

MATHEMATICS Extended Part
Module 2 (Algebra and Calculus)
Question-Answer Book

8.30 am – 11.00 am (2½ hours)
This paper must be answered in English

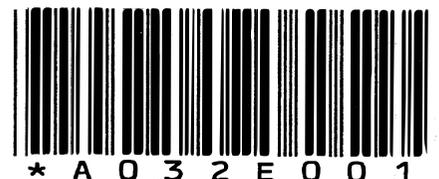
INSTRUCTIONS

- (1) After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5, 7, 9, 11 and 13.
- (2) This paper consists of TWO sections, A and B.
- (3) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
- (4) Graph paper and supplementary answer sheets will be supplied on request. Write your Candidate Number, mark the question number box and stick a barcode label on each sheet, and fasten them with string INSIDE this book.
- (5) Unless otherwise specified, all working must be clearly shown.
- (6) Unless otherwise specified, numerical answers must be exact.
- (7) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

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Candidate Number

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FORMULAS FOR REFERENCE

| | |
|---|--|
| $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$ | $\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2}$ |
| $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$ | $\sin A - \sin B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2}$ |
| $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$ | $\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2}$ |
| $2 \sin A \cos B = \sin(A+B) + \sin(A-B)$ | $\cos A - \cos B = -2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$ |
| $2 \cos A \cos B = \cos(A+B) + \cos(A-B)$ | |
| $2 \sin A \sin B = \cos(A-B) - \cos(A+B)$ | |

SECTION A (50 marks)

1. Find $\frac{d}{d\theta} \sec 6\theta$ from first principles. (5 marks)

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2. Let $(1+ax)^8 = \sum_{k=0}^8 \lambda_k x^k$ and $(b+x)^9 = \sum_{k=0}^9 \mu_k x^k$, where a and b are constants. It is given that $\lambda_2 : \mu_7 = 7 : 4$ and $\lambda_1 + \mu_8 + 6 = 0$. Find a . (5 marks)

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3. P is a point lying on AB such that $AP:PB=3:2$. Let $\vec{OA}=\mathbf{a}$ and $\vec{OB}=\mathbf{b}$, where O is the origin.

(a) Express \vec{OP} in terms of \mathbf{a} and \mathbf{b} .

(b) It is given that $|\mathbf{a}|=45$, $|\mathbf{b}|=20$ and $\cos\angle AOB=\frac{1}{4}$. Find

(i) $\mathbf{a}\cdot\mathbf{b}$,

(ii) $|\vec{OP}|$.

(5 marks)

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END OF PAPER

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