

**UNIVERSITY OF SWAZILAND
FACULTY OF EDUCATION
MAIN EXAMINATION PAPER 2016**

TITLE OF PAPER: CURRICULUM STUDIES IN MATHEMATICS I

COURSE CODE: CTE231/CTE531

PROGRAMME: B.ED 2 & PGCE

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS: ANSWER ANY FOUR QUESTIONS. EACH QUESTION IS WORTH 25 MARKS.

ADDITIONAL MATERIAL: GRID PAPER

This paper has 9 pages.

Do **NOT** open this question paper until instructed to do so by the invigilator

Question 1

- (a) Using appendix 1 (the extract from the syllabus, and IGCSE past examination questions on matrices) list:
- i) subtopics for the topic "Matrices." and [5]
 - ii) content for each subtopic in (i) [5]
- (b) Choose **two** (2) subtopics and identify at least **five** (5) contributory concepts for each of those subtopics [5]
- (c) Describe processes involved in the learning of operations on matrices [10]

Question 2

- (a) What are the ability levels of Bloom's taxonomy in the affective domain? [5]
- (b) Explain each level and describe how you would accommodate it in your classroom. [10]
- (c) Show
- i) How procedural knowledge is applied in the learning of Pythagoras's theorem [5]
 - ii) How conceptual knowledge is applied in the learning of Pythagoras's [5]

Question 3

You gave problem 6 [shown below subsection (c)] to your Form 4 class.

- a) Solve problem 6 [10]
- b) Identify **five** (5) mathematical knowledge the learner needs to solve the problem [10]
- c) Discuss the learner's solution in appendix 2 [5]

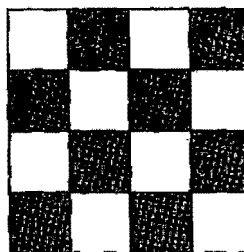
Problem 6: Counting Squares

Start with a small board, just 4×4 .

- i) How many squares are there? [It is not just 16!]

Continue investigating with different sizes of squares until you see a pattern. [Hint start with a 1 by 1 square]

- ii) How many squares are there on an 8×8 chess board?
- iii) How many squares are there on an $n \times n$ chess board?



Question 4

- a) Prepare a test specification grid for the topic: Quadratic Equations. [10]
- b) Use the test specification grid to write and classify **three** (3) test items for the topic. [15]

Question 5

Write an essay entitled: Realistic mathematics in the teaching and learning of secondary school mathematics.

OR

Write an essay entitled: Behaviourism in the secondary school mathematics class. [25]

Appendix 1

Syllabus Extract

21 Matrices	
Core	Extended
All learners should be able to: 21.1 Display information in the form of a matrix of any order. 21.2 Determine the order of a matrix. 21.3 Calculate the product of a matrix and a scalar. 21.4 Perform basic matrix operations: addition, subtraction and multiplication on matrices of any order (where compatible). 21.5 Understand and use the zero and the identity 2×2 matrices 21.6 Use equality of matrices in simple matrix equations.	21.7 Use the algebra of 2×2 matrices including the zero and identity matrices. 21.8 Calculate and use the determinant and inverse of a 2×2 matrix (non-singular matrix). 21.9 Solve simultaneous equations using matrices. 21.10 Use matrices in transformations.

IGCSE Past Examination Questions on matrices

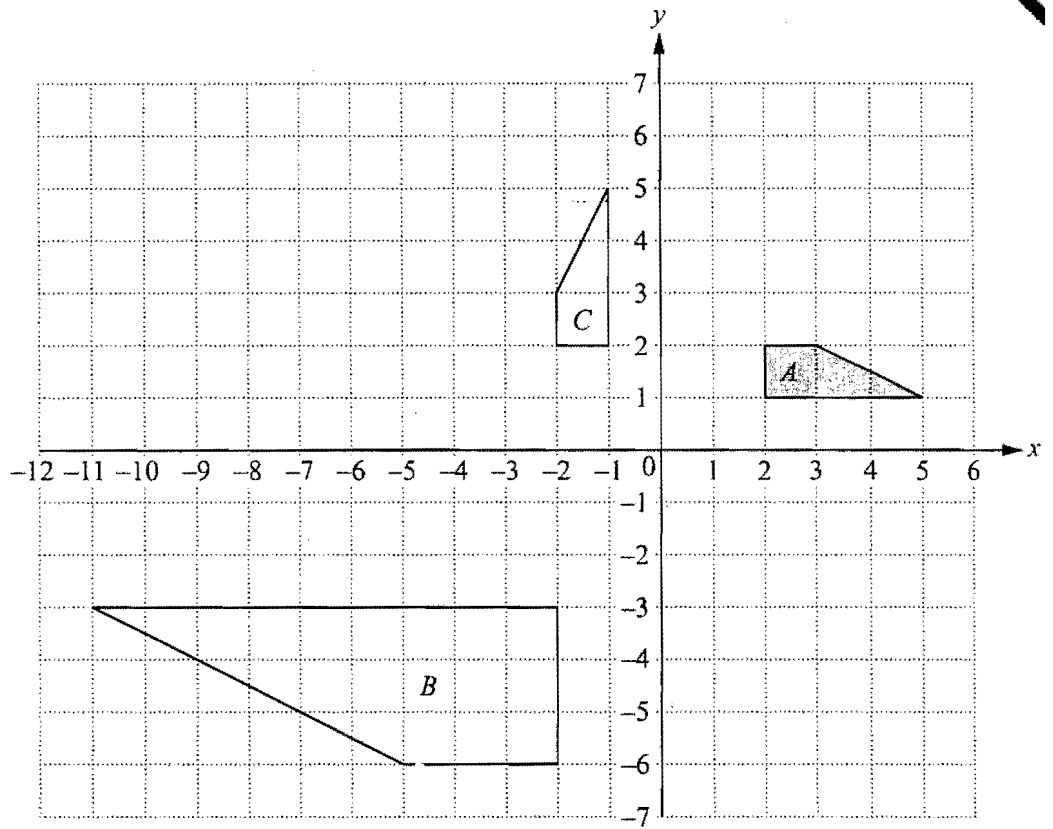
22 (a) Calculate $\begin{pmatrix} 3 & 7 \\ -1 & 4 \end{pmatrix} \begin{pmatrix} -2 & 1 \\ 4 & 2 \end{pmatrix}$.

(b) Calculate the inverse of $\begin{pmatrix} 5 & 3 \\ 6 & 4 \end{pmatrix}$.

11 $\mathbf{M} = \begin{pmatrix} 3 & 1 \\ -11 & -2 \end{pmatrix}$

Find \mathbf{M}^{-1} , the inverse of \mathbf{M} .

- 6** Find the 2×2 matrix that represents a rotation through 90° clockwise about $(0, 0)$.



- (a) Draw the image of
- (i) shape *A* after a translation by $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$,
 - (ii) shape *A* after a rotation through 180° about the point $(0, 0)$,
 - (iii) shape *A* after the transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$.

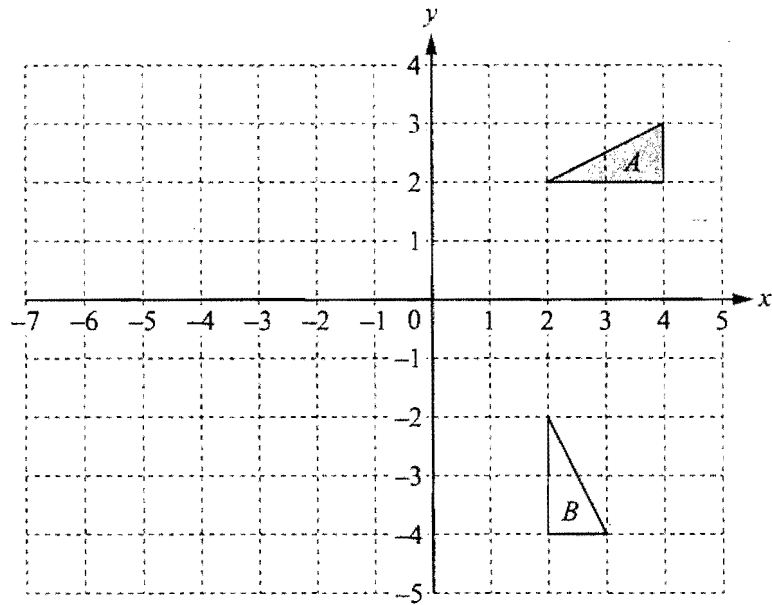
(b) Describe fully the **single** transformation that maps shape *A* onto shape *B*.

Answer(b)

.....

(c) Find the matrix which represents the transformation that maps shape *A* onto shape *C*.

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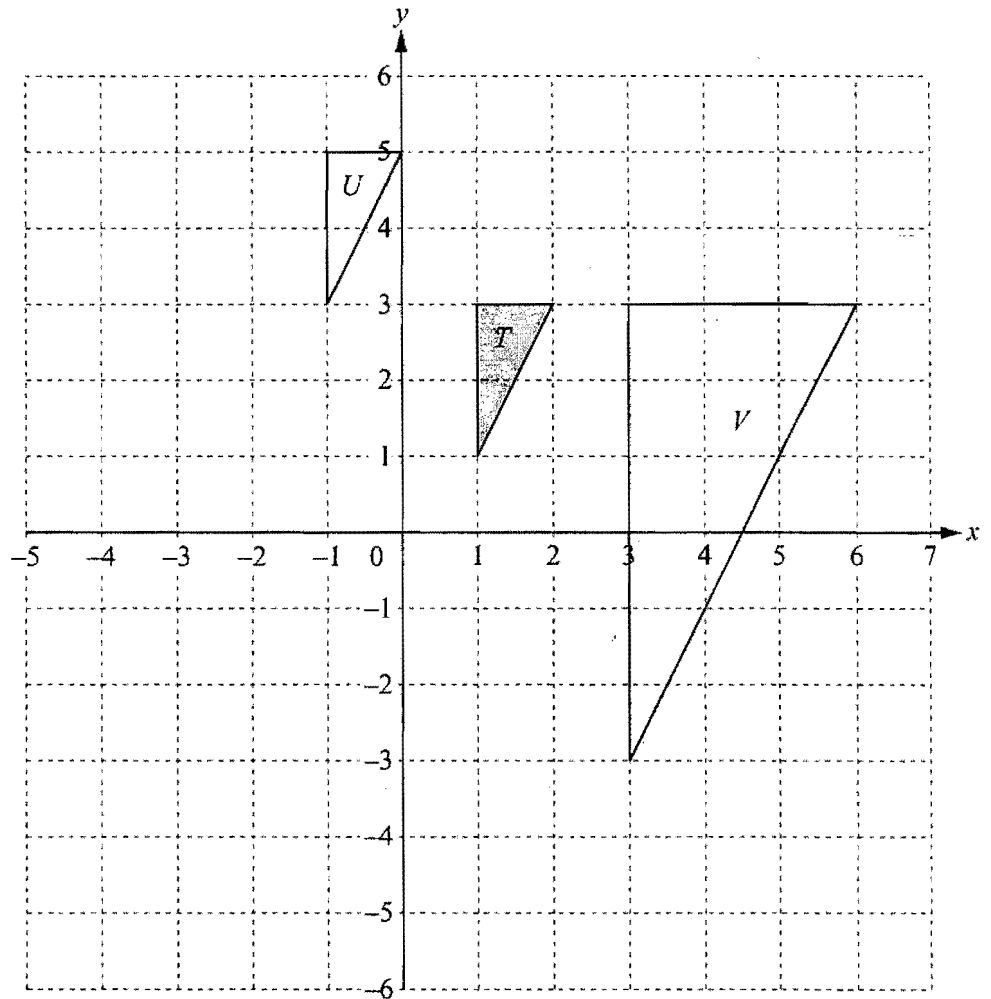


- (i) On the grid, draw the image of triangle A after the transformation represented by the

$$\text{matrix} \begin{pmatrix} -1.5 & 0 \\ 0 & -1.5 \end{pmatrix}.$$

- (ii) Find the 2×2 matrix which represents the transformation that maps triangle A onto triangle B .

1



(b) Describe fully the single transformation that maps

(i) triangle T onto triangle U ,

Answer(b)(i)

(ii) triangle T onto triangle V .

Answer(b)(ii)

9 $P = \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$ $Q = \begin{pmatrix} 1 & 2 \\ 0 & 3 \end{pmatrix}$ $R = \begin{pmatrix} 0 & u \\ 1 & v \end{pmatrix}$ $S = \begin{pmatrix} w & 3 \\ 8 & 2 \end{pmatrix}$



(a) Work out PQ .

Answer(a) $\begin{pmatrix} & \\ & \end{pmatrix}$

(b) Find Q^{-1} .

Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$

(c) $PR = RP$

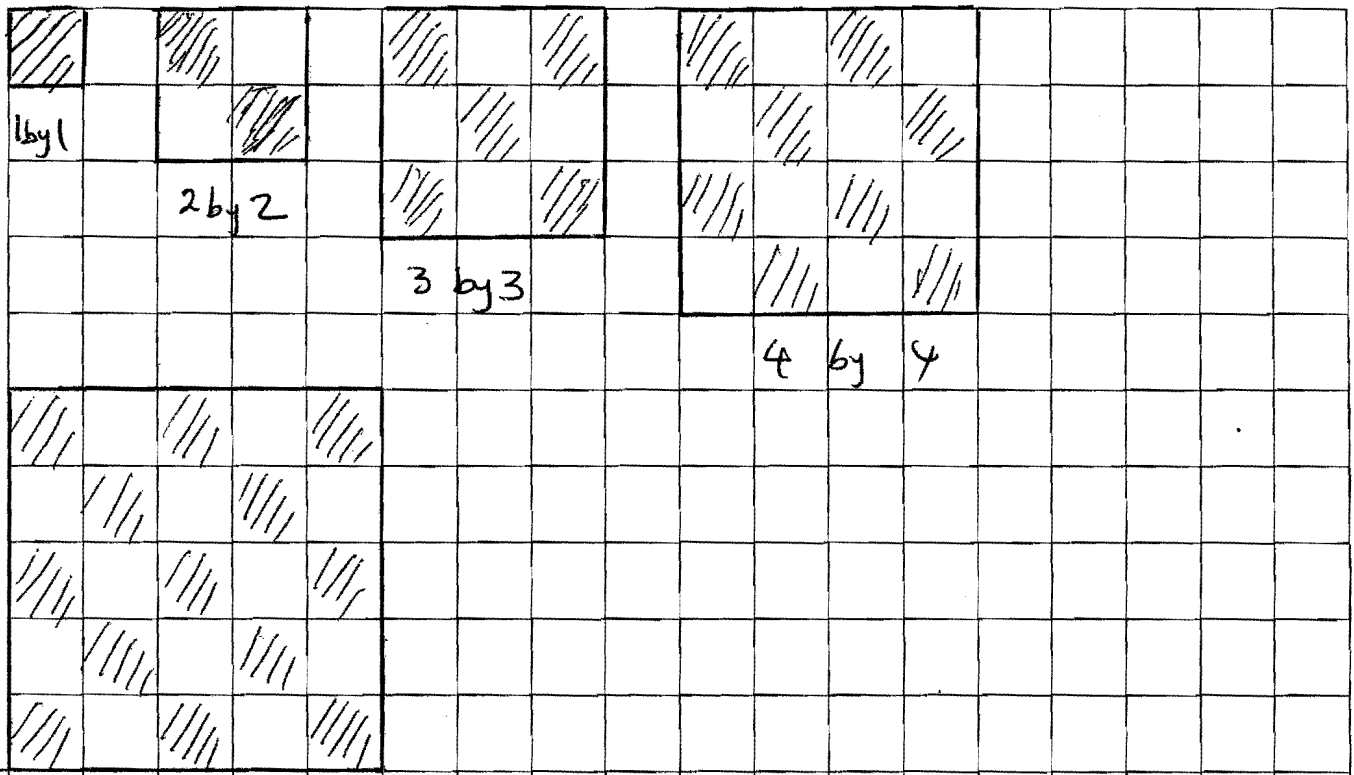
Find the value of u and the value of v .

Answer(c) $u = \dots\dots\dots$

$v = \dots\dots\dots$

(d) The determinant of S is 0.

Find the value of w .



2 by 2

3 by 3

4 by 4

5 by 5

Position	square size	number of squares
1	1 by 1	1
2	2 by 2	5
3	3 by 3	10
(i) 4	4 by 4	17
5	5 by 5	26

Except for the 1 by 1 square the rule is multiply position by itself and add 1

(ii) for the 8 by 8 square there will be 65 squares

(iii) for an n by n there will be $n^2 + 1$ squares