Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2019

Centre Number

Candidate Number

Mathematics

Assessment Unit C2
assessing
Module C2:
AS Core Mathematics 2

MV18

[AMC21]
WEDNESDAY 22 MAY, MORNING

Time

1 hour 30 minutes, plus your additional time allowance.

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer **all eight** questions in the spaces provided.
Do not write on blank pages.
Complete in black ink only.
Questions which require drawing or sketching should be completed using an H.B. pencil.
All working should be clearly shown in the spaces provided.
Marks may be awarded for partially correct solutions.
Answers without working may not gain full credit.
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 $\ln z \equiv \log_e z$

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(Questions start overleaf)

1 **(i)** Use the trapezium rule with four strips to find an approximation for [5 marks]

$$\int_0^{0.4} \cos 2x \, \mathrm{d}x$$

(ii) Suggest one way in which the approximation in **(i)** could be improved. [1 mark]

2 **(a)** Aaron has 15 weeks to save £165
The amounts of money he saves each week form an arithmetic series.

(i) If Aaron saves £a in the first week and increases the amount of money he saves each week by £d, show that

$a + 7d = 11$ [3 marks]

(ii) Given that Aaron saves £8.90 in the fifth week, find the values of a and d. [4 marks]

(b) Find the sum to infinity of the geometric series whose second and third terms are 11.6 and 2.32 respectively. [7 marks]

3 **Fig. 1** below shows a circular ceramic plate with centre O and radius 7.1 cm.

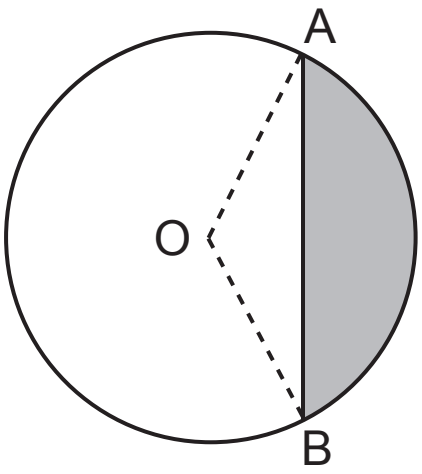

Fig. 1

A chord of length 9.3 cm is drawn between two points A and B on the circumference of the circle.

(i) Show that the angle AOB is 1.43 radians. [3 marks]

The shaded area in the diagram is to be painted purple.

(ii) Calculate the area to be painted purple. [5 marks]

4 Solve the equation

$2\sin\theta\cos\theta = 3\cos\theta$ where $0° \leqslant \theta \leqslant 360°$ [5 marks]

5 **(a)** Find

$$\int \frac{3x^{-3}}{2} - 6x \, dx$$ [3 marks]

(b) Fig. 2 below shows a sketch of the curve with equation

$$x = y^2 - 5y + 4$$

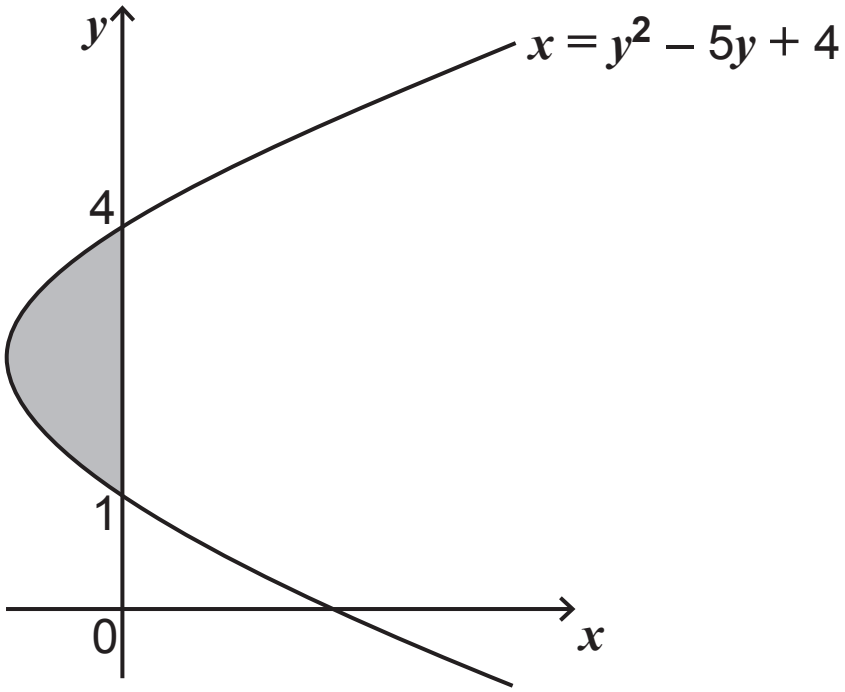

Fig. 2

Calculate the shaded area. [6 marks]

6 **(a)** Find the centre and radius of the circle with equation

$x^2 + y^2 - 6x + 2y + 6 = 0$ [4 marks]

(b) The line joining the points (–3, 8) and (1, –4) is a diameter of a circle.

Find the equation of this circle. [4 marks]

7 **(i)** Prove that

$\log_a \frac{x}{y} = \log_a x - \log_a y$ [6 marks]

(ii) Hence solve the equation

$\log_2(x^2 - 5x + 14) - \log_2(x + 1) = 1$ [6 marks]

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

$$\left(1 - \frac{x}{3}\right)^8$$ [4 marks]

(ii) Hence find the term independent of x in the expansion of

$$\left(2 + \frac{1}{x^2}\right)\left(1 - \frac{x}{3}\right)^8$$ [4 marks]

(b) At the beginning of a game of snooker, the 15 red balls each of diameter 52.5 mm are arranged in a triangular pattern as shown in **Fig. 3** below.

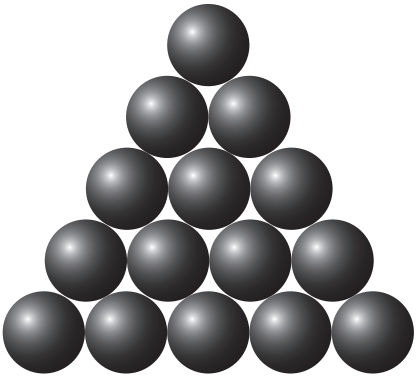

Fig. 3

A plastic frame in the shape of an equilateral triangle is used to arrange the balls into this pattern, as shown in **Fig. 4** below.

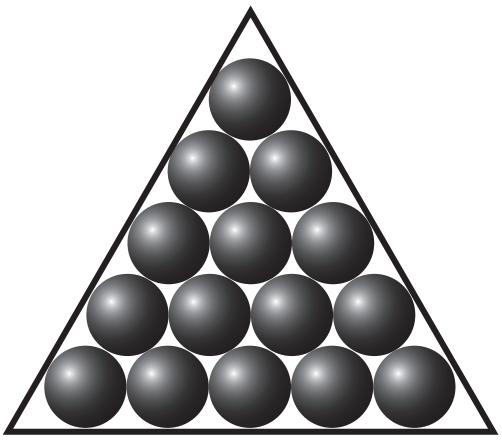

Fig. 4

Calculate the length of one side of the frame.
[5 marks]

This is the end of the question paper

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Examiner Number