WJEC
CBAC

GCE AS/A level

974/01

MATHEMATICS C2

Pure Mathematics

A.M. FRIDAY, 22 May 2009

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

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

$$\int_0^{0\cdot4} \frac{1}{2+\sqrt{x}}\,\mathrm{d}x.$$

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

2. *(a)* Find all values of θ between 0° and 360° satisfying

$$5\cos^2\theta + 2 = 3\sin^2\theta - 2\cos\theta.$$ [6]

(b) Find all values of x between 0° and 180° satisfying

$$\sin(2x + 12°) = -0{\cdot}53.$$ [3]

3. The triangle ABC is such that $AB = 16$ cm, $AC = 9$ cm and $A\hat{B}C = 23°$.

(a) Find the possible values of $A\hat{C}B$. Give your answers correct to the nearest degree. [2]

(b) Given that $B\hat{A}C$ is an **acute** angle, find

(i) the size of $B\hat{A}C$, giving your answer correct to the nearest degree,

(ii) the area of triangle ABC, giving your answer correct to one decimal place. [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

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

(b) The eighth term of an arithmetic series is 46. The sum of the first nine terms of the series is 225. 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

$$3 + 7 + 11 + 15 + \ldots\ldots\ldots .$$

Simplify your answer. [3]

5. *(a)* The ninth and tenth terms of a geometric series are 36 and 108 respectively. Find the seventh term of the geometric series. [3]

(b) Another geometric series has first term a and common ratio r. The second term of this geometric series is 9 and the sum to infinity of the series is 48.

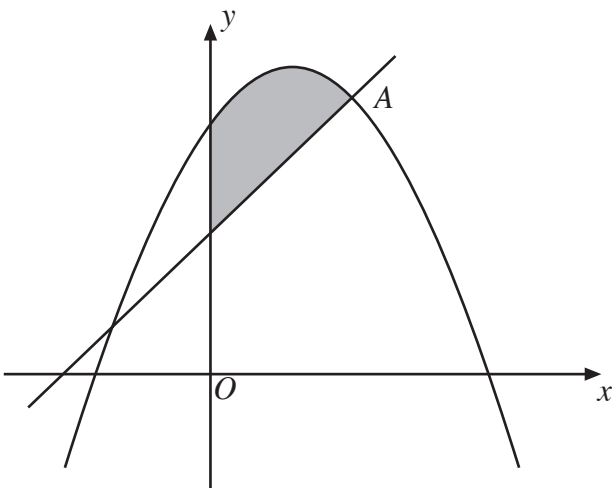
(i) Show that r satisfies the equation

$$16r^2 - 16r + 3 = 0.$$

 (ii) Find the two possible values for r and the corresponding values of a. [6]

6. *(a)* Find $\int \left(\frac{5}{x^3} - 3x^{\frac{1}{4}} \right) \mathrm{d}x.$ [2]

(b)



The diagram shows a sketch of the curve $y = 6 + 4x - x^2$ and the line $y = x + 2$. The point of intersection of the curve and the line in the first quadrant is denoted by A.

(i) Find the coordinates of A.

(ii) Find the area of the shaded region. [10]

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

$$\log_a \frac{x}{y} = \log_a x - \log_a y.$$ [3]

(b) Solve the equation

$$3^{5-2x} = 7.$$

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

(c) Solve the equation

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

TURN OVER

8. The circle C_1 has centre A and equation

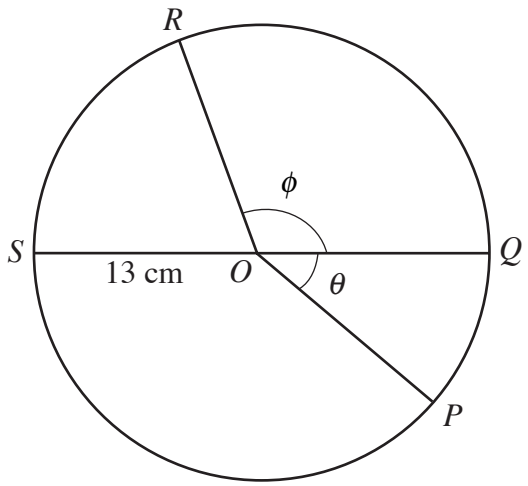
$$x^2 + y^2 - 6x + 2y - 15 = 0.$$

(a) Find the coordinates of A and the radius of C_1. [3]

(b) The point P has coordinates (7, 2) and lies on C_1. Find the equation of the tangent to C_1 at P. [4]

(c) The circle C_2 has centre $B(11, 14)$ and radius 8. A point Q lies on C_1 and a point R lies on C_2. Find the shortest possible length of the line QR. [3]

9.



The diagram shows four points P, Q, R and S on a circle with centre O and radius 13 cm. The line QS is a diameter of the circle, $P\hat{O}Q = \theta$ radians and $Q\hat{O}R = \phi$ radians.

(a) The area of sector POQ is 60 cm^2. Find the value of θ, giving your answer correct to two decimal places. [2]

(b) The length of the arc QR is 7 cm greater than the length of the arc RS. Find the value of ϕ, giving your answer correct to two decimal places. [3]