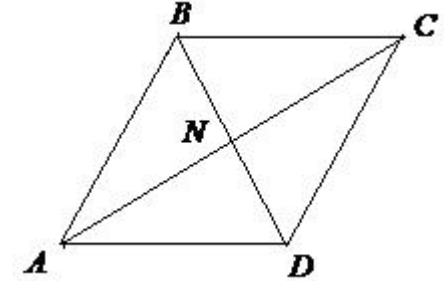


## Example 9

➤ In the rhombus, the equations of the two sides are given; side  $AB$ :  $5x - y + 4 = 0$  and side  $BC$ :  $x - 5y + 20 = 0$ . The diagonals meet at point  $N(4, 4)$ .

- 1) Find the equations the other two sides of rhombus.
- 2) Find the area of a rhombus.



**Solution:**

① Find coordinates of Point B

$$AB \cap BC$$

$$\begin{cases} 5x - y + 4 = 0 \\ x - 5y + 20 = 0 \end{cases} \Rightarrow \begin{matrix} x_B = 0 \\ y_B = 4 \end{matrix}$$

② Find coordinates of point D

$$x_N = \frac{x_B + x_D}{2} \Rightarrow x_D = 4$$

$$y_N = \frac{y_B + y_D}{2} \Rightarrow y_D = 0$$

③ Find eq. of side AD

$AD \parallel BC$

$$x - 5y + E_1 = 0$$

$$D(4, 0) \rightarrow 4 - 0 + E_1 = 0 \Rightarrow E_1 = -4$$

$$AD: x - 5y - 4 = 0$$

④ Find eq. of side CD

$CD \parallel AB$

$$5x - y + E_2 = 0 \xrightarrow{D(4, 0)}$$

$$20 - 0 + E_2 = 0$$

$$\Rightarrow E_2 = -20$$

$$CD: 5x - y - 20 = 0$$

⑤ Find coordinates of A

$AB \cap AD$

$$\begin{cases} 5x - y + 4 = 0 \\ x - 5y - 4 = 0 \end{cases}$$

$$\Rightarrow \begin{matrix} x_A = -1 \\ y_A = -1 \end{matrix}$$

## Example 9

➤ In the rhombus, the equations of the two sides are given; side  $AB$ :  $5x - y + 4 = 0$  and side  $BC$ :  $x - 5y + 20 = 0$ . The diagonals meet at point  $N(4, 4)$ .

- 1) Find the equations the other two sides of rhombus.
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**Solution:**

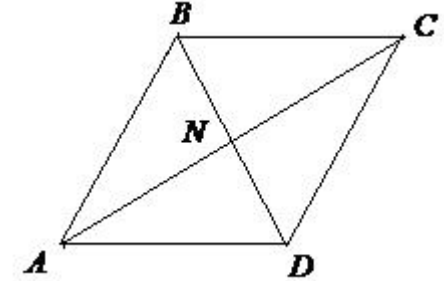
⑥ coordinates of  $C$

$BC \cap CD$

$$\begin{cases} 5x - y - 20 = 0 \\ x - 5y + 20 = 0 \end{cases} \Rightarrow \begin{matrix} x_c = 5 \\ y_c = 5 \end{matrix}$$

⑦  $|\vec{BD}| = \sqrt{(0-4)^2 + (4-0)^2} = 4\sqrt{2}$

⑧  $|\vec{AC}| = \sqrt{(-1-5)^2 + (-1-5)^2} = 6\sqrt{2}$



⑨ Area of the rhombus

$$S = \frac{1}{2} |\vec{BD}| |\vec{AC}|$$

$$= \frac{1}{2} 4\sqrt{2} 6\sqrt{2} = \underline{24}$$