

**Edexcel C2 Specimen Paper**

**Answer all questions. Time : 1 hour 30 minutes**

1. Find the first 3 terms, in ascending powers of  $x$ , of the binomial expansion of  $(2+3x)^6$ .  
(4)
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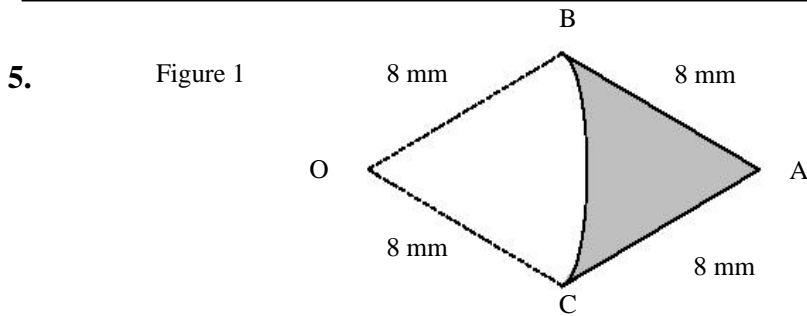
2. The circle  $C$  has centre  $(3, 4)$  and passes through the point  $(8, -8)$ . Find an equation for  $C$ .  
(4)
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3. The trapezium rule, with the table below, was used to estimate the area between the curve  $y = \sqrt{x^3 + 1}$ , the lines  $x = 1$ ,  $x = 3$  and the  $x$ -axis.

$x$	1	1.5	2	2.5	3
$y$	1.414	2.092	3.000		

- (a) Calculate, to 3 decimal places, the values of  $y$  for  $x = 2.5$  and  $x = 3$ . (2)
- (b) Use the values from the table and your answers to part (a) to find an estimate, to 2 decimal places, for this area. (4)
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4. Solve, for  $0 \leq x < 360^\circ$ , the equation  $3 \sin^2 x = 1 + \cos x$ , giving your answers to the nearest degree. (7)
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The shaded area in Fig. 1 shows a badge  $ABC$ , where  $AB$  and  $AC$  are straight lines, with  $AB = AC = 8$  mm. The curve  $BC$  is an arc of a circle, centre  $O$ , where  $OB = OC = 8$  mm and  $O$  is in the same plane as  $ABC$ . The angle  $BAC$  is 0.9 radians.

- (a) Find the perimeter of the badge. (2)
- (b) Find the area of the badge. (5)
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6. At the beginning of the year 2000 a company bought a new machine for £15 000. Each year the value of the machine decreases by 20% of its value at the start of the year.

- (a) Show that at the start of the year 2002, the value of the machine was £9600. (2)

When the value of the machine falls below £500, the company will replace it.

- (b) Find the year in which the machine will be replaced. (4)

To plan for a replacement machine, the company pays £1000 at the start of each year into a savings account. The account pays interest at a fixed rate of 5% per annum. The first payment was made when the machine was first bought and the last payment will be made at the start of the year in which the machine is replaced.

- (c) Using your answer to part (b), find how much the savings account will be worth immediately after the payment at the start of the year in which the machine is replaced. (4)

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7. (a) Use the factor theorem to show that  $(x + 1)$  is a factor of  $x^3 - x^2 - 10x - 8$ . (2)

- (b) Find all the solutions of the equation  $x^3 - x^2 - 10x - 8 = 0$ . (4)

- (c) Prove that the value of  $x$  that satisfies

$$2 \log_2 x + \log_2 (x - 1) = 1 + \log_2 (5x + 4) \quad (\text{I})$$

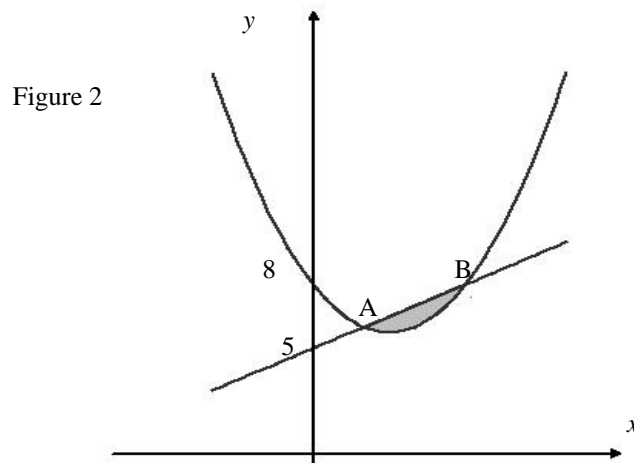
is a solution of the equation

$$x^3 - x^2 - 10x - 8 = 0. \quad (4)$$

- (d) State, with a reason, the value of  $x$  that satisfies equation (I). (2)

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8.



The line with equation  $y = x + 5$  cuts the curve with equation  $y = x^2 - 3x + 8$  at the points  $A$  and  $B$ , as shown in Fig. 2.

- (a) Find the coordinates of the points  $A$  and  $B$ . (5)

- (b) Find the area of the shaded region between the curve and the line, as shown in Fig. 2. (7)

9.

Figure 3

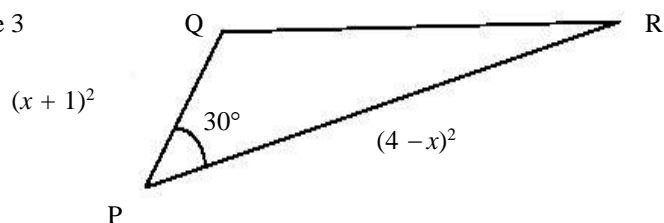


Figure 3 shows a triangle  $PQR$ . The size of angle  $QPR$  is  $30^\circ$ , the length of  $PQ$  is  $(x + 1)$  and the length of  $PR$  is  $(4 - x)^2$ , where  $X \in \mathfrak{R}$ .

- (a) Show that the area  $A$  of the triangle is given by  $A = \frac{1}{4}(x^3 - 7x^2 + 8x + 16)$  (3)
- (b) Use calculus to prove that the area of  $\triangle PQR$  is a maximum when  $x = \frac{2}{3}$ .  
Explain clearly how you know that this value of  $x$  gives the maximum area. (6)
- (c) Find the maximum area of  $\triangle PQR$ . (1)
- (d) Find the length of  $QR$  when the area of  $\triangle PQR$  is a maximum. (3)

**END**