

**ADVANCED SUBSIDIARY GCE**  
**MATHEMATICS**  
Core Mathematics 2  
**QUESTION PAPER**

**4722**

Candidates answer on the Printed Answer Book

**OCR Supplied Materials:**

- Printed Answer Book 4722
- List of Formulae (MF1)

**Other Materials Required:**

- Scientific or graphical calculator

**Friday 22 May 2009**  
**Morning**

**Duration:** 1 hour 30 minutes

**INSTRUCTIONS TO CANDIDATES**

These instructions are the same on the Printed Answer Book and the Question Paper.

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Printed Answer Book.
- **The questions are on the inserted Question Paper.**
- **Write your answer to each question in the space provided in the Printed Answer Book.** Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).
- 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.
- You are permitted to use a graphical calculator in this paper.
- 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.

**INFORMATION FOR CANDIDATES**

This information is the same on the Printed Answer Book and the Question Paper.

- The number of marks is given in brackets [ ] at the end of each question or part question on the Question Paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **4** pages. Any blank pages are indicated.

**INSTRUCTION TO EXAMS OFFICER / INVIGILATOR**

- Do not send this Question Paper for marking; it should be retained in the centre or destroyed.

- 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]

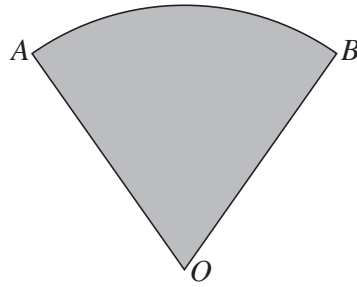


Fig. 1

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  $60 \text{ cm}^2$ .

- (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.

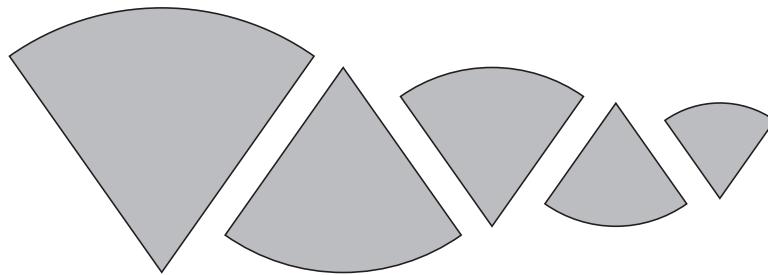


Fig. 2

- (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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**MATHEMATICS**

Core Mathematics 2

**4722**

**PRINTED ANSWER BOOK**

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**Friday 22 May 2009**  
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Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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<b>1 (i)</b>	
<b>1 (ii)</b>	
<b>2 (i)</b>	



<b>4 (i)</b>	

<b>4 (ii)</b>	



<b>5 (i)</b>	
<b>5 (ii)</b>	



<b>7 (i)</b>	
<b>7 (ii)</b>	
<b>7 (iii)</b>	

<b>7 (iv)</b>	
<b>8 (i)</b>	

<b>8 (ii) (a)</b>	
<b>8 (ii) (b)</b>	
<b>8 (ii) (c)</b>	

<b>9 (i)</b>	
<b>9 (ii)</b>	

<b>9(ii)(a)</b>	
<b>9(ii)(b)</b>	

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