1.1.3.6

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Question: If $\begin{pmatrix} 3 \\ 3 \end{pmatrix}$, $\begin{pmatrix} 6 \\ y \end{pmatrix}$, $\begin{pmatrix} x \\ 7 \end{pmatrix}$ and $\begin{pmatrix} 5 \\ 6 \end{pmatrix}$ are the vertices of a parallelogram taken in order, find the values of x and y. (10, 2011)

Solution: Property: midpoints of diagnol coincide. Let **O** be the midpoint of the diagnols.

$$\mathbf{O} = \frac{\begin{pmatrix} 3 \\ 3 \end{pmatrix} + \begin{pmatrix} x \\ 7 \end{pmatrix}}{2} \tag{0.1}$$

$$\implies \mathbf{O} = \begin{pmatrix} \frac{3+x}{2} \\ 5 \end{pmatrix}, \text{ And we also have:} \tag{0.2}$$

$$\mathbf{O} = \frac{\begin{pmatrix} 6 \\ y \end{pmatrix} + \begin{pmatrix} 5 \\ 6 \end{pmatrix}}{2} \tag{0.3}$$

$$\implies \mathbf{O} = \begin{pmatrix} 5.5 \\ \frac{6+y}{2} \end{pmatrix} \tag{0.4}$$

On comparing the two, we get, $x = 8$ (0.5)

$$y = 4 \tag{0.6}$$