

Paper Reference(s)

**6664/01**

**Edexcel GCE**

**Core Mathematics C2**

**Advanced Subsidiary**

**Wednesday 9 June 2010 – Afternoon**

**Time: 1 hour 30 minutes**

**Materials required for examination**

Mathematical Formulae (Pink)

**Items included with question papers**

Nil

**Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulas stored in them.**

**Instructions to Candidates**

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Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C2), the paper reference (6664), your surname, initials and signature.

**Information for Candidates**

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A booklet 'Mathematical Formulae and Statistical Tables' is provided.  
Full marks may be obtained for answers to ALL questions.  
There are 10 questions in this question paper. The total mark for this paper is 75.

**Advice to Candidates**

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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 not gain full credit.

1.

$$y = 3^x + 2x.$$

(a) Complete the table below, giving the values of  $y$  to 2 decimal places.

$x$	0	0.2	0.4	0.6	0.8	1
$y$	1	1.65				5

(2)

(b) Use the trapezium rule, with all the values of  $y$  from your table, to find an approximate value for  $\int_0^1 (3^x + 2x) dx$ .

(4)

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2.

$$f(x) = 3x^3 - 5x^2 - 58x + 40.$$

(a) Find the remainder when  $f(x)$  is divided by  $(x - 3)$ .

(2)

Given that  $(x - 5)$  is a factor of  $f(x)$ ,

(b) find all the solutions of  $f(x) = 0$ .

(5)

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3.

$$y = x^2 - k\sqrt{x}, \quad \text{where } k \text{ is a constant.}$$

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

(2)

(b) Given that  $y$  is decreasing at  $x = 4$ , find the set of possible values of  $k$ .

(2)

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4. (a) Find the first 4 terms, in ascending powers of  $x$ , of the binomial expansion of  $(1 + ax)^7$ , where  $a$  is a constant. Give each term in its simplest form.

(4)

Given that the coefficient of  $x^2$  in this expansion is 525,

(b) find the possible values of  $a$ .

(2)

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5. (a) Given that  $5 \sin \theta = 2 \cos \theta$ , find the value of  $\tan \theta$ . (1)
- (b) Solve, for  $0 \leq x < 360^\circ$ ,

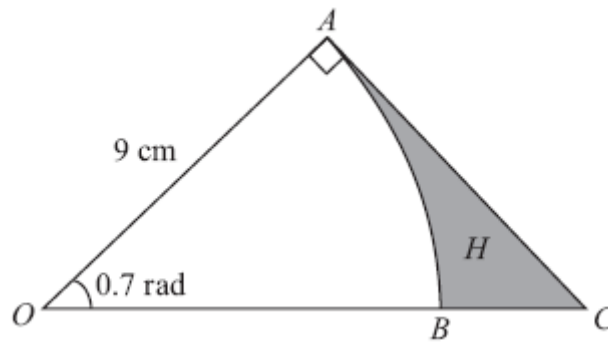
$$5 \sin 2x = 2 \cos 2x,$$

giving your answers to 1 decimal place.

(5)

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6.



**Figure 1**

Figure 1 shows the sector  $OAB$  of a circle with centre  $O$ , radius 9 cm and angle 0.7 radians.

- (a) Find the length of the arc  $AB$ . (2)
- (b) Find the area of the sector  $OAB$ . (2)

The line  $AC$  shown in Figure 1 is perpendicular to  $OA$ , and  $OBC$  is a straight line.

- (c) Find the length of  $AC$ , giving your answer to 2 decimal places. (2)

The region  $H$  is bounded by the arc  $AB$  and the lines  $AC$  and  $CB$ .

- (d) Find the area of  $H$ , giving your answer to 2 decimal places. (3)
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7. (a) Given that

$$2 \log_3(x - 5) - \log_3(2x - 13) = 1,$$

show that  $x^2 - 16x + 64 = 0$ .

(5)

(b) Hence, or otherwise, solve  $2 \log_3(x - 5) - \log_3(2x - 13) = 1$ .

(2)

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8.

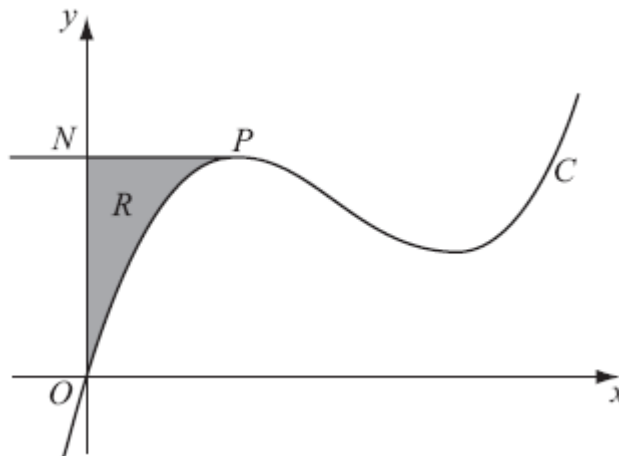


Figure 2

Figure 2 shows a sketch of part of the curve  $C$  with equation

$$y = x^3 - 10x^2 + kx,$$

where  $k$  is a constant.

The point  $P$  on  $C$  is the maximum turning point.

Given that the  $x$ -coordinate of  $P$  is 2,

(a) show that  $k = 28$ .

(3)

The line through  $P$  parallel to the  $x$ -axis cuts the  $y$ -axis at the point  $N$ .

The region  $R$  is bounded by  $C$ , the  $y$ -axis and  $PN$ , as shown shaded in Figure 2.

(b) Use calculus to find the exact area of  $R$ .

(6)

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9. The adult population of a town is 25 000 at the end of Year 1.

A model predicts that the adult population of the town will increase by 3% each year, forming a geometric sequence.

(a) Show that the predicted adult population at the end of Year 2 is 25 750. (1)

(b) Write down the common ratio of the geometric sequence. (1)

The model predicts that Year  $N$  will be the first year in which the adult population of the town exceeds 40 000.

(c) Show that 
$$(N - 1) \log 1.03 > \log 1.6$$
 (3)

(d) Find the value of  $N$ . (2)

At the end of each year, each member of the adult population of the town will give £1 to a charity fund.

Assuming the population model,

(e) find the total amount that will be given to the charity fund for the 10 years from the end of Year 1 to the end of Year 10, giving your answer to the nearest £1000. (3)

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10. The circle  $C$  has centre  $A(2,1)$  and passes through the point  $B(10, 7)$  .

(a) Find an equation for  $C$ .

(4)

The line  $l_1$  is the tangent to  $C$  at the point  $B$ .

(b) Find an equation for  $l_1$ .

(4)

The line  $l_2$  is parallel to  $l_1$  and passes through the mid-point of  $AB$ .

Given that  $l_2$  intersects  $C$  at the points  $P$  and  $Q$ ,

(c) find the length of  $PQ$ , giving your answer in its simplest surd form.

(3)

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**TOTAL FOR PAPER: 75 MARKS**

**END**