CSE-413

Assignment-02

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201714018

Ans. to the ques. no. - 01

Given,
Point 1 (0, 0) and Point 2 (8, 5)

Applying Bresenham's algorithm to plot the line:

$dx = 8 - 0 = 8$ and, $dy = 5 - 0 = 5$ (so, $m < 1$)

$P = 2\Delta y - \Delta x$
$= 2 * 5 - 8$
$= 10 - 8$
$= 2$

$P \geq 0 \rightarrow y{+}{+}$
$P = P + 2\Delta y - 2\Delta x$
$P < 0 \rightarrow$
$P = P + 2\Delta y$

Now,

x	y	P
0	0	2 (>0)
1	1	2 + 2*5 - 2*8 = -4 (<0)
2	1	-4 + 2*5 = 6 (>0)
3	2	6 + 2×5 - 2×8 = 0 (≥0)
4	3	0 + 2×5 - 2×8 = -6 (<0)
5	3	-6 + 2×5 = 4 (>0)
6	4	4 + 2×5 - 2×8 = -2 (<0)
7	4	-2 + 2×5 = 8 (>0)
8	5	8 + 2×5 - 2×8 = (2)

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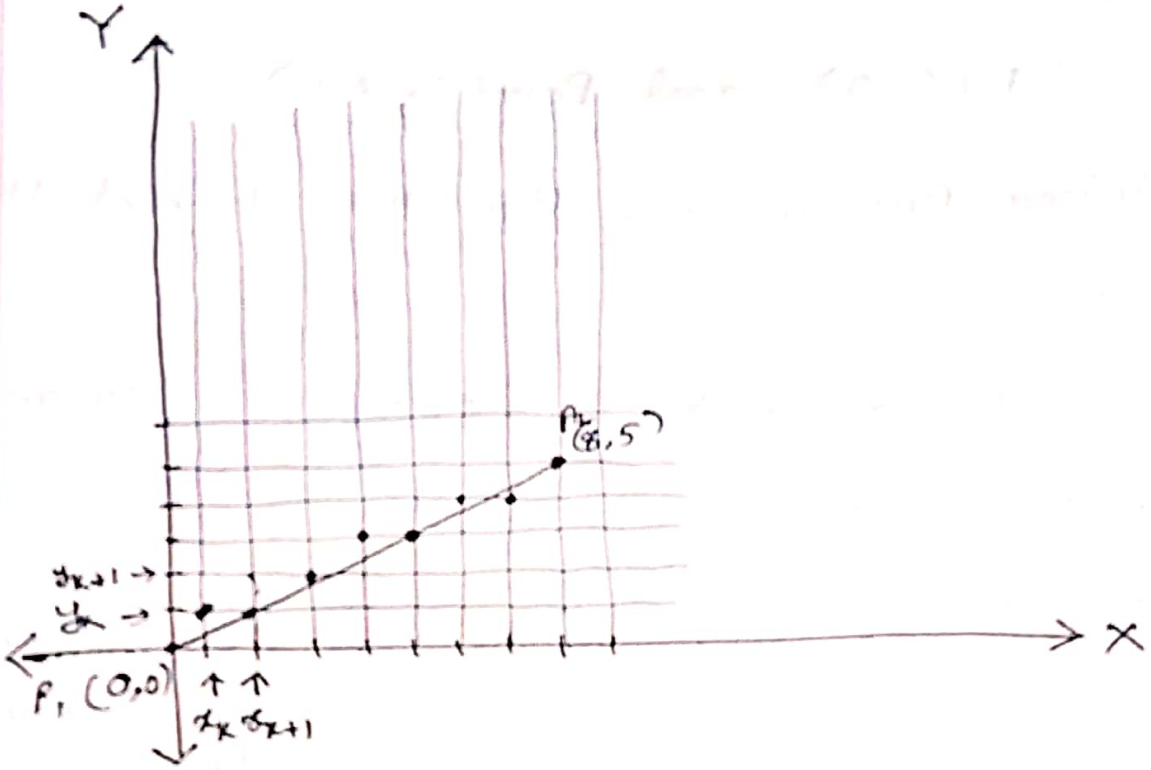
The diagram is drawn below:



Ans. to the ques. no. - 02

Given,

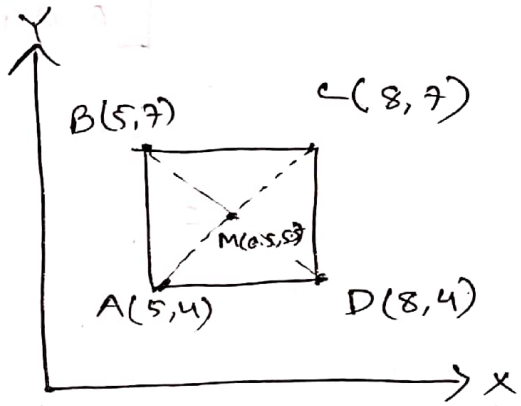
Coordinates of the square are-

A(5,4)

B(5,7)

C(8,7)

D(8,4)



Let, the midpoint of the diagonal of the square is M.

So, M is the midpoint of AC.

So, $M\left(\frac{5+8}{2}, \frac{7+4}{2}\right)$

$= M(6.5, 5.5)$

Now, we need composite Transformation for this problem.

① Translate M to origin.

② Rotation about origin (60°, Given)

③ Translate back to M.

④ after that we will find reflection about X-axis. (Mx)

$R_{\theta,M} = T_v \cdot R_\theta \, T_v^{-1}$

[Let, $m(h,k)$
So, $h = 6.5$
$k = 5.k$]

$$= \begin{bmatrix} 1 & 0 & h \\ 0 & 1 & k \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -h \\ 0 & 1 & -k \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 & h \\ 0 & 1 & k \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos 60^\circ & -\sin 60^\circ & 0 \\ \sin 60^\circ & \cos 60^\circ & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -h \\ 0 & 1 & -k \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 & 6.5 \\ 0 & 1 & 5.5 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0.5 & -\frac{\sqrt{3}}{2} & 0 \\ \frac{\sqrt{3}}{2} & 0.5 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -6.5 \\ 0 & 1 & -5.5 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 & 6.5 \\ 0 & 1 & 5.5 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0.5 & -\frac{\sqrt{3}}{2} & 1.513 \\ \frac{\sqrt{3}}{2} & 0.5 & -8.38 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 0.5 & -\frac{\sqrt{3}}{2} & 8.013 \\ \frac{\sqrt{3}}{2} & 0.5 & -2.88 \\ 0 & 0 & 1 \end{bmatrix}$$

P.T.O.

For, Reflection along x-axis.

$$MR_X = M_X \cdot R_{\theta,M}$$

$$= \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0.5 & -\frac{\sqrt{3}}{2} & 8.013 \\ \frac{\sqrt{3}}{2} & 0.5 & -2.88 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 0.5 & -\frac{\sqrt{3}}{2} & 8.013 \\ -\frac{\sqrt{3}}{2} & -0.5 & 2.88 \\ 0 & 0 & 1 \end{bmatrix}$$

Now, we will multiply MR_x with A, B, C, D coordinate to get the resultant coordinates.

A' (5,4) $= \begin{bmatrix} 0.5 & -\frac{\sqrt{3}}{2} & 8.013 \\ -\frac{\sqrt{3}}{2} & -0.5 & 2.88 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 5 \\ 4 \\ 1 \end{bmatrix} = \begin{bmatrix} 7.05 \\ -3.45 \\ 1 \end{bmatrix}$

B' (5,7) $= \begin{bmatrix} 0.5 & -\frac{\sqrt{3}}{2} & 8.013 \\ -\frac{\sqrt{3}}{2} & -0.5 & 2.88 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 5 \\ 7 \\ 1 \end{bmatrix} = \begin{bmatrix} 7.05 \\ -4.95 \\ 1 \end{bmatrix}$

$$C' = \begin{bmatrix} 0.5 & -\frac{\sqrt{3}}{2} & 8.013 \\ -\frac{\sqrt{3}}{2} & -0.5 & 2.88 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 8 \\ 7 \\ 1 \end{bmatrix} = \begin{bmatrix} 5.95 \\ -4.95 \\ 1 \end{bmatrix}$$

(8,7)

$$D' = \begin{bmatrix} 0.5 & -\frac{\sqrt{3}}{2} & 8.013 \\ -\frac{\sqrt{3}}{2} & -0.5 & 2.88 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 8 \\ 4 \\ 1 \end{bmatrix} = \begin{bmatrix} 5.95 \\ -6.05 \\ 1 \end{bmatrix}$$

(8,4)

Ans: A' (7.05, -3.45)

B' (7.05, -4.95)

C' (5.95, -4.95)

D' (5.95, -6.05)