

Practice paper

(Marks are shown in brackets.)

- 1** The sector AOB is removed from a circle of radius 5 cm.
The $\angle AOB$ is 1.4 radians and $OA = OB$.
- a** Find the perimeter of the sector AOB . (3)
- b** Find the area of sector AOB . (2)
- 2** Given that $\log_2 x = p$:
- a** Find $\log_2 (8x^2)$ in terms of p . (4)
- b** Given also that $p = 5$, find the value of x . (2)
- 3 a** Find the value of the constant a so that $(x - 3)$ is a factor of $x^3 - ax - 6$. (3)
- b** Using this value of a , factorise $x^3 - ax - 6$ completely. (4)
- 4 a** Find the coefficient of x^{11} and the coefficient of x^{12} in the binomial expansion of $(2 + x)^{15}$. (4)
- The coefficient of x^{11} and the coefficient of x^{12} in the binomial expansion of $(2 + kx)^{15}$ are equal.
- b** Find the value of the constant k . (3)
- 5 a** Prove that:
- $$\frac{\cos^2 \theta}{\sin \theta + \sin^2 \theta} \equiv \frac{1 - \sin \theta}{\sin \theta}, 0 < \theta < 180^\circ. \quad (4)$$
- b** Hence, or otherwise, solve the following equation for $0 < \theta < 180^\circ$:
- $$\frac{\cos^2 \theta}{\sin \theta + \sin^2 \theta} = 2$$
- Give your answers to the nearest degree. (4)
- 6 a** Show that the centre of the circle with equation $x^2 + y^2 = 6x + 8y$ is $(3, 4)$ and find the radius of the circle. (5)
- b** Find the exact length of the tangents from the point $(10, 0)$ to the circle. (4)
- 7** A father promises his daughter an eternal gift on her birthday. On day 1 she receives £75 and each following day she receives $\frac{2}{3}$ of the amount given to her the day before. The father promises that this will go on for ever.
- a** Show that after 2 days the daughter will have received £125. (2)
- b** Find how much money the father should set aside to ensure that he can cover the cost of the gift. (3)
- After k days the total amount of money that the daughter will have received exceeds £200.
- c** Find the smallest value of k . (5)

8 Given $I = \int_1^3 \left(\frac{1}{x^2} + 3\sqrt{x} \right) dx$:

a Use the trapezium rule with the table below to estimate I to 3 significant figures. (4)

x	1	1.5	2	2.5	3
y	4	4.119	4.493	4.903	5.307

b Find the exact value of I . (4)

c Calculate, to 1 significant figure, the percentage error incurred by using the trapezium rule as in part **a** to estimate I . (2)

9 The curve C has equation $y = 6x^{\frac{7}{3}} - 7x^2 + 4$.

a Find $\frac{dy}{dx}$. (2)

b Find $\frac{d^2y}{dx^2}$. (2)

c Use your answers to parts **a** and **b** to find the coordinates of the stationary points on C and determine their nature. (9)