

Paper Reference(s)

**6664/01**

**Edexcel GCE  
Core Mathematics C2  
Advanced Subsidiary Level**

**Monday 21 May 2007 – Morning  
Time: 1 hour 30 minutes**

**Materials required for examination**

Mathematical Formulae (Green)

**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**

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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 gain no credit.

1. Evaluate  $\int_1^8 \frac{1}{\sqrt{x}} dx$ , giving your answer in the form  $a + b\sqrt{2}$ , where  $a$  and  $b$  are integers. (4)
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2.  $f(x) = 3x^3 - 5x^2 - 16x + 12$ .
- (a) Find the remainder when  $f(x)$  is divided by  $(x - 2)$ . (2)

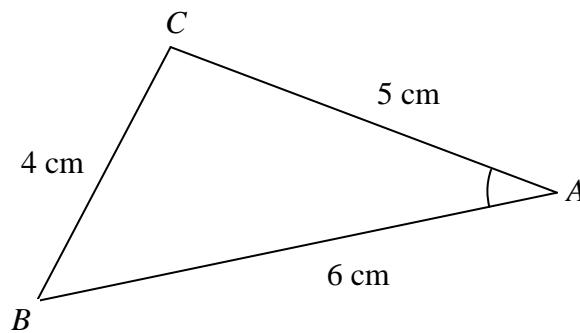
Given that  $(x + 2)$  is a factor of  $f(x)$ ,

- (b) factorise  $f(x)$  completely. (4)
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3. (a) Find the first four terms, in ascending powers of  $x$ , in the binomial expansion of  $(1 + kx)^6$ , where  $k$  is a non-zero constant. (3)

Given that, in this expansion, the coefficients of  $x$  and  $x^2$  are equal, find

- (b) the value of  $k$ , (2)
- (c) the coefficient of  $x^3$ . (1)
- 

4.



**Figure 1**

Figure 1 shows the triangle  $ABC$ , with  $AB = 6$  cm,  $BC = 4$  cm and  $CA = 5$  cm.

- (a) Show that  $\cos A = \frac{3}{4}$ . (3)
- (b) Hence, or otherwise, find the exact value of  $\sin A$ . (2)
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5. The curve  $C$  has equation

$$y = x\sqrt{x^3 + 1}, \quad 0 \leq x \leq 2.$$

- (a) Copy and complete the table below, giving the values of  $y$  to 3 decimal places at  $x = 1$  and  $x = 1.5$ .

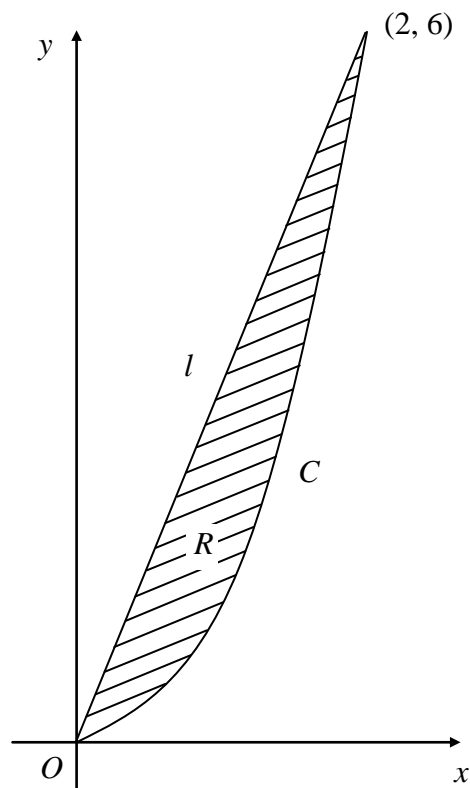
$x$	0	0.5	1	1.5	2
$y$	0	0.530			6

(2)

- (b) Use the trapezium rule, with all the  $y$  values from your table, to find an approximation for the

value of  $\int_0^2 x\sqrt{x^3 + 1} \, dx$ , giving your answer to 3 significant figures.

(4)



**Figure 2**

Figure 2 shows the curve  $C$  with equation  $y = x\sqrt{x^3 + 1}$ ,  $0 \leq x \leq 2$ , and the straight line segment  $l$ , which joins the origin and the point  $(2, 6)$ . The finite region  $R$  is bounded by  $C$  and  $l$ .

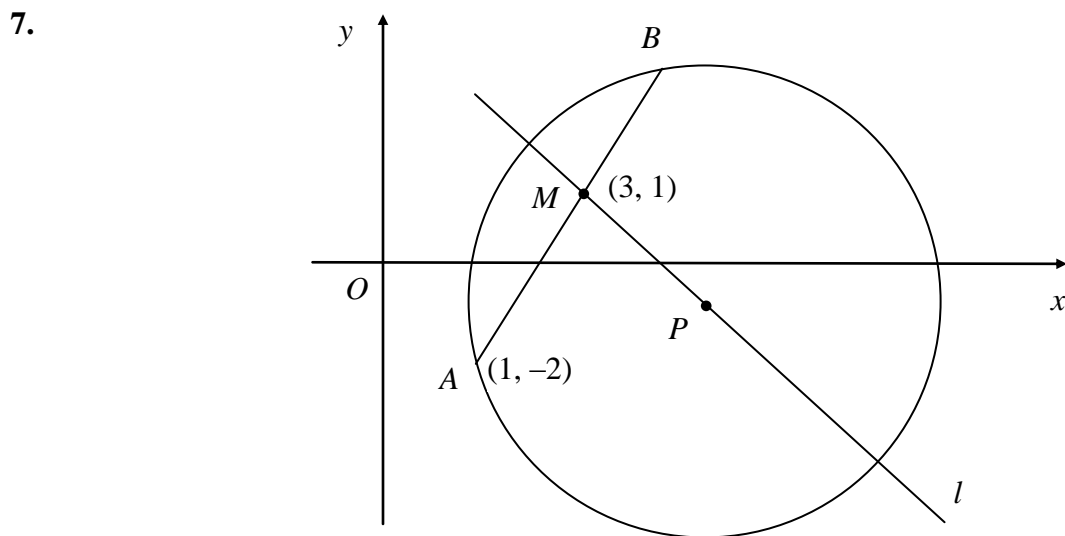
- (c) Use your answer to part (b) to find an approximation for the area of  $R$ , giving your answer to 3 significant figures.

(4)

6. (a) Find, to 3 significant figures, the value of  $x$  for which  $8^x = 0.8$ . (2)
- (b) Solve the equation

$$2 \log_3 x - \log_3 7x = 1. \quad (4)$$


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**Figure 3**

The points  $A$  and  $B$  lie on a circle with centre  $P$ , as shown in Figure 3.  
 The point  $A$  has coordinates  $(1, -2)$  and the mid-point  $M$  of  $AB$  has coordinates  $(3, 1)$ .  
 The line  $l$  passes through the points  $M$  and  $P$ .

- (a) Find an equation for  $l$ . (4)

Given that the  $x$ -coordinate of  $P$  is 6,

- (b) use your answer to part (a) to show that the  $y$ -coordinate of  $P$  is  $-1$ , (1)

- (c) find an equation for the circle. (4)
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8. A trading company made a profit of £50 000 in 2006 (Year 1).

A model for future trading predicts that profits will increase year by year in a geometric sequence with common ratio  $r$ ,  $r > 1$ .

The model therefore predicts that in 2007 (Year 2) a profit of £50 000 $r$  will be made.

- (a) Write down an expression for the predicted profit in Year  $n$ . (1)

The model predicts that in Year  $n$ , the profit made will exceed £200 000.

- (b) Show that  $n > \frac{\log 4}{\log r} + 1$ . (3)

Using the model with  $r = 1.09$ ,

- (c) find the year in which the profit made will first exceed £200 000, (2)
- (d) find the total of the profits that will be made by the company over the 10 years from 2006 to 2015 inclusive, giving your answer to the nearest £10 000. (3)
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9. (a) Sketch, for  $0 \leq x \leq 2\pi$ , the graph of  $y = \sin\left(x + \frac{\pi}{6}\right)$ . (2)

- (b) Write down the exact coordinates of the points where the graph meets the coordinate axes. (3)

- (c) Solve, for  $0 \leq x \leq 2\pi$ , the equation

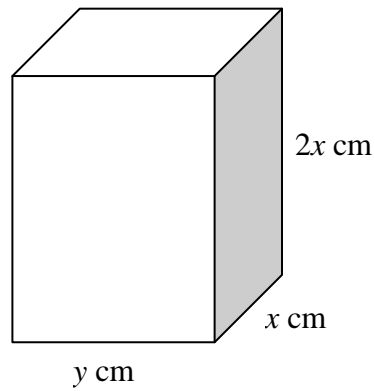
$$\sin\left(x + \frac{\pi}{6}\right) = 0.65,$$

giving your answers in radians to 2 decimal places.

(5)

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10.



**Figure 4**

Figure 4 shows a solid brick in the shape of a cuboid measuring  $2x$  cm by  $x$  cm by  $y$  cm.

The total surface area of the brick is  $600 \text{ cm}^2$ .

(a) Show that the volume,  $V \text{ cm}^3$ , of the brick is given by

$$V = 200x - \frac{4x^3}{3}. \quad (4)$$

Given that  $x$  can vary,

(b) use calculus to find the maximum value of  $V$ , giving your answer to the nearest  $\text{cm}^3$ . (5)

(c) Justify that the value of  $V$  you have found is a maximum. (2)

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**TOTAL FOR PAPER: 75 MARKS**

**END**