

Please check the examination details below before entering your candidate information

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Centre Number	Candidate Number
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Pearson Edexcel International GCSE

Tuesday 21 May 2024

Morning (Time: 2 hours)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">Paper reference</td> <td style="padding: 5px;">4PM1/01R</td> </tr> </table>	Paper reference	4PM1/01R
Paper reference	4PM1/01R		

Further Pure Mathematics

PAPER 1R



Calculators may be used.	Total Marks
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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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Pearson

International GCSE in Further Pure Mathematics Formulae sheet

MensurationSurface area of sphere = $4\pi r^2$ Curved surface area of cone = $\pi r \times$ slant heightVolume 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, $S_\infty = \frac{a}{1-r}$ $|r| < 1$ **Binomial series** $(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \dots + \frac{n(n-1)\dots(n-r+1)}{r!}x^r + \dots$ 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

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

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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** Without using a calculator, solve the inequality $\sqrt{50}x - \sqrt{18} > 6x + 5$

Give your answer in an exact form with a rationalised denominator.

Show your working clearly.

(4)

(Total for Question 1 is 4 marks)



2 Given that

$$1 - \frac{1}{3}x + \frac{5}{36}x^2 + \dots$$

is the binomial expansion, in ascending powers of x , of $(1 + Ax)^n$

where A and n are rational numbers,

(a) find the value of A and the value of n

(6)

(b) Hence find the value of the coefficient of x^3

Give your answer in the form $-\frac{p}{q}$ where p is a prime number and q is an integer.

(2)

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Question 2 continued

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(Total for Question 2 is 8 marks)



Question 3 continued

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(Total for Question 3 is 8 marks)



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Question 4 continued

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(Total for Question 4 is 9 marks)



5 The sum of the first 10 terms of an arithmetic series A is $36k + 1$ where k is a constant.

The 6th term of A is $4k + 1$

(a) (i) Find an expression in terms of k for the common difference of A

(ii) Show that the first term of A is -8

(5)

Given that the 4th term of A is 7

(b) show that $k = 4$

(2)

The sum of the first n terms of A is S_n and the n th term of A is U_n

(c) Find the value of n such that $S_n = 5U_{n+10} + 105$

(4)

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Question 5 continued

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Question 5 continued

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Question 5 continued

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(Total for Question 5 is 11 marks)



- 6 A particle P is moving in a straight line. The displacement s of P , in metres, at time t seconds, $t \geq 0$, is given by

$$s = e^{2t} \sin 3t + 2$$

At time $t = 0$, P is at the point A and at time $t = \frac{\pi}{6}$, P is at the point B

- (a) Find the exact distance AB

(2)

- (b) Find the exact velocity of P when $t = \frac{\pi}{3}$

(4)

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Question 6 continued

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(Total for Question 6 is 6 marks)



7 The curve C has equation $y = -\log_4(x + 4)$

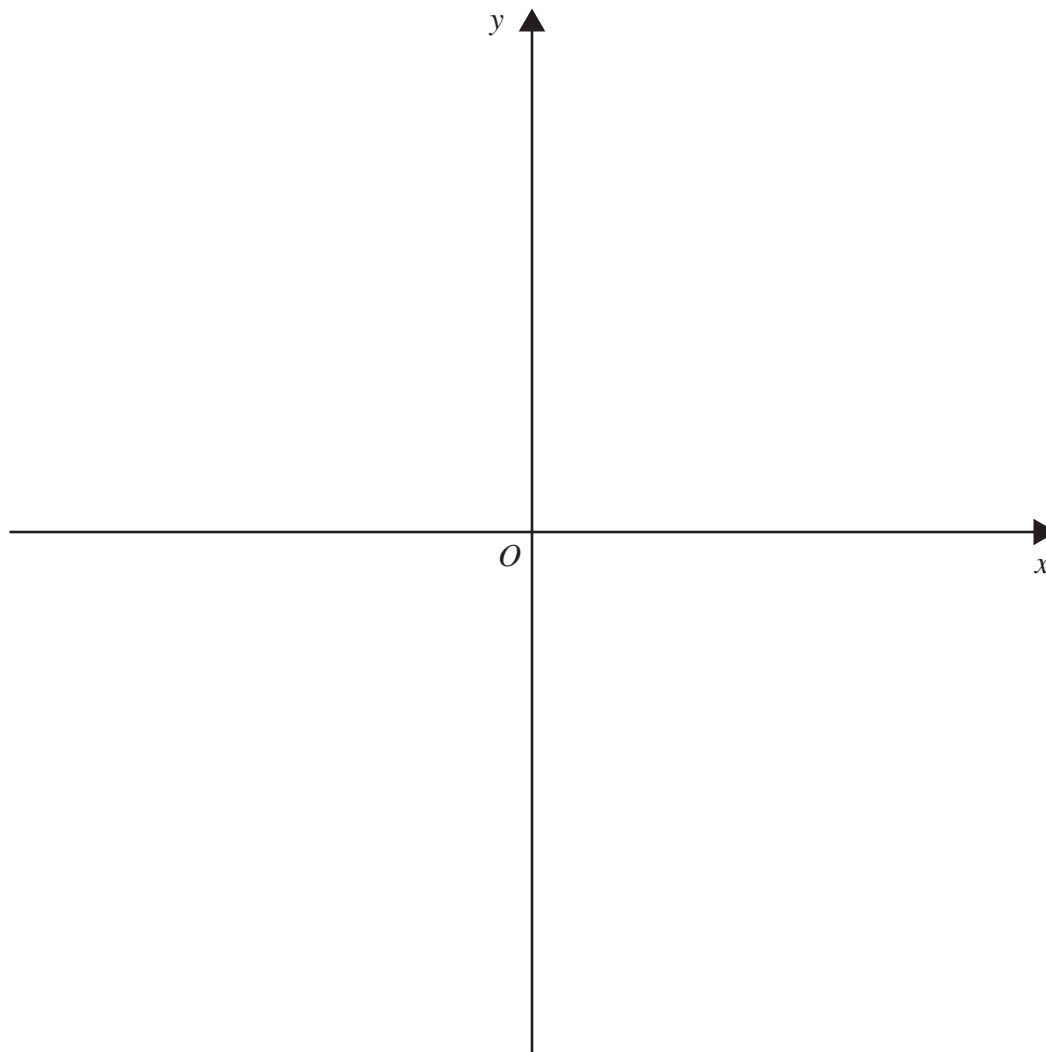
(a) Using the axes below, sketch the graph of C .

Label the coordinates of the points of intersection of C with the coordinate axes and the equation of any asymptote to C .

(4)

(b) Solve the equation $\log_{(x+4)} 256 - \log_4(x + 4) = 0$

(5)



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Question 7 continued

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(Total for Question 7 is 9 marks)



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)



- 9 The point A has coordinates $(-4, 3)$ and the point B has coordinates $(6, 8)$
The points A and B lie on the line k

(a) Find an equation of k (2)

The point C , on k , is such that $AC : CB = 4:1$

(b) Find the coordinates of point C (2)

The point D with coordinates (p, q) , where $p < 0$, lies on the line l through C that is perpendicular to k

The length of CD is $8\sqrt{5}$

(c) Find the coordinates of D (6)

(d) Find the area of triangle ACD (2)

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Question 9 continued

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Question 9 continued

Handwriting practice area consisting of 20 horizontal dotted lines for writing answers.

(Total for Question 9 is 12 marks)



10 The quadratic equation $2x^2 + kx + 4 = 0$ has roots α and β such that

$$k < 0 \text{ and } \alpha > \beta$$

Given that $\alpha^2 - \beta^2 = \frac{7\sqrt{17}}{4}$

(a) show that $k = -7$

(8)

(b) Hence form a quadratic equation that has roots

$$(\alpha - \beta) \text{ and } (\alpha + \beta)$$

(4)

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Question 10 continued

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Question 10 continued

Area for writing answers, consisting of multiple horizontal dotted lines.

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Question 10 continued

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(Total for Question 10 is 12 marks)



Question 11 continued

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Handwriting practice area consisting of 25 horizontal dotted lines.



