



Rewarding Learning

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
January 2014

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## Mathematics

Assessment Unit C1

*assessing*

Module C1: AS Core Mathematics 1

[AMC11]



MONDAY 13 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) Fig. 1 below shows a sketch of the graph of the function  $y = f(x)$

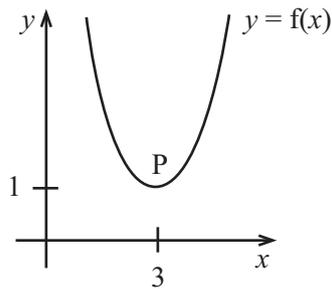


Fig. 1

Point P has coordinates (3, 1).

Sketch, on separate diagrams, the graphs of:

(i)  $y = f(x) - 1$  [2]

(ii)  $y = f(x - 2)$  [2]

(iii)  $y = f(3x)$  [2]

clearly labelling the image of point P.

- (b) Simplify as far as possible

$$\frac{(1 - \sqrt{2})^2}{2 + \sqrt{2}} \quad [6]$$

2 L is the line whose equation is

$$y + 2x = 10$$

L crosses the  $y$ -axis at A and the  $x$ -axis at B.

(i) Write down the coordinates of A and B. [2]

(ii) Find the equation of the perpendicular bisector of the line AB. [6]

3 Given that

$$(x - p)(2x^2 - qx + 2) \equiv 2x^3 - 11x^2 + 17x - 6$$

(i) find the values of  $p$  and  $q$ . [5]

(ii) Hence solve the equation

$$2x^3 - 11x^2 = 6 - 17x \quad [5]$$

4 (a) Differentiate

$$6x^3 + \sqrt[3]{x} \quad [2]$$

(b) Find the range of values of  $k$  for which the equation

$$x^2 - 3kx + 4 = 0$$

has no real roots. [4]

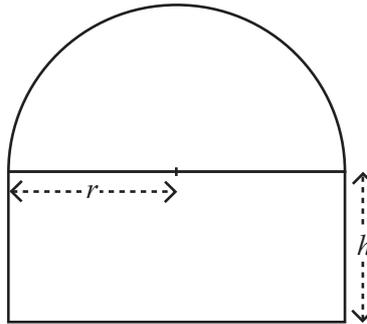
5 Find the equation of the normal to the curve  $y = \frac{3}{x}$  at the point where  $x = 1$   
Give your answer in the form  $ax + by + c = 0$  [7]

6 Solve the simultaneous equations

$$\begin{aligned} 9^x \times 9^y &= 27 \\ 25^x \div 5^y &= 625 \end{aligned}$$

[9]

7 **Fig. 2** below shows a wooden headboard in the shape of a rectangle surmounted by a semicircle.



**Fig. 2**

The radius of the semicircle is  $r$  metres.

The height of the rectangle is  $h$  metres.

The perimeter of the headboard is 6 metres.

(i) Show that  $h = 3 - r - \frac{1}{2}\pi r$  [3]

(ii) Hence find, in terms of  $\pi$ , the value of  $r$  for which the area of the headboard is a maximum. [10]

8 The expressions  $(x^2 - ax - b)$  and  $(2x^2 + b)$  have a common factor  $(x + c)$ , where  $a$ ,  $b$  and  $c \neq 0$

(i) Show that

$$b = \frac{2ac}{3} \quad [6]$$

(ii) Given that  $a = -b = -3c$ , find the common factors. [4]

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

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