

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

--	--	--	--	--

--	--	--	--

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 ►

P71817A

©2023 Pearson Education Ltd.

J:1/1/1/



Pearson

International GCSE in Further Pure Mathematics Formulae sheet

Mensuration

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

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

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

Series

Arithmetic series

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

Geometric series

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

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

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

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

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



- 2 The point A has coordinates $(-5, 3)$, the point B has coordinates $(4, 0)$ and the point C has coordinates $(-1, 5)$.

The line l passes through C and is perpendicular to AB .

- (a) Find an equation of l .

Give your answer in the form $ax + by + c = 0$ where a , b and c are integers.

(4)

The line l intersects AB at the point D .

- (b) Show that the coordinates of D are $(-2, 2)$.

(3)

- (c) Show that l is not the perpendicular bisector of AB .

(2)

- (d) Find the value of $\tan \angle ABC$.

Give your answer in its simplest form.

(4)



Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area with 25 horizontal dotted lines.



P 7 1 8 1 7 A 0 5 3 2

Question 2 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

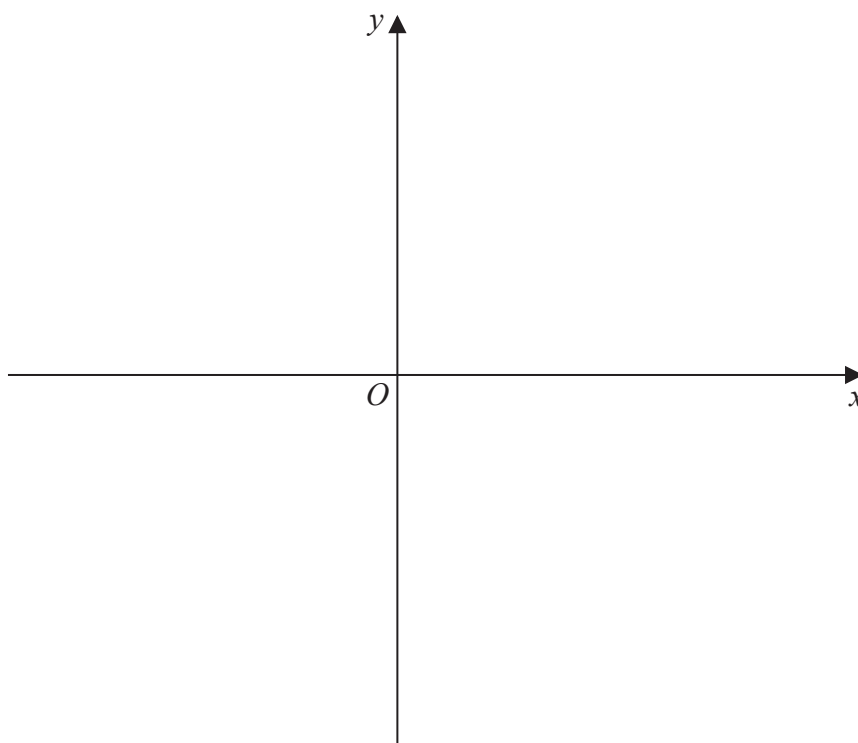
(Total for Question 2 is 13 marks)



- 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)



.....

.....

.....

.....

.....

.....



Question 3 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 3 is 9 marks)



Question 4 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 4 is 9 marks)



P 7 1 8 1 7 A 0 1 1 3 2

Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 5 is 8 marks)



Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

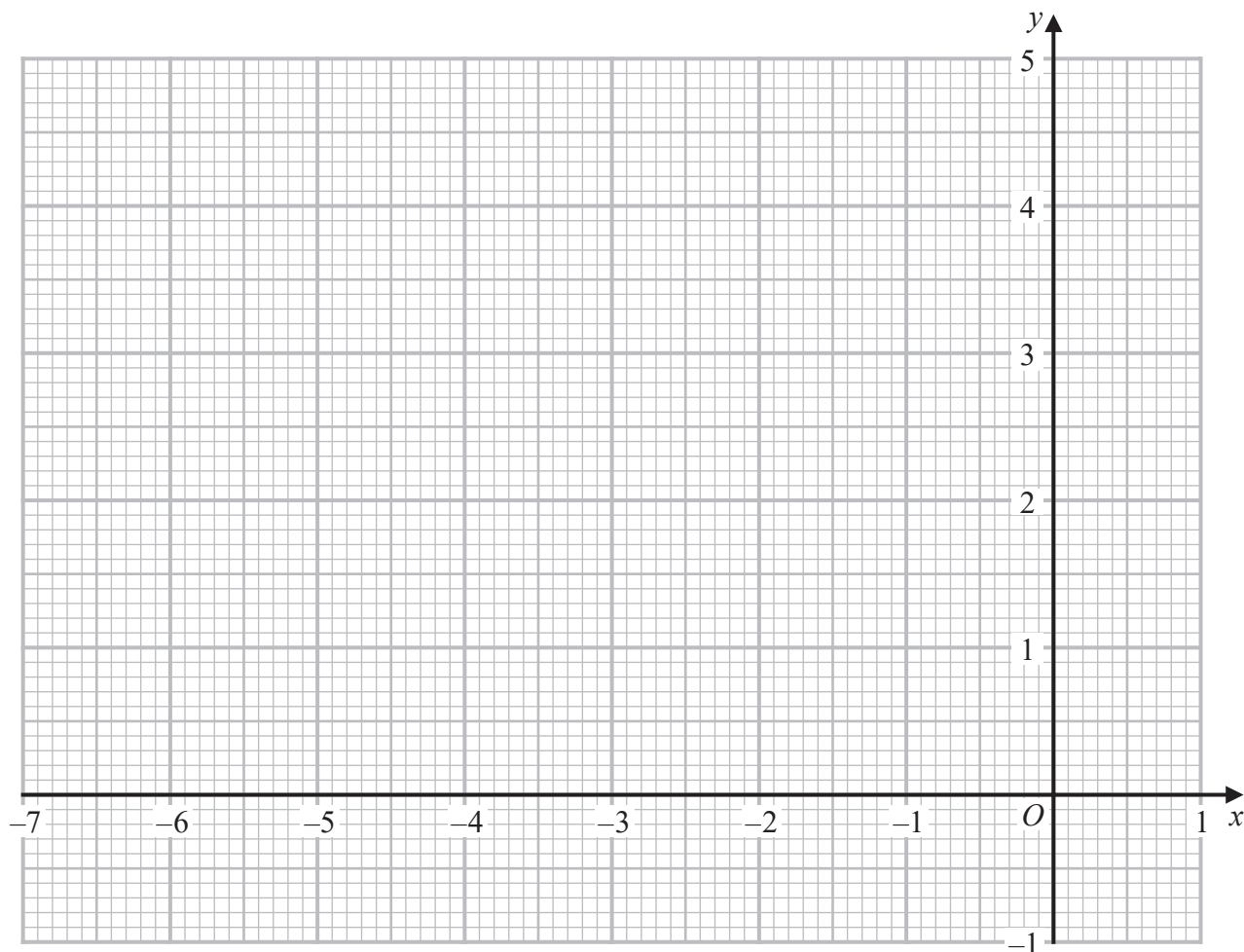
DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 6 is 7 marks)



Question 7 continued



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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



Question 7 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

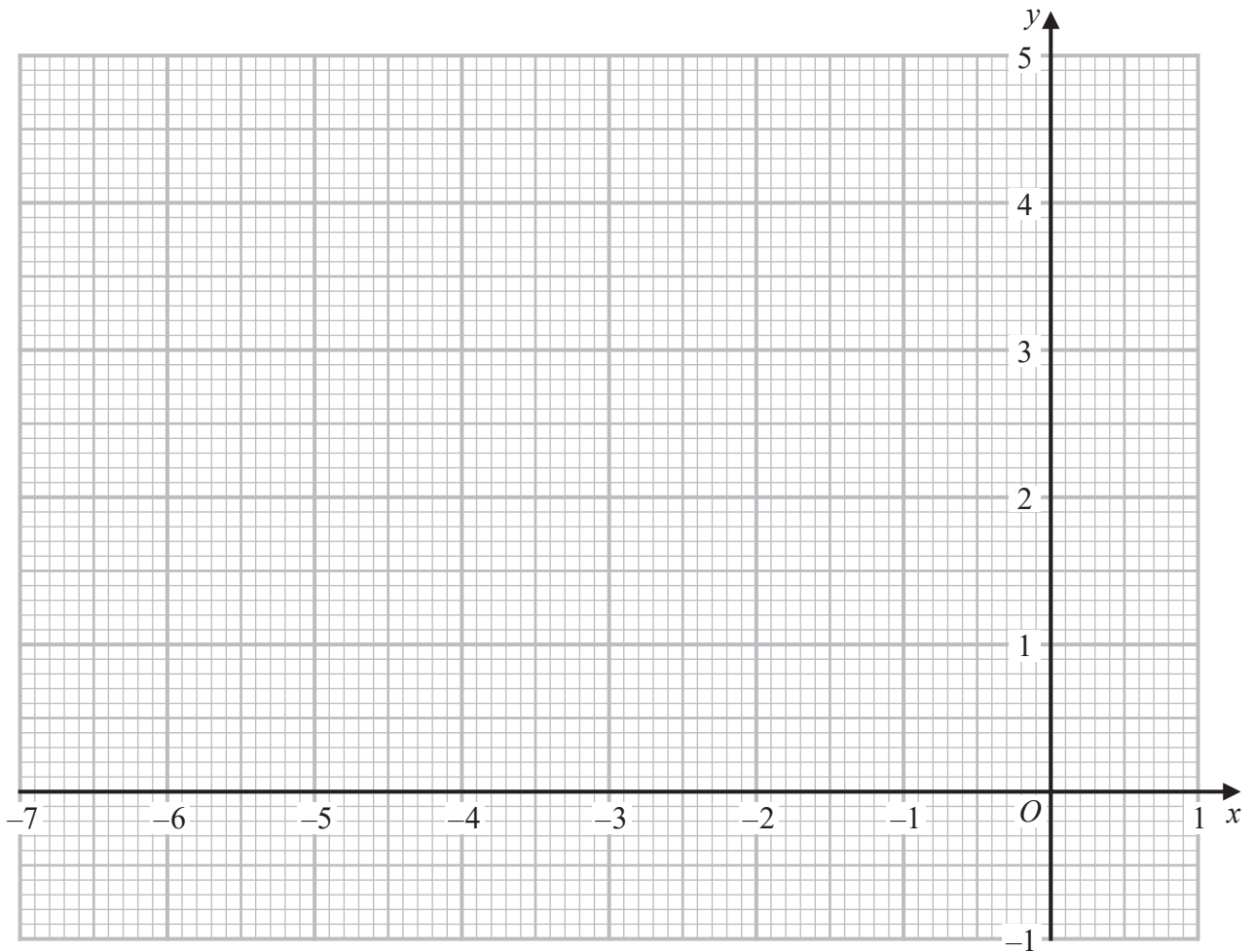
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 7 continued

Only use this grid if you need to redraw your graph.



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 7 is 10 marks)



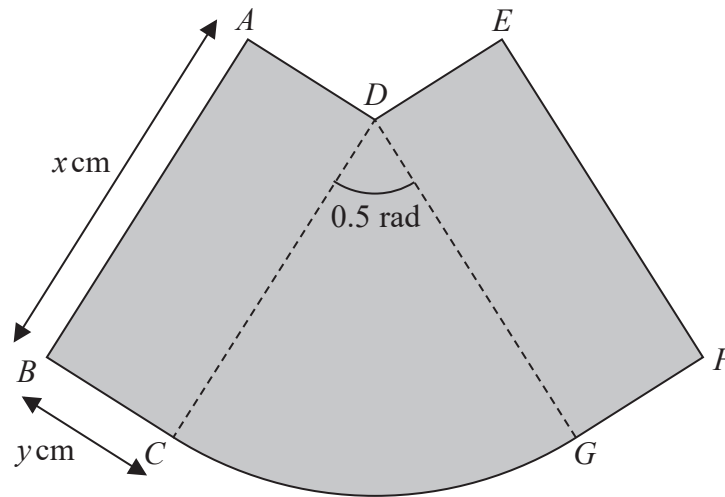


Diagram NOT accurately drawn

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)

.....

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



P 7 1 8 1 7 A 0 2 1 3 2

Question 8 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 8 is 13 marks)



P 7 1 8 1 7 A 0 2 3 3 2

Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 9 is 8 marks)



Question 10 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area with 25 horizontal dotted lines.



P 7 1 8 1 7 A 0 2 7 3 2

Question 10 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 10 is 9 marks)



P 7 1 8 1 7 A 0 2 9 3 2

Question 11 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



P 7 1 8 1 7 A 0 3 1 3 2

