

# 1-1.3-2

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## Question:

The coordinates of the three consecutive vertices of a parallelogram  $ABCD$  are  $A(1,3)$ ,  $B(-1,2)$ , and  $C(2,5)$ . Find the coordinates of the fourth vertex  $D$ . (10,2021)

## Sol:

Given  $A = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ ,  $B = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ , and  $C = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$

Let  $D$  be  $\begin{pmatrix} x \\ y \end{pmatrix}$

In a parallelogram, midpoints of diagonals are same.

Therefore midpoint of  $AC$  and  $BD$  is the same.

Midpoint of

$$AC = \left( \frac{1+2}{2}, \frac{3+5}{2} \right) = \left( \frac{3}{2}, 4 \right) \quad (0.1)$$

Midpoint of

$$BD = \left( \frac{-1+x}{2}, \frac{2+y}{2} \right) \quad (0.2)$$

Now equating both the midpoints we get

$$\left( \frac{3}{2}, 4 \right) = \left( \frac{-1+x}{2}, \frac{2+y}{2} \right) \quad (0.3)$$

Solving for  $x$  and  $y$ ,  
we get  $x=4$  and  $y=6$

Hence  $D = \begin{pmatrix} 4 \\ 6 \end{pmatrix}$