Paper Reference(s)

6671

Edexcel GCE

Pure Mathematics P1
(New Syllabus)
Advanced/Advanced Subsidiary

Monday 20 May 2002 − Morning
Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Answer Book (AB16)	Nil
Mathematical Formulae (Lilac)	
Graph paper (ASG2)	

Candidates may only use one of the basic scientific calculators approved by the Qualifications and Curriculum Authority.

Instructions to Candidates

In the boxes on the answer book, write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Pure Mathematics P1), the paper reference (6671), your surname, initials and signature.
When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
This paper has eight questions. Pages 6, 7 and 8 are blank.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner. Answers without working may gain no credit.

1. (a) Find the sum of all the integers between 1 and 1000 which are divisible by 7.

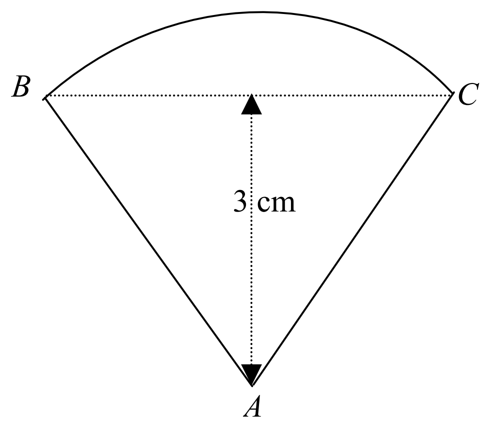
(3)

(b) Hence, or otherwise, evaluate $\sum_{r=1}^{142}(7r+2)$.

(3)

2.

Figure 1



The shape of a badge is a sector *ABC* of a circle with centre *A* and radius *AB*, as shown in Fig 1. The triangle *ABC* is equilateral and has a perpendicular height 3 cm.

(a) Find, in surd form, the length *AB*.

(2)

(b) Find, in terms of π, the area of the badge.

(2)

(c) Prove that the perimeter of the badge is $\frac{2\sqrt{3}}{3}(\pi+6)$ cm.

(3)

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3. Given that $f(x) = 15 - 7x - 2x^2$,

(a) find the coordinates of all points at which the graph of $y = f(x)$ crosses the coordinate axes.

(3)

(b) Sketch the graph of $y = f(x)$.

(2)

(c) Calculate the coordinates of the stationary point of f(x).

(3)

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4. (a) By completing the square, find in terms of k the roots of the equation

$$x^2 + 2kx - 7 = 0.$$

(4)

(b) Prove that, for all values of k, the roots of $x^2 + 2kx - 7 = 0$ are real and different.

(2)

(c) Given that $k = \sqrt{2}$, find the exact roots of the equation.

(2)

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5. $$\text{f}(x) = 5\sin 3x°, \qquad 0 \leq x \leq 180.$$

(a) Sketch the graph of f(x), indicating the value of x at each point where the graph intersects the x-axis

(3)

(b) Write down the coordinates of all the maximum and minimum points of f(x).

(3)

(c) Calculate the values of x for which f(x) = 2.5

(4)

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6. Given that $\text{f}(x) = (2x^{\frac{3}{2}} - 3x^{-\frac{3}{2}})^2 + 5, \quad x > 0,$

(a) find, to 3 significant figures, the value of x for which f(x) =5.

(3)

(b) Show that f(x) may be written in the form $Ax^3 + \dfrac{B}{x^3} + C$, where A, B and C are constants to be found.

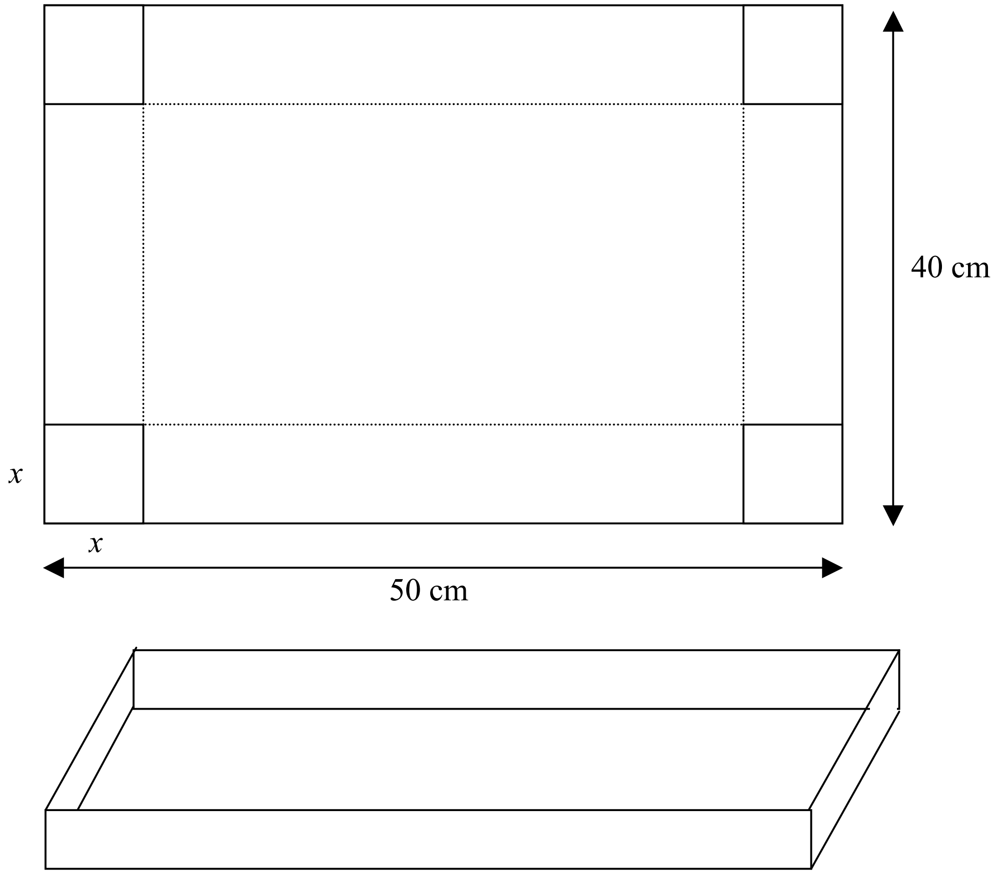
(3)

(c) Hence evaluate $\displaystyle\int_1^2 \text{f}(x) \; \text{d}x$.

(5)

7.

Figure 2



A rectangular sheet of metal measures 50 cm by 40 cm. Squares of side x cm are cut from each corner of the sheet and the remainder is folded along the dotted lines to make an open tray, as shown in Fig. 2.

(a) Show that the volume, V cm^3, of the tray is given by

$$V = 4x(x^2 - 45x + 500).$$

(3)

(b) State the range of possible values of x.

(1)

(c) Find the value of x for which V is a maximum.

(4)

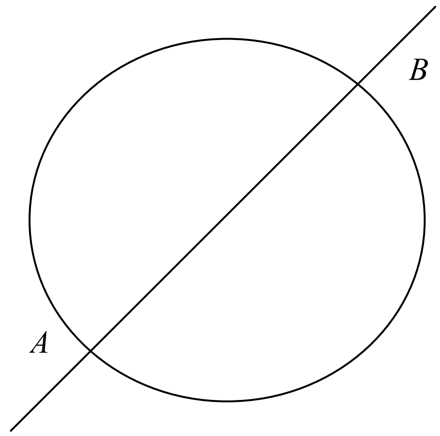
(d) Hence find the maximum value of V.

(2)

(e) Justify that the value of V you found in part (d) is a maximum.

(2)

8. **Figure 3**



The points A(−3, −2) and B(8 , 4) are at the ends of a diameter of the circle shown in Fig. 3.

(a) Find the coordinates of the centre of the circle.

(2)

(b) Find an equation of the diameter *AB*, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(4)

(c) Find an equation of tangent to the circle at *B*.

(3)

The line l passes through *A* and the origin.

(d) Find the coordinates of the point at which l intersects the tangent to the circle at *B*, giving your answer as exact fractions.

(4)

END