

ADVANCED General Certificate of Education 2017

Mathematics

Assessment Unit C4 assessing Module C4: Core Mathematics 4

Centre Number

Candidate Number

AMC41

[AMC41] WEDNESDAY 7 JUNE, 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 $\ln z \equiv \log_e z$ 10346

20AMC4101

1	(i)	Write	
		$12\cos\theta + 5\sin\theta$	
		π	
		in the form $R\cos(\theta - \alpha)$, where R is a positive integer and $0 < \alpha < \frac{\pi}{2}$ [3]
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The depth d (m) of water in a reservoir at time t (hours) can be modelled by the equation

$d = 12\cos t + 5\sin t + 20$

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2	The	e functions f and g are define	d as:	
		$\mathbf{f}(x) = 2x^2 - 4$	x > 0	
		$g(x) = \sec x$	$-\frac{\pi}{2} < x < \frac{\pi}{2}$	
	(i)	Find the inverse function f	$^{-1}(x)$ and state its domain	in. [4]
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(iii) State the range of the function $g(x)$. [1]	
 (iii) State the range of the function g(x). (iv) Find the composite function fg(x). 	
(iv) Find the composite function fg(x). [2]
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3	The	e points A, B and C have position vectors
		$\overrightarrow{OA} = \begin{pmatrix} 2\\1\\3 \end{pmatrix} \qquad \overrightarrow{OB} = \begin{pmatrix} 4\\-2\\5 \end{pmatrix} \qquad \overrightarrow{OC} = \begin{pmatrix} -3\\2\\7 \end{pmatrix}$
	(i)	Find \overrightarrow{BA} [2]
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)	Find the angle ABC. [5]

4	The	e value V of a car decreases at a rate proportional to V .
	(i)	Model this by a differential equation. [2]
	٨٩	and wears a converte an initial value of \$25,000, has a value of \$15,000
	AII	Find the value of the car after 5 years [9]
	(11)	[7]
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$\ln 3x$



A sail for a boat can be modelled by the area between the curve	$y = x^2$	$\ln 3x$,
the x-axis and the lines $x = 1$ and $x = 4$		

Find the area of the sail.

[8]

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6	Ac	curve is defined by the parametric equations
		$x = 2 + 3\sin\theta$ and $y = \sin\theta - \cos\theta$
	(i)	Find $\frac{dy}{dx}$ in terms of θ .
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-	Find $\frac{d^2 y}{dx^2}$ in terms of θ .	[2
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7 (a)	Solve	
(a)		
	$\sin\left(x-\frac{\pi}{3}\right) = \sqrt{3}\sin x$	
	for $-\pi \leq x \leq \pi$ [5]	
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	$\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta} \equiv \sec 2\theta + \tan 2\theta$	[6]
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	$\int \frac{3\cos x \sin^2 x}{4 - \sin^2 x} \mathrm{d}x$	[12
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