



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.

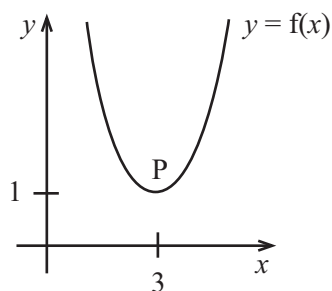
**Answer all eight questions.**

**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

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

4 (a) Differentiate

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

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

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

has no real roots. [4]

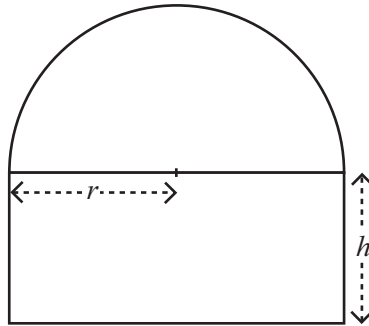
5 Find the equation of the normal to the curve  $y = \frac{3}{x}$  at the point where  $x = 1$   
Give your answer in the form  $ax + by + c = 0$  [7]

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

$$b = \frac{2ac}{3}$$

[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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