

GCE AS/A Level

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.

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- 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 $\cos B\widehat{C}A$ 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

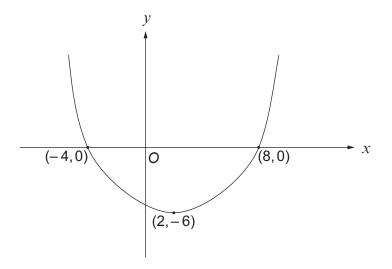
(a)
$$\frac{5\sqrt{5}-9}{3+2\sqrt{5}}$$
, [4]

(b)
$$\left(2\sqrt{13}\right)^2 - \left(3\sqrt{7} \times \sqrt{28}\right) - \frac{5\sqrt{99}}{\sqrt{11}}$$
 [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 $a \ne 0$, 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 $2x^2 + 11x + 12 \ge 0$. [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]

[2]

- (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.

END OF PAPER