FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

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.

Mathematical formulae and statistical tables are available.

This paper has ten questions.

Advice to Candidates

You must show sufficient working to make your methods clear to an examiner. Answers without working may gain no credit.

Written by Shaun Armstrong

1. The nth term of a sequence is defined by

$$u_n = n^2 - 6n + 11, \quad n \geq 1.$$

Given that the kth term of the sequence is 38, find the value of k. **(3)**

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2. Find

$$\int (4x^2 - \sqrt{x})\ \mathrm{d}x.$$ **(3)**

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3. Find the integer n such that

$$4\sqrt{12} - \sqrt{75} = \sqrt{n}\,.$$ **(4)**

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4. *(a)* Evaluate

$$(36^{\frac{1}{2}} + 16^{\frac{1}{4}})^{\frac{1}{3}}.$$ **(3)**

(b) Solve the equation

$$3x^{-\frac{1}{2}} - 4 = 0.$$ **(3)**

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5. The curve $y = \mathrm{f}(x)$ passes through the point $P\,(-1, 3)$ and is such that

$$\frac{\mathrm{d}y}{\mathrm{d}x} = -\frac{1}{x^2}, \quad x \neq 0.$$

(a) Using integration, find $\mathrm{f}(x)$. **(4)**

(b) Sketch the curve $y = \mathrm{f}(x)$ and write down the equations of its asymptotes. **(3)**

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6. $f(x) = x^2 - 10x + 17.$

(a) Express $f(x)$ in the form $a(x + b)^2 + c$. **(3)**

(b) State the coordinates of the minimum point of the curve $y = f(x)$. **(1)**

(c) Deduce the coordinates of the minimum point of each of the following curves:

(i) $y = f(x) + 4$,

(ii) $y = f(2x)$. **(4)**

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7. Given that the equation

$$4x^2 - kx + k - 3 = 0,$$

where k is a constant, has real roots,

(a) show that

$$k^2 - 16k + 48 \geq 0, \quad \textbf{(2)}$$

(b) find the set of possible values of k, **(3)**

(c) state the smallest value of k for which the roots are equal and solve the equation when k takes this value. **(3)**

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8. *(a)* The first and third terms of an arithmetic series are 3 and 27 respectively.

(i) Find the common difference of the series.

(ii) Find the sum of the first 11 terms of the series. **(5)**

(b) Find the sum of the integers between 50 and 150 which are divisible by 8. **(5)**

Turn over

9. A curve has the equation $y = x^3 - 5x^2 + 7x$.

(a) Show that the curve only crosses the x-axis at one point. **(4)**

The point P on the curve has coordinates (3, 3).

(b) Find an equation for the normal to the curve at P, giving your answer in the form $ax + by = c$, where a, b and c are integers. **(6)**

The normal to the curve at P meets the coordinate axes at Q and R.

(c) Show that triangle OQR, where O is the origin, has area $28\frac{1}{8}$. **(3)**

10.

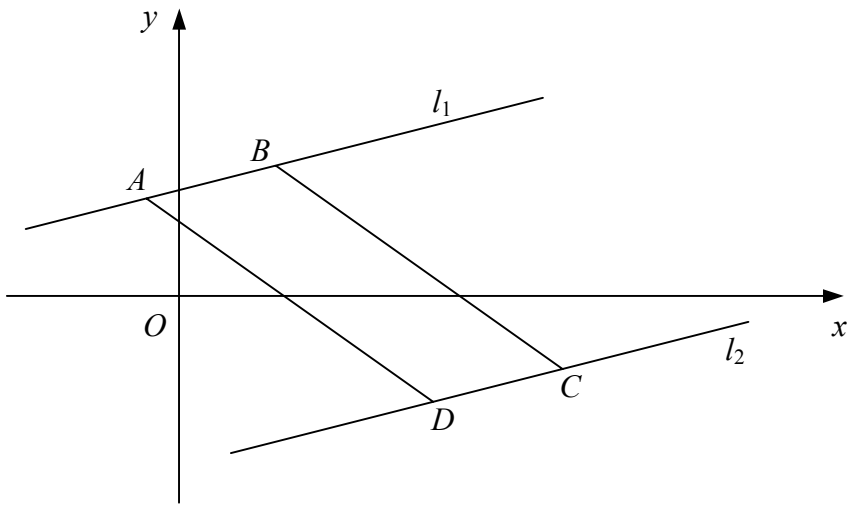

Figure 1

Figure 1 shows the parallelogram $ABCD$.

The points A and B have coordinates $(-1, 3)$ and $(3, 4)$ respectively and lie on the straight line l_1.

(a) Find an equation for l_1, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(4)**

The points C and D lie on the straight line l_2 which has the equation $x - 4y - 21 = 0$.

(b) Show that the distance between l_1 and l_2 is $k\sqrt{17}$, where k is an integer to be found. **(7)**

(c) Find the area of parallelogram $ABCD$. **(2)**

END