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Paper Reference(s)

6671

Edexcel GCE

Pure Mathematics P1

Advanced/Advanced Subsidiary

Thursday 9 January 2003 – Afternoon

Time: 1 hour 30 minutes

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

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 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.

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1. $$y = 7 + 10x^{\frac{3}{2}}.$$

(*a*) Find $\frac{dy}{dx}$.

(2)

(*b*) Find $\int y \ dx$.

(3)

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2. (*a*) Sketch, for $0 \le x \le 360°$, the graph of $y = \sin (x + 30°)$.

(2)

(*b*) Write down the coordinates of the points at which the graph meets the axes.

(3)

(*c*) Solve, for $0 \le x < 360°$, the equation

$$\sin (x + 30°) = -\tfrac{1}{2}.$$

(3)

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3. (*a*) Given that $3^x = 9^{y-1}$, show that $x = 2y - 2$.

(2)

(*b*) Solve the simultaneous equations

$$x = 2y - 2,$$

$$x^2 = y^2 + 7.$$

(6)

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4. A geometric series has first term 1200. Its sum to infinity is 960.

(*a*) Show that the common ratio of the series is $-\frac{1}{4}$.

(3)

(*b*) Find, to 3 decimal places, the difference between the ninth and tenth terms of the series.

(3)

(*c*) Write down an expression for the sum of the first n terms of the series.

(2)

Given that n is odd,

(*d*) prove that the sum of the first n terms of the series is

$$960(1 + 0.25^n).$$

(2)

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5. On a journey, the average speed of a car is v m s^{-1}. For $v \geq 5$, the cost per kilometre, C pence, of the journey is modelled by

$$C = \frac{160}{v} + \frac{v^2}{100}.$$

Using this model,

(*a*) show, by calculus, that there is a value of v for which C has a stationary value, and find this value of v.

(5)

(*b*) Justify that this value of v gives a minimum value of C.

(2)

(*c*) Find the minimum value of C and hence find the minimum cost of a 250 km car journey.

(3)

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6. The straight line l_1 with equation $y = \frac{3}{2}x - 2$ crosses the y-axis at the point P. The point Q has coordinates $(5, -3)$.

(a) Calculate the coordinates of the mid-point of PQ.

(3)

The straight line l_2 is perpendicular to l_1 and passes through Q.

(b) Find an equation for l_2 in the form $ax + by = c$, where a, b and c are integer constants.

(4)

The lines l_1 and l_2 intersect at the point R.

(c) Calculate the exact coordinates of R.

(4)

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7. **Figure 1**

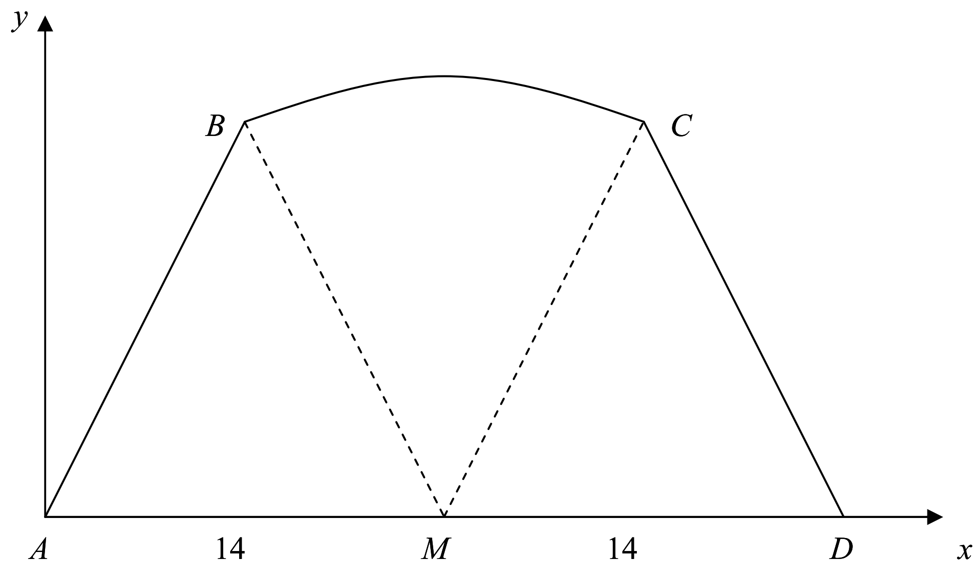

Figure 1 shows the cross-section *ABCD* of a chocolate bar, where *AB, CD* and *AD* are straight lines and *M* is the mid-point of *AD*. The length *AD* is 28 mm, and *BC* is an arc of a circle with centre *M*.

Taking *A* as the origin, *B*, *C* and *D* have coordinates (7, 24), (21, 24) and (28, 0) respectively.

(*a*) Show that the length of *BM* is 25 mm.

(1)

(*b*) Show that, to 3 significant figures, $\angle BMC = 0.568$ radians.

(3)

(*c*) Hence calculate, in mm^2, the area of the cross-section of the chocolate bar.

(5)

Given that this chocolate bar has length 85 mm,

(*d*) calculate, to the nearest cm^3, the volume of the bar.

(2)

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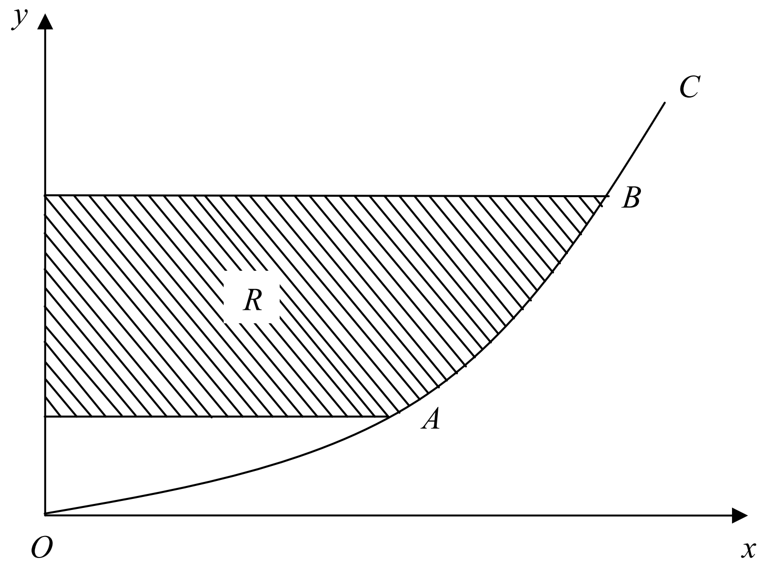
8. **Figure 2**



The curve C, shown in Fig. 2, represents the graph of

$$y = \frac{x^2}{25}, \quad x \geq 0.$$

The points A and B on the curve C have x-coordinates 5 and 10 respectively.

(a) Write down the y-coordinates of A and B.

(1)

(b) Find an equation of the tangent to C at A.

(4)

The finite region R is enclosed by C, the y-axis and the lines through A and B parallel to the x-axis.

(c) For points (x, y) on C, express x in terms of y.

(2)

(d) Use integration to find the area of R.

(5)

END