

# Line Assignment

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## I. QUESTION

**Class 11, Exercise 10.1, Q(9): Without using distance formula, show that points  $(-2, -1)$ ,  $(4, 0)$ ,  $(3, 3)$  and  $(-3, 2)$  are the vertices of a parallelogram.**

## II. SOLUTION

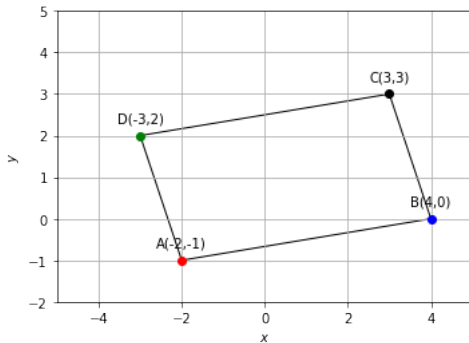


Figure 1: parallelogram ABCD

We can prove that the points are the vertices of a parallelogram if the direction vectors of opposite lines are equal

Consider figure I, where

$$\mathbf{A} = \begin{pmatrix} -2 \\ -1 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}$$

$$\mathbf{C} = \begin{pmatrix} 3 \\ 3 \end{pmatrix} \quad \mathbf{D} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

let the direction vector be

$$\mathbf{P} = \mathbf{B} - \mathbf{A} = \begin{pmatrix} 6 \\ 1 \end{pmatrix}$$

(1)

$$\mathbf{Q} = \mathbf{C} - \mathbf{D} = \begin{pmatrix} 6 \\ 1 \end{pmatrix}$$

(2)

$$\mathbf{R} = \mathbf{A} - \mathbf{C} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$$

(3)

$$\mathbf{S} = \mathbf{A} - \mathbf{D} = \begin{pmatrix} 1 \\ -3 \end{pmatrix} \quad (4)$$

from eq(1) and (2)  $\mathbf{P} = \mathbf{Q}$

and from eq(3) and (4)  $\mathbf{R} = \mathbf{S}$

since the direction vectors of opposite lines are same the points  $(-2, -1)$ ,  $(4, 0)$ ,  $(3, 3)$  and  $(-3, 2)$  forms the vertices of a parallelogram

## CONSTRUCTION

Symbol	Value	Description
A	$\begin{pmatrix} -2 \\ -1 \end{pmatrix}$	Vertex A
B	$\begin{pmatrix} 4 \\ 0 \end{pmatrix}$	Vertex B
C	$\begin{pmatrix} 3 \\ 3 \end{pmatrix}$	Vertex C
D	$\begin{pmatrix} -3 \\ 2 \end{pmatrix}$	Vertex D
P	$\begin{pmatrix} 1 \\ 6 \end{pmatrix}$	vector AB
Q	$\begin{pmatrix} 1 \\ 6 \end{pmatrix}$	vector DC
R	$\begin{pmatrix} 1 \\ -3 \end{pmatrix}$	vector BC
S	$\begin{pmatrix} 1 \\ -3 \end{pmatrix}$	vector AD

Get the python code of the figures from

(1) [https://github.com/kkousar/KOUSAR\\_FWC/blob/m](https://github.com/kkousar/KOUSAR_FWC/blob/m)