



Rewarding Learning

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
January 2009

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## Mathematics

### Assessment Unit C2

*assessing*

Module C2: AS Core Mathematics 2

[AMC21]



THURSDAY 15 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 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  $\ln z \equiv \log_e z$

**Answer all eight questions.**

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

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

**1** In a triangle ABC

AB = 6 cm, AC = 9 cm and angle A =  $39^\circ$

Find:

(i) the length of BC, [3]

(ii) the angle C. [3]

**2** (a) Integrate with respect to  $x$

$$3 - 2\sqrt{x} + 3x^{-2} \quad [4]$$

(b) Use the trapezium rule with 5 ordinates to find an approximate value for

$$\int_0^2 2^x dx \quad [6]$$

**3** (i) Write down the centre and find the radius of the circle whose equation is

$$x^2 + y^2 + 8x - 2y - 9 = 0 \quad [3]$$

(ii) Show that the point P (-5, -4) lies on the circle. [2]

(iii) Find the equation of the tangent to the circle at the point P. [5]

4 (a) (i) Use the binomial expansion to expand

$$\left(1 + \frac{x}{2}\right)^{10}$$

in ascending powers of  $x$  up to and including the term in  $x^3$  [4]

(ii) By choosing a suitable value of  $x$ , use the expansion to find the value of  $(1.005)^{10}$  correct to 5 decimal places. [3]

(b) A married couple, Nicole and Brad, take out savings' investment plans. Nicole plans to save £225 in the first year, £275 in the second year, £325 in the third year and so on increasing the annual amount saved by £50

Using the fact that her planned savings form an arithmetic progression,

(i) find the amount that Nicole plans to save in the 10th year of her savings plan, [2]

(ii) find the **total** amount that Nicole plans to save over a 20 year period. [3]

Brad plans to save £14 000 over a 20 year period.

He plans to save £ $P$  in the first year. His planned annual savings form an arithmetic progression with common difference £60

(iii) Find the value of  $P$  [3]

5 (i) Show that

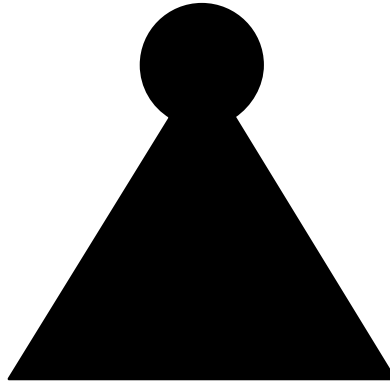
$$5 - 2 \cos \theta - 8 \sin^2 \theta = 8 \cos^2 \theta - 2 \cos \theta - 3 \quad [3]$$

(ii) Hence, solve the equation

$$5 - 2 \cos \theta - 8 \sin^2 \theta = 0$$

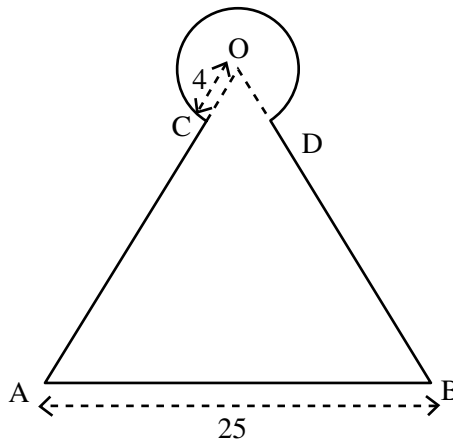
for  $0^\circ < \theta \leq 180^\circ$  [5]

6 **Fig. 1** below shows a baseball court in a children's playground.



**Fig. 1**

The dimensions of the court are shown in **Fig. 2** below.



**Fig. 2**

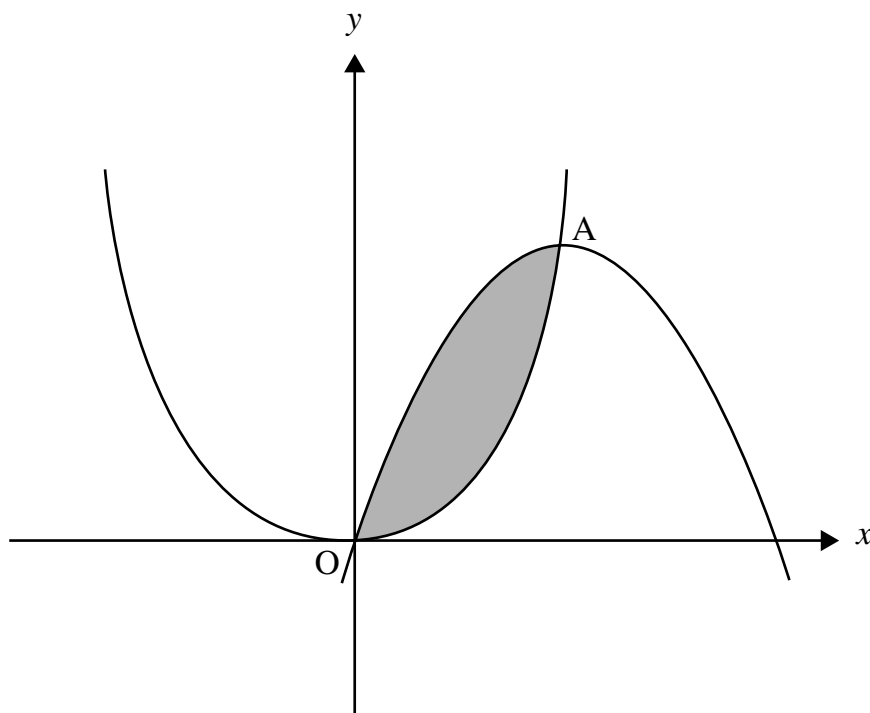
O is the centre of a circle, radius 4 m.  
 $OA = OB = AB = 25$  m.  
 Angle  $COD = \frac{\pi}{3}$  radians.

Find:

(i) the perimeter of the baseball court, [4]

(ii) the area of the baseball court. [5]

- 7 The curves  $y = 3x - x^2$  and  $y = x^2$  are shown in **Fig. 3** below. The curves intersect at the origin and at the point A.



**Fig. 3**

- (i) Show that the  $x$  coordinate of A is  $1\frac{1}{2}$  [3]

- (ii) Hence, find the shaded area bounded by the curves

$$y = 3x - x^2 \text{ and } y = x^2 \quad [6]$$

- 8 Solve the equation

$$\log_x 9 = 2 \log_3 x + 3 \quad [8]$$

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

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