FWC22037

ASSIGNMENT-MATRICES

Contents

1. Problem

In the Figure given $\mathbf{ar(DRC)} = \mathbf{ar(DPC)}$ and $\mathbf{ar(BDP)} = \mathbf{ar(ARC)}$. Show that the Quadrilaterals **ABCD** and **DCPR** are Trapeziums.

2. Solution

1. Given that the area of the triangles **DRC** and **DPC** are equal.
2. From triangles **DCR** and **DPC**

$$\frac{1}{2}[(\mathbf{D}-\mathbf{C})\mathbf{x}(\mathbf{D}-\mathbf{R})] = \frac{1}{2}[(\mathbf{C}-\mathbf{D})\mathbf{x}(\mathbf{C}-\mathbf{P})] \tag{1}$$

$$(\mathbf{C}-\mathbf{D})\mathbf{x}[(\mathbf{C}-\mathbf{P})-(\mathbf{D}-\mathbf{R})] = 0$$
$$(\mathbf{C}-\mathbf{D})\mathbf{x}[\mathbf{C}-\mathbf{P}-\mathbf{D}+\mathbf{R}] = 0$$
$$(\mathbf{C}-\mathbf{D})\mathbf{x}(\mathbf{C}-\mathbf{D})+(\mathbf{C}-\mathbf{D})\mathbf{x}(\mathbf{R}-\mathbf{P}) = \mathbf{0}$$

$$(\mathbf{C}-\mathbf{D})\mathbf{x}(\mathbf{R}-\mathbf{P}) = \mathbf{0} \tag{2}$$

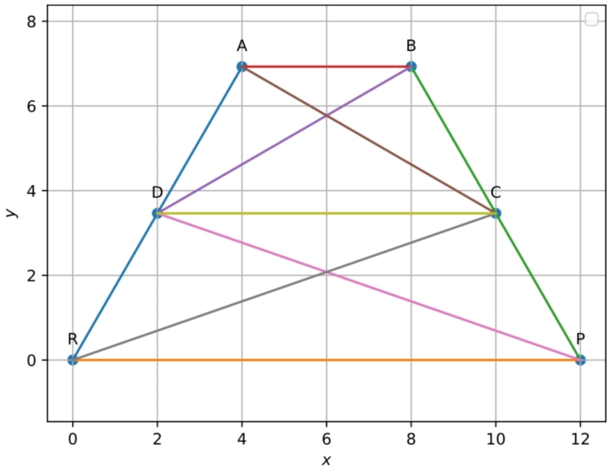
3. From equation 2 the cross product is 0 the lines **A-B** is parallel to **D-C** and the quadrilateral **DCRP** a Trapezium.
4. Given that the area of the triangles **BDP** and **ARC** are equal. From the information given we can say the area of triangles **ADC** and **BCD**.

$$\frac{1}{2}[(\mathbf{D}-\mathbf{C})\mathbf{x}(\mathbf{D}-\mathbf{A})] = \frac{1}{2}[(\mathbf{C}-\mathbf{D})\mathbf{x}(\mathbf{C}-\mathbf{B})] \tag{3}$$

$$(\mathbf{C}-\mathbf{D})\mathbf{x}[(\mathbf{C}-\mathbf{B})-(\mathbf{D}-\mathbf{A})] = 0$$
$$(\mathbf{C}-\mathbf{D})\mathbf{x}[\mathbf{C}-\mathbf{B}-\mathbf{D}+\mathbf{A}] = 0$$
$$(\mathbf{C}-\mathbf{D})\mathbf{x}(\mathbf{C}-\mathbf{D})+(\mathbf{C}-\mathbf{D})\mathbf{x}(\mathbf{A}-\mathbf{B}) = \mathbf{0}$$

$$(\mathbf{C}-\mathbf{D})\mathbf{x}(\mathbf{A}-\mathbf{B}) = \mathbf{0} \tag{4}$$

5. From equation 4 the cross product is 0 the lines **A-B** is parallel to **D-C** and the quadrilateral **ABCD** a Trapezium.



Figure

3. Construction

Symbol	**Co-ordinates**	**Description**
a	12	RP
c	8	RA
b	4	AB
R	$\begin{pmatrix}0\\0\end{pmatrix}$	point vector R
P	$\begin{pmatrix}a\\0\end{pmatrix}$	point vector P
A	$\begin{pmatrix}c.cos(\theta)\\c.sin(\theta)\end{pmatrix}$	point vector A
B	A+P	point vector B

The figure above is generated using python code provided in the below source code link.

https://github.com/siva-gayathri/FWC/blob/main/assigment-1/codes/main.py