

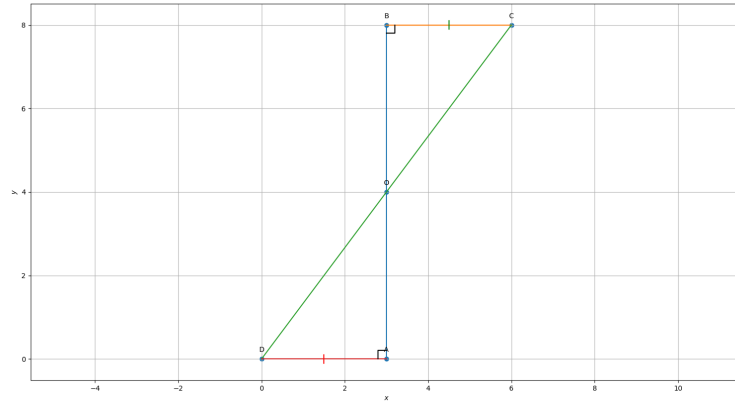
# CHAPTER-7 TRIANGLES

## 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

$$\mathbf{A} = a\mathbf{e}_1, \mathbf{B} = \begin{pmatrix} a \\ b \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 2a \\ b \end{pmatrix}, \mathbf{D} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (1)$$

**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  $DC$

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

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

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

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

$$(9)$$

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

$$\text{Equation of } AB \text{ is defined as } x = 3 \quad (11)$$

$$(12)$$

$$(13)$$

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

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