

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 **4PM1/01R**

Further Pure Mathematics

PAPER 1R



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

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

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

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

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

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

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

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

Logarithms

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

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Answer all ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** An arithmetic series has 5th term 16 and 100th term 301

Find the sum of the first 50 terms of the series.

(5)

(Total for Question 1 is 5 marks)



- 2 A particle P is moving along a straight line, which passes through the fixed point O .

At time t seconds ($t \geq 0$), the velocity, v m/s, of P is given by

$$v = t^2 - 3t + 4$$

At time t seconds the acceleration of P is a m/s²

- (a) Find an expression for a in terms of t

(2)

The displacement of P from O is 7 m when $t = 2$

- (b) Find the exact displacement of P from O when $t = 4$

(5)

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Question 2 continued

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(Total for Question 2 is 7 marks)

3

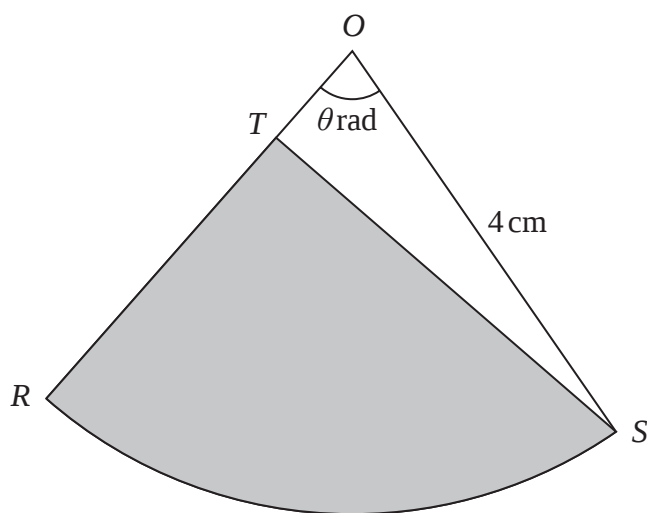


Diagram **NOT**
accurately drawn

Figure 1

Figure 1 shows sector ORS of a circle with centre O and radius 4 cm .
The size of angle ROS is θ radians.

The area of sector ORS is $2\pi\text{ cm}^2$

(a) Find the exact value of θ (2)

(b) Find the perimeter, in cm to 3 significant figures, of the sector ORS . (2)

The point T lies on OR such that $OT : TR = 1 : 3$

The region shown shaded in Figure 1 is bounded by the line TR , the line TS and the arc RS of the sector.

The area of this region is $A\text{ cm}^2$

(c) Find the exact value of A (2)

6



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Question 3 continued

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(Total for Question 3 is 6 marks)

Question 4 continued

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(Total for Question 4 is 7 marks)

5 Differentiate with respect to x

(a) $e^{4x}(6x+2)^{\frac{3}{2}}$

Give your answer in the form $e^{4x}(\sqrt{6x+2})(Ax+B)$ where A and B are integers.

(5)

(b) $\frac{\sin 3x}{(2x-4)^3}$

(3)

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Question 5 continued

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(Total for Question 5 is 8 marks)

6 Given that $\frac{a + \sqrt{5}}{\sqrt{5} - 2} = 11 + 5\sqrt{5}$

- (a) without using a calculator, find the value of a
Show your working clearly.

(2)

Triangle PQR is such that

$$PR = (x + 3) \text{ cm} \quad QR = x \text{ cm} \quad \text{angle } QPR = 30^\circ \quad \text{angle } PQR = 45^\circ$$

- (b) Show that $x = 3 + 3\sqrt{2}$

(3)

Given that $\sin 105^\circ = \frac{\sqrt{6} + \sqrt{2}}{4}$ and that the area of triangle PQR is $A \text{ cm}^2$

- (c) find the exact value of A in the form $\frac{9}{8}(p\sqrt{6} + q\sqrt{2} + r\sqrt{3} + s)$
where p, q, r and s are integers.

(3)

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Question 6 continued

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Question 6 continued

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Question 6 continued

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(Total for Question 6 is 8 marks)

7 A curve C has equation $y = \log_{10}(x + 2)$

(a) Using the axes below, sketch the graph of C .

Label the coordinates of the points of intersection of C with the coordinate axes.

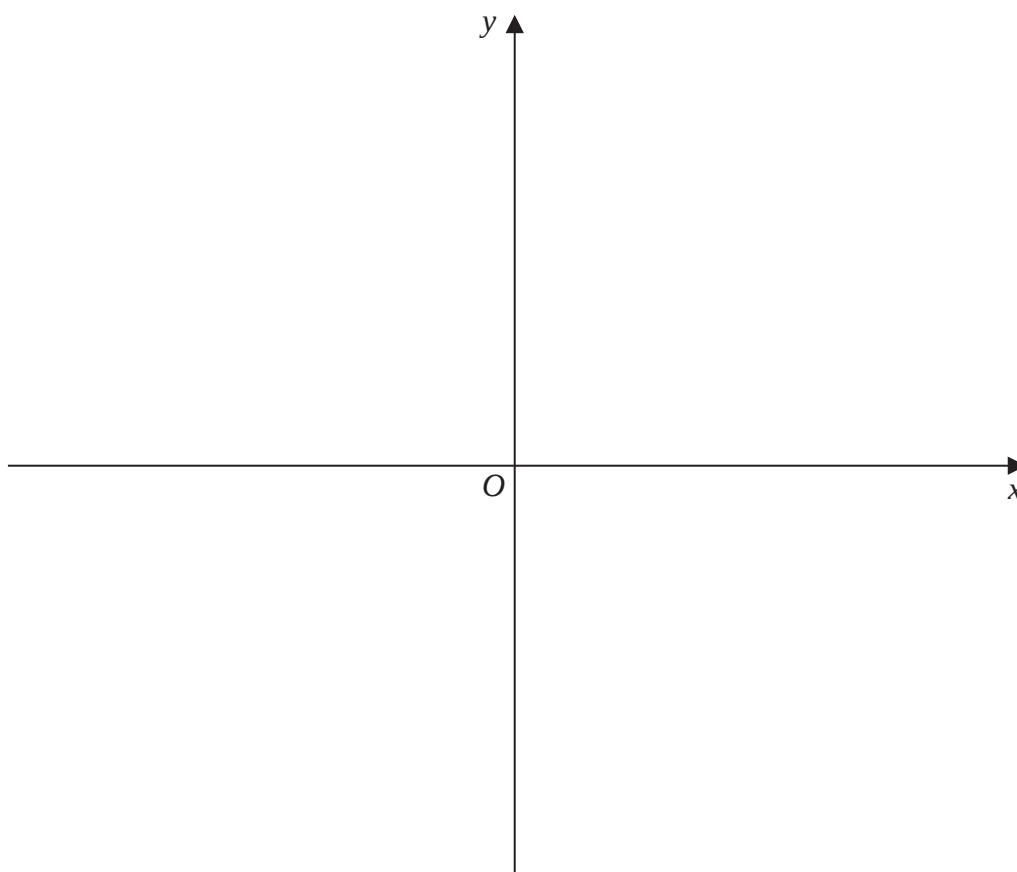
(2)

(b) Solve the equation $2(\log_a 4 + \log_a 16) = 1$

(3)

(c) Solve the equation $5\log_q 16 + 4\log_2 q = 24$

(6)



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Question 7 continued

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Question 7 continued

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Question 7 continued

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(Total for Question 7 is 11 marks)

- 8 (a) Using the binomial expansion, or otherwise, find the complete expansion of

$$(x + y)^3 \quad (1)$$

The quadratic equation

$$2x^2 + 3x + 4 = 0$$

has roots α and β

- (b) Without solving the equation, find the value of

$$\alpha^3 + \beta^3 \quad (4)$$

- (c) Hence, form a quadratic equation with integer coefficients that has roots

$$\frac{\alpha}{\beta^2} \text{ and } \frac{\beta}{\alpha^2} \quad (5)$$

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Question 8 continued

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Question 8 continued

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Question 8 continued

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(Total for Question 8 is 10 marks)

Question 9 continued

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Question 9 continued

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Question 9 continued

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(Total for Question 9 is 10 marks)

Question 10 continued

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Question 10 continued

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Question 10 continued

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(Total for Question 10 is 11 marks)



Question 11 continued

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Question 11 continued

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Question 11 continued

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Question 11 continued

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(Total for Question 11 is 17 marks)**TOTAL FOR PAPER IS 100 MARKS**