



**GCE AS/A level**

0974/01

**MATHEMATICS C2**

**Pure Mathematics**

A.M. FRIDAY, 18 May 2012

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

$$\int_1^2 \frac{1}{\sqrt{5-x^2}} dx.$$

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

2. (a) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$10\cos^2\theta + 3\cos\theta = 4\sin^2\theta - 2. \quad [6]$$

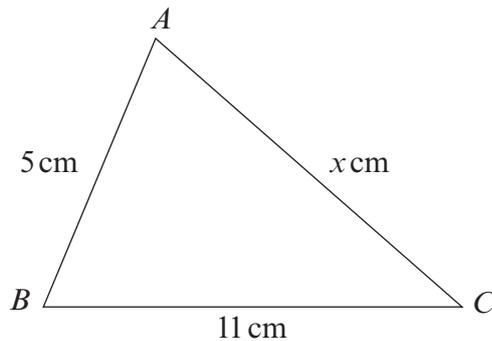
- (b) Find all values of  $x$  in the range  $0^\circ \leq x \leq 180^\circ$  satisfying

$$\sin(3x - 21^\circ) = -0.809. \quad [3]$$

- (c) Find all values of  $\phi$  in the range  $0^\circ \leq \phi \leq 360^\circ$  satisfying

$$\cos\phi - 5\sin\phi = 0. \quad [3]$$

3. (a) The diagram below shows a sketch of the triangle  $ABC$  with  $AB = 5$  cm,  $AC = x$  cm,  $BC = 11$  cm and  $\cos \hat{BAC} = \frac{2}{5}$ .



Write down and simplify a quadratic equation satisfied by  $x$ .  
Hence evaluate  $x$ . [3]

- (b) The triangle  $XYZ$  is such that  $XY = 32$  cm,  $XZ = 15$  cm and  $\hat{XYZ} = 19^\circ$ .  
Find the possible values of  $\hat{YXZ}$ . Give your answers correct to the nearest degree. [4]

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 sum of the third, fourth and tenth terms of an arithmetic series is 79. The sum of the sixth and seventh terms of the series is 61. Find the first term and the common difference of the series. [4]

- (c) Find an expression, in terms of  $n$ , for the sum of the first  $n$  terms of the arithmetic series

$$15 + 13 + 11 + 9 + \dots$$

Simplify your answer.

[3]

5. A geometric series has first term  $a$  and common ratio  $r$ . The sum of the first and second terms of the series is 72. The sum of the first and third terms of the series is 120.

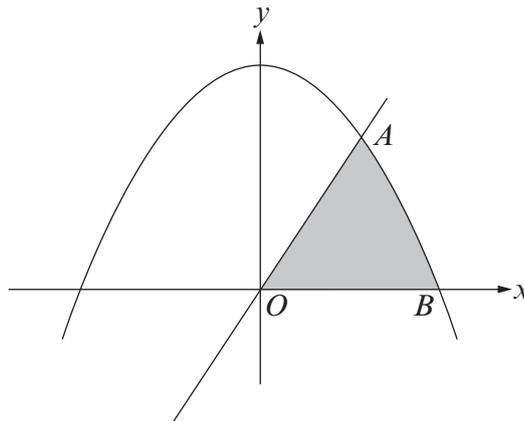
- (a) Show that  $r$  satisfies the equation

$$3r^2 - 5r - 2 = 0. \quad [4]$$

- (b) Given that  $|r| < 1$ , find the value of  $r$  and the sum to infinity of the series. [5]

6. (a) Find  $\int \left( 3\sqrt{x} - \frac{2}{x^{\frac{5}{3}}} \right) dx$ . [2]

- (b)



The diagram shows a sketch of the curve  $y = 36 - x^2$  and the line  $y = 5x$ . The curve and the line intersect at the point  $A$  in the first quadrant and the curve intersects the positive  $x$ -axis at the point  $B$ .

- (i) Showing your working, find the coordinates of  $A$  and the coordinates of  $B$ .

- (ii) Find the area of the shaded region.

[10]

**TURN OVER**

7. (a) Given that  $x > 0$ , show that

$$\log_a x^n = n \log_a x. \quad [3]$$

- (b) Solve the equation

$$9^{\frac{x}{2}-3} = 6.$$

Show your working and give your answer correct to three decimal places. [3]

- (c) Solve the equation

$$\log_a(x-2) + \log_a(4x+1) = 2\log_a(2x-3). \quad [4]$$

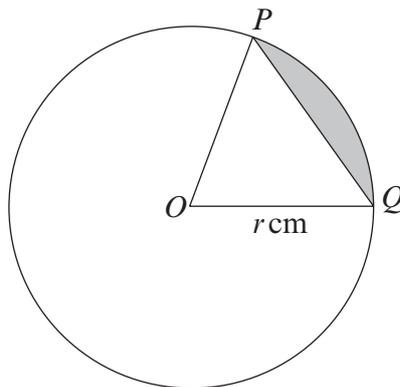
8. The circle  $C$  has centre  $A$  and equation

$$x^2 + y^2 - 4x + 6y + 1 = 0.$$

- (a) Find the coordinates of  $A$  and the radius of  $C$ . [3]

- (b) The point  $R$  lies on the circle  $C$ . The tangent to the circle at  $R$  passes through the point  $T(8, 2)$ . Find the length of  $RT$ . [3]

- 9.



The diagram shows a circle with centre  $O$  and radius  $r$  cm. The points  $P$  and  $Q$  are on the circle and  $\widehat{POQ} = 1.12$  radians. Given that the area of the shaded region is  $10.35 \text{ cm}^2$ , find the value of  $r$ . Give your answer correct to one decimal place. [5]