



Rewarding Learning

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
January 2011

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## Mathematics

Assessment Unit C2

*assessing*

Module C2: AS Core Mathematics 2

[AMC21]



MONDAY 24 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 figure unless otherwise stated.

You are permitted to use a graphic or scientific calculator 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.

Throughout the paper the logarithmic notation used is  $\ln z$  where it is noted that  $\ln z \equiv \log_e z$



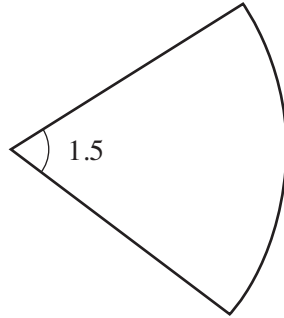
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**Answer all eight questions.**

**Show clearly the full development of your answers.**

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

- 1** The arc of the sector of a circle subtends an angle of 1.5 radians at its centre as shown in **Fig. 1** below.



**Fig. 1**

The area of this sector is  $36 \text{ cm}^2$

- (i)** Find the radius of the circle. [2]
- (ii)** Find the perimeter of the sector. [3]

2 Fig. 2 below shows a plan of a field ABCD.

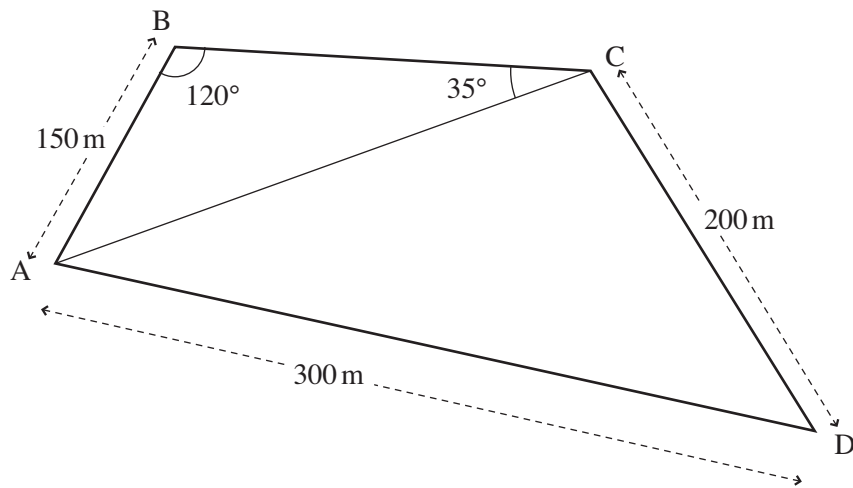


Fig. 2

- (i) Find the length of AC. [2]
- (ii) Find the area of the triangle ABC. [3]
- (iii) Find the angle ADC. [3]
- (iv) Find the area of the field. [2]

3 A circle is given by the equation

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

(i) Find the centre and radius of the circle.

[4]

A tangent is drawn to the circle from the point A (5, 6).

The tangent touches the circle at the point B as shown in **Fig. 3** below.

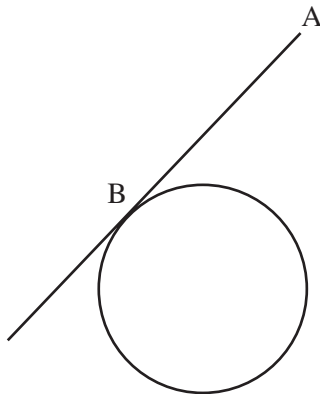


Fig. 3

(ii) Find the length AB.

[4]

4 (a) (i) Sketch the graph of

$$y = \tan 2x$$

for  $-180^\circ < x < 180^\circ$

[2]

(ii) State the period of this graph.

[1]

(iii) Solve the equation

$$\tan 2x = 3$$

for  $-180^\circ < x < 180^\circ$

[4]

(b) Prove the identity

$$\frac{1 - \cos^2 \theta}{\sin \theta \cos \theta} = \tan \theta$$

[3]

5 (a) Find

$$\int 6\sqrt{x} - \frac{2}{x^3} dx \quad [3]$$

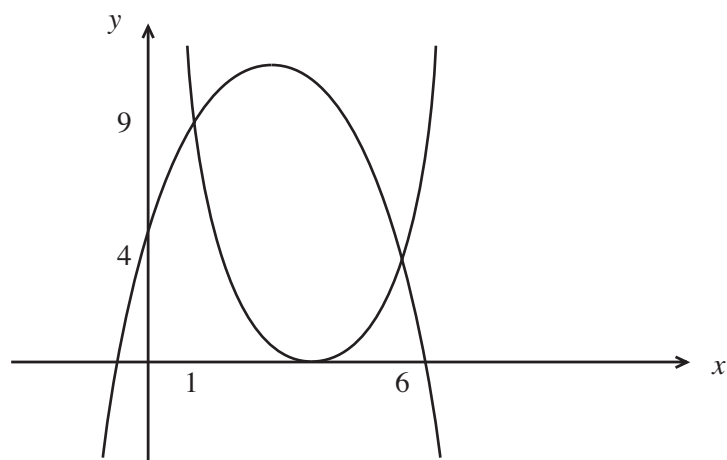
(b) The graphs of

$$y = x^2 - 8x + 16$$

and

$$y = 4 + 6x - x^2$$

are shown in **Fig. 4** below.



**Fig. 4**

The coordinates of the points of intersection of the curves are (1, 9) and (6, 4).

Find the area between the 2 curves.

[7]

6 (a) A sequence is defined recursively by

$$u_{n+1} = \frac{3}{10}u_n + 4$$

where  $u_1 = -5$

(i) Find the values of  $u_2$  and  $u_3$  [2]

(ii) The sequence converges to a limit  $l$ .  
By forming and solving an equation, find the exact value of  $l$ . [2]

(b) A solution by trial and improvement is not acceptable.

Bill has borrowed a sum of money.

His repayments will form an Arithmetic Progression.

He agrees to repay £200 at the end of the first month, £195 at the end of the second month, £190 at the end of the third month and so on until the loan is repaid.

(i) Find how much he will repay at the end of the 12th month. [2]

(ii) Find after how many months he will make his final repayment. [2]

(iii) Calculate the total amount of money that he will repay. [3]

7 (a) (i) Rewrite as a single logarithm

$$\log_3 8 - 3 \log_3 x$$
 [3]

(ii) Hence solve the equation

$$\log_3 8 - 3 \log_3 x = 3$$
 [4]

(b) A solution by trial and improvement is not acceptable.

A patch of mould increases its area by 12% each day.

Initially the patch of mould has an area of  $A_0$

Find after how many days the area of the patch of mould is 17 times  $A_0$  [4]

8 If

$$(1 + ax)^n = 1 - 4x + 7x^2 + \dots$$

find the values of  $a$  and  $n$ .

[10]

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

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