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VCE Specialist Mathematics $\frac{1}{2}$
Transformations I [4.2]
Test

24.5 Marks. 1 Minute Reading. 25 Minutes Writing

Results:

Test Questions	_____ / 24.5
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Section A: Test Questions (24.5 Marks)

Question 1 (4.5 marks)

Tick whether the following statements are **true** or **false**.

Statement	True	False
a. A linear transformation is defined by a rule of the form $(x, y) \rightarrow (ax + by, cx + dy)$.		
b. You can find the first column of a linear transformation by finding the coordinates that $(1, 0)$ maps to, and the second column by finding the coordinates that $(0, 1)$ maps to.		
c. The point $(2, -1)$ under the transformation $(x, y) \rightarrow (2x - 3y, -x + 4y)$ has image $(1, -6)$.		
d. If a triangle T has area $k \text{ units}^2$, it then undergoes a transformation represented by matrix A , where $ \det(A) = c$, then the area of the transformation triangle T' has an area $\frac{k}{c} \text{ units}^2$.		
e. A dilation by a factor 2 from the x -axis is always the same as a dilation by a factor $\frac{1}{2}$ from the y -axis.		
f. For a shear parallel to the x -axis, the points further away from the x -axis vertically shift further horizontally than the points closer to the x -axis.		
g. A projection of any point onto the y -axis will reduce the y -coordinate to 0.		
h. In order for a transformation to be reversed, the determinant of the transformation matrix must not be 0 and there must be only one pre-image for the image.		
i. If there is a sequence of transformations T_1, T_2, T_3 applied in that order, then the resulting transformation will be given by $T_R = T_1 T_2 T_3$, where each T_i is a 2×2 matrix.		

Question 2 (6 marks)

For the following questions, state the composite transformation matrix and find the image of the point $(1, -2)$.

- a. Reflection in the y -axis and projection onto x -axis. (2 marks)

- b. Shear of factor 4 parallel to the x -axis and reflection in the x -axis. (2 marks)

- c. Dilation of factor 2 from y -axis and shear of factor 3 parallel to the y -axis. (2 marks)

Space for Personal Notes

Question 3 (9 marks)

$$A = \begin{bmatrix} 2 & -2 \\ -1 & 3 \end{bmatrix}$$

- a.** Find $\det A$. (1 mark)

- b.** Find A^{-1} . (2 marks)

The triangle R is transformed into the triangle S by the matrix A .

- c.** Given that the area of triangle S is 72 square units, find the area of triangle R . (2 marks)

The triangle S has vertices at the points $(0, 4)$, $(8, 16)$ and $(12, 4)$.

d. Find the coordinates of the vertices of R . (4 marks)

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Question 4 (5 marks)

Consider the transformation given by $A = \begin{bmatrix} -1 & 3 \\ 2 & 5 \end{bmatrix}$.

- a.** Find the image of $(1,1)$ under the transformation A . (1 mark)

- b.** Find the inverse matrix A^{-1} . (2 marks)

It is known that (a, b) under the transformation A was $(11, 33)$.

- c.** Find the values of a and b . (2 marks)

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VCE Specialist Mathematics ½

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