Materials required for examination	**Items included with question papers**
Mathematical Formulae (Green)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner. Answers without working may gain no credit.

1. Find $\int (6x^2 + 2 + x^{-\frac{1}{2}})\, dx$, giving each term in its simplest form.

(4)

2. Find the set of values of x for which

$$x^2 - 7x - 18 > 0.$$

(4)

3. On separate diagrams, sketch the graphs of

(a) $y = (x + 3)^2$,

(3)

(b) $y = (x + 3)^2 + k$, where k is a positive constant.

(2)

Show on each sketch the coordinates of each point at which the graph meets the axes.

4. A sequence $a_1, a_2, a_3, \ldots$ is defined by

$$a_1 = 3,$$

$$a_{n+1} = 3a_n - 5, \quad n \geq 1.$$

(a) Find the value a_2 and the value of a_3.

(2)

(b) Calculate the value of $\displaystyle\sum_{r=1}^{5} a_r$.

(3)

5. Differentiate with respect to x

(a) $x^4 + 6\sqrt{x}$,

(3)

(b) $\dfrac{(x+4)^2}{x}$.

(4)

6. (*a*) Expand and simplify $(4 + \sqrt{3})(4 - \sqrt{3})$.

(2)

(*b*) Express $\dfrac{26}{4 + \sqrt{3}}$ in the form $a + b\sqrt{3}$, where a and b are integers.

(2)

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7. An athlete prepares for a race by completing a practice run on each of 11 consecutive days. On each day after the first day he runs further than he ran on the previous day. The lengths of his 11 practice runs form an arithmetic sequence with first term a km and common difference d km.

He runs 9 km on the 11th day, and he runs a total of 77 km over the 11 day period.

Find the value of a and the value of d.

(7)

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8. The equation $x^2 + 2px + (3p + 4) = 0$, where p is a positive constant, has equal roots.

(*a*) Find the value of p.

(4)

(*b*) For this value of p, solve the equation $x^2 + 2px + (3p + 4) = 0$.

(2)

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9. Given that $f(x) = (x^2 - 6x)(x - 2) + 3x$,

(*a*) express $f(x)$ in the form $x(ax^2 + bx + c)$, where a, b and c are constants.

(3)

(*b*) Hence factorise $f(x)$ completely.

(2)

(*c*) Sketch the graph of $y = f(x)$, showing the coordinates of each point at which the graph meets the axes.

(3)

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10. The curve C with equation $y = f(x)$, $x \neq 0$, passes through the point $(3, 7\frac{1}{2})$.

Given that $f'(x) = 2x + \dfrac{3}{x^2}$,

(*a*) find $f(x)$.

(5)

(*b*) Verify that $f(-2) = 5$.

(1)

(*c*) Find an equation for the tangent to C at the point $(-2, 5)$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(5)

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11. The line l_1 passes through the points $P(-1, 2)$ and $Q(11, 8)$.

(*a*) Find an equation for l_1 in the form $y = mx + c$, where m and c are constants.

(4)

The line l_2 passes through the point $R(10, 0)$ and is perpendicular to l_1. The lines l_1 and l_2 intersect at the point S.

(*b*) Calculate the coordinates of S.

(5)

(*c*) Show that the length of RS is $3\sqrt{5}$.

(2)

(*d*) Hence, or otherwise, find the exact area of triangle PQR.

(4)

TOTAL FOR PAPER: 75 MARKS

END

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