



# Cambridge International AS & A Level

 CANDIDATE  
NAME

 CENTRE  
NUMBER

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  |  |
|--|--|--|--|--|

 CANDIDATE  
NUMBER

|  |  |  |  |
|--|--|--|--|
|  |  |  |  |
|--|--|--|--|

## MATHEMATICS

**9709/15**

Paper 1 Pure Mathematics 1

**May/June 2026**
**1 hour 50 minutes**

You must answer on the question paper.

You will need: List of formulae (MF19)

### INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

### INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].

 This document has **16** pages.



$$4x^2 + 2y^2 - 3y = 21 \quad \text{and} \quad 2x - y - 5 = 0. \quad [5]$$

PapaCambridge





- 2 A tank is being filled with water at a rate of  $200 \text{ cm}^3 \text{ s}^{-1}$ . The volume of water in the tank,  $V \text{ cm}^3$ , is given by

$$V = 100\pi h + \frac{1}{3}\pi h^3,$$

where  $h$  is the height of water in the tank in centimetres.

Find the exact rate at which  $h$  is increasing when  $h = 30$ .

[3]

PapaCambridge





- 3 The coefficient of  $x^4$  in the expansion of  $(p + 2x)^5$  is equal to the coefficient of  $x^2$  in the expansion of  $(1 - 2qx)^4$ , where  $p$  and  $q$  are constants.

(a) Find an expression for  $p$  in terms of  $q$ . [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Given that  $p = \frac{6}{5}$ , find the two possible values of the coefficient of  $x^3$  in the expansion of  $(3 + qx)^6$ . [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....





**4** The equation of a curve is  $y = -4x^2 + 2x + 3$ .

- (a)** Use differentiation to find the  $x$ -coordinate of the stationary point of the curve. [2]

[illegible]

The curve is stretched by factor 3 in the  $y$ -direction and then by factor  $\frac{1}{2}$  in the  $x$ -direction.

- (b)** Find the  $x$ -coordinate of the stationary point of the transformed curve. [1]

.....

.....

.....

.....

- (c) Find the equation of the transformed curve. Give your answer in the form  $y = ax^2 + bx + c$ , where  $a$ ,  $b$  and  $c$  are integers to be found. [3]

PapaCambridge

A blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. A faint watermark reading "PapaCambridge" is visible diagonally from the top left towards the center.





- 5 (a) Express  $2x^2 - 16x - 18$  in the form  $2(x+a)^2 + b$ , where  $a$  and  $b$  are constants to be found. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b) Hence, solve the equation  $2x^8 - 16x^4 - 18 = 0$ . [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....





- 6 Find the set of values of  $k$  for which the line  $y + 4x = k$  and the curve with equation  $y = 4 - 7x - 2x^2$  have at least one point of intersection. [4]

PapaCambridge



7 (a) Prove the identity

$$\frac{\cos \theta}{1 - \sin \theta} - \frac{1}{\cos \theta} \equiv \tan \theta. \quad [4]$$

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Hence, solve the equation

$$\frac{2 \cos \theta}{1 - \sin \theta} - \frac{2}{\cos \theta} + 3 = 0$$

for  $0^\circ \leq \theta \leq 360^\circ$ . [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

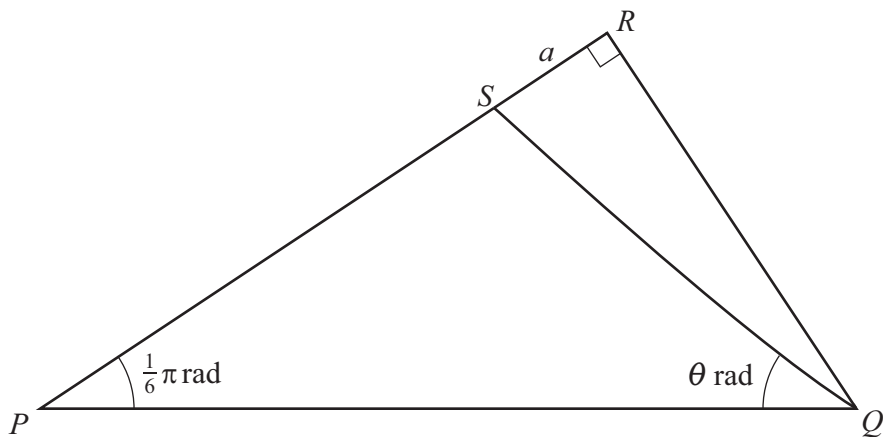
.....

.....

.....

.....





The diagram shows a right-angled triangle  $PQR$ . The point  $S$  lies on  $PR$  and is such that  $PS = 4RS$ . The distance  $RS = a$ . The angle  $QPR = \frac{1}{6}\pi$  radians, and the angle  $PQS = \theta$  radians.

- (a) Find the exact distance  $QS$  in terms of  $a$ . Give your answer in the form  $\sqrt{\frac{c}{d}}a$ , where  $c$  and  $d$  are integers to be found. [2]

.....

.....

.....

.....

.....

- (b) (i) Show that the angle  $RQS = \sin^{-1}\left(\frac{\sqrt{21}}{14}\right)$ . [2]

.....

.....

.....

.....

.....

- (ii) Hence, find the exact value of  $\theta$ . [1]

.....

.....

.....

.....





- 9 A function  $f$  is defined by  $f(x) = 3 - \frac{4}{2x+3}$  for  $x > -\frac{3}{2}$ .

(a) (i) Find  $f'(x)$ . [2]

.....

.....

.....

.....

.....

.....

(ii) Hence, show that  $f$  is an increasing function. [1]

.....

.....

.....

(b) (i) Find an expression for  $f^{-1}(x)$ . [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

(ii) State the domain and range of  $f^{-1}$ . [2]

.....

.....

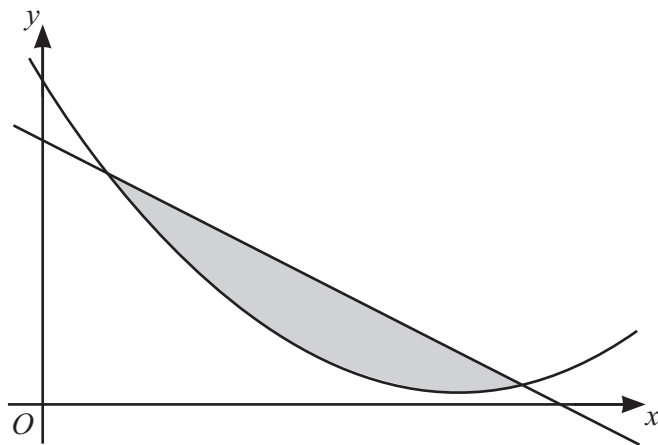
.....

.....





10

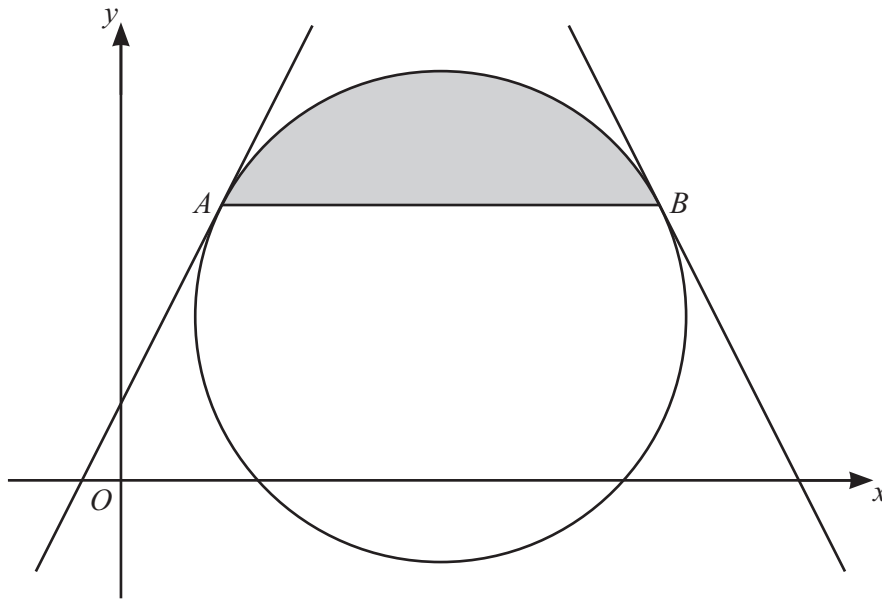


The diagram shows the curve with equation  $y = x^2 - 12x + 37$  and the line  $y = -4x + 30$ .

Find the area of the shaded region.

[7]

[illegible]



In the diagram,  $AB$  is a chord of the circle with equation  $(x-6)^2 + (y-3)^2 = 20$ . The two tangents to the circle with equations  $y = 2x + 1$  and  $y = -2x + 25$  meet the circle at the points  $A$  and  $B$  respectively.

- (a) Find the coordinates of the points  $A$  and  $B$ . [4]

[illegible]



[5]

[illegible]



- 12 (a) The first term of an arithmetic progression is 5730 and the common difference is  $-23$ .

Find the value of the first negative term.

[3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b) The first term of a geometric progression is  $\sin \theta$  and the second term is  $\frac{1}{2} \tan \theta$ , where  $0 < \theta < \frac{1}{2}\pi$ .

- (i) Find the set of values of  $\theta$  for which the progression is convergent.

[3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....





[3]

[illegible]



If you use the following page to complete the answer to any question, the question number must be clearly shown.

PapaCambridge

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (Cambridge University Press & Assessment) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in our Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cambridgeinternational.org](http://www.cambridgeinternational.org) after the live examination series.

Cambridge International Education is the name of our awarding body and a part of Cambridge University Press & Assessment, which is a department of the University of Cambridge.

