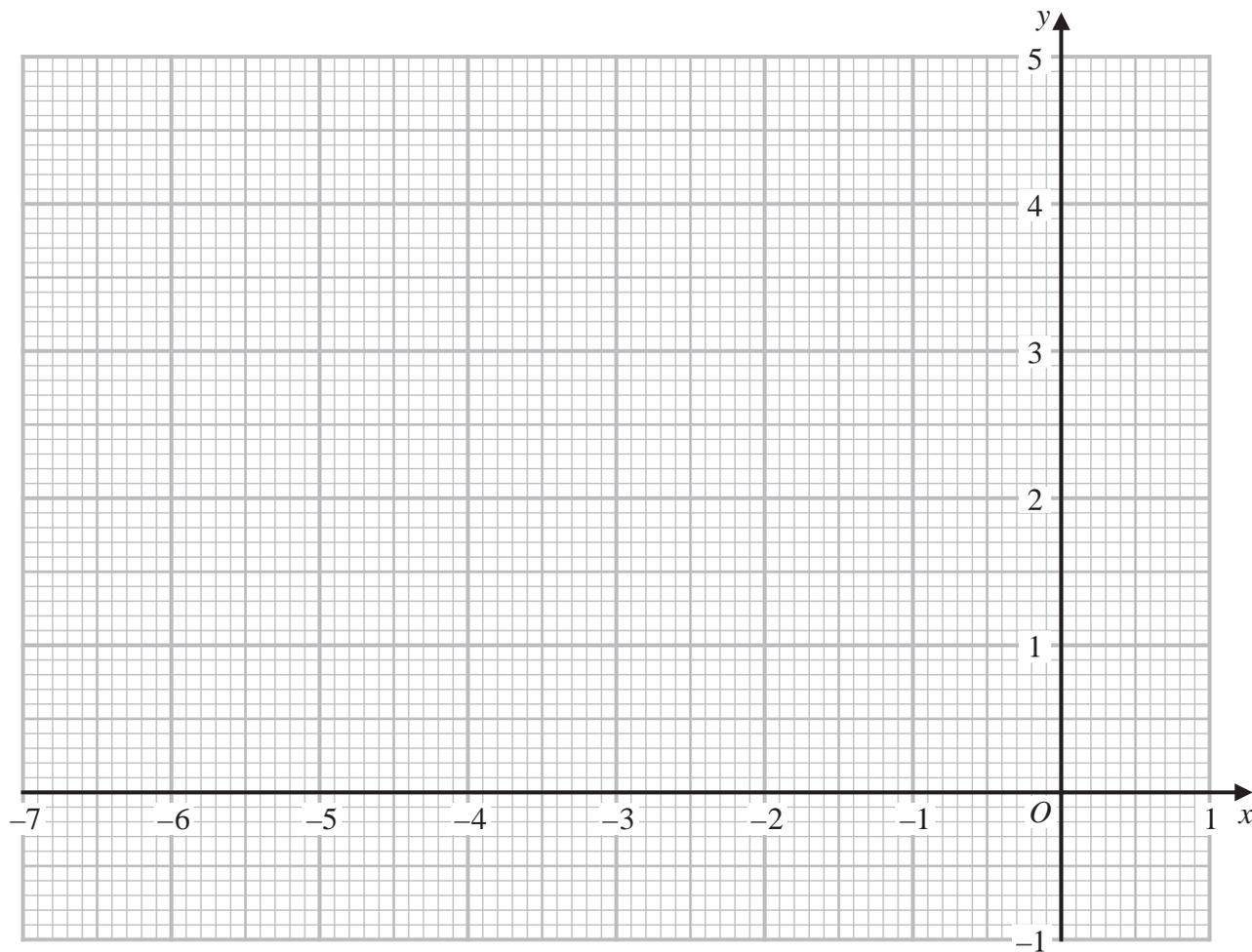
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Question 7 continued

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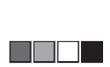
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(Total for Question 7 is 10 marks)



8

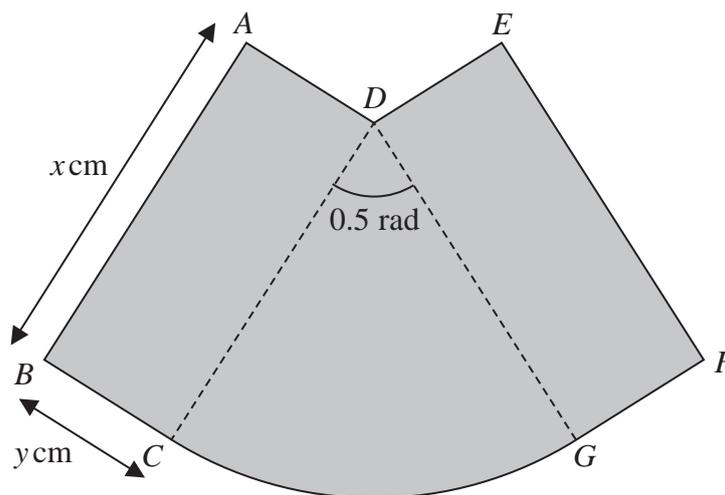


Diagram NOT accurately drawn

Figure 1

Figure 1 shows a badge, shown shaded, made from two identical rectangles, $ABCD$ and $DEFG$, and a sector DCG of a circle with centre D .

Each rectangle measures x cm by y cm.

The radius of the sector is x cm and the angle CDG is 0.5 radians.

The area of the badge is 50 cm^2

The perimeter of the badge is P cm.

(a) Show that

$$P = 2x + \frac{100}{x} \tag{5}$$

Given that x can vary,

(b) use calculus, to find the exact value of x for which P is a minimum.

Justify that this value of x gives a minimum value for P

(6)

(c) Find the minimum value of P

Give your answer in the form $k\sqrt{2}$, where k is an integer to be found.

(2)

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Question 8 continued

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Question 8 continued

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Area with horizontal dotted lines for writing.

(Total for Question 8 is 13 marks)



Question 9 continued

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Area with horizontal dotted lines for writing.

(Total for Question 9 is 8 marks)



Question 10 continued

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Area for writing the answer to Question 10, featuring horizontal dotted lines.



Question 10 continued

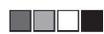
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Area with horizontal dotted lines for writing.

(Total for Question 10 is 9 marks)



Question 11 continued

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A large rectangular area with a rounded border, containing numerous horizontal dotted lines for writing.



