

GCE Examinations  
Advanced / Advanced Subsidiary

## Core Mathematics C1

Sample Paper from Solomon Press

Time: 1 hour 30 minutes

### INSTRUCTIONS TO CANDIDATES

- Answer **all** the questions.
- Give non-exact numerical answers correct to 3 significant figures, unless a different degree of accuracy is specified in the question or is clearly appropriate.
- **You are not permitted to use a calculator in this paper.**

### INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 72.
- **You are reminded of the need for clear presentation in your answers.**



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1. (i) Calculate the discriminant of  $2x^2 + 3x - 1$ . [2]

(ii) State, with a reason, the number of real roots of the equation

$$2x^2 + 3x - 1 = 0. \quad [2]$$

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

$$2x^2 - 11x + 12 < 0. \quad [4]$$

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

(ii) Find the value of  $x$  such that

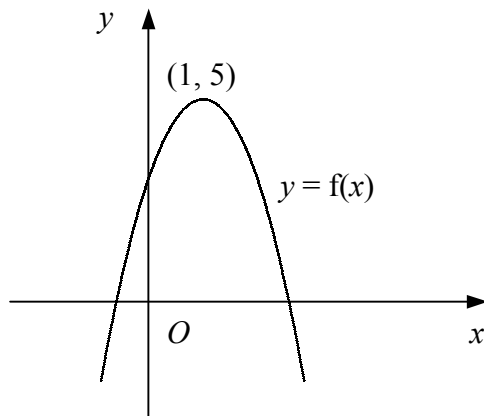
$$2^{x+1} = 4\sqrt{2}. \quad [3]$$

4. Solve the simultaneous equations

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

$$x^2 + 2xy + y^2 = 9 \quad [7]$$

5.



The diagram 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 the curve with equation

(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]

6. The curve with equation

$$y = x + \frac{8}{x} + 3, \quad x > 0,$$

has a stationary point at  $A$ .

(i) Find the  $x$ -coordinate of  $A$ , giving your answer in the form  $k\sqrt{2}$ . [5]

(ii) Find the exact  $y$ -coordinate of  $A$  in its simplest form. [2]

(iii) Determine whether the stationary point is a maximum point or a minimum point. [3]

**Turn over**

7. The straight line  $l_1$  passes through the points  $A (-2, 2)$  and  $B (1, 3)$ .
- (i) 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  $C (9, -1)$ .

- (ii) Find an equation for  $l_2$ . [2]

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

- (iii) show that the ratio of the length of  $AB$  to the length of  $AD$  is  $1 : 3$  [5]

8. The curve  $C$  has the equation  $y = x^3 - 4x^2 + x + 6$ .

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

- (ii) 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.

- (iii) Find an equation of the tangent to  $C$  at  $P$ . [6]

9. The points  $P (-8, 3)$ ,  $Q (4, 7)$  and  $R (6, 1)$  all lie on circle  $C$ .

- (i) Show that  $\angle PQR = 90^\circ$ . [3]

- (ii) Hence, find the coordinates of the centre of  $C$ . [2]

- (iii) Show that  $C$  has the equation

$$x^2 + y^2 + 2x - 4y - 45 = 0. \quad [3]$$

- (iv) Find, in the form  $y = mx + c$ , the equation of the tangent to  $C$  at  $Q$ . [4]