

1.3.4

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If $A(1, 3)$, $B(-1, 2)$, $C(2, 5)$ and $D(x, 4)$ are the vertices of a parallelogram ABCD, then the value of x is _____ (10, 2012)

Solution:

In a parallelogram, the opposite sides are equal. Therefore, the length of side AC equals to the length of side BD:

$$\mathbf{C - A = D - B} \quad (0.1)$$

$$\mathbf{D = B + C - A} \quad (0.2)$$

Substituting the coordinates:

$$\begin{pmatrix} x \\ 4 \end{pmatrix} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} + \begin{pmatrix} 2 \\ 5 \end{pmatrix} - \begin{pmatrix} 1 \\ 3 \end{pmatrix} \quad (0.3)$$

$$= \begin{pmatrix} -1 + 2 - (-1) \\ 2 + 5 - 3 \end{pmatrix} \quad (0.4)$$

$$= \begin{pmatrix} 0 \\ 4 \end{pmatrix} \quad (0.5)$$

This gives us the equations:

$$x = 0 \quad (0.6)$$

$$4 = 4 \quad (0.7)$$

Answer: $x=0$

