



Rewarding Learning

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
January 2013

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## Mathematics

### Assessment Unit C1

*assessing*

Module C1: AS Core Mathematics 1

[AMC11]



MONDAY 14 JANUARY, MORNING

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#### 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.**

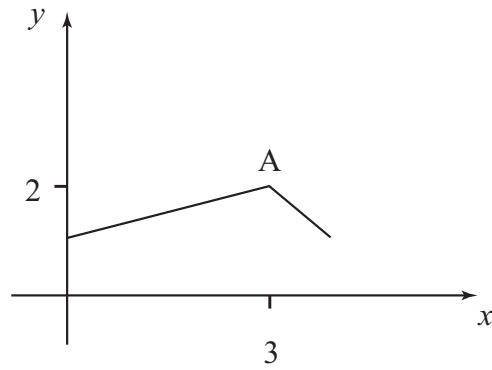
**You are not permitted to use any calculating aid in this paper.**

**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)  $y = f\left(\frac{1}{2}x\right)$  [2]

clearly labelling the image of the point A.

- (b) Simplify as far as possible

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

- 3 Solve the simultaneous equations

$$\begin{aligned} xy &= 2 \\ x - 2y &= 3 \end{aligned} \quad [6]$$

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

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

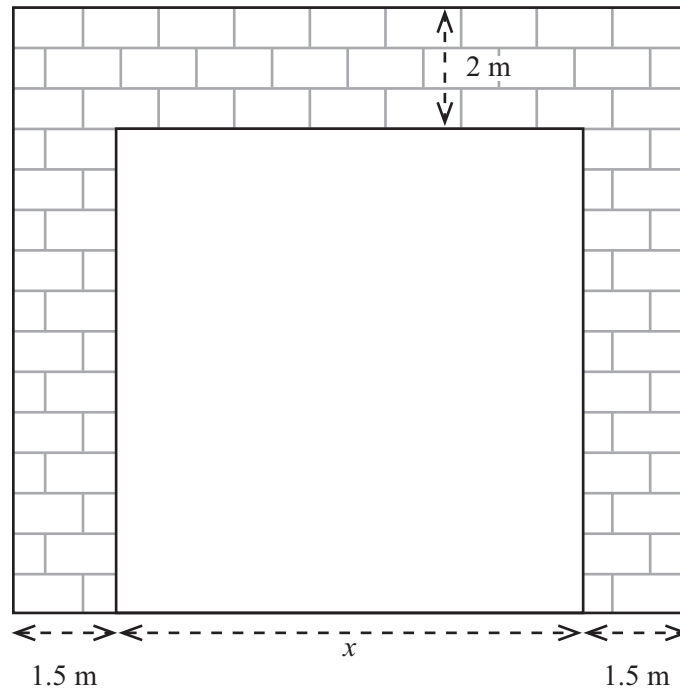
at the point where  $x = 4$

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]

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**THIS IS THE END OF THE QUESTION PAPER**

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