Core Mathematics C2   For Edexcel
Advanced Subsidiary

Paper D

Time: 1 hour 30 minutes

Instructions and Information

Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and/or integration.

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.

1. (*a*) Evaluate

    (i) $\log_5 25$

    (2)

    (ii) $\log_7 7$

    (1)

    (iii) $\log_8 4$

    (2)

(*b*) Solve the equation $7^x = 5$, giving your answer to 3 decimal places.

    (3)

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2. The sales of a new aircraft were recorded for the first two years after the initial launch. In the first year 5120 aircraft were sold and in the second year 3840 were sold.

An analyst predicts that future sales will form a geometric progression with first two terms 5120 and 3840.

Calculate the forecasts for,

(*a*) the total number of aircraft which will be sold in the first six years after the launch,

    (3)

(*b*) the total number of aircraft that will ever be sold.

    (3)

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3. (*a*) Find $\int 3\sqrt{x}\, dx$.

    (3)

(*b*) The gradient of a curve is given by $\dfrac{dy}{dx} = 3\sqrt{x}$. The curve passes through the point (4, 5).

Find the equation of the curve.

    (3)

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4. (*a*) Expand $(1 + 2x)^7$ in ascending powers of x up to and including the term in x^3. Simplify the coefficients in your expansion.

    (4)

(*b*) Use your series, with a suitable value of x to obtain a value of 1.002^7, giving your answer to 8 significant figures.

    (3)

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5. (*a*) Show that the equation

$$3\sin^2 x = 5\cos x + 1$$

can be written as

$$3\cos^2 x + 5\cos x - 2 = 0.$$

(2)

(*b*) Hence solve, for $0 \le x < 360°$, the equation

$$3\sin^2 x = 5\cos x + 1,$$

giving your answers to 1 decimal place where appropriate.

(5)

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6. The circle C has equation

$$x^2 + y^2 + 2x + 4y - 21 = 0.$$

(*a*) Find the coordinates of the centre of this circle.

(3)

(*b*) Show that the point $(4, -1)$ lies on the circle.

(1)

(*c*) Find the equation of the tangent to C at the point $(4, -1)$.

(5)

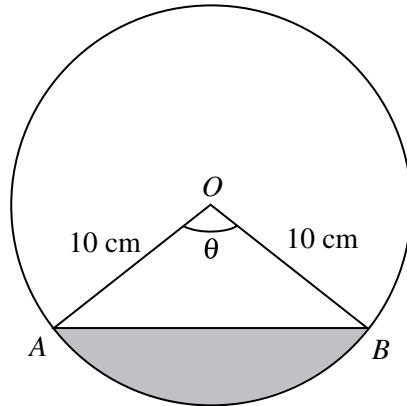**7.** The equation of a curve is given by $y = x^4 - 2x^2 + 11$

(*a*) Show that the curve has a turning point at $(1, 10)$ and find the coordinates of the other turning points.

(6)

(*b*) Sketch the curve.

(2)

(*c*) Find the equation of a tangent to the curve at the point $(2, 19)$.

(3)

8.

O is the centre of a circle or radius 10 cm and A and B are two points on the circumference such that $\angle AOB = \theta$ radians.

(a) Find expressions, in terms of θ, for:

   (i) the area of the sector AOB

(2)

   (ii) the area of the triangle AOB

(2)

   (iii) the shaded area enclosed between the chord AB and the arc AB.

(2)

(b) If the shaded area is one third of the area of the sector, then show that
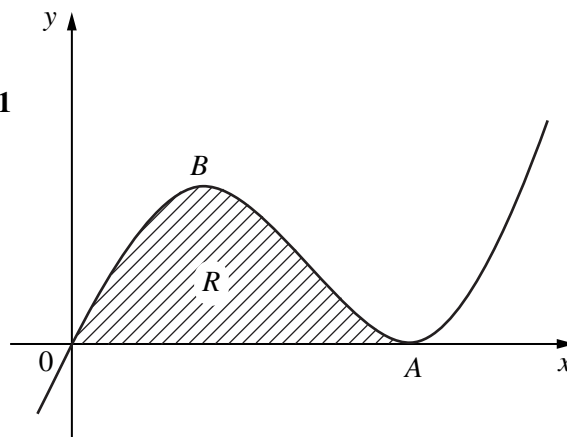$2\theta - 3\sin\theta = 0$.

(2)

9.

Figure 1

Figure 1 shows part of the curve with equation
$$y = x^3 - 4x^2 + 4x.$$

The curve touches the x-axis at A and has a maximum turning point at B.

(a) Factorise $x^3 - 4x^2 + 4x$ fully and use your result to write down the coordinates of A.

(2)

(b) Find the coordinates of B.

(5)

The shaded region R is bounded by the curve and the x-axis.

(c) Find the area of R.

(5)

END   **TOTAL 75 MARKS**