Rewarding Learning

Centre Number

Candidate Number

**ADVANCED SUBSIDIARY (AS)**
**General Certificate of Education**
**2017**

# Mathematics

Assessment Unit C2
*assessing*
Module C2:
AS Core Mathematics 2

*AMC21*

## [AMC21]
## FRIDAY 19 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** Find

$$\int 6t^2 + t^{\frac{1}{2}} + 9 - 3t^{-3}\,\mathrm{d}t \qquad [5]$$

**2** **(i)** Use the trapezium rule with four ordinates to find an approximate value for

$$\int_0^{0.6} 10^x \, dx$$

[5]

**(ii)** Briefly explain why in this case the trapezium rule gives a value greater than the exact value. [1]

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**3** The line $y = 8$ crosses the curve $y = 6x - x^2$ at the points A and B.

**(i)** Find the $x$ coordinates of A and B. [2]

**(ii)** Hence find the area bounded by the line $y = 8$ and the curve $y = 6x - x^2$ [7]

**4** **(a)** A girl invests £1 000 at 8% per annum compound interest added annually.

**(i)** Find the value of the investment at the end of $n$ years. [1]

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**(ii)** Hence find how many years it will be until the value of the investment exceeds £2 000 [3]

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**(Questions continue overleaf)**

**(b) (i)** Show that the sum of the first $n$ natural numbers is

$$S_n = \frac{n(n+1)}{2}$$

[4]

**(ii)** Find the sum of the integers between 1 and 600 inclusive that are not divisible by 3 [6]

**5** Solve the equation

$$\frac{2}{\tan^2\theta} + 8 = \frac{7}{\sin\theta}$$

where $0° \leqslant \theta \leqslant 180°$ [9]

**6** Use the binominal theorem to expand, in ascending powers of $x$,

$$(2 + x - x^2)^6$$

as far as the term in $x^3$ [6]

7 **(i)** Prove that

$$\log_a x^n = n \log_a x \qquad [6]$$

**(ii)** Find $x$ given that

$$\log_a x = \log_{a^2} (x + 6) \qquad [6]$$

**8** **Fig. 1** below shows a framework for part of a stained glass window.
AB, BC and CA are tangents to the circle, centre O and radius *r*.

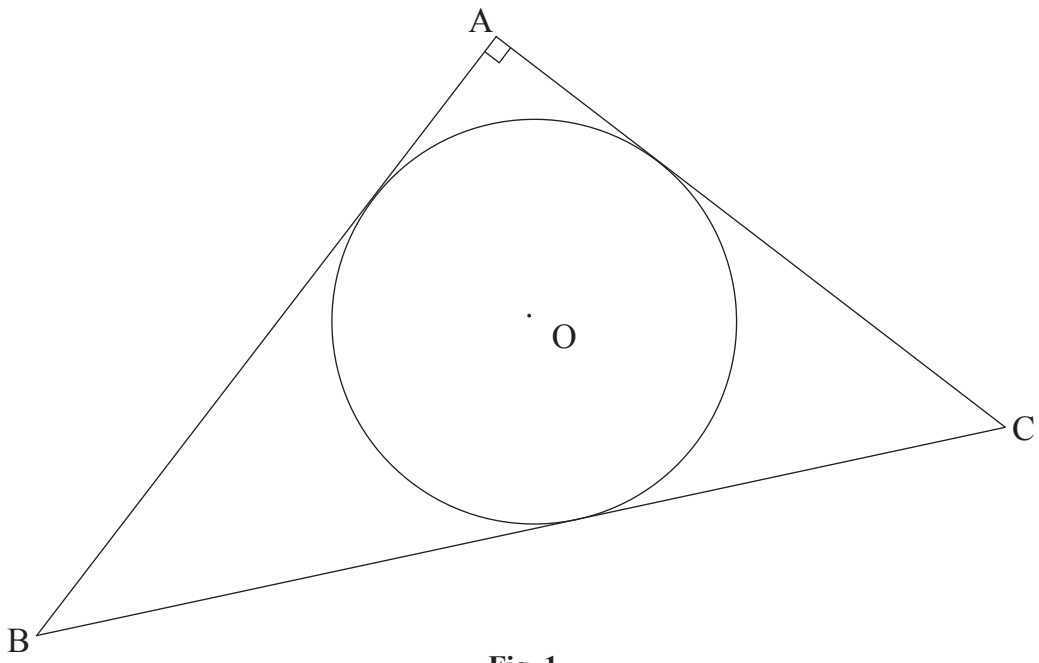


**Fig. 1**

AB = 20 cm
AC = 16 cm
BÂC = 90°

**(i)** Find the exact length of BC. [1]

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**(ii)** Hence show that $r$ is 5.19 cm. [5]

**(iii)** Find, in radians, the angle ABC. [1]

**[Turn over**

The framework is to be filled with glass of four different colours as shown in **Fig. 2** below.

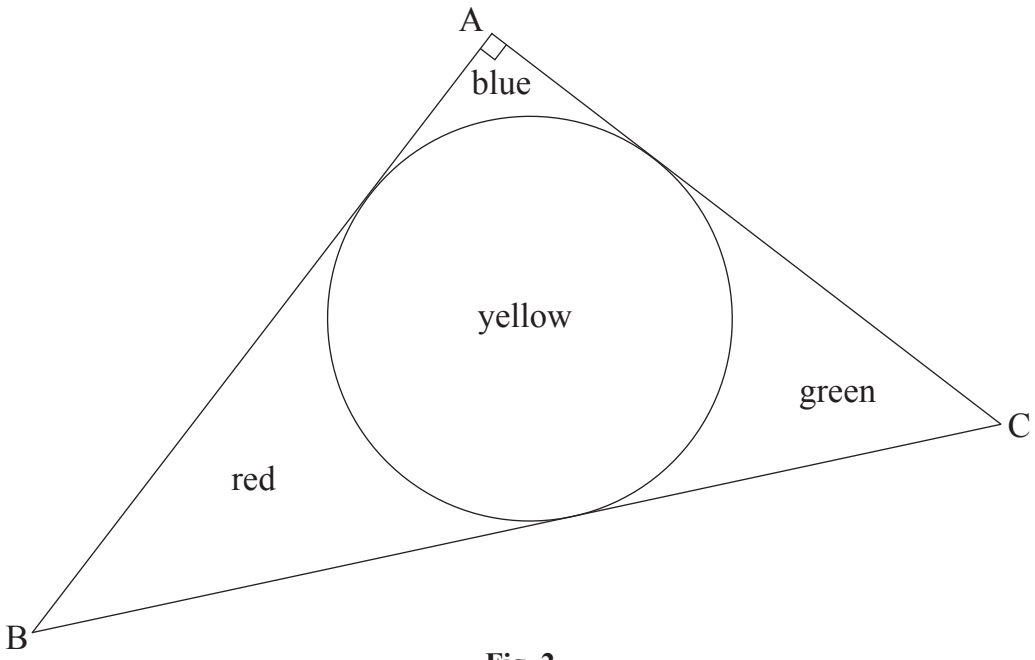


**Fig. 2**

**(iv)** Find the area of the red glass. [7]

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

**Examiner Number**