

Distance Between Two Points

To find the distance between two points when the coordinates of the two points are given, we use the following formula:

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

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Example 1

Find the length of the line segment joining C(2, -3) to D(2, 1).

(x_1, y_1) (x_2, y_2)

Solution

$$\begin{aligned} D_{CD} &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(2 - 2)^2 + (1 - -3)^2} \\ &= \sqrt{(0)^2 + (4)^2} \\ &= \sqrt{0 + 16} \\ &= \sqrt{16} \\ &= 4 \end{aligned}$$

what if

$$\begin{aligned} D &= \sqrt{12} \\ &= \sqrt{4 \cdot 3} \\ &= 2\sqrt{3} \end{aligned} \quad \left| \begin{aligned} &2\sqrt{50} \\ &2\sqrt{25 \cdot 2} \\ &10\sqrt{2} \end{aligned} \right.$$

Example 2

Calculate the distance between the points B(2, -3) and C(9, 4).

Solution (x_1, y_1) (x_2, y_2)

$$\begin{aligned} D_{BC} &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(9 - 2)^2 + (4 - -3)^2} \\ &= \sqrt{(7)^2 + (7)^2} \\ &= \sqrt{49 + 49} \\ &= \sqrt{98} \quad \text{Can you think of another way to express } \sqrt{98} \text{ ???} \end{aligned}$$

$$\Rightarrow \sqrt{98}$$

$$\Rightarrow \sqrt{49 \times 2}$$

$$\Rightarrow 7\sqrt{2} \text{ units}$$

Example 3

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

A triangle has vertices at A(1, 5), B(1, 2), and C(5, 2). Find the perimeter.

* distance around the outside

Solution

$$\begin{aligned} D_{AB} &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(1 - 1)^2 + (2 - 5)^2} \\ &= \sqrt{(0)^2 + (-3)^2} \\ &= \sqrt{0 + 9} \\ &= \sqrt{9} \\ &= 3 \end{aligned}$$

$$\begin{aligned} D_{BC} &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(5 - 1)^2 + (2 - 2)^2} \\ &= \sqrt{(4)^2 + (0)^2} \\ &= \sqrt{16 + 0} \\ &= \sqrt{16} \\ &= 4 \end{aligned}$$

$$\begin{aligned} D_{AC} &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(5 - 1)^2 + (2 - 5)^2} \\ &= \sqrt{(4)^2 + (-3)^2} \\ &= \sqrt{16 + 9} \\ &= \sqrt{25} \\ &= 5 \end{aligned}$$

$$\begin{aligned} \text{Perimeter} &= 3 + 4 + 5 \\ &= 12 \text{ units} \end{aligned}$$

