Line Assignment

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Problem Statement **- ABCD is a quadrilateral in which P, Q, R and S are mid-points of the sides AB, BC, CD and DA (see Fig). AC is a diagonal. Show that :**

1. **SR ∥ AC and SR =1/2 (AC)**
2. **PQ = SR**
3. **PQRS is a parallelogram.**

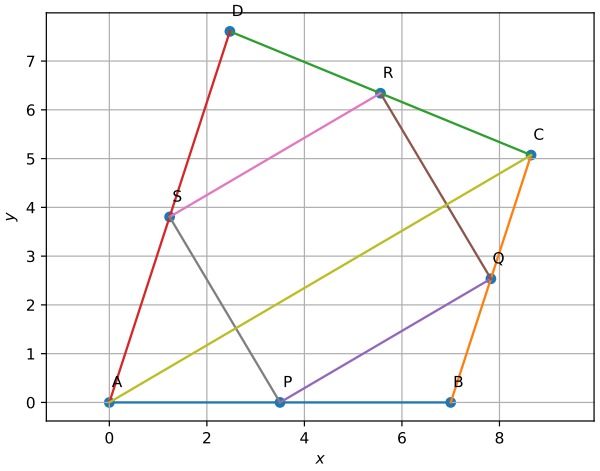

Figure 1: Figure

Solution

Given : ABCD is a Quadrilateral P,Q,R and S are the midpoints of line AB,BC,CD,DA.We can obtain the points P,Q,R and S from A,B,C and D and are given by

P = $\frac{(A+B)}{2}$
Q = $\frac{(C+B)}{2}$
R = $\frac{(C+D)}{2}$
S = $\frac{(D+A)}{2}$

(3) To prove that PQRS is a parallelogram we need to prove PQ // SR To prove SR ∥ PQ
Direction vector of line SR $\boldsymbol{(R-S)} = \frac{(C-A)}{2}$

Direction vector of line PQ $\boldsymbol{(Q-P)} = \frac{(C-A)}{2}$

$$\boldsymbol{(R-S)} = \boldsymbol{(Q-P)} = \frac{\boldsymbol{(C-A)}}{\boldsymbol{2}} \tag{1}$$

Since the direction vectors of line SR and PQ are in same direction

$SR \parallel PQ$
Therefore, $\boldsymbol{PQRS}$ is a parallelogram

(1) Directional vector of line SR = $\boldsymbol{(R-S)} = \frac{(C-A)}{2}$
Directional vector of line AC = $\boldsymbol{(C-A)}$

It is observed that the constant k is $\frac{1}{2}$
Therefore

$$SR \parallel AC \tag{2}$$

and from equation 1

$$\boldsymbol{SR} = \frac{\boldsymbol{1}}{\boldsymbol{2}}\boldsymbol{AC} \tag{3}$$

(2) To prove PQ = SR
From euqation 1

$$\boldsymbol{(Q-P)} = \boldsymbol{(R-S)} = \frac{\boldsymbol{(C-A)}}{\boldsymbol{2}} \tag{4}$$

1 Execution

The below python code realizes the construction:

https://github.com/bhavani360/FWC_assignments

Construction

The dimensions of the Quadrilateral ABCD are taken as below

symbol	value
r	8
θ	pi/2.5
d	7
A	(0,0)
B	(d,0)
D	(rcosθ,rsinθ)
C	(D/1.5)+B