



ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2014

## Mathematics

Assessment Unit C2  
*assessing*  
Module C2: AS Core Mathematics 2  
[AMC21]

MV18

FRIDAY 6 JUNE, AFTERNOON

### 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 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 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.

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 (a)** The first five terms of a sequence are

$$\frac{2}{1}, \frac{3}{4}, \frac{4}{9}, \frac{5}{16}, \frac{6}{25} \dots$$

(i) Write down the next term in this sequence. [1 mark]

(ii) Write down, in terms of  $n$ , a formula for the  $n$ th term of this sequence. [2 marks]

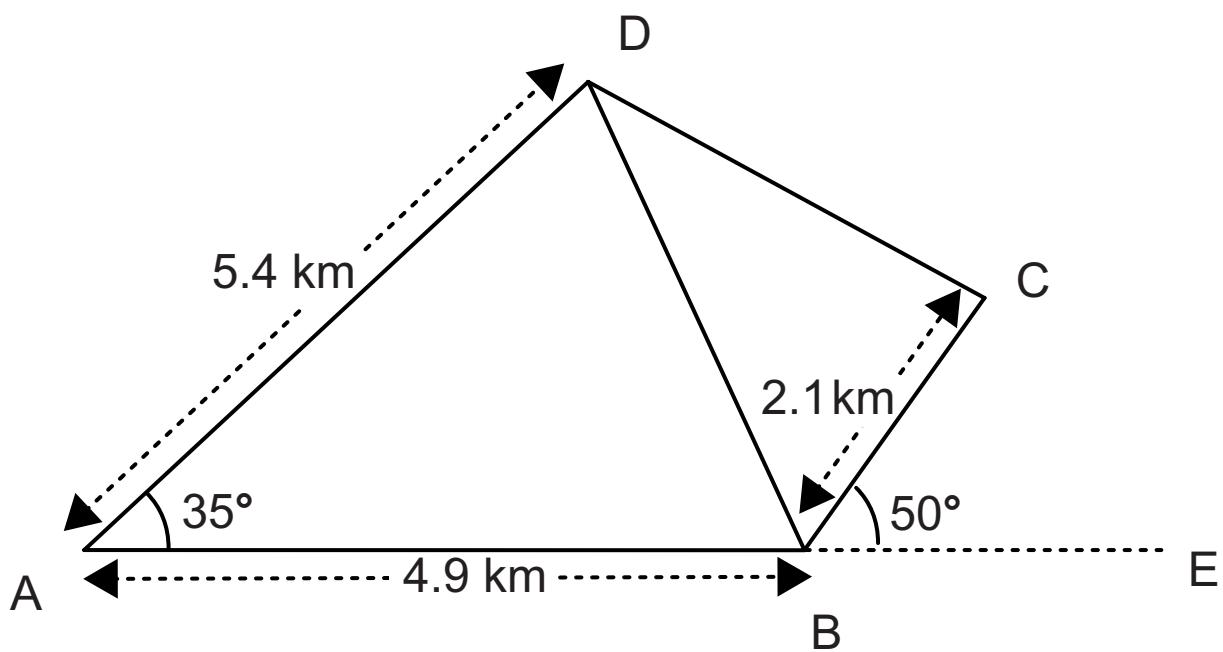
(iii) State whether this sequence converges or diverges or oscillates. [1 mark]

**(b)** Find the coefficient of  $x^5$  in the binomial expansion of  $(3 - x)^7$  [4 marks]

2 Find

$$\int \frac{16}{x^2} + x^{\frac{1}{3}} + 9x - 7 \, dx \quad [5 \text{ marks}]$$

3 A surveyor has made a sketch of a patch of waste ground, ABCD, as shown in **Fig. 1** below.



**Fig. 1**

The points A, B and E lie along the same straight line. He records the following measurements:

$$AB = 4.9 \text{ km}$$

$$AD = 5.4 \text{ km}$$

$$BC = 2.1 \text{ km}$$

$$\text{angle } DAB = 35^\circ$$

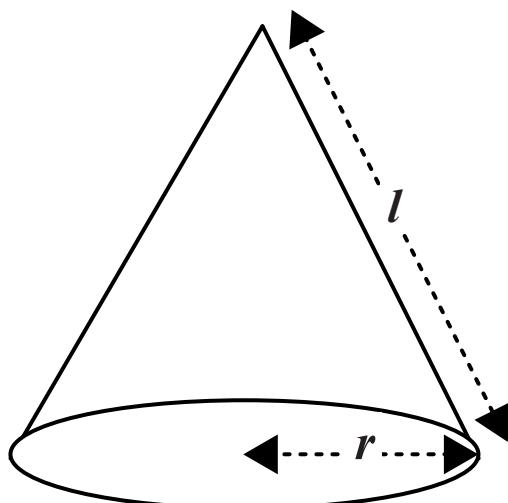
$$\text{angle } CBE = 50^\circ$$

(i) Find the length of DB. [2 marks]

(ii) Find the angle ABD. [2 marks]

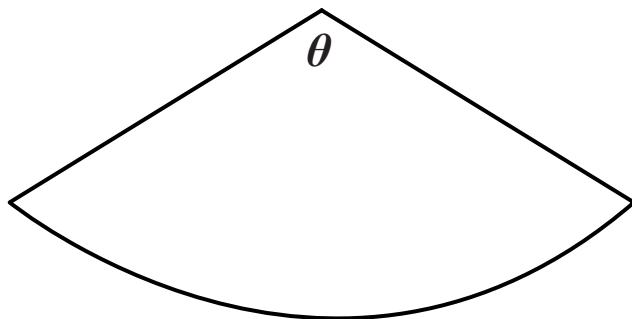
(iii) Find the area of the waste ground ABCD. [4 marks]

4 (a) A right circular cone has a base radius of  $r$  and slant height  $l$  as shown in **Fig. 2** below.



**Fig. 2**

The curved surface area of this cone can be unfolded to form the sector of a circle as shown in **Fig. 3** below.



**Fig. 3**

The radii of this sector subtend an angle of  $\theta$  radians at its centre.

(i) Find  $\theta$ , in terms of  $\pi$ ,  $r$  and  $l$ . [3 marks]

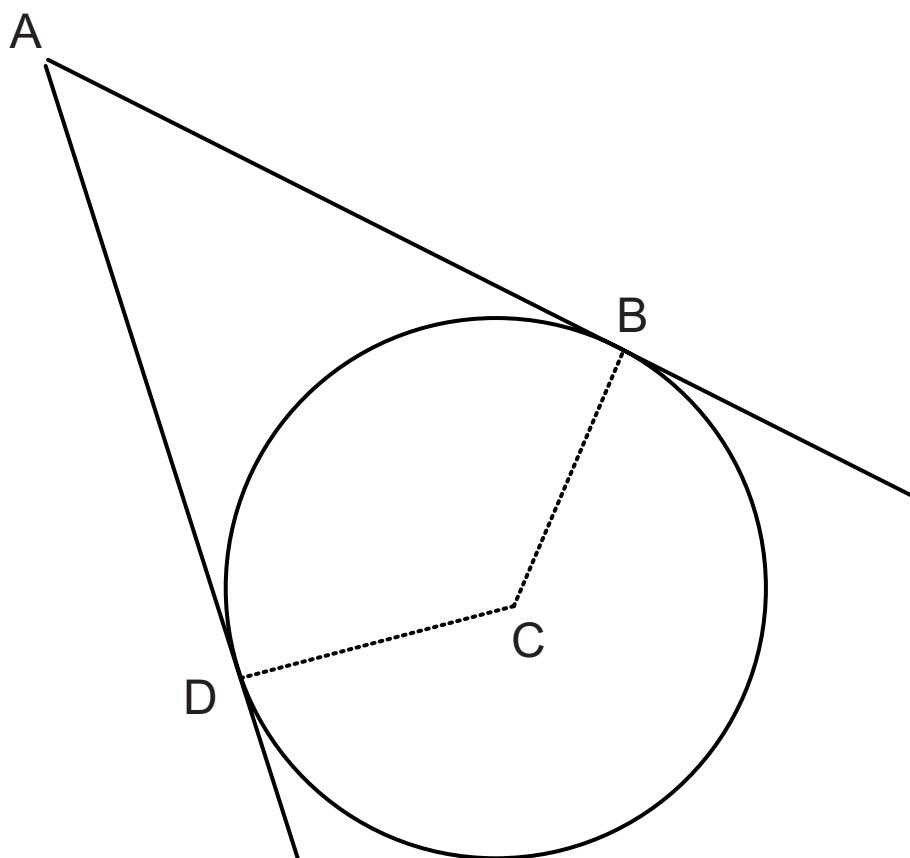
(ii) Hence show that the curved surface area of a cone is given by  $\pi r l$ . [2 marks]

**(b) The circle**

$$x^2 - 6x + y^2 + 10y + 18 = 0$$

has its centre at the point C.

Tangents drawn from the point A (-2, 4) meet the circle at the points B and D respectively, as shown in **Fig. 4** below.

**Fig. 4**

Find the area of the kite ABCD. [7 marks]

5 (a) A geometric progression has first term 100 and common ratio  $\frac{3}{5}$

(i) Find the 16th term of this progression. [2 marks]

(ii) Find the sum to infinity of this progression. [2 marks]

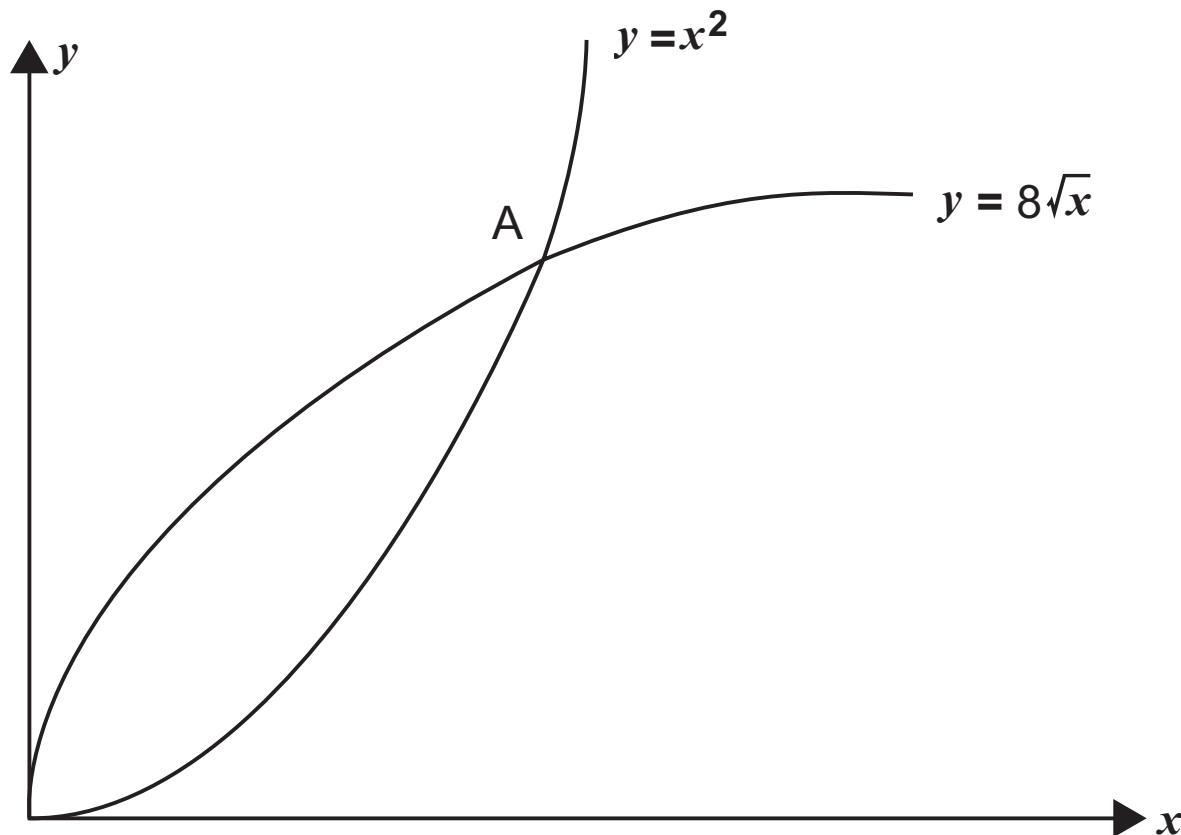
(b) Prove that the sum of the first  $n$  terms of a geometric progression, with first term  $a$  and common ratio  $r$ , is

$$S_n = \frac{a(1 - r^n)}{1 - r} \quad [6 \text{ marks}]$$

## 6 The graphs of the curves

$$y = x^2 \text{ and } y = 8\sqrt{x}$$

are shown in **Fig. 5** below.



**Fig. 5**

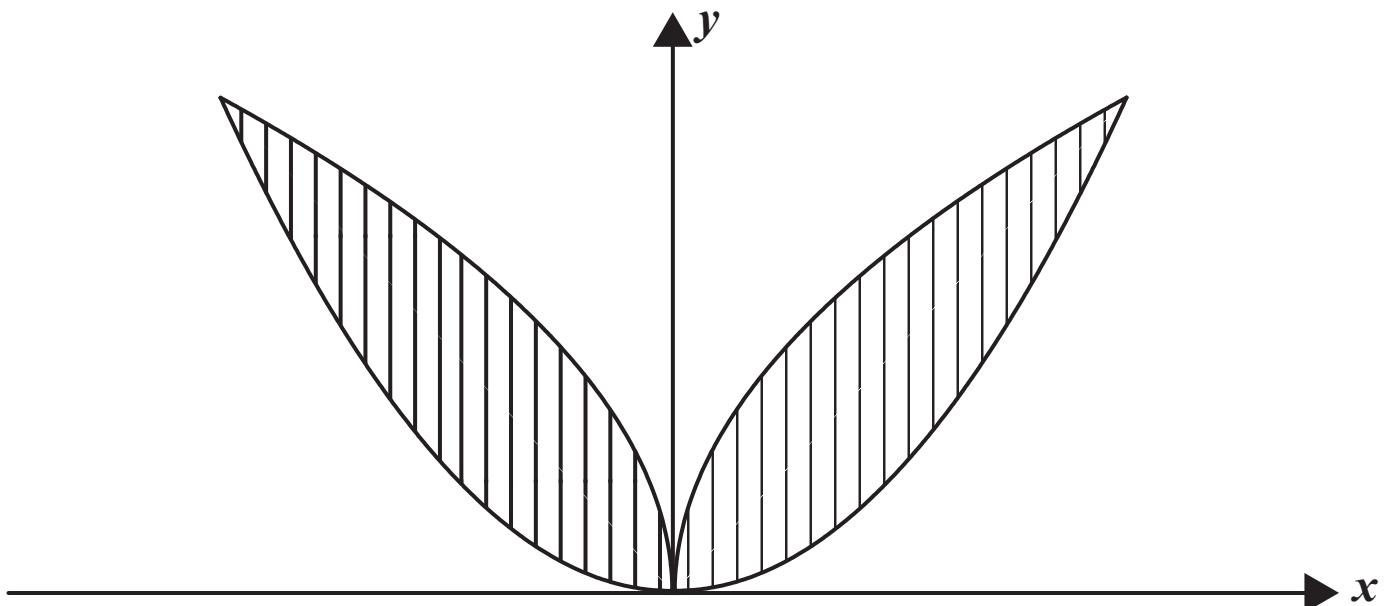
The curves cross at the point A.

(i) Find the coordinates of A. [3 marks]

A garden centre has created a logo by reflecting the area between the curves

$$y = x^2 \text{ and } y = 8\sqrt{x}$$

in the  $y$ -axis, as shown shaded in **Fig. 6** below.



**Fig. 6**

(ii) Find the area of the logo. [7 marks]

7 (a) Solve the equation

$$4 - \sin \theta = 6 \cos^2 \theta$$

for  $0^\circ \leq \theta \leq 360^\circ$  [7 marks]

(b) Prove the identity

$$\tan \theta + \frac{1}{\tan \theta} \equiv \frac{1}{\sin \theta \cos \theta} \quad [5 \text{ marks}]$$

8 Solve the simultaneous equations

$$\log_4 x + \log_4 y = 2$$

$$\log_9 x - \log_9 y = -\frac{1}{2} \quad [10 \text{ marks}]$$

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

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