



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2012

Mathematics

Assessment Unit C1

assessing

Module C1: AS Core Mathematics 1

[AMC11]



FRIDAY 13 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 curve is given by the equation

$$y = 3x^2 - 4x + 1$$

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

(ii) Hence find the equation of the normal to this curve at the point (2, 5). [4]

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

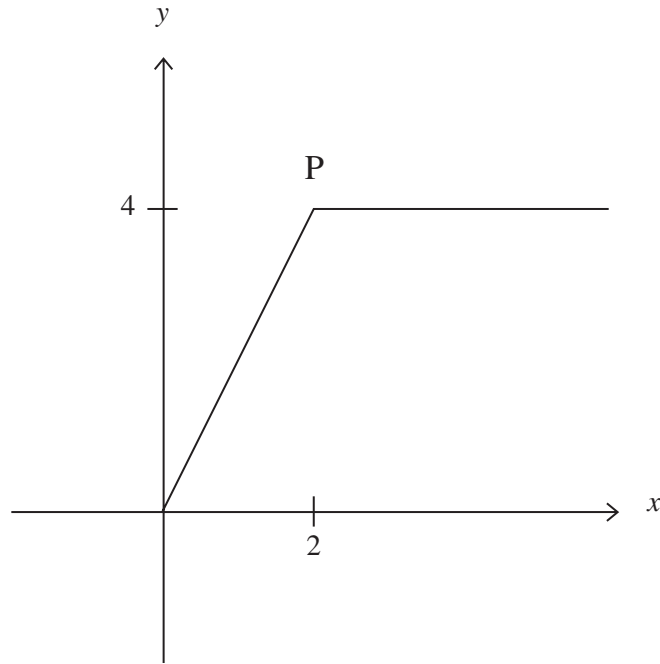


Fig. 1

Point P has coordinates (2, 4).

Sketch, on separate diagrams, the graphs of:

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

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

clearly identifying the image of the point P.

3 (a) Differentiate

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

(b) Simplify as far as possible

$$\left[\frac{x}{x-3} - \frac{x+4}{x+3} \right] \div \frac{x+6}{x^2-9}$$
 [6]

4 (a) Rationalise the denominator of

$$\frac{14}{3 - \sqrt{2}} \quad [4]$$

(b) Solve the equation

$$2^{x+1} = 8^{1-x} \quad [5]$$

5 (a) (i) Write $x^2 + 6x - 2$ in the form $(x + p)^2 - q$ [2]

(ii) Hence state the minimum value of $x^2 + 6x - 2$ and the value of x at which it occurs. [2]

(iii) Solve the equation

$$x^2 + 6x = 2 \quad [3]$$

(b) A rectangular mosaic tile has length x cm and breadth $(6 - x)$ cm.
The area of the tile must be at least 5 cm^2
Find the range of possible values of x . [6]

- 6 A local vegetable producer wishes to construct a storage facility. A sketch of the store is shown in **Fig. 2** below.

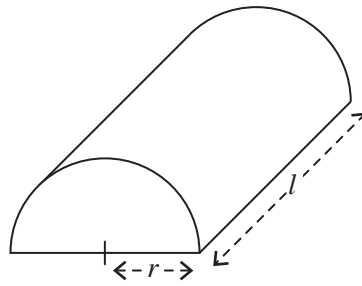


Fig. 2

The store is in the shape of a prism with semi-circular cross-section.
 The cross-section has radius r metres.
 The store has length l metres.
 Plastic material will be used to cover the roof and each end.
 The store will have a volume of $125\pi \text{ m}^3$

- (i) Find an expression for l in terms of r . [2]

- (ii) Show that the surface area of material needed can be expressed as

$$S = \pi r^2 + \frac{250\pi}{r} \quad [3]$$

- (iii) Using calculus, find the value of r which minimises the surface area of material to be used and hence find this minimum surface area. [7]

- 7 A curve has the equation

$$y = ax^2 + bx + c$$

The curve goes through the points $(2, 3)$ and $(-1, 9)$.
 The curve has a turning point at $x = 1$

- Find the values of a , b and c . [10]

- 8 (a) When $6x^2 + x + 7$ is divided by $(x - a)$ it leaves the same remainder as when it is divided by $(x + 2a)$, where $a \neq 0$

Find the value of a .

[6]

- (b) For what values of k will the x -axis be a tangent to the curve

$$y = 2kx^2 + (1+k)x + k$$

[6]

THIS IS THE END OF THE QUESTION PAPER

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