RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced Subsidiary General Certificate of Education
Advanced General Certificate of Education

MATHEMATICS 4722

Core Mathematics 2

Tuesday **6 JUNE 2006** Afternoon 1 hour 30 minutes

Additional materials:
8 page answer booklet
Graph paper
List of Formulae (MF1)

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the spaces provided on the answer booklet.
- Answer **all** the questions.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.
- You are permitted to use a graphical calculator in this paper.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 72.
- Questions carrying smaller numbers of marks are printed earlier in the paper, and questions carrying larger numbers of marks later in the paper.
- **You are reminded of the need for clear presentation in your answers.**

This question paper consists of 4 printed pages.

1 Find the binomial expansion of $(3x-2)^4$. [4]

2 A sequence of terms $u_1, u_2, u_3, \ldots$ is defined by

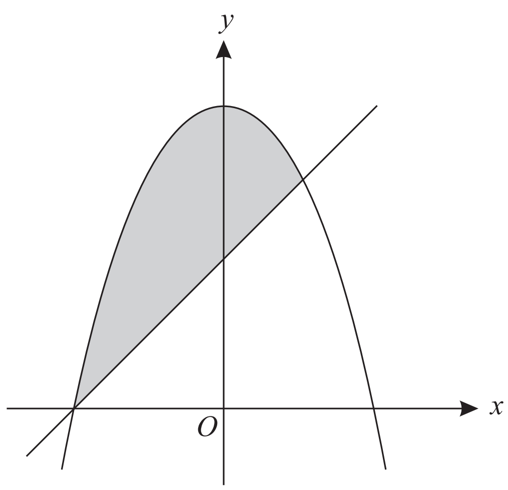
$$u_1 = 2 \qquad \text{and} \qquad u_{n+1} = 1 - u_n \text{ for } n \geqslant 1.$$

(i) Write down the values of u_2, u_3 and u_4. [2]

(ii) Find $\displaystyle\sum_{n=1}^{100} u_n$. [3]

3 The gradient of a curve is given by $\dfrac{dy}{dx} = 2x^{-\frac{1}{2}}$, and the curve passes through the point $(4, 5)$. Find the equation of the curve. [6]

4



The diagram shows the curve $y = 4 - x^2$ and the line $y = x + 2$.

(i) Find the x-coordinates of the points of intersection of the curve and the line. [2]

(ii) Use integration to find the area of the shaded region bounded by the line and the curve. [6]

5 Solve each of the following equations, for $0° \leqslant x \leqslant 180°$.

(i) $2\sin^2 x = 1 + \cos x$. [4]

(ii) $\sin 2x = -\cos 2x$. [4]

6 **(i)** John aims to pay a certain amount of money each month into a pension fund. He plans to pay £100 in the first month, and then to increase the amount paid by £5 each month, i.e. paying £105 in the second month, £110 in the third month, etc.

If John continues making payments according to this plan for 240 months, calculate

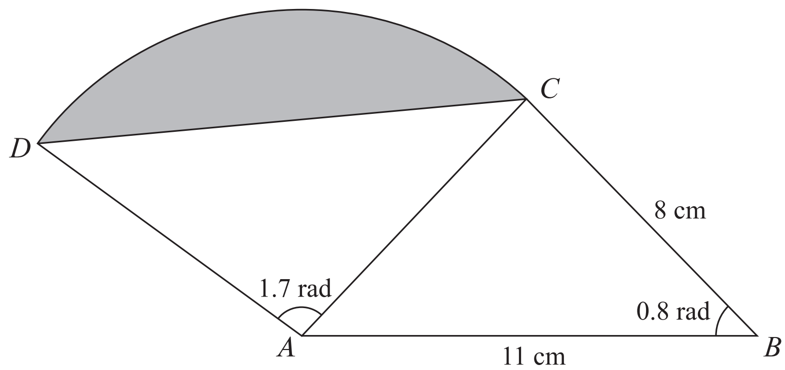
(a) how much he will pay in the final month, [2]

(b) how much he will pay altogether over the whole period. [2]

(ii) Rachel also plans to pay money monthly into a pension fund over a period of 240 months, starting with £100 in the first month. Her monthly payments will form a geometric progression, and she will pay £1500 in the final month.

Calculate how much Rachel will pay altogether over the whole period. [5]

7



The diagram shows a triangle ABC, and a sector ACD of a circle with centre A. It is given that $AB = 11$ cm, $BC = 8$ cm, angle $ABC = 0.8$ radians and angle $DAC = 1.7$ radians. The shaded segment is bounded by the line DC and the arc DC.

(i) Show that the length of AC is 7.90 cm, correct to 3 significant figures. [3]

(ii) Find the area of the shaded segment. [3]

(iii) Find the perimeter of the shaded segment. [4]

8 The cubic polynomial $2x^3 + ax^2 + bx - 10$ is denoted by $\mathrm{f}(x)$. It is given that, when $\mathrm{f}(x)$ is divided by $(x - 2)$, the remainder is 12. It is also given that $(x + 1)$ is a factor of $\mathrm{f}(x)$.

(i) Find the values of a and b. [6]

(ii) Divide $\mathrm{f}(x)$ by $(x + 2)$ to find the quotient and the remainder. [5]

[Question 9 is printed overleaf.]

9 **(i)** Sketch the curve $y = \left(\frac{1}{2}\right)^x$, and state the coordinates of any point where the curve crosses an axis. [3]

(ii) Use the trapezium rule, with 4 strips of width 0.5, to estimate the area of the region bounded by the curve $y = \left(\frac{1}{2}\right)^x$, the axes, and the line $x = 2$. [4]

(iii) The point P on the curve $y = \left(\frac{1}{2}\right)^x$ has y-coordinate equal to $\frac{1}{6}$. Prove that the x-coordinate of P may be written as

$$1 + \frac{\log_{10} 3}{\log_{10} 2}.$$ [4]