Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE

Tuesday 19 May 2026

Afternoon (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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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

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

Calculus

Quotient rule (differentiation)

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

Trigonometry

Cosine rule

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

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

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

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

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

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

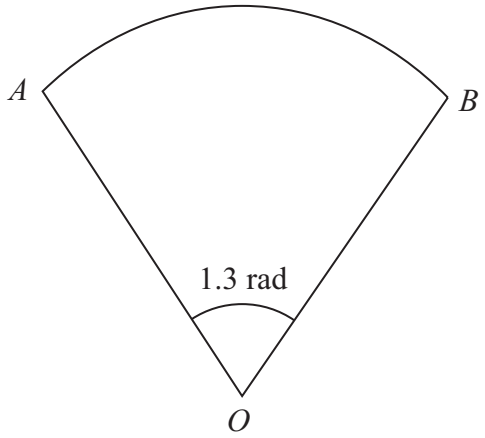

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Figure 1

Figure 1 shows a sector AOB of a circle with centre O

The area of sector AOB is $31.85\,\text{cm}^2$
The size of angle AOB is 1.3 radians.

Find the perimeter of sector AOB

(Total for Question 1 is 3 marks)

2 The sum of the first n terms of an arithmetic series A is S_n

Given that $S_n = \frac{n}{2}(3 + 5n)$

(a) show that $S_n = \sum_{r=1}^{n}(5r - 1)$

(6)

The nth term of A is t_n

Given that $S_{n+3} = 4t_{20} - 18$

(b) find the value of n

(4)

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Question 2 continued

(Total for Question 2 is 10 marks)

3 The roots of the equation $3x^2 - 5x + 1 = 0$ are α and β, where $\alpha > \beta$

Without solving the equation

(a) (i) find the exact value of $\alpha^2 + \beta^2$

(3)

(ii) show that $\alpha - \beta = \dfrac{\sqrt{13}}{3}$

(2)

(b) Hence form a quadratic equation that has roots

$$\frac{\alpha + \beta}{\alpha} \text{ and } \frac{\alpha - \beta}{\beta}$$

Give your answer in the form $ax^2 + bx + c\sqrt{d}$ where a, b, c and d are prime numbers.

(6)

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Question 3 continued

Question 3 continued

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Question 3 continued

(Total for Question 3 is 11 marks)

4 The curve C has equation $y = x\sqrt{3x-4} \qquad x \geqslant \frac{4}{3}$

(a) Show that $\frac{dy}{dx} = \frac{Mx + N}{2\sqrt{3x-4}}$ where M and N are integers to be found.

(4)

(b) Find the gradient of C at the point where $x = \frac{8}{3}$

(2)

(c) Find an equation of the tangent to C at the point where $x = \frac{8}{3}$

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

(4)

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Question 4 continued

(Total for Question 4 is 10 marks)

5 A particle P is moving along the x-axis.

At time t seconds ($t \geqslant 0$) the velocity, v m/s, of P is given by $v = 2\cos 3t$

(a) Find the least value of t for which $v = 1$

(2)

(b) Find the acceleration of P when $t = \frac{\pi}{2}$

(3)

When $t = \frac{\pi}{6}$, P is at the point where $x = 2$

(c) Find the distance of P from the origin when $t = \frac{\pi}{2}$

(4)

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Question 5 continued

(Total for Question 5 is 9 marks)

6

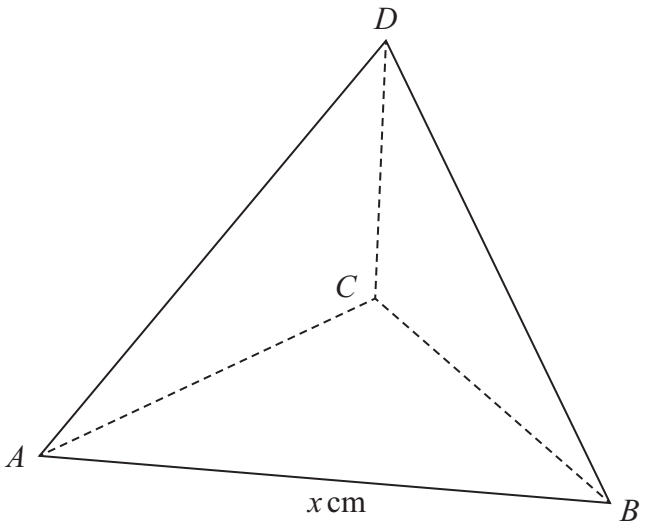

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Figure 2

Figure 2 shows a triangular based pyramid $ABCD$ where triangle ABC is the base.

$$AB = BC = AC = AD = BD = CD = x\,\text{cm}$$

(a) Show that the perpendicular height of the pyramid from the vertex D to the base ABC is $\frac{\sqrt{P}}{Q}x\,\text{cm}$ where P and Q are integers to be found.

(5)

The angle between plane ADB and plane BCD is θ

(b) Show that $\cos\theta = \frac{1}{3}$

(4)

The volume of the pyramid $ABCD$ is $\frac{16\sqrt{2}}{3}\,\text{cm}^3$

(c) Find the value of x

(4)

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Question 6 continued

Question 6 continued

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Question 6 continued

(Total for Question 6 is 13 marks)

7 (a) (i) Expand $(1 - 3x)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^3 expressing each coefficient as a simplified fraction.

(3)

(ii) Write down the range of values of x for which your expansion is valid.

(1)

$$f(x) = \frac{2 - x}{\sqrt{1 - 3x}} \qquad x < \frac{1}{3}$$

(b) Find the series expansion of $f(x)$ in ascending powers of x up to and including the term in x^3 expressing each coefficient as a simplified fraction where appropriate.

(3)

The region R is bounded by the curve with equation $y = f(x)$, the positive x-axis, the positive y-axis and the line with equation $x = 0.1$

(c) Hence, using calculus, find an estimate for the area of R giving your answer to 4 decimal places.

(4)

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Question 7 continued

(Total for Question 7 is 11 marks)

8

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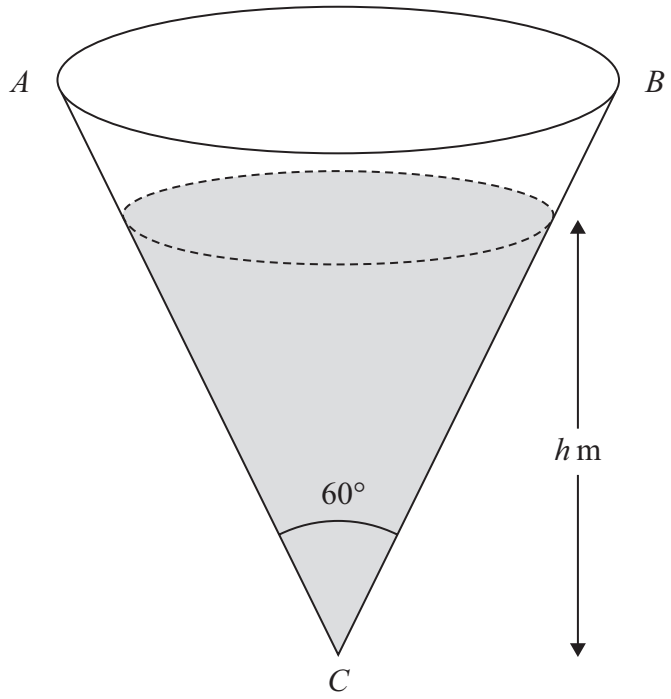

Figure 3

Figure 3 shows a water tank in the shape of a hollow right circular cone fixed with its axis of symmetry vertical.

The diameter of the circular rim of the cone is AB
The vertex C is below AB such that $\angle ACB = 60°$

The tank is initially empty before water starts flowing into the tank.

At time t seconds after the water starts flowing, the height of the surface of the water in the tank above C is h metres.

Water flows into the tank at a constant rate of $F\,\text{m}^3/\text{s}$ where F is a constant.

The rate at which h is increasing at the instant when $h = 2$ is $0.04\,\text{m/s}$

Find the exact value of F

(6)

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Question 8 continued

Question 8 continued

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Question 8 continued

(Total for Question 8 is 6 marks)

9 Using the formulae for $\sin(A - B)$ and $\cos(A - B)$ given on page 2 of this booklet

(a) show that $\tan(A - B) = \dfrac{\tan A - \tan B}{1 + \tan A \tan B}$

(4)

The line k has equation $2y + 5x - 7 = 0$
The line l has equation $3y - 2x + 3 = 0$

(b) Hence, or otherwise, find in degrees to one decimal place, the size of the obtuse angle between line k and line l

(5)

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Question 9 continued

(Total for Question 9 is 9 marks)

10 Solve, giving your answers to 3 significant figures, the equation

$$3\log_3 x^2 - 4\log_x 3 = 12$$

Show your working clearly.

(7)

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Question 10 continued

(Total for Question 10 is 7 marks)

11 A geometric series G has first term a and common ratio r
The nth term of G is U_n

Given that $8U_1 + 4U_2 = 8$ and $2U_1 \times U_3 = U_2$

(a) find

(i) the value of a

(ii) the value of r

(4)

(b) Find the sum to infinity of G

(2)

(c) Hence find, using logarithms, the least value of n such that $U_n < 0.06$

(5)

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Question 11 continued

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Question 11 continued

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TOTAL FOR PAPER IS 100 MARKS

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