Assignment-9 (B4)

Problem definition:

Write a C++ program to implement reflection of 2D object about x-axis, y axis & x=y axis. Also rotate object about arbitrary point given by user.

Objective:

To be able to implement the transformation matrices for reflections & rotation.

Outcome:

Understanding of reflection & rotation about various axes.

Theory: The following are the basic reflection

i) about x-axis
ii) about y-axis
iii) about x=y
iv) about x=-y

i) We know that if a shape is reflected about x-axis, each vertex's x coordinate remains the same whereas y co-ordinate change their sign. The matrix is as follows:

$$T = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

iii) About y axis: the y-coordinate remain the same whereas the x-coordinates change their sign
This can be achieved by:

$$T = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

iii) About $x=y$: This is the line inclined at an angle of 45° w.r.t the x-axis.

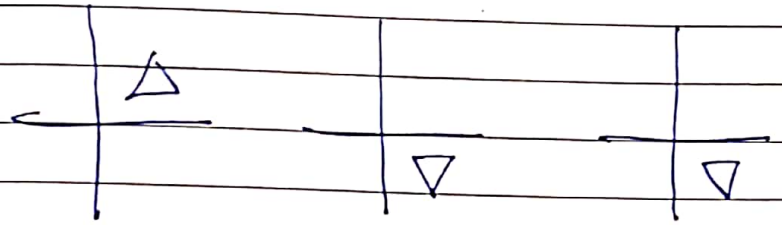
$$T = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

iv) About $x=-y$. This is the line inclined at an angle of $-45°$ / $+135°$ to the x-axis.

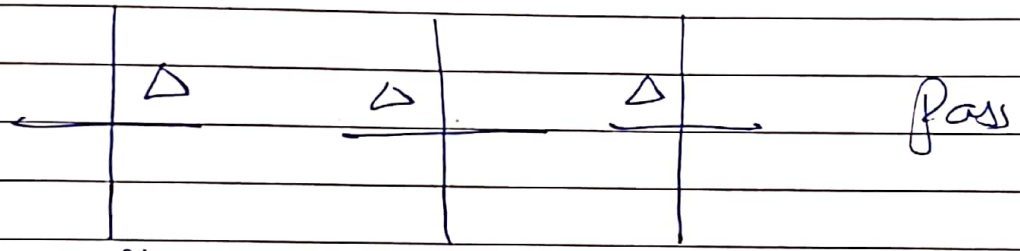
$$T = \begin{bmatrix} 0 & -1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

-> An object can be rotated at an angle θ w.r.t an arbitrary pt (x, y) as follows:
- Translate object by $(-x, -y)$
- rotate by angle θ.
- ~~rotate~~ retranslate by (x, y)

Test Cases :

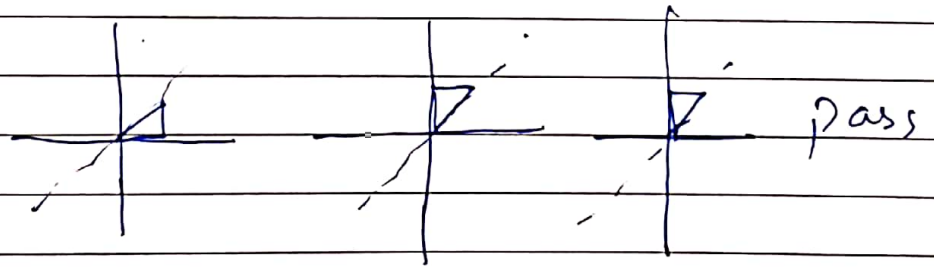
Input	expected O/P	Actual O/P	result
			Pass

x - reflection



Pass

y - reflection



pass

x - y

Conclusion : Thus we performed reflection and rotation of a 2-D object