

ADVANCED SUBSIDIARY GCE
MATHEMATICS
Core Mathematics 2

4722

Candidates answer on the Answer Booklet

OCR Supplied Materials:

- 8 page Answer Booklet
- List of Formulae (MF1)

Other Materials Required:

None

Friday 22 May 2009
Morning

Duration: 1 hour 30 minutes



INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Answer Booklet.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- 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.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- This document consists of **4** pages. Any blank pages are indicated.

- 1 The lengths of the three sides of a triangle are 6.4 cm, 7.0 cm and 11.3 cm.
- (i) Find the largest angle in the triangle. [3]
 - (ii) Find the area of the triangle. [2]
- 2 The tenth term of an arithmetic progression is equal to twice the fourth term. The twentieth term of the progression is 44.
- (i) Find the first term and the common difference. [4]
 - (ii) Find the sum of the first 50 terms. [2]
- 3 Use logarithms to solve the equation $7^x = 2^{x+1}$, giving the value of x correct to 3 significant figures. [5]
- 4 (i) Find the binomial expansion of $(x^2 - 5)^3$, simplifying the terms. [4]
- (ii) Hence find $\int (x^2 - 5)^3 dx$. [4]
- 5 Solve each of the following equations for $0^\circ \leq x \leq 180^\circ$.
- (i) $\sin 2x = 0.5$ [3]
 - (ii) $2 \sin^2 x = 2 - \sqrt{3} \cos x$ [5]
- 6 The gradient of a curve is given by $\frac{dy}{dx} = 3x^2 + a$, where a is a constant. The curve passes through the points $(-1, 2)$ and $(2, 17)$. Find the equation of the curve. [8]
- 7 The polynomial $f(x)$ is given by $f(x) = 2x^3 + 9x^2 + 11x - 8$.
- (i) Find the remainder when $f(x)$ is divided by $(x + 2)$. [2]
 - (ii) Use the factor theorem to show that $(2x - 1)$ is a factor of $f(x)$. [2]
 - (iii) Express $f(x)$ as a product of a linear factor and a quadratic factor. [3]
 - (iv) State the number of real roots of the equation $f(x) = 0$, giving a reason for your answer. [2]

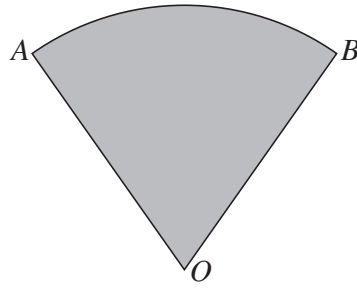


Fig. 1

Fig. 1 shows a sector AOB of a circle, centre O and radius OA . The angle AOB is 1.2 radians and the area of the sector is 60 cm^2 .

- (i) Find the perimeter of the sector. [4]

A pattern on a T-shirt, the start of which is shown in Fig. 2, consists of a sequence of similar sectors. The first sector in the pattern is sector AOB from Fig. 1, and the area of each successive sector is $\frac{3}{5}$ of the area of the previous one.

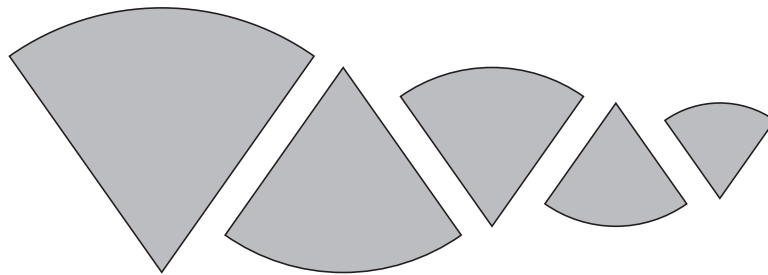


Fig. 2

- (ii) (a) Find the area of the fifth sector in the pattern. [2]
 (b) Find the total area of the first ten sectors in the pattern. [2]
 (c) Explain why the total area will never exceed a certain limit, no matter how many sectors are used, and state the value of this limit. [3]

- 9 (i) Sketch the graph of $y = 4k^x$, where k is a constant such that $k > 1$. State the coordinates of any points of intersection with the axes. [2]

- (ii) The point P on the curve $y = 4k^x$ has its y -coordinate equal to $20k^2$. Show that the x -coordinate of P may be written as $2 + \log_k 5$. [4]

- (iii) (a) Use the trapezium rule, with two strips each of width $\frac{1}{2}$, to find an expression for the approximate value of

$$\int_0^1 4k^x \, dx. \quad [3]$$

- (b) Given that this approximate value is equal to 16, find the value of k . [3]

There are no questions printed on this page.



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