Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2013

Mathematics

Assessment Unit C1

assessing

Module C1: AS Core Mathematics 1

[AMC11]

AMC11

MONDAY 14 JANUARY, MORNING

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number on the Answer Booklet provided.
Answer **all eight** questions.
Show clearly the full development of your answers.
Answers should be given to three significant figures unless otherwise stated.
You are not permitted to use any calculating aid in this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

A copy of the **Mathematical Formulae and Tables booklet** is provided.

Answer all eight questions.

Show clearly the full development of your answers.

Answers should be given to three significant figures unless otherwise stated.

You are not permitted to use any calculating aid in this paper.

1 A and B are the points (2, –5) and (4, 1) respectively.

(i) Find the equation of the line AB. [3]

(ii) The point (t, –3) lies on the line AB.
Find the value of t. [2]

2 **(a)** The graph of the function $y = f(x)$ is sketched in **Fig. 1** below.

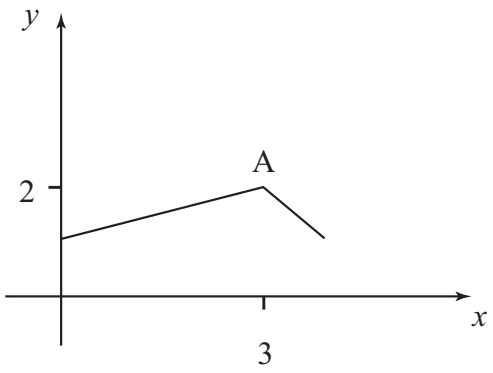

Fig. 1

Point A has coordinates (3, 2).
Sketch, on separate diagrams, the graphs of:

(i) $y = f(x) + 2$ [2]

(ii) $y = f(\frac{1}{2}x)$ [2]

clearly labelling the image of the point A.

(b) Simplify as far as possible

$$\left[\frac{1}{x+3} - \frac{1}{x-2}\right] \div \frac{5}{2x+6}$$ [5]

3 Solve the simultaneous equations

$$xy = 2$$
$$x - 2y = 3$$ [6]

4 **(a)** A curve has the equation

$$y = x^4 - 8x^2$$

(i) Find $\frac{dy}{dx}$. [2]

(ii) Find the turning points on the curve and hence sketch the curve. [9]

(b) Solve the equation

$$\frac{8^{x+1}}{2^x} = 16$$ [5]

5 **(a)** Differentiate

$$-\frac{7}{x^3} + 2\sqrt{x}$$ [2]

(b) An outdoor pool is treated with a chemical to reduce the amount of algae. The amount of algae A in the pool t days after the treatment can be modelled by the equation

$$A = 15t^2 - 120t + 250$$

(i) Find $\frac{dA}{dt}$. [2]

(ii) Hence find how many days after treatment the pool will have the least amount of algae. [4]

6 f(x) is the expression $ax^3 + bx + 7$
($x - 1$) is a factor of f(x).
When f(x) is divided by ($2x + 1$) the remainder is 9
Find a and b. [7]

7 **(a)** Show that the equation

$$(k - 2)\,x^2 + 2x - k = 0$$

has real roots for any real value of k. [5]

(b) Find the equation of the normal to the curve

$$y = x + \frac{4}{x}$$

at the point where $x = 4$
Leave your answer in the form $ax + by + c = 0$
where a, b and c are integers to be found. [8]

8 A square garage door of length x m is surrounded on three sides, by brickwork. The brickwork is 1.5 m wide on each side of the door and of height 2 m above the door, as shown in **Fig. 2** below.

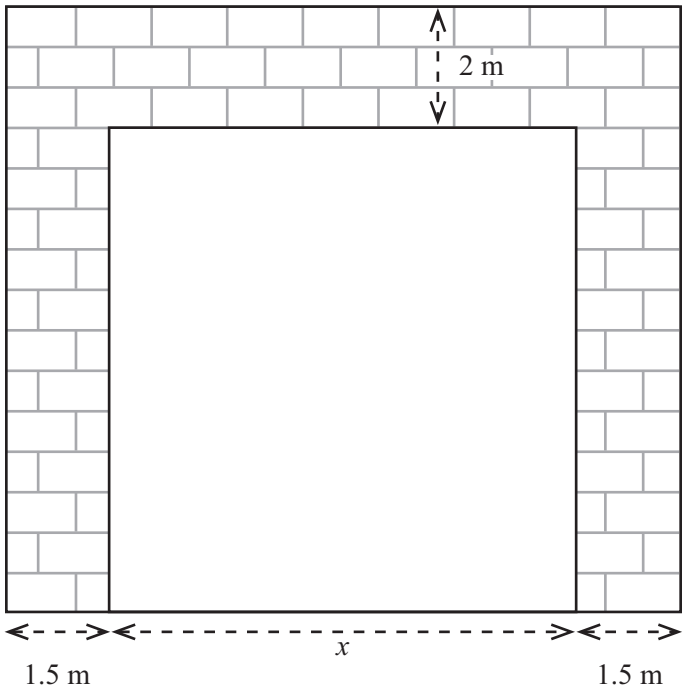

Fig. 2

In order to meet building regulations, the area of brickwork must be more than twice the area of the garage door.

(i) Show that $2x^2 - 5x - 6 < 0$ [6]

(ii) Hence solve this quadratic inequality to find the range of values of x within which the length of the garage door must lie. [5]

THIS IS THE END OF THE QUESTION PAPER