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TUTGATHER PRACTICE PAPER

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2027

MATHEMATICS Extended Part Module M2
PAPER

Question-Answer Book

Candidate Number

TUTGATHER
PRACTICE PAPER · NOT AN OFFICIAL HKEAA PAPER

1 hour 5 minutes

This paper must be answered in English

Topic practice: Matrices

INSTRUCTIONS

(1) This paper consists of THREE sections, A(1), A(2) and B.

(2) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins.

(3) Unless otherwise specified, all working must be clearly shown.

(4) Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.

(5) The diagrams in this paper are not necessarily drawn to scale.

(6) Calculators and mathematical drawing instruments may be used.

(7) The marks for each question are shown in brackets.

(8) No extra time will be given after the 'Time is up' announcement.

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SECTION A(1) (16 marks)

1. Let $A = \begin{pmatrix} 2 & -1 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 \\ -2 & 5 \end{pmatrix}$. Find $2A - 3B$. **(3 marks)**

2. Find the inverse of the matrix $C = \begin{pmatrix} 4 & 3 \\ 2 & 5 \end{pmatrix}$. **(3 marks)**

3. Let $P = \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ and $Q = \begin{pmatrix} 1 & 0 \\ 3 & 1 \end{pmatrix}$. Show that $(PQ)^T = Q^T P^T$. **(4 marks)**

Answers written in the margins will not be marked.
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4. Let $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and I be the 2×2 identity matrix. (a) Find $A^2 - 5A$. (b) Hence find a matrix B such that $AB = I$, expressing B in terms of A and I. **(6 marks)**

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SECTION A(2) (24 marks)

5. Let $M = \begin{pmatrix} 2 & 1 \\ 5 & 3 \end{pmatrix}$. (a) Find M^{-1}. (b) Hence solve the system $2x + y = 4$, $5x + 3y = 11$. **(7 marks)**

6. Let $A = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$. (a) Show that $A^2 - 2A - 3I = O$, where I is the 2×2 identity matrix and O is the 2×2 zero matrix. (b) Hence find A^{-1}. (c) Using the result in (a), express A^3 in the form $pA + qI$, where p and q are constants. **(8 marks)**

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7. Let $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 0 \\ 1 & 1 \end{pmatrix}$. (a) Find AB and BA. (b) Is $AB = BA$? Justify your answer. (c) Find $(AB)^T$ and $B^T A^T$, and verify that $(AB)^T = B^T A^T$. **(9 marks)**

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SECTION B (10 marks)

8. Let $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$. (a) Find A^{-1}. (b) Solve the matrix equation $AX = B$, where $B = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$. (c) For a 2×2 matrix C, prove that if $AC = I$, then $CA = I$. **(10 marks)**

END OF PAPER

Answers written in the margins will not be marked.

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