1. A unit square is transformed by a 2 × 2 transformation matrix. The resulting position vectors are

$$\begin{pmatrix} 0 & 2 & 8 & 6 \\ 0 & 3 & 4 & 1 \end{pmatrix}$$

What is the transformation matrix?

3. A triangle is defined by $\begin{pmatrix} 2 & 4 & 4 \\ 2 & 2 & 4 \end{pmatrix}$

Find the transformed coordinates after the following transformations.

(1) 90° rotation about origin.
(2) reflection about line $y = -x$

4. Give the explicit form of the 3 × 3 matrix representing the transformation: scaling by a factor of 2 in the X direction and then rotation about (2 , 1) .

5. A polygon has 4 vertices located at $A(20, 10)$, $B(60, 10)$, $C(60, 30)$, $D(20, 30)$. Indicate a transformation matrix to double the size of the polygon with point A located at the same place.

6. A triangle PQR has its vertices located at $P(80,50)$, $Q(60,10)$, $R(100,10)$. It is desired to obtain its reflection about an axis, parallel to the Y axis and passing through the point A (30,10). Work out the necessary transformation matrix and also the coordinates of the vertices of the reflected triangle.

7. A mirror is vertically placed such that it passes through (20,0) and (0,20). Find the reflected view of a triangle with vertices (30,40), (50,50) and (40,70) in this mirror.

8. Show that a 2D reflection through X axis followed by a 2D reflection through the line $y = -x$ is equivalent to pure rotation about the origin.

9. The reflection along the line $y = x$ is equivalent to the reflection along the X axis followed by counter clockwise rotation by θ degrees. Find the value of θ.

10. In 2D graphics the following transformation matrix would reflect a point about the diagonal line passing through the origin and (10,10)

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

Show that this is same as coordination of matrix for 45 degree clockwise rotation followed by reflection about X axis and finally by counter clockwise rotation by 45 degrees (about origin).

1. Prove that if rotation angle is θ the transformation matrix formed when multiplied by the transformation matrix formed when angle is $-\theta$ is equal to identity matrix.