

Core Mathematics C1 Advanced Subsidiary

For Edexcel

Paper I

Time: 1 hour 30 minutes

Instructions and Information

Candidates may NOT use a calculator in this paper.

Full marks may be obtained for answers to ALL questions.

The booklet 'Mathematical Formulae and Statistical Tables', available from Edexcel, may be used.

Advice to Candidates

You must show sufficient working to make your methods clear to an examiner.

Answers without working may gain no credit.

Published by Elmwood Press
80 Attimore Road
Welwyn Garden City
Herts. AL8 6LP
Tel. 01707 333232

These sheets may be copied for use solely by the purchaser's institute.

© Elmwood Press

1. (a) Simplify $\frac{a^{\frac{1}{4}}a^{\frac{1}{8}}}{a^{\frac{1}{2}}}$ (1)
- (b) Express $\left(\frac{2}{3}\right)^{-2}$ as an exact fraction in its simplest form (2)
- (c) Simplify $\sqrt{20} + 3\sqrt{45}$, giving your answer in simplified surd form. (2)
- (d) Given that $\frac{4^n \times 2^{5n}}{16^n} = 2^{kn}$, find the value of k . (3)
-

2. (a) Differentiate with respect to x
- $$\frac{5x^2 - 1}{3x} \quad (3)$$
- (b) Find $\int \left(\frac{1}{x^2} - x\right) dx$. (3)
- (c) Find $\int (x^3 + \sqrt{x}) dx$. (3)
-

3. Find the gradient of the straight line l with equation $3y - 2x + 5 = 0$ (1)
- Find an equation of the straight line which passes through the origin and which is perpendicular to l . (3)
-

4. Find the coordinates of the points of intersection of the line $y = 2x + 3$ and the curve $y = x^2 - 2x + 5$, giving your answers as surds. (5)
-

5. The terms of a sequence are given by
- $$u_n = (2n + k)^2, n \geq 1,$$
- where k is a positive constant.
- (a) Write down the values of u_1 and u_2 , in terms of k . (2)
- Given that $u_2 = 2u_1$,
- (b) find the value of k , (2)
- (c) show that $u_3 = 4(11 + 6\sqrt{2})$. (2)
-

6. (a) Express $x^2 - 4x + 7$ in the form $(x + a)^2 + b$ where a and b are constants to be determined. Hence show that the value of $x^2 - 4x + 7$ is positive for all values of x . (4)

(b) Sketch the graph of $y = x^2 - 4x + 7$.
Mark the axis of symmetry and give its equation.
State the coordinates of the lowest point of the curve. (3)

(c) Solve the inequality $x^2 - 4x + 7 < 12$ (2)

7. The first term of an arithmetic series is -7 and the eighth term of the series is 14 .
(a) Find the common difference and the sum of the first thirty terms of the series. (4)

(b) Find the value of n for which the n th term of the series is 212 . (2)

(c) Find the value of n for which the sum of the first n terms is 114 . (4)

8. (a) Sketch the graph of $y = \frac{1}{x}$, where $x \neq 0$, showing the parts of the graph corresponding to both positive and negative values of x . (2)

(b) Describe fully the geometrical transformation that transforms the curve $y = \frac{1}{x}$ to the curve $y = \frac{1}{x + 2}$. (2)

(c) Describe fully the geometrical transformation that transforms the curve $y = \frac{1}{x}$ to the curve $y = \frac{1}{x} + 4$. (2)

(d) Hence sketch the curve $y = \frac{1}{x + 2}$ and curve $y = \frac{1}{x} + 4$. (3)

(e) Differentiate $\frac{1}{x}$ with respect to x and hence find the gradient of the curve $y = \frac{1}{x} + 4$ at the point $(2, 4\frac{1}{2})$. (3)

9. The curve C has equation $y = f(x)$. Given that

$$\frac{dy}{dx} = 6x^2 - 4x + 1$$

and that C passes through the point $P(1, 0)$

(a) find y in terms of x . (4)

(b) Find an equation of the tangent to C at P . (3)

The tangent to C at the point Q is parallel to the tangent at P .

(c) Calculate the x -coordinate of Q . (5)

END

TOTAL 75 MARKS