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Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2011

Mathematics

Assessment Unit C2

assessing

Module C2: AS Core Mathematics 2

[AMC21]

AMC21

MONDAY 24 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 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 $\ln z \equiv \log_e z$

6080

Answer all eight questions.

Show clearly the full development of your answers.

Answers should be given to three signficant 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 $36 \, \text{cm}^2$

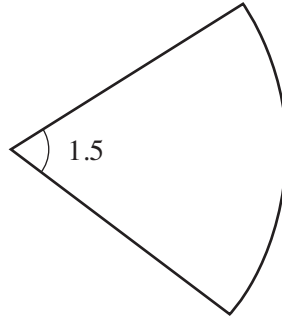**(i)**   Find the radius of the circle.   [2]

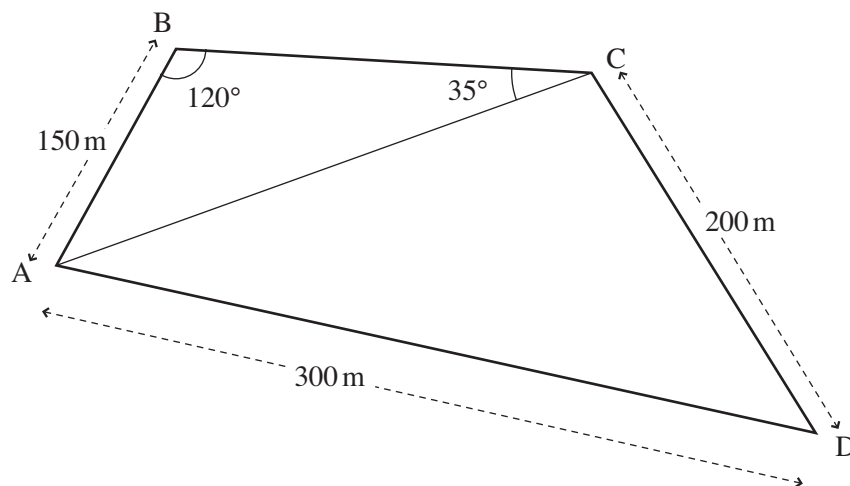**(ii)** Find the perimeter of the sector.   [3]

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.
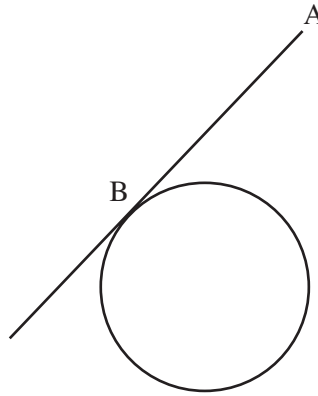

Fig. 3

(ii) Find the length AB. [4]

4   **(a)** **(i)** Sketch the graph of

$$y = \tan 2x$$

for $-180° < x < 180°$ [2]

(ii) State the period of this graph. [1]

(iii) Solve the equation

$$\tan 2x = 3$$

for $-180° < x < 180°$ [4]

(b) Prove the identity

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

[3]

5 **(a)** Find

$$\int 6\sqrt{x} - \frac{2}{x^3}\,dx$$

[3]

(b) The graphs of

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

and

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

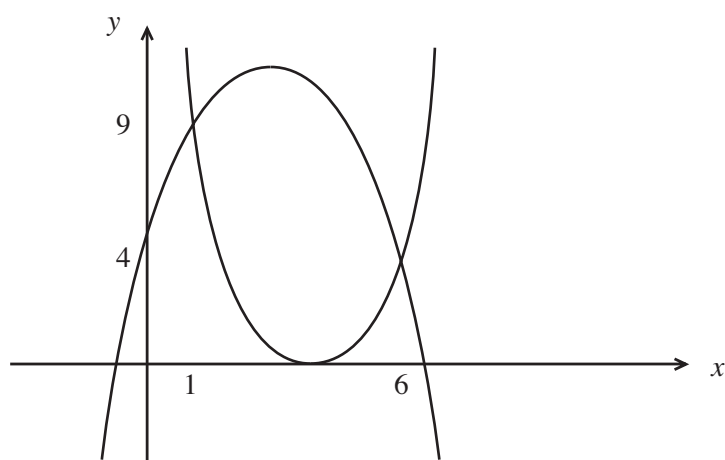are shown in **Fig. 4** below.

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

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

find the values of *a* and *n*.   [10]

THIS IS THE END OF THE QUESTION PAPER