Rewarding Learning

Centre Number

Candidate Number

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2018

Mathematics

Assessment Unit C2
assessing
Module C2:
AS Core Mathematics 2

AMC21

[AMC21]
WEDNESDAY 23 MAY, MORNING

TIME

1 hour 30 minutes.

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 outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen**.
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 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 $\ln z \equiv \log_e z$

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1 Use the Trapezium Rule with five ordinates to find an estimate of

$$\int_1^2 \sqrt{1 + 2x^2}\, dx \qquad [6]$$

2 The equation of a circle is

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

(i) Find the centre and radius of this circle. [4]

(ii) Find the equation of the tangent to this circle at the point (−3, 3). [4]

[Turn over

3 **(a)** Find

$$\int 2x^3 - \sqrt{x} + \frac{1}{x^4} - 3 \, dx \qquad [5]$$

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(b) The curves with equations $y = x^2 - 5x + 8$ and $y = -x^2 + 5x - 4$ intersect at the points (2, 2) and (3, 2) as shown in **Fig. 1** below.

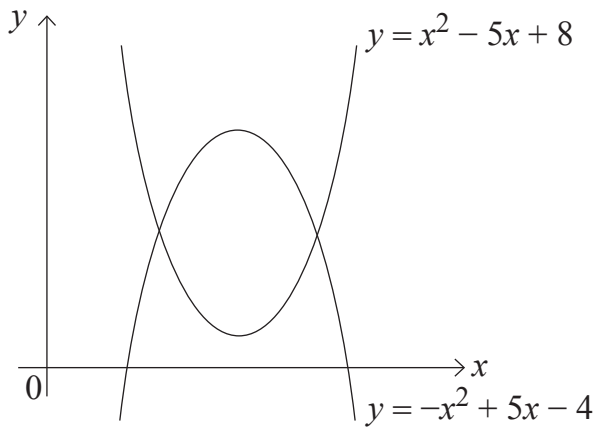

Fig. 1

Find the area enclosed by the curves. [6]

4 A wing of a toy aeroplane can be modelled by two triangles ABC and ACD joined together to make a quadrilateral ABCD, as shown in **Fig. 2** below.

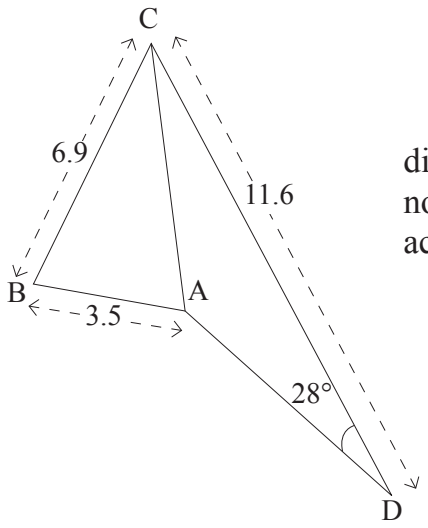

diagram not drawn accurately

Fig. 2

AB = 3.5 cm BC = 6.9 cm
The area of the triangle ABC is 9.8 cm^2

(i) Find the size of $C\hat{B}A$. [3]

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CD = 11.6 cm

$A\hat{D}C = 28°$ $C\hat{A}D$ is obtuse.

(ii) Find the size of $C\hat{A}D$. [6]

5 **(i)** Use the binomial theorem to expand

$$(3 + x)^5$$

in ascending powers of x. [4]

(ii) Hence, or otherwise, find the values of P, Q and R for which

$$(3 + x)^5 - (3 - x)^5 \equiv Px + Qx^3 + Rx^5$$ [4]

6 **(i)** Prove that

$$\frac{(1 - \cos \theta)(1 + \cos \theta)}{\sin \theta \cos \theta} \equiv \tan \theta \qquad [4]$$

(ii) Hence, solve the equation

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

for $0 \leqslant \theta \leqslant 2\pi$ [6]

7 Animator Paul is designing a new character, Alfie, for a game as shown in **Fig. 3** below.
Fig. 4 below shows a circle of radius r and centre O.
AB is a chord of the circle with $A\hat{O}B = \theta$ radians.

Fig. 3

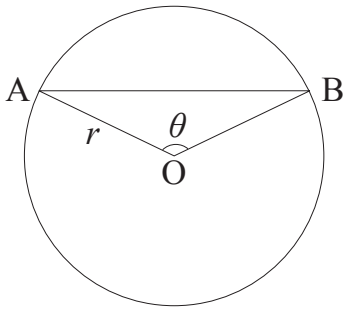

Fig. 4

Paul models Alfie's hat as the minor segment and his face as the major segment of this circle.

(i) Find, in terms of r and θ, the area of Alfie's hat. [3]

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In the model, the area of Alfie's face is m times the area of his hat.

(ii) Find m in terms of θ and π. [5]

8 **(a)** Given that

$$\frac{5^{x-1}}{3^{2x}} = 27$$

find x. [8]

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(b) The first three terms in an arithmetic progression are

$$\log(4x + 1), \quad \log(2x + 3), \quad \log(x + 3)$$

Find the value of x. [7]

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
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7	
8	
Total Marks	

Examiner Number