



**CARIBBEAN EXAMINATIONS COUNCIL
ADVANCED PROFICIENCY EXAMINATION**

MATHEMATICS

UNIT 1 – PAPER 03B

1½ hours

23 MAY 2003 (p.m.)

This examination paper consists of **THREE** questions. One question from each of Modules 1.1, 1.2 and 1.3.

The maximum mark for each question is 20.

The maximum mark for this examination is 60.

This examination consists of 4 printed pages.

INSTRUCTIONS TO CANDIDATES

1. **DO NOT** open this examination paper until instructed to do so.
2. Answer **ALL THREE** questions.
3. Unless otherwise stated in the question, all numerical answers **MUST** be given exactly **OR** to three significant figures as appropriate.

Examination material:

Mathematical formulae and tables

Electronic calculator

Ruler and graph paper

Section A (Module 1.1)

Answer this question.

1. (a) Find the values of $x \in \mathbf{R}$ which satisfy the inequality

$$|5x - 3| \leq |x - 4|. \quad [5 \text{ marks}]$$

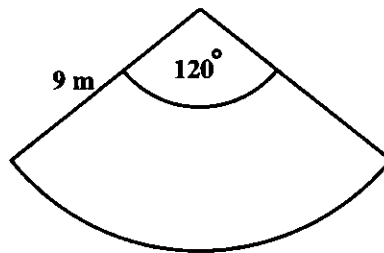
- (b) Find the values of the constants p and q such that $x - 1$ and $x + 1$ are factors of

$$4x^3 - px^2 - qx + 3. \quad [5 \text{ marks}]$$

- (c) Find the values of x which satisfy the equation

$$2^{2x} - 3(2^{x+2}) + 32 = 0. \quad [6 \text{ marks}]$$

- (d) Find the radius of the circle whose area is equal to the area of the sector in the diagram shown below (**not drawn to scale**). [4 marks]

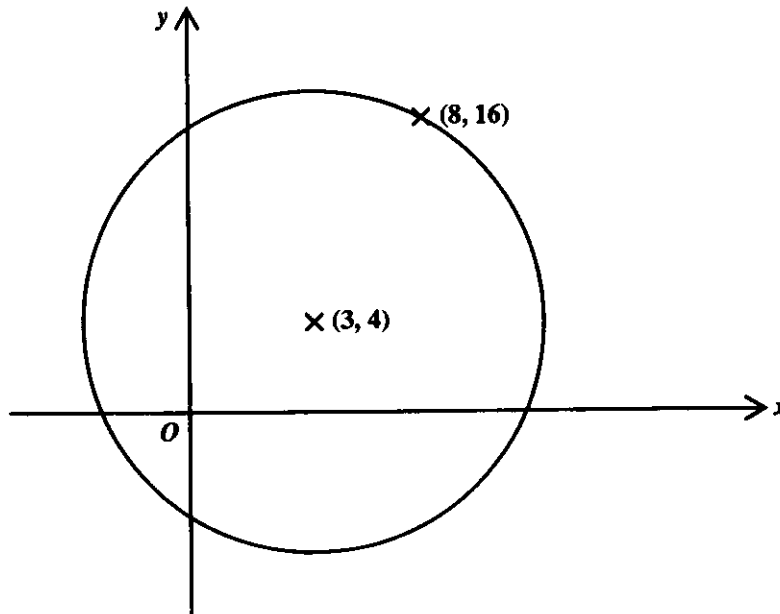


Total 20 marks

Section B (Module 1.2)

Answer this question.

2. (a) The diagram below, not drawn to scale, shows the circle, C, in the Cartesian plane.



C has centre (3, 4) and passes through the point (8, 16). Find the equation of C. [4 marks]

- (b) Let α and β be the roots of the equation $2x^2 + 4x + 1 = 0$.

- (i) Without solving the equation, write down the value of

a) $\alpha + \beta$ b) $\alpha \beta$. [2 marks]

- (ii) Hence, find the value of $\alpha^2 + \beta^2$. [2 marks]

- (iii) Find also the equation whose roots are $\frac{1}{\alpha^2}, \frac{1}{\beta^2}$. [3 marks]

- (c) Solve, for $0 \leq \theta \leq \pi$, the equation

$\sin \theta + \sin 2\theta + \sin 3\theta = 0$. [6 marks]

- (d) Find the values of $t \in \mathbf{R}$ such that the vectors

$$\begin{aligned} \mathbf{u} &= 3\mathbf{i} + 2t\mathbf{j} \\ \mathbf{v} &= -2\mathbf{i} + 3t\mathbf{j} \end{aligned}$$

are perpendicular.

[3 marks]

Total 20 marks

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Section C (Module 1.3)

Answer this question.

3. (a) (i) Find $\lim_{x \rightarrow 2} \frac{x^3 - 4x}{x - 2}$. [4 marks]

- (ii) Determine the real values of x for which the function

$$\frac{4x}{(|2x - 7| - 5)}$$
 is continuous. [4 marks]

- (b) Differentiate with respect to x the function

$$\frac{x}{3x + 4}$$
 [4 marks]

Hence, or otherwise, find

$$\int \frac{16}{(3x + 4)^2} dx$$
 [2 marks]

- (c) The graph of the curve $y = x^2$ between $x = 0$ and $x = 2$ is rotated through 2π radians about the x -axis.

Find the volume of the solid generated. [6 marks]

Total 20 marks

END OF TEST