

**ADVANCED SUBSIDIARY GCE
MATHEMATICS**

Core Mathematics 2

4722

QUESTION PAPER

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 20 May 2011

Afternoon

Duration: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

These instructions are the same on the printed answer book and the question paper.

- The question paper will be found in the centre of the printed answer book.
- Write your name, centre number and candidate number in the spaces provided on the printed answer book. Please write clearly and in capital letters.
- **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. Make sure 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 scientific or 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

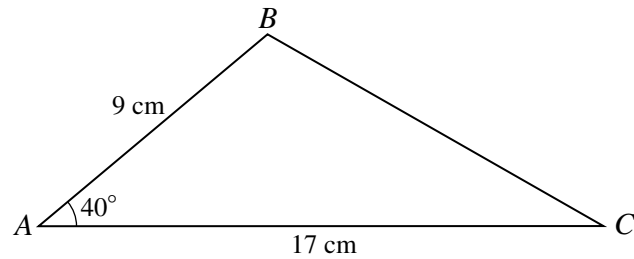
This information is the same on the printed answer book and the question paper.

- 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 diagram shows triangle ABC , with $AB = 9$ cm, $AC = 17$ cm and angle $BAC = 40^\circ$.

(i) Find the length of BC . [2]

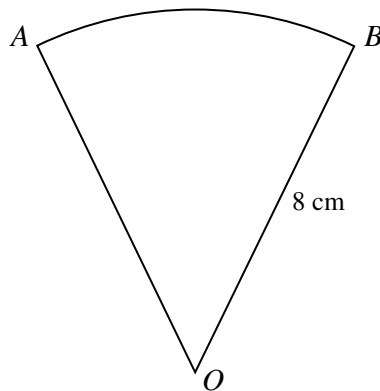
(ii) Find the area of triangle ABC . [2]

(iii) D is the point on AC such that angle $BDA = 63^\circ$. Find the length of BD . [3]

2 (i) Find $\int (6x^{\frac{1}{2}} - 1) dx$. [3]

(ii) Hence find the equation of the curve for which $\frac{dy}{dx} = 6x^{\frac{1}{2}} - 1$ and which passes through the point $(4, 17)$. [3]

3

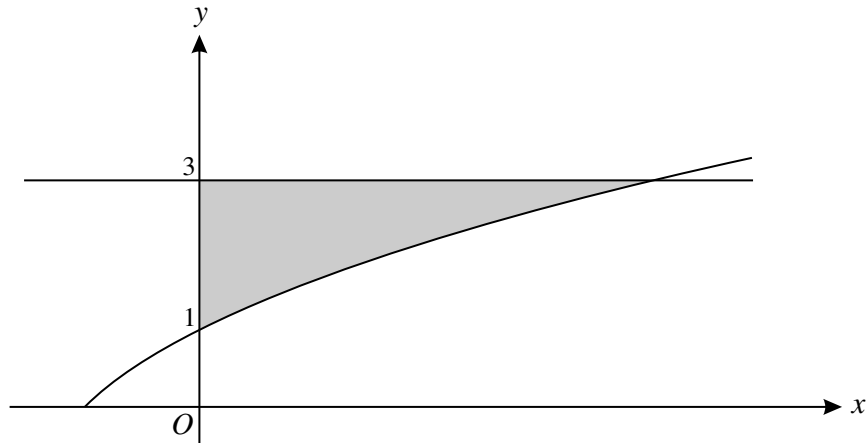


The diagram shows a sector AOB of a circle, centre O and radius 8 cm. The perimeter of the sector is 23.2 cm.

(i) Find angle AOB in radians. [3]

(ii) Find the area of the sector. [2]

4



The diagram shows the curve $y = -1 + \sqrt{x+4}$ and the line $y = 3$.

(i) Show that $y = -1 + \sqrt{x+4}$ can be rearranged as $x = y^2 + 2y - 3$. [2]

(ii) Hence find by integration the exact area of the shaded region enclosed between the curve, the y-axis and the line $y = 3$. [5]

5 The first four terms in the binomial expansion of $(3 + kx)^5$, in ascending powers of x , can be written as $a + bx + cx^2 + dx^3$.

(i) State the value of a . [1]

(ii) Given that $b = c$, find the value of k . [5]

(iii) Hence find the value of d . [2]

6 The cubic polynomial $f(x)$ is defined by $f(x) = x^3 + x^2 - 11x + 10$.

(i) Use the factor theorem to find a factor of $f(x)$. [2]

(ii) Hence solve the equation $f(x) = 0$, giving each root in an exact form. [6]

7 (a) The first term of a geometric progression is 7 and the common ratio is -2 .

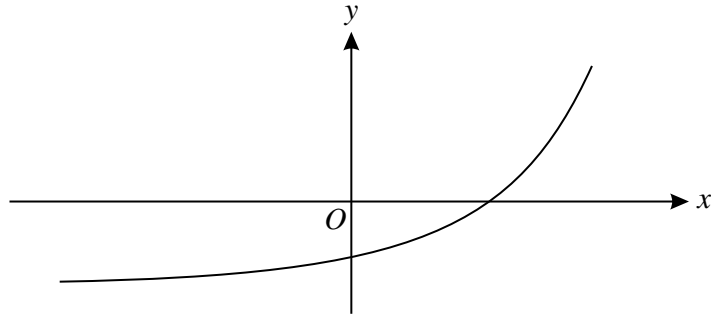
(i) Find the ninth term. [2]

(ii) Find the sum of the first 15 terms. [2]

(b) The first term of an arithmetic progression is 7 and the common difference is -2 . The sum of the first N terms is -2900 . Find the value of N . [5]

[Questions 8 and 9 are printed overleaf.]

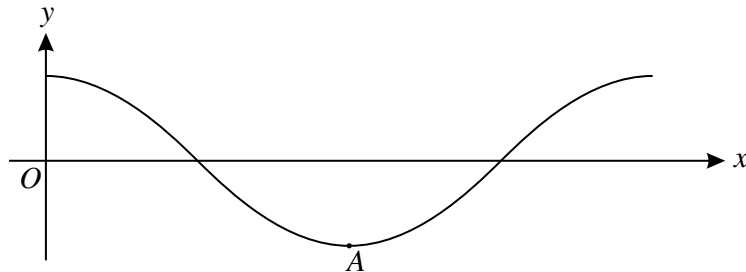
8



The diagram shows the curve $y = 2^x - 3$.

- (i) Describe the geometrical transformation that transforms the curve $y = 2^x$ to the curve $y = 2^x - 3$. [2]
- (ii) State the y -coordinate of the point where the curve $y = 2^x - 3$ crosses the y -axis. [1]
- (iii) Find the x -coordinate of the point where the curve $y = 2^x - 3$ crosses the x -axis, giving your answer in the form $\log_a b$. [2]
- (iv) The curve $y = 2^x - 3$ passes through the point $(p, 62)$. Use logarithms to find the value of p , correct to 3 significant figures. [3]
- (v) Use the trapezium rule, with 2 strips each of width 0.5, to find an estimate for $\int_3^4 (2^x - 3) dx$. Give your answer correct to 3 significant figures. [3]

9 (a)



The diagram shows part of the curve $y = \cos 2x$, where x is in radians. The point A is the minimum point of this part of the curve.

- (i) State the period of $y = \cos 2x$. [1]
- (ii) State the coordinates of A . [2]
- (iii) Solve the inequality $\cos 2x \leq 0.5$ for $0 \leq x \leq \pi$, giving your answers exactly. [4]
- (b) Solve the equation $\cos 2x = \sqrt{3} \sin 2x$ for $0 \leq x \leq \pi$, giving your answers exactly. [4]

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