



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2010

Mathematics

Assessment Unit C2

assessing

Module C2: AS Core Mathematics 2

[AMC21]



THURSDAY 27 MAY, 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 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 (i)** Write down the first 5 terms of the sequence defined by the recurrence relationship

$$u_{n+1} = \frac{2}{1+u_n}, \text{ where } n > 0 \text{ and } u_1 = 3 \quad [3]$$

- (ii)** State if the sequence diverges, converges and/or oscillates. [2]

- 2 (i)** Write down the centre of the circle whose equation is

$$x^2 + y^2 + 4y - 21 = 0$$

and find the circle's radius. [4]

- (ii)** Find the gradient of the tangent to this circle at the point (3, 2). [3]

- 3 A gold earring can be modelled as a sector of a circle with a triangle removed as shown in Fig. 1 below.

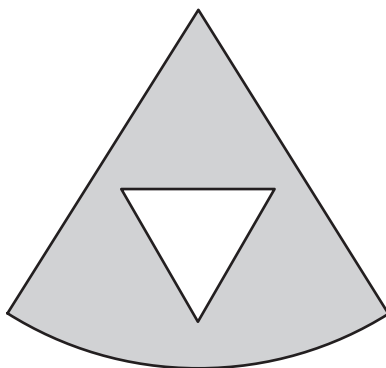


Fig. 1

The sector has angle $\frac{\pi}{4}$ radians and is cut from a circle of radius 3 cm.

- (i) Find the area of this sector. [2]

The triangle is equilateral and of side 1 cm.
The gold is 0.1 cm thick.

- (ii) Find the volume of gold in the earring. [5]

- 4 The first, second and third terms of a geometric series are

5, 3 and x .

- (i) Find x . [3]

- (ii) State why a sum to infinity for this series exists. [1]

- (iii) Find the sum to infinity of this series. [2]

- 5 (i) Find the first four terms in the binomial expansion, in ascending powers of x , of

$$(1 + 3x)^4 \quad [4]$$

The first three terms in the binomial expansion, in ascending powers of x , of

$$(1 + x)^{12}$$

are

$$1 + 12x + 66x^2$$

For a certain value of x , where $x \neq 0$, the sum of the first three terms in the binomial expansion of $(1 + x)^{12}$ is equal to the sum of the first four terms in the binomial expansion in (i).

- (ii) Find x . [3]

- 6 (a) Find

$$\int 3 - x^{-3} \, dx \quad [3]$$

- (b) Fig. 2 below shows a sketch of the graph of

$$y = 4x^2 - x^3$$

for $0 \leq x \leq a$, where $a > 4$

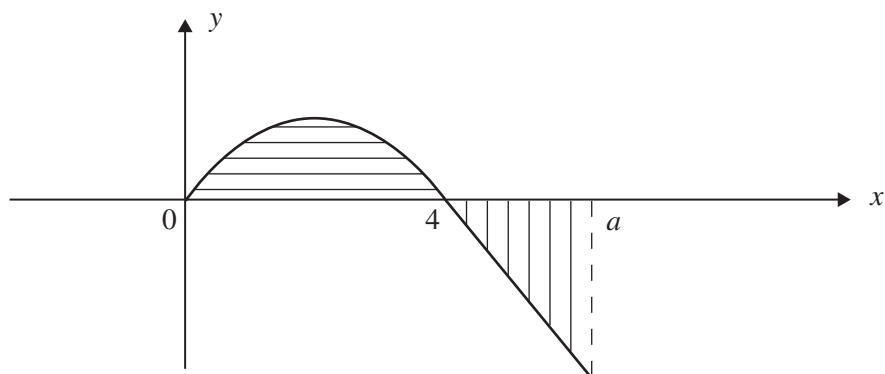


Fig. 2

- Given that the two shaded regions have equal areas, find a . [8]

7 (a) Solve the equation

$$3 \sin^2 x + 8 \cos x = 0$$

for $-\pi \leq x < \pi$

[7]

(b) Two ships, C and D, leave harbour at 0900 hours.

Ship D travels at a speed of 24 knots on a bearing of 030°

Ship C travels at a speed of 15 knots on a bearing of 140° as shown in **Fig. 3** below.

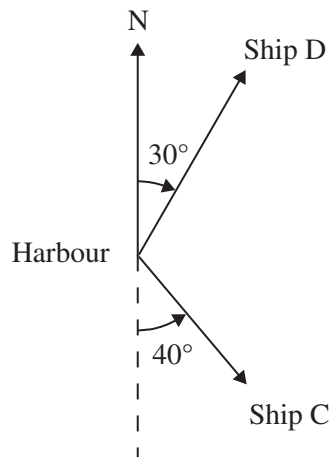


Fig. 3

[1 knot is a speed of 1 nautical mile per hour]

Find the bearing and the distance, in nautical miles, of ship C from ship D at 1200 hours.

[10]

8 (a) Find x given that

$$3^{2x} = 7 \quad [4]$$

(b) Find x given that

$$\log x + \log x^2 + 2 \log x^3 = 1 \quad [5]$$

(c) Given that

$$\log_2 x - \log_2 y = 6$$

and that

$$2^3 = \frac{1}{z}$$

show that

$$y = z^2x \quad [6]$$

THIS IS THE END OF THE QUESTION PAPER
