

Please check the examination details below before entering your candidate information

|                      |                      |                      |                      |                      |                      |                      |                      |                      |  |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|--|
| Candidate surname    |                      |                      |                      |                      | Other names          |                      |                      |                      |  |
| Centre Number        |                      |                      |                      |                      | Candidate Number     |                      |                      |                      |  |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |  |

**Pearson Edexcel International GCSE**

**Tuesday 10 June 2025**

Afternoon (Time: 2 hours)

Paper reference **4PM1/02R**

**Further Pure Mathematics**

**PAPER 2R**



**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 ►

P76509A

©2025 Pearson Education Ltd.  
Y:1/1/1/1/



  
**Pearson**

# International GCSE in Further Pure Mathematics Formulae sheet

## Mensuration

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

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

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  $ABC$ :  $a^2 = b^2 + c^2 - 2bc \cos A$

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

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

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

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

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

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

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

## 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



Answer all ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 The points  $A$ ,  $B$ ,  $C$  and  $D$  are the vertices of a quadrilateral  $ABCD$  such that

$$\overrightarrow{AB} = 3\mathbf{a} + 2\mathbf{b}$$

$$\overrightarrow{AD} = 2\mathbf{a} - 5\mathbf{b}$$

$$\overrightarrow{AC} = 5\mathbf{a} - 3\mathbf{b}$$

Show that  $ABCD$  is a parallelogram.

(4)

(Total for Question 1 is 4 marks)



- 2 The point  $P$  has coordinates  $(-7, 3)$  and the point  $Q$  has coordinates  $(3, 18)$

The point  $R$  divides the line  $PQ$  in the ratio  $2:3$

The line  $l$  passes through  $R$  and is perpendicular to the line  $PQ$

- (a) Find an equation of line  $l$

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

(5)

The line  $l$  crosses the  $x$ -axis at the point  $S$

- (b) Find the area of triangle  $QRS$

(5)



DO NOT WRITE IN THIS AREA

Question 2 continued

Handwriting practice area with 20 horizontal dotted lines.



Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

Question 2 continued

Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 2 is 10 marks)



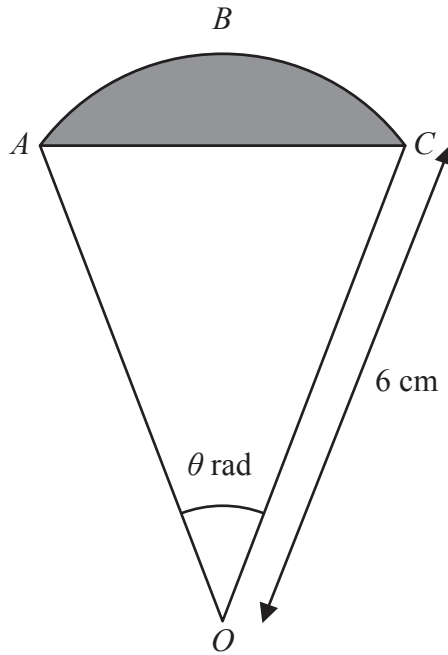


Diagram NOT  
accurately drawn

**Figure 1**

Figure 1 shows sector  $OABC$  of a circle with centre  $O$  and radius 6 cm  
The size of angle  $AOC$  is  $\theta$  radians.

The perimeter of sector  $OABC$  is  $(12 + \pi)$  cm

The region shown shaded in Figure 1 is bounded by the arc  $ABC$  and the line  $AC$   
The area of this region is  $S \text{ cm}^2$

Find the exact value of  $S$

(6)



DO NOT WRITE IN THIS AREA

Question 3 continued

Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 3 is 6 marks)



4 (i) Find the value of  $\sum_{k=6}^{17} 3(2)^{k-1}$  (4)

(ii) The common ratio of a geometric series  $G$  is positive.

The third term of  $G$  is  $\frac{7}{13}$  and the ninth term of  $G$  is  $\frac{448}{9477}$

$G$  is convergent with sum to infinity  $S$

Find the exact value of  $S$

(7)



DO NOT WRITE IN THIS AREA

Question 4 continued

Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 4 is 11 marks)



5

$$f(x) = x^3 + x^2 + x + c \quad \text{where } c \text{ is a constant}$$

The remainder when  $f(x)$  is divided by  $(x-2)$  is 4 times the remainder when  $f(x)$  is divided by  $(x+1)$

(a) Show that  $c = 6$

(4)

Given that  $(x+2)$  is a factor of  $f(x)$

(b) show that the equation  $f(x) = 0$  has only one real root.

(4)



DO NOT WRITE IN THIS AREA

Question 5 continued

Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 5 is 8 marks)



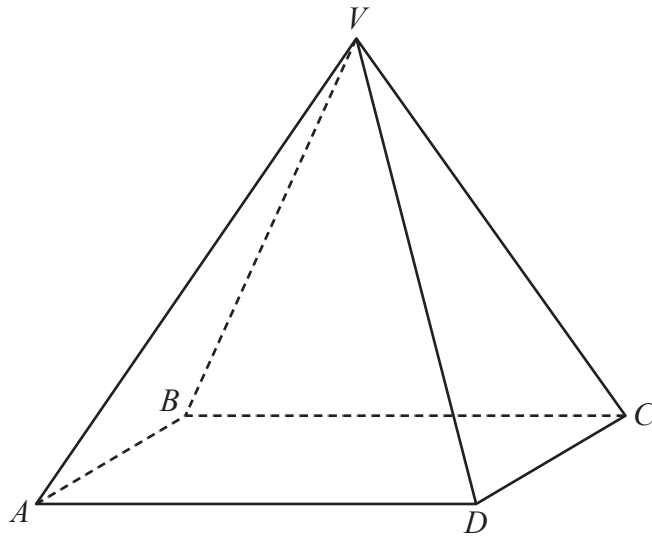


Diagram **NOT**  
accurately drawn

**Figure 2**

Figure 2 shows a right pyramid  $VABCD$  with vertex  $V$  and rectangular base  $ABCD$

$$AD = VC = 3AB$$

Find in degrees, to one decimal place, the size of the angle between the plane  $CVD$  and the base  $ABCD$

(6)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

Question 6 continued

Handwriting practice area with 20 horizontal dotted lines.



Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

Question 6 continued

Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 6 is 6 marks)



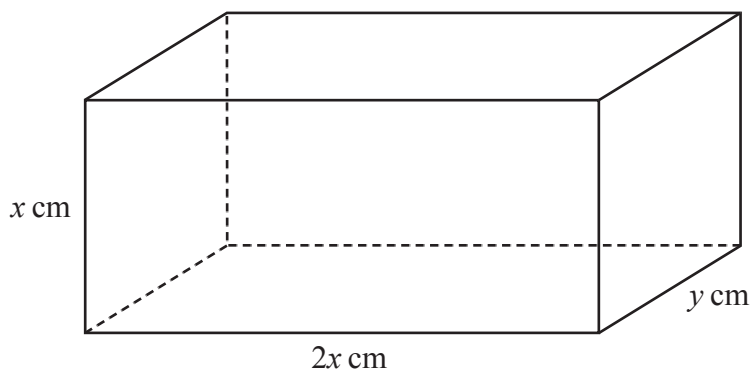


Diagram **NOT**  
accurately drawn

**Figure 3**

Figure 3 shows a solid cuboid with sides of length  $x$  cm,  $2x$  cm and  $y$  cm

The volume of the cuboid is  $72 \text{ cm}^3$

The total surface area of the cuboid is  $A \text{ cm}^2$

(a) Show that  $A = \frac{216}{x} + 4x^2$  (4)

(b) Use calculus to find the minimum value of  $A$   
Justify that your value is a minimum value of  $A$  (7)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

Question 7 continued

Handwriting practice area with 20 horizontal dotted lines.



Question 7 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

Question 7 continued

Handwriting practice area with horizontal dotted lines.

(Total for Question 7 is 11 marks)



- 8 Use calculus to find the gradient of the curve with equation

$$y = e^{3x}(9x+2)^{\frac{1}{3}}$$

at the point on the curve where  $x = 1$

Give your answer to 3 significant figures.

(5)



DO NOT WRITE IN THIS AREA

Question 8 continued

Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 8 is 5 marks)



9 (i) Solve the equation  $3(\log_a 9 + \log_a 27) = 1$

Give your answer in the form  $a = b^c$  where  $b$  is prime and  $c$  is an integer.

(3)

(ii) Solve the equation  $\log_4 p + \log_p 256 = -4$

(6)



DO NOT WRITE IN THIS AREA

Question 9 continued

Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 9 is 9 marks)



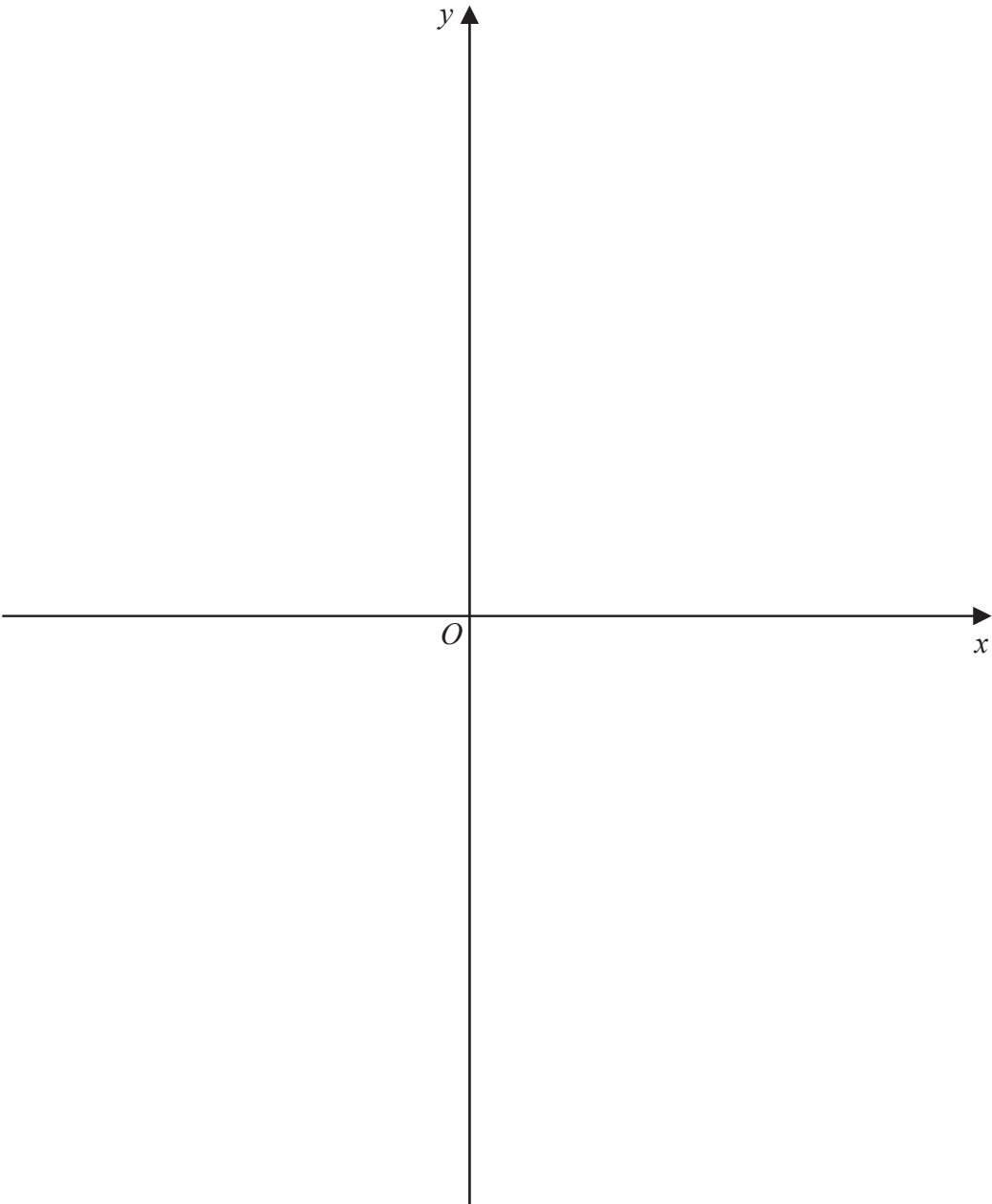


DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 10 continued



.....

.....

.....

.....

.....

.....

.....

.....

Question 10 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

Question 10 continued

Handwriting practice area with horizontal dotted lines.

(Total for Question 10 is 18 marks)



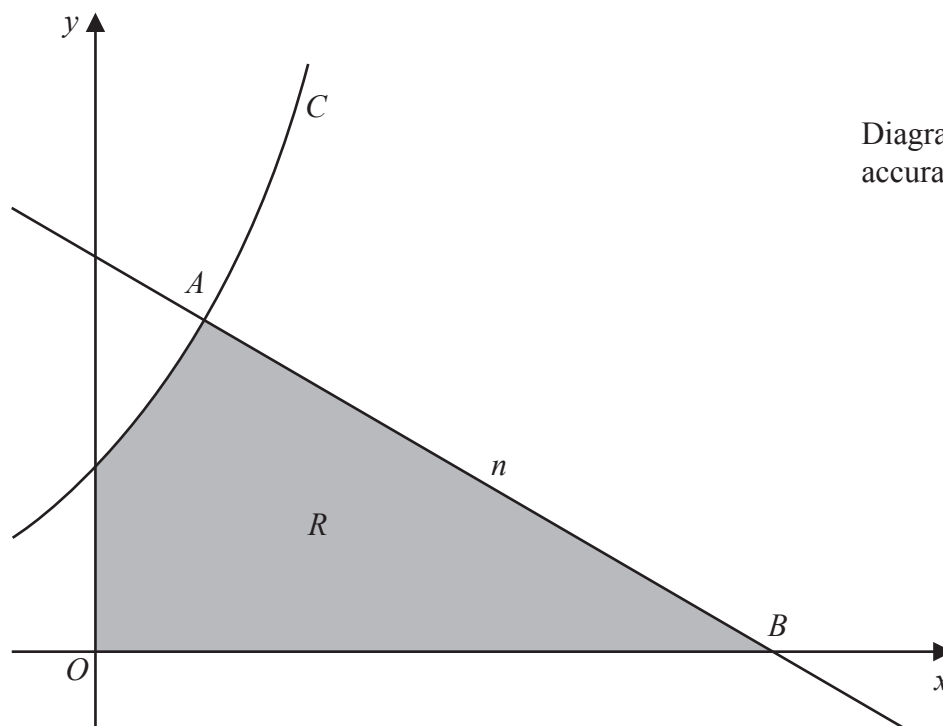


Figure 4

Figure 4 shows part of a curve  $C$  with equation  $y = 3e^{\frac{x}{3}}$ .  
The point  $A$  with coordinates  $(2, p)$  lies on  $C$ .

- (a) Write down the exact value of  $p$

(1)

The straight line  $n$ , shown on Figure 4, is the normal to  $C$  at  $A$  and crosses the  $x$ -axis at point  $B$ .

The region  $R$ , shown shaded in Figure 4, is bounded by  $C$ ,  $n$ , the  $x$ -axis and the  $y$ -axis.

- (b) Use algebraic integration to find the area of  $R$

Give your answer in the form  $\frac{W}{V}e^2 + We^{\frac{2}{3}} - W$

where  $W$  and  $V$  are integers to be found.

(11)

.....

.....

.....

.....

.....



DO NOT WRITE IN THIS AREA

Question 11 continued

Handwriting practice area with 20 horizontal dotted lines.



**Question 11 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**(Total for Question 11 is 12 marks)**

**TOTAL FOR PAPER IS 100 MARKS**

