



**GCE AS/A level**

974/01

**MATHEMATICS C2**

**Pure Mathematics**

P.M. FRIDAY, 14 January 2011

1½ hours

#### **ADDITIONAL MATERIALS**

In addition to this examination paper, you will need:

- a 12 page answer book;
- a Formula Booklet;
- a calculator.

#### **INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen.

Answer **all** questions.

Sufficient working must be shown to demonstrate the **mathematical** method employed.

#### **INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

1. Use the Trapezium Rule with five ordinates to find an approximate value for the integral

$$\int_1^2 \sqrt{4+x^3} \, dx.$$

Show your working and give your answer correct to three decimal places. [4]

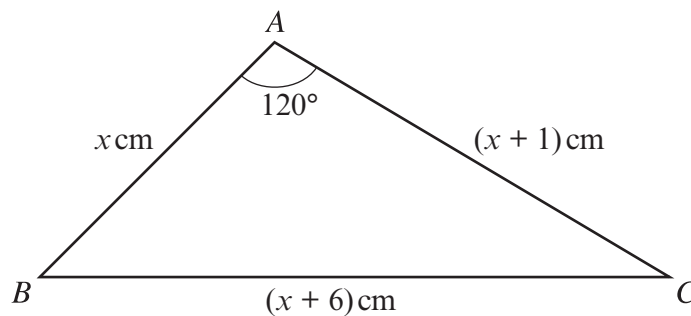
2. (a) Find all values of  $\theta$  between  $0^\circ$  and  $360^\circ$  satisfying

$$7 \sin^2 \theta + 1 = 3 \cos^2 \theta - \sin \theta. \quad [6]$$

- (b) Find all values of  $x$  between  $0^\circ$  and  $180^\circ$  satisfying

$$\cos(2x + 25^\circ) = -0.454. \quad [3]$$

3. The diagram below shows a sketch of the triangle  $ABC$  with  $AB = x$  cm,  $AC = (x + 1)$  cm,  $BC = (x + 6)$  cm and  $\hat{A} = 120^\circ$ .



- (a) Show that  $x$  satisfies the equation  $2x^2 - 9x - 35 = 0$ . Hence evaluate  $x$ . [4]

- (b) Find the area of triangle  $ABC$ . Give your answer correct to two decimal places. [2]

4. (a) An arithmetic series has first term  $a$  and common difference  $d$ . Prove that the sum of the first  $n$  terms of the series is given by

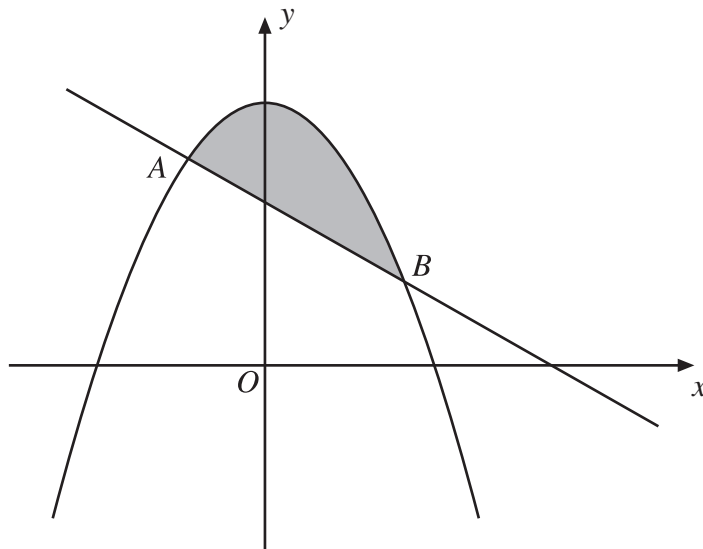
$$S_n = \frac{n}{2} [2a + (n - 1)d]. \quad [3]$$

- (b) The eighth term of an arithmetic series is 28. The sum of the first twenty terms of the series is 710. Find the first term and common difference of the arithmetic series. [5]

- (c) The first term of another arithmetic series is  $-3$  and the fifteenth term is 67. Find the sum of the first fifteen terms of this arithmetic series. [2]

5. (a) The second term of a geometric series is 6 and the fifth term is 384.
- Find the common ratio of the series.
  - Find the sum of the first eight terms of the geometric series. [6]
- (b) The first term of another geometric series is 5 and the common ratio is  $1 \cdot 1$ .
- The  $n$ th term of this series is 170, correct to the nearest integer. Find the value of  $n$ .
  - Dafydd, who has been using his calculator to investigate various properties of this geometric series, claims that the sum to infinity of the series is 940. Explain why this result cannot possibly be correct. [5]

6. (a) Find  $\int \left( \frac{3}{\sqrt{x}} - 4x^{\frac{2}{3}} \right) dx$ . [2]
- (b)



The diagram shows a sketch of the curve  $y = 25 - x^2$  and the line  $y = -2x + 17$ . The line and the curve intersect at the points  $A$  and  $B$ .

- Find the coordinates of  $A$  and  $B$ . [4]
- Find the area of the shaded region. [7]

**TURN OVER.**

7. Find all values of  $x$  satisfying the equation

$$\log_a(6x^2 + 11) - \log_a x = 2\log_a 5. \quad [5]$$

8. The circle  $C$  has centre  $A$  and equation

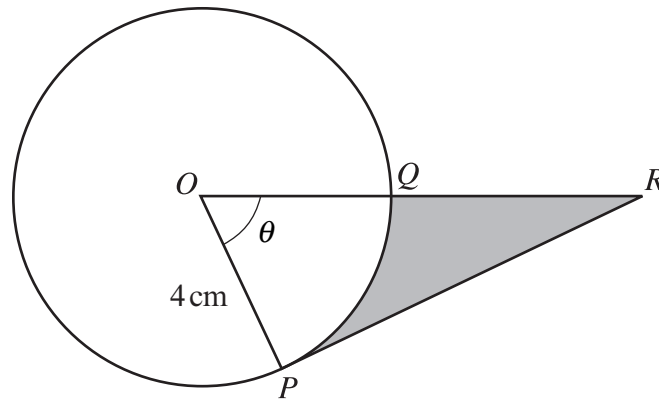
$$x^2 + y^2 - 2x + 6y - 15 = 0.$$

(a) (i) Write down the coordinates of  $A$ .

(ii) The point  $P$  has coordinates  $(4, -7)$  and lies on  $C$ . Find the equation of the tangent to  $C$  at  $P$ . [5]

(b) The line  $L$  has equation  $y = x + 4$ . Show that  $L$  and  $C$  do not intersect. [4]

9.



The diagram shows two points  $P$  and  $Q$  on a circle with centre  $O$  and radius 4 cm. The tangent to the circle at  $P$  intersects the line  $OQ$  produced at the point  $R$ . The length of the arc  $PQ$  is 5.2 cm and  $\widehat{POQ} = \theta$  radians.

(a) Find the value of  $\theta$ . [2]

(b) Calculate the area of the shaded region, giving your answer correct to one decimal place. [6]