

GCE Examinations  
Advanced Subsidiary

## **Core Mathematics C1**

Sample Paper from Solomon Press

Time: 1 hour 30 minutes

### *Instructions and Information*

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Candidates may NOT use a calculator in this paper.

Full marks may be obtained for answers to ALL questions.

Mathematical formulae and statistical tables are available.

This paper has ten questions.

### *Advice to Candidates*

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You must show sufficient working to make your methods clear to an examiner.  
Answers without working may gain no credit.



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1. Find the set of values of  $x$  for which

$$2x^2 - 11x + 12 < 0. \quad (4)$$

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2. (a) Express  $(6\frac{1}{4})^{-\frac{1}{2}}$  as an exact fraction in its simplest form. (2)

- (b) Find the value of  $x$  such that

$$2^{x+1} = 4\sqrt{2}. \quad (3)$$

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3. A sequence is defined by the recurrence relation

$$u_{n+1} = 8 + ku_n, \quad n \geq 1, \quad u_1 = 3,$$

where  $k$  is a constant.

Given that  $u_3 = 11$ ,

- (a) find the two possible values of  $k$ . (5)

Given also that  $k < 0$ ,

- (b) find the value of  $u_4$ . (1)
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4. (a) Find  $\int (6x^{\frac{1}{2}} - x) \, dx$ . (2)

The curve with equation  $y = f(x)$  passes through the point with coordinates  $(1, 6\frac{1}{2})$  and is such that

$$f'(x) = 6x^{\frac{1}{2}} - x.$$

- (b) Show that the point with coordinates  $(4, 27)$  lies on the curve  $y = f(x)$ . (4)
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5. Solve the simultaneous equations

$$2x - y + 9 = 0$$

$$x^2 + 2xy + y^2 = 9 \quad (7)$$

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6. A curve has the equation

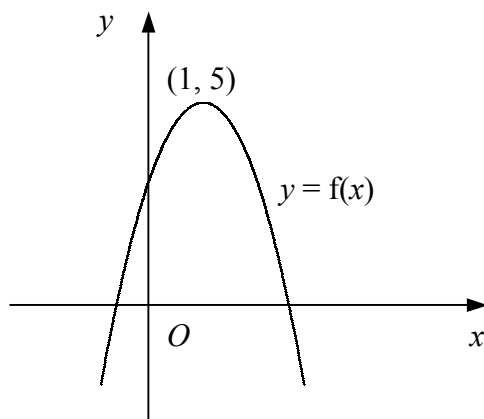
$$y = x + \frac{8}{x} + 3.$$

- (a) Find the gradient of the curve at the point  $P(2, 9)$ . (4)

The tangent to the curve at the point  $Q$  is parallel to the tangent to the curve at  $P$ .

- (b) Find the coordinates of  $Q$ . (3)
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7.



**Figure 1**

Figure 1 shows the curve with equation  $y = f(x)$  which has a turning point at  $(1, 5)$ .

- (a) Showing the coordinates of the turning point in each case, sketch on separate diagrams the curves with equations

(i)  $y = f(x + 3)$ ,

(ii)  $y = f(2x)$ . (4)

- (b) Given also that

$$f(x) = ax^2 + bx + 3,$$

find the values of the constants  $a$  and  $b$ . (4)

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**Turn over**

8. A sports club has 400 members when it launches a scheme to recruit new members. In a model of the outcome of the scheme, it is assumed that 20 new members join in the first month, 24 in the second month, 28 in the third month and so on, with the number joining the club increasing by 4 in each subsequent month.

Using this model,

- (a) find the number of new members who join the club in the eighth month of the scheme, (2)

- (b) find the total number of new members who join the club during the first year of the scheme. (2)

The model also assumes that the club will lose 8 members each month.

- (c) Find how many months the scheme would have to run for before the total membership of the club is 1000. (6)
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9. The straight line  $l_1$  passes through the points  $A(-2, 2)$  and  $B(1, 3)$ .

- (a) Find an equation for  $l_1$ , giving your answer in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers. (4)

The straight line  $l_2$  is perpendicular to  $l_1$  and passes through the point  $C(9, -1)$ .

- (b) Find an equation for  $l_2$ . (2)

Given that  $l_1$  and  $l_2$  intersect at the point  $D$ ,

- (c) show that the ratio of the length of  $AB$  to the length of  $AD$  is  $1 : 3$  (5)
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10. The curve  $C$  has the equation  $y = x^3 - 4x^2 + x + 6$ .

- (a) Show that  $(x + 1)(x - 2)(x - 3) \equiv x^3 - 4x^2 + x + 6$ . (2)

- (b) Sketch the curve  $C$ , showing the coordinates of any points of intersection with the coordinate axes. (3)

The point  $P$  on  $C$  has  $x$ -coordinate 1.

- (c) Find an equation of the tangent to  $C$  at  $P$ . (6)
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**END**