

Write your name here

Surname

Other names

**Pearson Edexcel**  
International  
Advanced Level

Centre Number

Candidate Number

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# Core Mathematics C1

## Advanced Subsidiary



Monday 13 January 2014 – Morning  
**Time: 1 hour 30 minutes**

Paper Reference  
**6663A/01**

**You must have:**

Mathematical Formulae and Statistical Tables (Pink)

Total Marks

**Calculators may NOT be used in this examination.**

### Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B). Coloured pencils and highlighter pens must not be used.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.

### Information

- The total mark for this paper is 75.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

**Turn over ▶**

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## 1. Simplify fully

$$(a) \quad (2\sqrt{x})^2 \quad (1)$$

$$(b) \frac{5 + \sqrt{7}}{2 + \sqrt{7}} \quad (3)$$



### **Question 1 continued**

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Q1

(Total 4 marks)



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2.  $y = 2x^2 - \frac{4}{\sqrt{x}} + 1, \quad x > 0$

- (a) Find  $\frac{dy}{dx}$ , giving each term in its simplest form. (3)

(b) Find  $\frac{d^2y}{dx^2}$ , giving each term in its simplest form. (2)



## **Question 2 continued**

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Q2

(Total 5 marks)



### **3. Solve the simultaneous equations**

$$x - 2y - 1 = 0$$

$$x^2 + 4y^2 - 10x + 9 = 0$$

(7)

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### **Question 3 continued**

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Q3

(Total 7 marks)



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4.

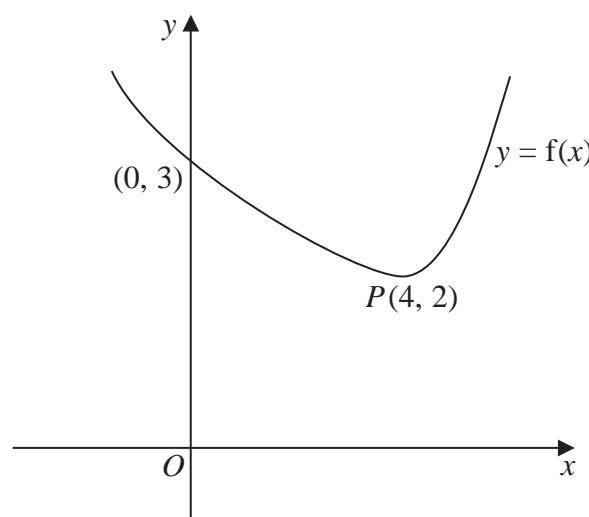
**Figure 1**

Figure 1 shows a sketch of a curve with equation  $y = f(x)$ .

The curve crosses the  $y$ -axis at  $(0, 3)$  and has a minimum at  $P(4, 2)$ .

On separate diagrams, sketch the curve with equation

- (a)  $y = f(x + 4)$ , (2)  
(b)  $y = 2f(x)$ . (2)

On each diagram, show clearly the coordinates of the minimum point and any point of intersection with the  $y$ -axis.



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**Question 4 continued**

**Q4**

**(Total 4 marks)**



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5. Given that for all positive integers  $n$ ,

$$\sum_{r=1}^n a_r = 12 + 4n^2$$

- (a) find the value of  $\sum_{r=1}^5 a_r$  (2)

(b) Find the value of  $a_6$  (3)



### **Question 5 continued**

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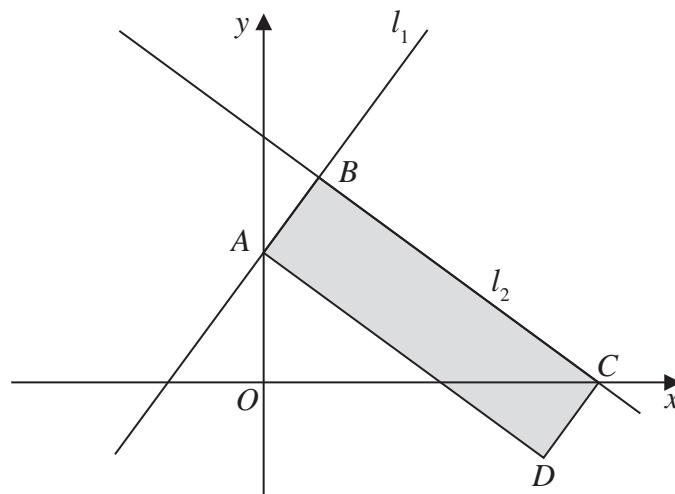
Q5

(Total 5 marks)



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6.

**Figure 2**

The straight line  $l_1$  has equation  $2y = 3x + 7$

The line  $l_1$  crosses the  $y$ -axis at the point  $A$  as shown in Figure 2.

- (a) (i) State the gradient of  $l_1$   
(ii) Write down the coordinates of the point  $A$ .

(2)

Another straight line  $l_2$  intersects  $l_1$  at the point  $B$  (1, 5) and crosses the  $x$ -axis at the point  $C$ , as shown in Figure 2.

Given that  $\angle ABC = 90^\circ$ ,

- (b) find an equation of  $l_2$  in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers.

(4)

The rectangle  $ABCD$ , shown shaded in Figure 2, has vertices at the points  $A$ ,  $B$ ,  $C$  and  $D$ .

- (c) Find the exact area of rectangle  $ABCD$ .

(5)

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### **Question 6 continued**

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### **Question 6 continued**

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## **Question 6 continued**

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Q6

(Total 11 marks)



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7. Shelim starts his new job on a salary of £14 000. He will receive a rise of £1500 a year for each full year that he works, so that he will have a salary of £15 500 in year 2, a salary of £17 000 in year 3 and so on. When Shelim's salary reaches £26 000, he will receive no more rises. His salary will remain at £26 000.

- (a) Show that Shelim will have a salary of £26 000 in year 9.

(2)

- (b) Find the total amount that Shelim will earn in his job in the first 9 years.

(2)

Anna starts her new job at the same time as Shelim on a salary of £A. She receives a rise of £1000 a year for each full year that she works, so that she has a salary of £(A + 1000) in year 2, £(A + 2000) in year 3 and so on. The maximum salary for her job, which is reached in year 10, is also £26 000.

- (c) Find the difference in the total amount earned by Shelim and Anna in the first 10 years.

(6)



### **Question 7 continued**

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### **Question 7 continued**

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### **Question 7 continued**

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Q7

(Total 10 marks)



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- 8.** The equation  $2x^2 + 2kx + (k + 2) = 0$ , where  $k$  is a constant, has two distinct real roots.

- (a) Show that  $k$  satisfies

$$k^2 - 2k - 4 > 0 \quad (3)$$

- (b) Find the set of possible values of  $k$ .

(4)



### **Question 8 continued**

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Q8

(Total 7 marks)



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9. A curve with equation  $y = f(x)$  passes through the point  $(3, 6)$ . Given that

$$f'(x) = (x - 2)(3x + 4)$$

- (a) use integration to find  $f(x)$ . Give your answer as a polynomial in its simplest form. (5)

(b) Show that  $f(x) \equiv (x - 2)^2(x + p)$ , where  $p$  is a positive constant. State the value of  $p$ . (3)

(c) Sketch the graph of  $y = f(x)$ , showing the coordinates of any points where the curve touches or crosses the coordinate axes. (4)



### **Question 9 continued**

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### **Question 9 continued**

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**Question 9 continued**

**Q9**

**(Total 12 marks)**



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- 10.** The curve  $C$  has equation  $y = x^3 - 2x^2 - x + 3$

The point  $P$ , which lies on  $C$ , has coordinates  $(2, 1)$ .

- (a) Show that an equation of the tangent to  $C$  at the point  $P$  is  $y = 3x - 5$

(5)

The point  $Q$  also lies on  $C$ .

Given that the tangent to  $C$  at  $Q$  is parallel to the tangent to  $C$  at  $P$ ,

- (b) find the coordinates of the point  $Q$ .

(5)



**Question 10 continued**

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**Question 10 continued**

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Q10

(Total 10 marks)

**TOTAL FOR PAPER: 75 MARKS**

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