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 5

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 seven 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

Edexcel
Success through qualifications

1. $\mathrm{f}(x) \equiv ax^3 + bx^2 - 7x + 14$, where a and b are constants.

Given that when $\mathrm{f}(x)$ is divided by $(x - 1)$ the remainder is 9,

(*a*) write down an equation connecting a and b. **(2 marks)**

Given also that $(x + 2)$ is a factor of $\mathrm{f}(x)$,

(*b*) find the values of a and b. **(4 marks)**

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2. (i) Differentiate with respect to x

$$2x^3 + \sqrt{x} + \frac{x^2 + 2x}{x^2}.$$

(5 marks)

(ii) Evaluate

$$\int_1^4 \left(\frac{x}{2} + \frac{1}{x^2} \right) \mathrm{d}x.$$

(5 marks)

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3. (*a*) An arithmetic series has first term a and common difference d. Prove that the sum of the first n terms of the series is

$$\tfrac{1}{2} n[2a + (n - 1)d].$$

(4 marks)

A company made a profit of £54 000 in the year 2001. A model for future performance assumes that yearly profits will increase in an arithmetic sequence with common difference £d. This model predicts total profits of £619 200 for the 9 years 2001 to 2009 inclusive.

(*b*) Find the value of d. **(4 marks)**

Using your value of d,

(*c*) find the predicted profit for the year 2011. **(2 marks)**

An alternative model assumes that the company's yearly profits will increase in a geometric sequence with common ratio 1.06. Using this alternative model and again taking the profit in 2001 to be £54 000,

(*d*) find the predicted profit for the year 2011.

(3 marks)

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4. (*a*) Write down formulae for sin (A + B) and sin (A – B).

Using X = A + B and Y = A – B, prove that

$$\text{Sin } X + \sin Y = 2 \sin \frac{X+Y}{2} \cos \frac{X-Y}{2}.$$

(4 marks)

(*b*) Hence, or otherwise, solve, for $0 \leq \theta < 360$,

$$\sin 40° + \sin 20° = 0.$$

(5 marks)

5. **Figure 1**

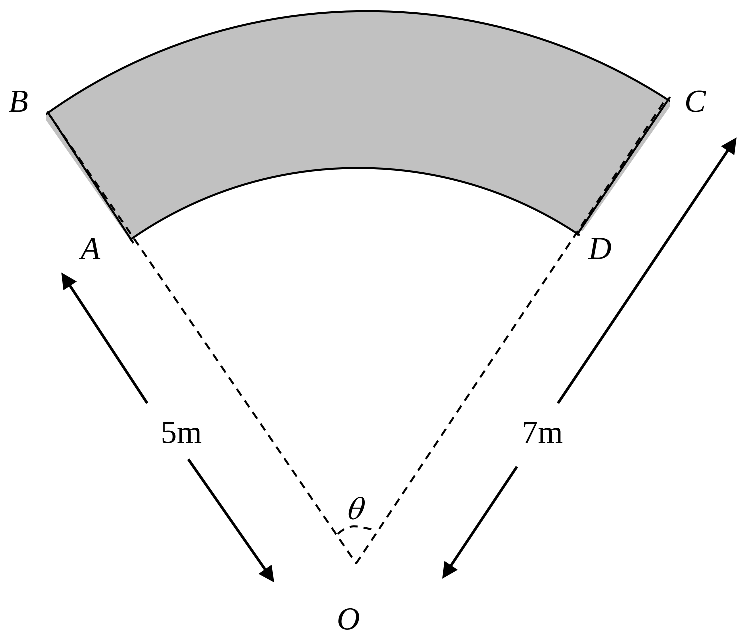

Figure 1 shows a gardener's design for the shape of a flower bed with perimeter *ABCD*.

AD is an arc of a circle with centre *O* and radius 5 m.

BC is an arc of a circle with centre *O* and radius 7 m.

OAB and *ODC* are straight lines and the size of $\angle AOD$ is θ radians.

(*a*) Find, in terms of θ, an expression for the area of the flower bed. **(3 marks)**

Given that the area of the flower bed is 15 m^2,

(*b*) show that θ = 1.25, **(2 marks)**

(*c*) calculate, in m, the perimeter of the flower bed. **(3 marks)**

The gardener now decides to replace arc *AD* with the straight line *AD*.

(*d*) Find, to the nearest cm, the reduction in the perimeter of the flower bed. **(2 marks)**

6. (*a*) Given that

$$(2+x)^5 + (2-x)^5 \equiv A + Bx^2 + Cx^4,$$

Find the values of the constants A, B and C. **(6 marks)**

(*b*) Using the substitution $y = x^2$ and your answers to part (a), solve,

$$(2+x)^5 + (2-x)^5 = 349\,.$$ **(5 marks)**

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7. **Figure 2**

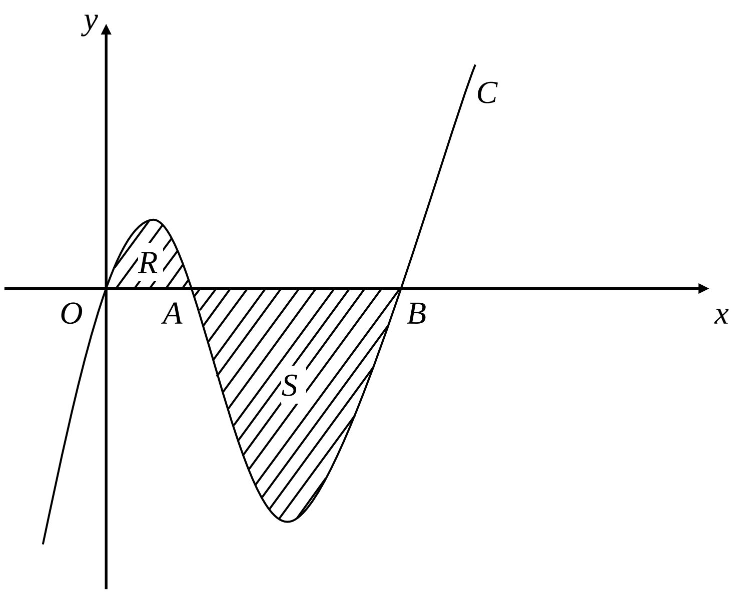

Figure 2 shows part of the curve C with equation $y = \mathrm{f}(x)$, where

$$\mathrm{f}(x) = x^3 - 6x^2 + 5x.$$

The curve crosses the x-axis at the origin O and at the points A and B.

(*a*) Factorise $\mathrm{f}(x)$ completely **(3 marks)**

(*b*) Write down the x-coordinates of the points A and B. **(1 marks)**

(*c*) Find the gradient of C at A. **(3 marks)**

The region R is bounded by C and the line OA, and the region S is bounded by C and the line AB.

(*d*) Use integration to find the area of the combined regions R and S, shown shaded in Fig. 2. **(7 marks)**

END