Fig. 1

Question 1.3.5:
If $(3,3),(6,y),(x,7)$ and $(5,6)$ are the vertices of a parallelogram taken in order, find the values of x and y.

Solution:
In a parallelogram, the diagonals bisect each other. Therefore, the midpoint of diagonal joining $(3,3)$ and $(x,7)$ is equal to the midpoint of diagonal joining $(6,y)$ and $(5,6)$.

$$\mathbf{A} = \begin{pmatrix}3\\3\end{pmatrix}\ \mathbf{B} = \begin{pmatrix}6\\y\end{pmatrix}\ \mathbf{C} = \begin{pmatrix}x\\7\end{pmatrix}\ \mathbf{D} = \begin{pmatrix}5\\6\end{pmatrix} \tag{1}$$

condition for the given points to form a parallelogram.

$$\mathbf{B} - \mathbf{A} = \mathbf{C} - \mathbf{D} \tag{2}$$

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix}3\\y-3\end{pmatrix}\ \mathbf{C} - \mathbf{D} = \begin{pmatrix}x-5\\1\end{pmatrix} \tag{3}$$

$\therefore\ x = 8,\ y = 4$

Final Answer: $x = 8,\ y = 4$