



*Rewarding Learning*

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2016

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## Mathematics

Assessment Unit C1

*assessing*

Module C1: AS Core Mathematics 1

[AMC11]

MV18

**WEDNESDAY 18 MAY, MORNING**

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### **Time**

1 hour 30 minutes, plus your additional time allowance.

### **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 at the end of each question 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.**

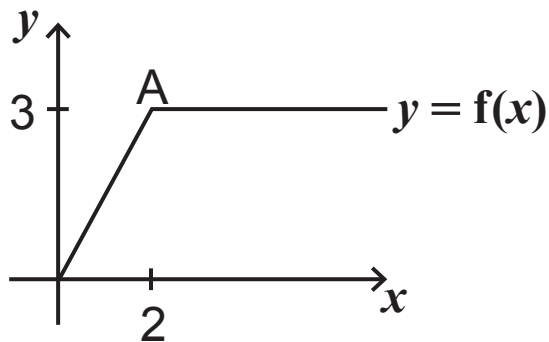
**Answers should be given to three significant figures unless otherwise stated.**

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

**1 Simplify as far as possible [5 marks]**

$$\frac{1 - \sqrt{5}}{\sqrt{5} + 3}$$

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



**Fig. 1**

Point A has coordinates (2, 3).

Sketch, on separate diagrams, the graphs of:

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

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

clearly labelling the image of the point A.

(iii) When  $y = f(x + a)$  is sketched, the point A maps onto the point with coordinates (6, 3).

Write down the value of  $a$ . [1 mark]

**3** Solve

$$\frac{81}{3^{x-1}} = \sqrt{27} \quad [6 \text{ marks}]$$

**4 (a)** Simplify as far as possible

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

**(b)** The straight line  $L_1$  has equation  $y - 2x + 1 = 0$

The straight line  $L_2$  passes through the point (4, 2).

$L_2$  is perpendicular to  $L_1$

Find the coordinates of the point of intersection of  $L_1$  and  $L_2$  [6 marks]

**5 (a)** The polynomial  $f(x)$  is given by

$$f(x) = 2x^3 - 7x^2 - 42x + k$$

where  $k$  is a constant.

**(i)** Given that  $(x + 4)$  is a factor of  $f(x)$ ,  
show that  $k = 72$  [3 marks]

**(ii)** Express  $f(x)$  as a product of linear factors.  
[4 marks]

**(b)** When the expression  $(x^3 + 1)$  is divided by  $(x + c)$ , the  
remainder is  $\frac{35}{8}$

By using the Remainder Theorem, find the value of  $c$ .  
[3 marks]

**6 (a)** A curve is given by the equation

$$y = x^3 + ax^2 + bx$$

where  $a$  and  $b$  are constants.

The curve has stationary points at  $x = 2$  and  $x = -\frac{4}{3}$   
Find the values of  $a$  and  $b$ . [7 marks]

**(b)** A curve is given by the equation

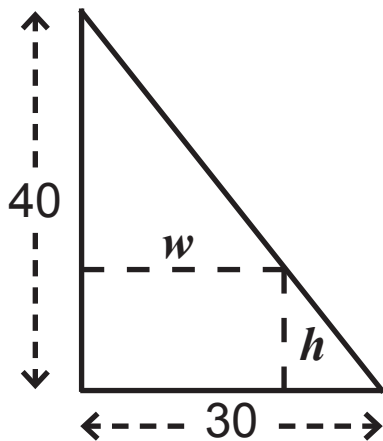
$$y = \frac{\sqrt[3]{x}}{2} + \frac{8}{x} + 1$$

**(i)** Find  $\frac{dy}{dx}$  [3 marks]

**(ii)** Hence find the equation of the tangent to the curve  
at the point where  $x = 8$

Leave your answer in the form  $ax + by + c = 0$ ,  
where  $a$ ,  $b$  and  $c$  are integers. [4 marks]

- 7 A tailor has a piece of cloth in the shape of a right-angled triangle as shown in **Fig. 2** below.



**Fig. 2**

The piece of cloth has base length 30 cm and perpendicular height 40 cm.

The tailor wants to cut out a rectangle from this piece of cloth.

The rectangle has width  $w$  cm and height  $h$  cm.

- (i) Show that the area of the rectangle can be expressed as

$$A = 40w - \frac{4w^2}{3} \quad [6 \text{ marks}]$$

- (ii) Using calculus, find the values of  $w$  and  $h$  for which  $A$  is a maximum. [6 marks]

8 (a) The quadratic equation

$$(k + 1)x^2 + 6x + (k - 2) = 0$$

has real roots.

Find the range of values of  $k$ . [7 marks]

(b) A quadratic equation has the form

$$x^2 + bx + c = 0$$

The roots of this equation are  $n$  and  $(n + 1)$ , where  $n$  is a positive integer.

Find the value of  $b^2 - 4c$  [5 marks]

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

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