



GCE AS/A Level

0973/01



S17-0973-01

MATHEMATICS – C1
Pure Mathematics

WEDNESDAY, 17 MAY 2017 – MORNING

1 hour 30 minutes

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- a WJEC pink 16-page answer booklet;
- a Formula Booklet.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Answer **all** questions.

Sufficient working must be shown to demonstrate the **mathematical** method employed.

Calculators are **not** allowed for this paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

1. The points A and B have coordinates $(-2, 3)$ and $(4, 5)$ respectively. The line L_1 passes through the point B and is **perpendicular** to AB .

(a) (i) Find the gradient of AB .

(ii) Find the equation of L_1 .

[5]

The line L_2 has equation $x + 2y + 1 = 0$.
The lines L_1 and L_2 intersect at the point C .

(b) (i) Show that C has coordinates $(7, -4)$.

(ii) Show that the value of $\cos \hat{BCA}$ may be expressed in the form $\frac{3}{\sqrt{a}}$, where a is an integer whose value is to be found.

[7]

(c) The line CB is extended to the point D so that B is the mid-point of CD .

(i) Find the coordinates of D .

(ii) **Write down** the geometrical name for the triangle ACD .

[3]

2. Simplify

(a) $\frac{5\sqrt{5}-9}{3+2\sqrt{5}}$,

[4]

(b) $(2\sqrt{13})^2 - (3\sqrt{7} \times \sqrt{28}) - \frac{5\sqrt{99}}{\sqrt{11}}$.

[4]

3. The curve C has equation $y = \frac{3}{4}x^2 - 4x - 10$.

(a) The point P has coordinates $(6, -7)$ and lies on the curve C . Find the equation of the **tangent** to C at P .

[4]

(b) The point Q lies on C and is such that the gradient of the **normal** to C at Q is -2 . Find the x -coordinate of Q .

[3]

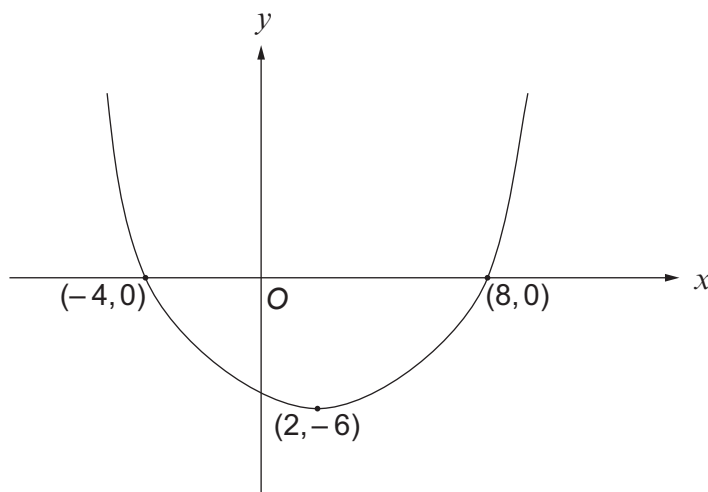
4. (a) Express $-2x^2 - 20x + 35$ in the form $a(x + b)^2 + c$, where the values of the constants a , b and c are to be found.

[3]

(b) **Without carrying out any further calculation**, write down the stationary value of $y = -2x^2 - 20x + 35$ and state whether this stationary value is a maximum or a minimum.

[2]

5. (a) Use the binomial theorem to expand $\left(x + \frac{2}{x}\right)^4$, simplifying each term of the expansion. [4]
- (b) In the binomial expansion of $(a + 2x)^6$, where $a \neq 0$, the coefficient of the term in x^2 is equal to the coefficient of the term in x . Find the value of a . [4]
6. Solve the inequality $2x^2 + 11x + 12 \geq 0$. [3]
7. (a) Given that $x - 2$ is a factor of $kx^3 + 2x^2 - 41x + 10$, write down an equation satisfied by k . Hence show that $k = 8$. [2]
- (b) Factorise $8x^3 + 2x^2 - 41x + 10$. [3]
- (c) Find the remainder when $8x^3 + 2x^2 - 41x + 10$ is divided by $2x + 1$. [2]
8. The diagram shows a sketch of the graph of $y = f(x)$. The graph passes through the points $(-4, 0)$ and $(8, 0)$ and has a minimum point at $(2, -6)$.



- (a) Sketch the graph of $y = -\frac{1}{2}f(x)$, indicating the coordinates of the stationary point and the coordinates of the points of intersection of the graph with the x -axis. [3]
- (b) Siân is asked by her teacher to draw the graph of $y = f(ax)$ for various non-zero values of the constant a . Write down two facts about the stationary point on Siân's graph which will always be true whatever her choice of a . [2]

TURN OVER

9. (a) Given that $y = -5x^2 - 7x + 13$, find $\frac{dy}{dx}$ from first principles. [5]

(b) Differentiate $6x^{\frac{3}{4}} + \frac{5}{x^3} - 9$ with respect to x . [2]

10. The curve C has equation

$$y = x^3 - 9x^2 + 15x + 10.$$

(a) (i) Find the coordinates of each of the stationary points of C.
 (ii) Determine the nature of each of these stationary points. [6]

(b) Sketch C, indicating the coordinates of each of the stationary points. [2]

(c) Given that the equation

$$x^3 - 9x^2 + 15x + 10 = k$$

has only one real root, find the range of possible values for k . [2]

END OF PAPER