

Matrices and Transformations Questions and Answers - Form 4

Topical Mathematics

Questions

- a. Given triangle ABC with vertices A (-6, 5), B(-4, 1) and C(3, 2) and that A(-6, 5) is mapped onto A¹(-6, -4) by a shear with y-axis in variant. On the grid provided below;
- draw triangle ABC
 - draw triangle A¹B¹C¹, the image of triangle ABC, under the shear
 - determine the matrix representing the shear
- b. Triangle A¹B¹C¹ is mapped onto A¹¹B¹¹C¹¹ by a transformation defined by the matrix

$$\begin{pmatrix} -1 & 0 \\ 3/2 & -1 \end{pmatrix}$$

- Draw triangle A¹¹B¹¹C¹¹ on the same grid as ABC and A¹B¹C¹
- Describe fully a single transformation that maps A¹¹B¹¹C¹¹

2.

- a. Under a certain rotation A(2,0) is mapped onto A¹(-4, 2) and B(0,5) is mapped onto B¹(-9, 0)
- On the grid provided plot the lines AB and A¹B¹ on the same axes
 - Hence determine by construction the co-ordinates of the centre and angle of rotation
- b. Under a quarter positive turn about the origin O, A¹ is mapped onto A¹¹ and B¹ is mapped onto B¹¹. Determine the co-ordinates of A¹¹ and B¹¹
- c. Describe fully a single transformation which would map A to A¹¹ and B to B¹¹

3. A transformation T is represented by the matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ and transformation U by $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ the matrix. Given that a rectangle has co-ordinates at A (1,2) B(6, 2), C(6, 4) and D (1, 4) and that under T the image of ABCD is A¹B¹C¹D¹ and under U the image of A₁B₁C₁D₁ is A₂B₂C₂D₂:

- Find the co-ordinates of A₁B₁C₁D₁ and A₂B₂C₂D₂
- On the grid provided, plot ABCD, A₁B₁C₁D₁ and A₂B₂C₂D₂
- Describe the transformation represented by:-

- U
- UT

- d. If A₂B₂C₂D₂ were to be transformed by a transformation represented by the matrix to map onto A₃B₃C₃D₃. What would be the area of A₃B₃C₃D₃

4. The vertices of a quadrilateral are A(2,2) B(8,2), C (8,6) and D(6,4) under a rotation the images of vertices A and D are A(0,8) and D¹(-2, 12).

- On the grid provided and using the same axes draw the quadrilateral ABCD and the points A¹ and D¹
- Determine the centre and angle of rotation
- Locate the points B¹ and C¹ under the rotation and complete the quadrilateral

5. A translation maps the point P(5, -3) onto P¹(2, -5)

- Determine the translation vector T
- A Point R¹ is the image of R(-2, -3) under the same translation in (a) above, find the magnitude of P¹R¹

6. Triangle ABC has vertices at A(0, -1), B(4, 3)and C(2,2).

- Find the coordinates of image triangle A¹B¹C¹ of triangle ABC under translation $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$

Answers

1.

a.

i. B (4,-5), C (3,6 1/2)

Δ ABC drawn

Δ ABC drawn

ii. Shear maps

l (1, 1 1/2)

Matrix = $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

$\begin{pmatrix} 1 & 1/2 \\ 0 & 1 \end{pmatrix}$

b.

i.

$$\begin{pmatrix} 1 & 1 & 1 \\ -1 & 0 & 0 \\ 3/2 & -1 & 0 \end{pmatrix} \begin{matrix} A & B & C \\ -6 & -4 & 3 \\ -4 & -5 & 6 1/2 \end{matrix}$$

$$= \begin{pmatrix} A'' & B'' & C'' \\ 6 & 4 & -3 \\ -5 & -1 & -2 \end{pmatrix}$$

Δ A'' B'' C'' D'' drawn

ii. Half turn about (0,0)

2.

a. Centre (-2, -2) 90°

b. A¹¹ (-2, -4), B¹¹ (0, 9)

c. Half-turn about the centre (0, 2)

