Paper Reference (complete below)	Centre No.	Surname	Initial(s)
6663/01	Candidate No.	Signature	

Paper Reference(s)

6663

Edexcel GCE

Core Mathematics C2

Advanced Subsidiary

Set A: Practice Paper 4

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
Total	

Materials required for examination
Mathematical Formulae

Items included with question papers
Nil

Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and/or integration. Thus candidates may NOT use calculators such as the Texas Instruments TI-89, TI-92, Casio *cfx* 9970G, Hewlett Packard HP 48G.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature. You must write your answer for each question in the space following the question. If you need more space to complete your answer to any question, use additional answer sheets.

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.

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.

Turn over

1. (a) Using the factor theorem, show that $(x + 3)$ is a factor of

$$x^3 - 3x^2 - 10x + 24.$$ **(2 marks)**

(b) Factorise $x^3 - 3x^2 - 10x + 24$ completely. **(4 marks)**

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2. $$\text{f}(n) = n^3 + pn^2 + 11n + 9, \text{ where } p \text{ is a constant.}$$

(a) Given that f(n) has a remainder of 3 when it is divided by $(n + 2)$, prove that $p = 6$.
(2 marks)

(b) Show that f(n) can be written in the form $(n + 2)(n + q)(n + r) + 3$, where q and r are integers to be found. **(3 marks)**

(c) Hence show that f(n) is divisible by 3 for all positive integer values of n. **(2 marks)**

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3. Find the values of θ, to 1 decimal place, in the interval $-180 \leq \theta < 180$ for which

$$2\sin^2\theta° - 2\sin\theta° = \cos^2\theta°.$$ **(8 marks)**

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4. Every £1 of money invested in a savings scheme continuously gains interest at a rate of 4% per year. Hence, after x years, the total value of an initial £1 investment is £y, where

$$y = 1.04^x.$$

(a) Sketch the graph of $y = 1.04^x$, $x \geq 0$. **(2 marks)**

(b) Calculate, to the nearest £, the total value of an initial £800 investment after 10 years.
(2 marks)

(c) Use logarithms to find the number of years it takes to double the total value of any initial investment. **(3 marks)**

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5. The curve C with equation $y = p + qe^x$, where p and q are constants, passes through the point (0, 2). At the point P (ln 2, $p + 2q$ on C, the gradient is 5.

(*a*) Find the value of p and the value of q. **(5 marks)**

The normal to C at P crosses the x-axis at L and the y-axis at M.

(*b*) Show that the area of ΔOLM, where O is the origin, is approximately 53.8 **(5 marks)**

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6. **Figure 3**

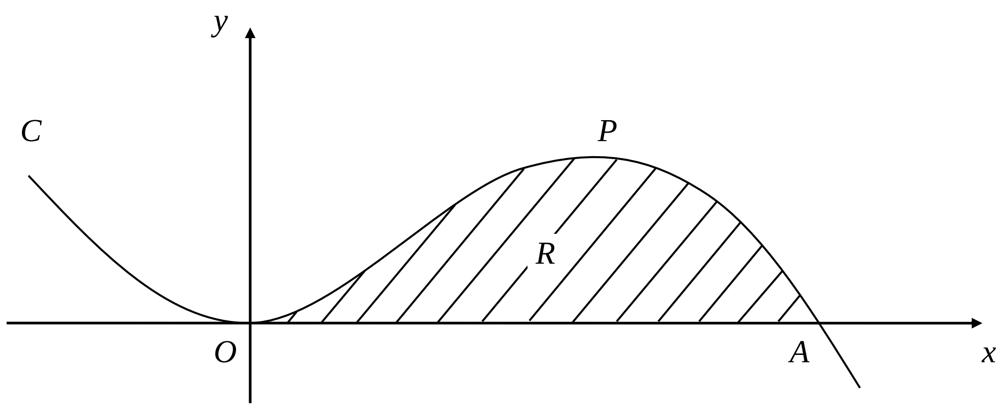

Figure 3 shows part of the curve C with equation

$$y = \tfrac{3}{2}x^2 - \tfrac{1}{4}x^3.$$

The curve C touches the x-axis at the origin and passes through the point $A(p, 0)$.

(*a*) Show that $p = 6$. **(1 marks)**

(*b*) Find an equation of the tangent to C at A. **(4 marks)**

The curve C has a maximum at the point P.

(*c*) Find the x-coordinate of P. **(2 marks)**

The shaded region R, in Fig. 3, is bounded by C and the x-axis.

(*d*) Find the area of R. **(4 marks)**

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7. **Figure 1**

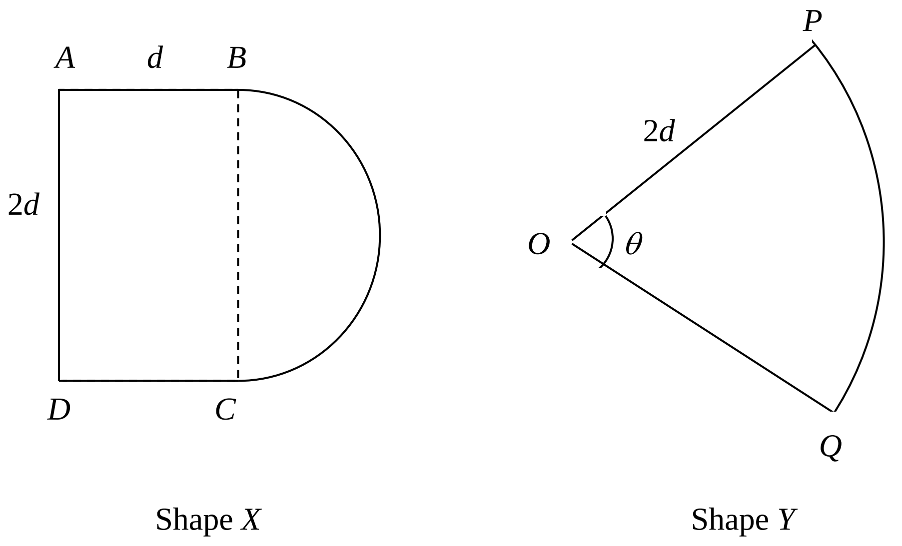

Figure 1 shows the cross-sections of two drawer handles.

Shape X is a rectangle $ABCD$ joined to a semicircle with BC as diameter. The length $AB = d$ cm and $BC = 2d$ cm.

Shape Y is a sector OPQ of a circle with centre O and radius $2d$ cm.
Angle POQ is θ radians.

Given that the areas of the shapes X and Y are equal,

(*a*) prove that $\theta = 1 + \frac{1}{4}\pi$. **(5 marks)**

Using this value of θ, and given that $d = 3$, find in terms of π,

(*b*) the perimeter of shape X, **(2 marks)**

(*c*) the perimeter of shape Y. **(3 marks)**

(*d*) Hence find the difference, in mm, between the perimeters of shapes X and Y. **(2 marks)**

8. $$f(x) = \left(1 + \frac{x}{k}\right)^n, \qquad k, n \in \mathbb{N}, \qquad n > 2.$$

Given that the coefficient of x^3 is twice the coefficient of x^2 in the binomial expansion of f(x),

(a) prove that $n = 6k + 2$. **(3 marks)**

Given also that the coefficients of x^4 and x^5 are equal and non-zero,

(b) form another equation in n and k and hence show that $k = 2$ and $n = 14$. **(4 marks)**

Using these values of k and n,

(c) expand f(x) in ascending powers of x, up to and including the term in x^5. Give each coefficient as an exact fraction in its lowest terms **(4 marks)**

END