

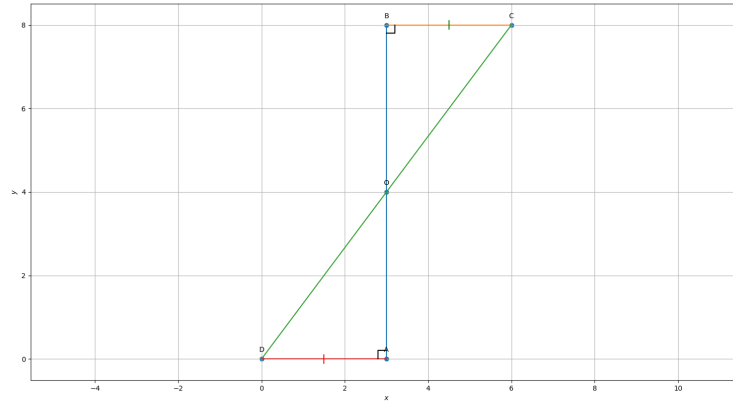
CHAPTER-7 TRIANGLES

1 Exercise 7.1

Q3. AD and BC are equal perpendiculars to a line segment AB . Show that CD bisects AB .

Construction

The input parameters for construction are shown in 1:



Symbol	Values	Description
a	3	$AD = BC$
b	8	AB
\mathbf{e}_1	$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$	basis vector

Table 1: Parameters

$$\mathbf{A} = 3\mathbf{e}_1, \mathbf{B} = \begin{pmatrix} 3 \\ 8 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 6 \\ 8 \end{pmatrix}, \mathbf{D} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (1)$$

Solution: Given

$$\mathbf{D} - \mathbf{A} = \mathbf{B} - \mathbf{C} \quad (2)$$

$$\angle DAB = \angle CBA = 90^\circ \quad (3)$$

To Prove:

$$\mathbf{C} - \mathbf{O} = \mathbf{O} - \mathbf{D} \quad (4)$$

Proof:

Consider linesegment DC

Let \mathbf{O} represent the Midpoint of DC

$$\mathbf{O} = \frac{1}{2}(\mathbf{C} + \mathbf{D}) \quad (5)$$

$$\Rightarrow = \frac{1}{2} \begin{pmatrix} 6 \\ 8 \end{pmatrix} + \frac{1}{2} \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (6)$$

$$\Rightarrow = \frac{1}{2} \begin{pmatrix} 6 \\ 8 \end{pmatrix} \quad (7)$$

$$= \begin{pmatrix} 3 \\ 4 \end{pmatrix} \quad (8)$$

$$(9)$$

$$\text{Since } AB \perp DA, AB \text{ is parallel to } x = 0 \quad (10)$$

$$\text{Equation of } AB \text{ is defined as } x = a \quad (11)$$

$$(12)$$

$$(13)$$

from (8) and (12) \mathbf{O} lies on linesegment CD and line DC intersects BA at its midpoint O .

$$\mathbf{C} - \mathbf{O} = \mathbf{O} - \mathbf{D} \quad (14)$$