

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

**Advanced Subsidiary General Certificate of Education
Advanced General Certificate of Education**

MEI STRUCTURED MATHEMATICS

2601

Pure Mathematics 1

Wednesday **12 JANUARY 2005** Afternoon 1 hour 20 minutes

Additional materials:
Answer booklet
Graph paper
MEI Examination Formulae and Tables (MF12)

TIME 1 hour 20 minutes

INSTRUCTIONS TO CANDIDATES

- Write your Name, Centre Number and Candidate Number in the spaces provided on the answer booklet.
- Answer **all** questions.
- You are permitted to use only a scientific calculator in this paper.

INFORMATION FOR CANDIDATES

- The allocation of marks is given in brackets [] at the end of each question or part question.
- You are advised that an answer may receive no marks unless you show sufficient detail of the working to indicate that a correct method is being used.
- Final answers should be given to a degree of accuracy appropriate to the context.
- The total number of marks for this paper is 60.

This question paper consists of 3 printed pages and 1 blank page.

Section A (30 marks)

- 1 State the exact value of $\tan 30^\circ$. Write 30° in radians as simply as possible in the form $k\pi$. [3]
- 2 Solve the equation $|2x - 5| = 13$. [3]
- 3 Sketch the graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.
- Solve the equation $\sin x = -0.3$ for $0^\circ \leq x \leq 360^\circ$. [4]
- 4 Obtain the binomial expansion of $(1 - 5x)^4$, simplifying the coefficients. [4]
- 5 Find the x -coordinates of the points on the curve $y = x^3 - 4x^2 + 2$ where the gradient is 3. [4]
- 6 The equation $5x^2 + 3x + c = 0$ has a repeated root. Find the value of c and the value of the repeated root. [4]
- 7 A circle of radius 7 cm has a sector of angle 1.6 radians. Calculate the arc length of the sector.
- The arc length is measured with a flexible ruler as 10.2 cm. Calculate the relative error in this measurement. Give your answer to 2 significant figures. [4]
- 8 Given that $y = 5x$, find $\int_0^3 \pi x^2 dy$. State clearly what this integral represents. [4]

Section B (30 marks)

9

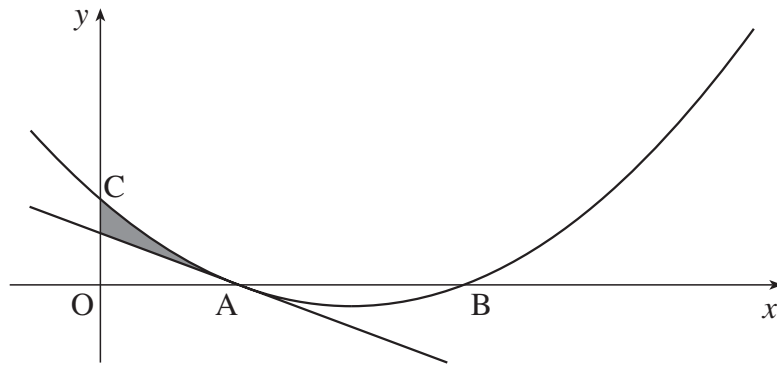


Fig. 9

The curve $y = x^2 - 7x + 10$ cuts the x -axis at A and B and the y -axis at C as shown in Fig. 9.

- (i) Write down the coordinates of C.

Show that A is $(2, 0)$ and find the coordinates of B.

Hence or otherwise find the coordinates of the turning point of the curve. [5]

- (ii) Solve the inequality $x^2 - 7x + 10 > 0$. [2]

- (iii) Show that the equation of the tangent to the curve at A is $y = -3x + 6$. [3]

- (iv) Calculate the area of the region bounded by the portion AC of the curve, the tangent at A and the y -axis. This region is shown shaded in Fig. 9. [5]

10 A circle with centre $(2, 4)$ has equation $x^2 + y^2 - 4x - 8y = 25$.

- (i) Show that the radius of the circle is $\sqrt{45}$. [3]

- (ii) Prove that the point $(8, 8)$ is outside the circle. [2]

- (iii) Find the equation of the line which is perpendicular to the line $y + 2x = 8$ and which passes through the centre of the circle. [3]

- (iv) P and Q are the points where the line $y + 2x = 8$ crosses the circle. Show that PQ is a diameter of the circle and find the coordinates of P and Q. [7]

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