

# Matgeo-q.3.4.5

AI25BTECH11036-SNEHAMRUDULA

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**3.4.5** Construct a rhombus whose side is of length 3.4 cm and one of its angles is  $45^\circ$ .

## solution I

Let the side length be

$$s = 3.4 \quad (1)$$

and the given angle be

$$\theta = 45^\circ. \quad (2)$$

We now place the vertices of the rhombus as follows:

$$\mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \quad (3)$$

$$\mathbf{B} = s \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \quad (4)$$

$$\mathbf{D} = s \begin{pmatrix} \cos \theta \\ \sin \theta \end{pmatrix}. \quad (5)$$

## solution II

The fourth vertex is obtained using the parallelogram law:

$$\mathbf{C} = \mathbf{B} + \mathbf{D} - \mathbf{A}. \quad (6)$$

Thus, the coordinates of the rhombus are

$$\mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \quad (7)$$

$$\mathbf{B} = \begin{pmatrix} 3.4 \\ 0 \end{pmatrix}, \quad (8)$$

$$\mathbf{D} = \begin{pmatrix} \frac{3.4}{\sqrt{2}} \\ \frac{3.4}{\sqrt{2}} \end{pmatrix}, \quad (9)$$

$$\mathbf{C} = \begin{pmatrix} 3.4 + \frac{3.4}{\sqrt{2}} \\ \frac{3.4}{\sqrt{2}} \end{pmatrix}. \quad (10)$$

Verification of equal sides:

$$\|\mathbf{B} - \mathbf{A}\| = s, \quad (11)$$

$$\|\mathbf{D} - \mathbf{A}\| = s, \quad (12)$$

$$\|\mathbf{C} - \mathbf{B}\| = s, \quad (13)$$

$$\|\mathbf{C} - \mathbf{D}\| = s. \quad (14)$$

Hence,  $ABCD$  is a rhombus with side length  $s = 3.4$  cm and  $\angle DAB = \theta = 45^\circ$ .

# Graphical Representation

Rhombus with side = 3.4 cm and angle A =  $45^\circ$

