Friday 18 May 2012 – Morning

AS GCE MATHEMATICS

4722   Core Mathematics 2

QUESTION PAPER

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. HB pencil may be used for graphs and diagrams only.
* Answer **all** the questions.
* Read each question carefully. Make sure you know what you have to do before starting your answer.
* 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.
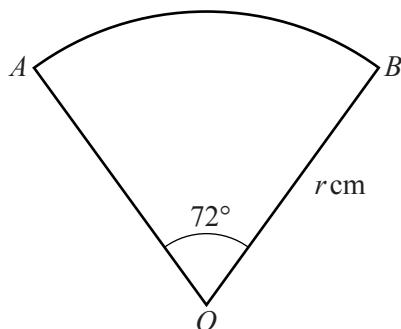* The number of marks is given in brackets **[ ]** at the end of each question or part question on the Question Paper.
* **You are reminded of the need for clear presentation in your answers.**
* The total number of marks for this paper is **72**.
* The Printed Answer Book consists of **12** pages. The 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 recycled. Please contact OCR Copyright should you wish to re-use this document.

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Turn over

1 **(i)** Find the binomial expansion of $(3 + 2x)^5$, simplifying the terms. **[4]**

(ii) Hence find the binomial expansion of $(3 + 2x)^5 + (3 - 2x)^5$. **[2]**

2 **(i)** Find $\int (x^2 - 2x + 5)\, dx$. **[3]**

(ii) Hence find the equation of the curve for which $\dfrac{dy}{dx} = x^2 - 2x + 5$ and which passes through the point (3, 11). **[3]**

3

The diagram shows a sector AOB of a circle, centre O and radius r cm. Angle AOB is $72°$.

(i) Express $72°$ exactly in radians, simplifying your answer. **[1]**

The area of the sector AOB is 45π cm^2.

(ii) Find the value of r. **[2]**

(iii) Find the area of the segment bounded by the arc AB and the chord AB, giving your answer correct to 3 significant figures. **[3]**

4 Solve the equation

$$4\cos^2 x + 7\sin x - 7 = 0,$$

giving all values of x between $0°$ and $360°$. **[6]**

5 **(a)** A sequence $u_1, u_2, u_3, \ldots$ is defined by

$$u_1 = 4 \quad \text{and} \quad u_{n+1} = \frac{2}{u_n} \quad \text{for } n \geq 1.$$

(i) Write down the values of u_2 and u_3. **[2]**

(ii) Describe the behaviour of the sequence. **[1]**

(b) In an arithmetic progression the ninth term is 18 and the sum of the first nine terms is 72. Find the first term and the common difference. **[5]**

6 **(i)** Use the trapezium rule, with 2 strips each of width 4, to show that an approximate value of $\int_1^9 4\sqrt{x}\,dx$ is $32 + 16\sqrt{5}$. **[3]**
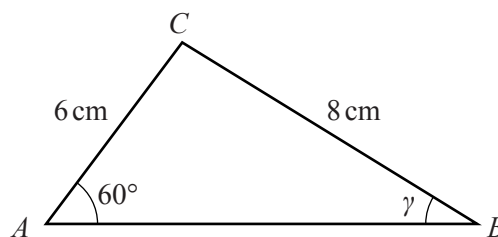
 (ii) Use a sketch graph to explain why the actual value of $\int_1^9 4\sqrt{x}\,dx$ is greater than $32 + 16\sqrt{5}$. **[2]**

 (iii) Use integration to find the exact value of $\int_1^9 4\sqrt{x}\,dx$. **[4]**

7 **(a)** **(i)** Given that α is the acute angle such that $\tan\alpha = \frac{2}{5}$, find the exact value of $\cos\alpha$. **[2]**

 (ii) Given that β is the obtuse angle such that $\sin\beta = \frac{3}{7}$, find the exact value of $\cos\beta$. **[3]**

 (b)

The diagram shows a triangle ABC with $AC = 6\,\text{cm}$, $BC = 8\,\text{cm}$, angle $BAC = 60°$ and angle $ABC = \gamma$. Find the exact value of $\sin\gamma$, simplifying your answer. **[3]**

8 Two cubic polynomials are defined by

$$\text{f}(x) = x^3 + (a-3)x + 2b\,, \quad \text{g}(x) = 3x^3 + x^2 + 5ax + 4b,$$

where a and b are constants.

 (i) Given that $\text{f}(x)$ and $\text{g}(x)$ have a common factor of $(x-2)$, show that $a = -4$ and find the value of b. **[6]**

 (ii) Using these values of a and b, factorise $\text{f}(x)$ fully. Hence show that $\text{f}(x)$ and $\text{g}(x)$ have two common factors. **[5]**

9 **(a)** An arithmetic progression has first term $\log_2 27$ and common difference $\log_2 x$.

 (i) Show that the fourth term can be written as $\log_2 (27x^3)$. **[3]**

 (ii) Given that the fourth term is 6, find the exact value of x. **[2]**

 (b) A geometric progression has first term $\log_2 27$ and common ratio $\log_2 y$.

 (i) Find the set of values of y for which the geometric progression has a sum to infinity. **[2]**

 (ii) Find the exact value of y for which the sum to infinity of the geometric progression is 3. **[5]**

THERE ARE NO QUESTIONS WRITTEN ON THIS PAGE.