Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2014

Mathematics

Assessment Unit C2

assessing

Module C2: AS Core Mathematics 2

[AMC21]

AMC21

FRIDAY 6 JUNE, AFTERNOON

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

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

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

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

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

(b) Find the coefficient of x^5 in the binomial expansion of

$$(3 - x)^7$$ [4]

2 Find

$$\int \frac{16}{x^2} + x^{\frac{1}{3}} + 9x - 7 \, \mathrm{d}x$$ [5]

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

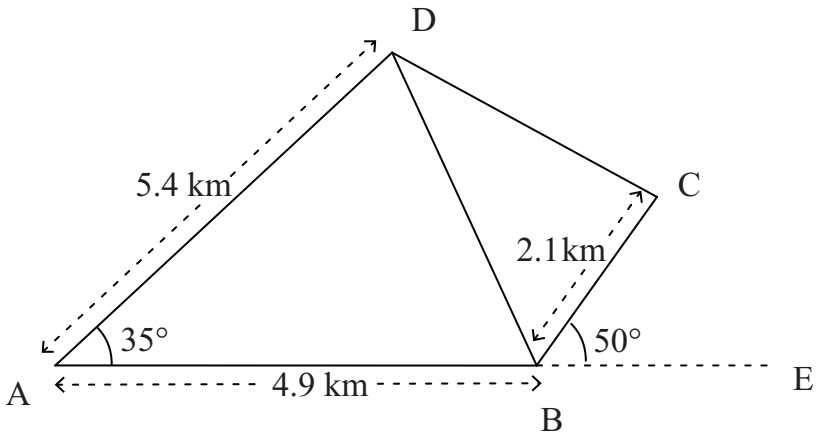

Fig. 1

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

AB = 4.9 km
AD = 5.4 km
BC = 2.1 km
angle DAB = 35°
angle CBE = 50°

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

(ii) Find the angle ABD. [2]

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

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

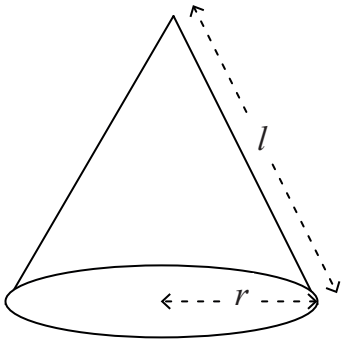

Fig. 2

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

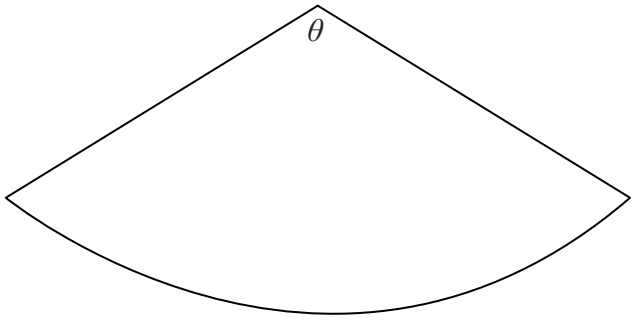

Fig. 3

The radii of this sector subtend an angle of θ radians at its centre.

(i) Find θ, in terms of π, r and l. [3]

(ii) Hence show that the curved surface area of a cone is given by πrl. [2]

(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.

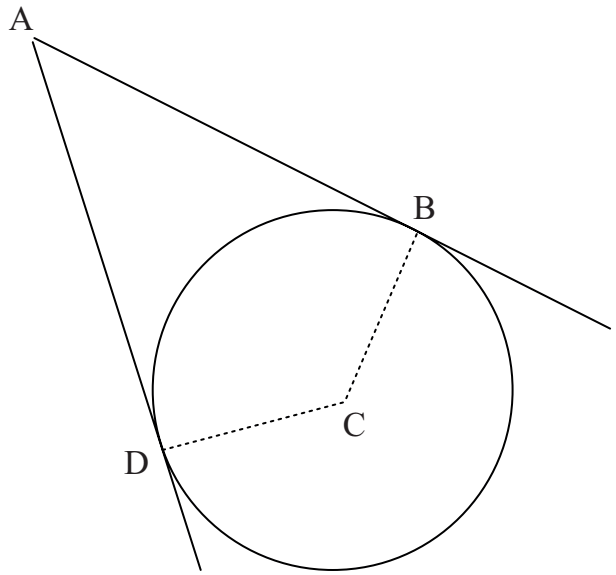

Fig. 4

Find the area of the kite ABCD. [7]

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

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

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

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

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

6 The graphs of the curves

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

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

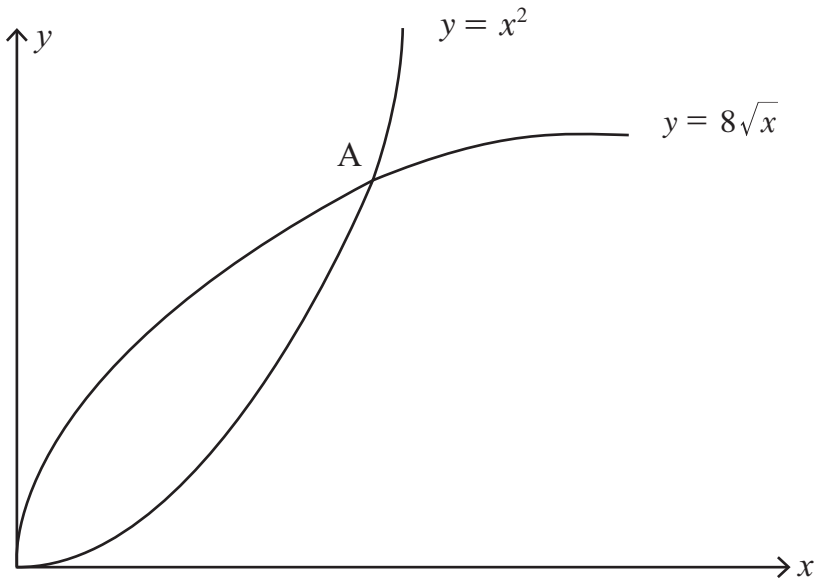

Fig. 5

The curves cross at the point A.

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

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.

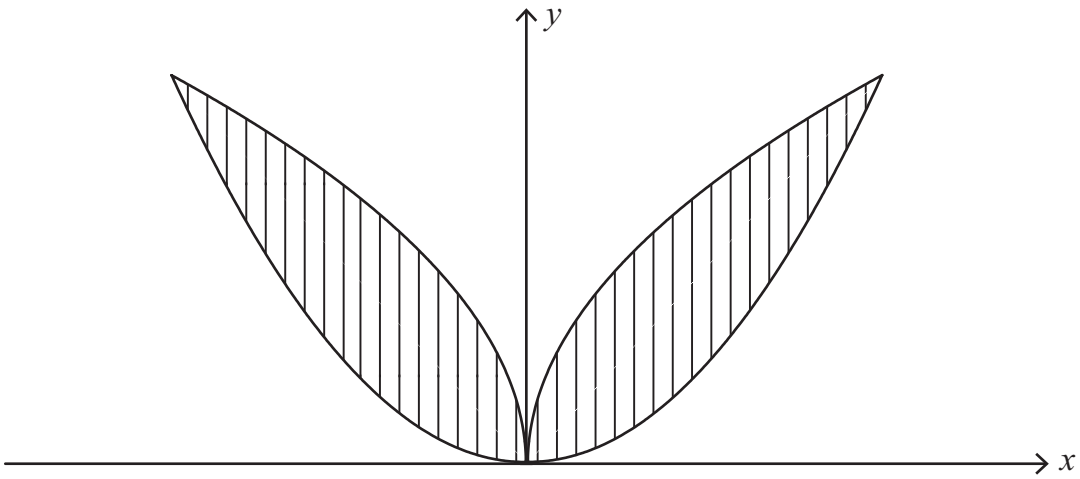

Fig. 6

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

7 **(a)** Solve the equation

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

for $0° \leqslant \theta \leqslant 360°$ [7]

(b) Prove the identity

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

8 Solve the simultaneous equations

$$\log_4 x + \log_4 y = 2$$
$$\log_9 x - \log_9 y = -\frac{1}{2}$$ [10]

THIS IS THE END OF THE QUESTION PAPER