Name: Varsha Reddy

Assignment-4

Roll No. : FWC22038

PROBLEM:

ABCD,DCFE and ABFE are parallelograms.Show that ar(ADE) = ar(BCF)

Theory: Parallelograms on the same base and in between the same parallels are equal in area.
Given: ABCD,DCFE and ABFE are parallelograms.

Solution Statement:

We can see that the sides of a triangle ADE and BCF are also the opposite sides of a given parallelogram. Now we can show both the triangles are congruent using congruency property. We know that congruent triangles are equal areas.

0.1 Construction

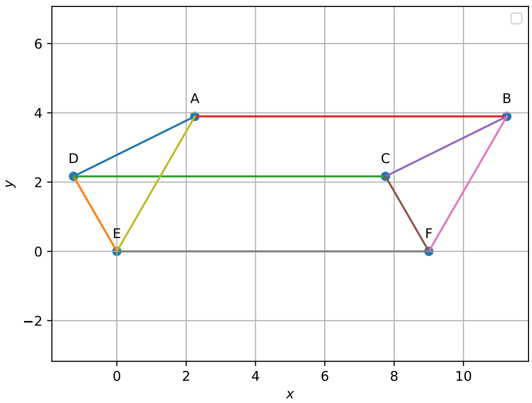

Figure of Construction

0.2 Table :

The input parameters for this construction are

Symbol	Value	Description
a	3	EA
b	4.5	EF
c	2	ED
θ_1	$1\pi/3$	$\angle$AEF
θ_2	$2\pi/3$	$\angle$DEF
E	$\begin{pmatrix} 0 \\ 0 \end{pmatrix}$	Point E

1. Considering point 'E' as origin.
2. From E,with some angle of 60 degrees,mark the point 'A'.
3. From E,with some angle of 120 degrees,mark the point 'D'.
4. With the distance of 'b' locate the point 'F'.
5. To locate a point 'B'

$$\mathbf{B = A{+}F{-}E}$$

6. To locate a point 'C'

$$\mathbf{C = D{+}F{-}E}$$

7. Joining all the lines from the figure.

0.3 Solution

n ABCD,

$$\mathbf{A} - \mathbf{B} = \mathbf{D} - \mathbf{C} \tag{1}$$

$$\mathbf{A} - \mathbf{D} = \mathbf{B} - \mathbf{C} \tag{2}$$

In DEFC,

$$\mathbf{D} - \mathbf{C} = \mathbf{E} - \mathbf{F} \tag{3}$$

$$\mathbf{D} - \mathbf{E} = \mathbf{C} - \mathbf{F} \tag{4}$$

In ABEF,

$$\mathbf{A} - \mathbf{B} = \mathbf{E} - \mathbf{F} \tag{5}$$

$$\mathbf{A} - \mathbf{E} = \mathbf{B} - \mathbf{F} \tag{6}$$

To Prove:

$$\mathbf{Ar(ADE)} = \mathbf{Ar(BCF)} \tag{7}$$

Area of the triangle ΔADE is given by

Ar(ΔADE)

$$= \frac{1}{2}\left\|\mathbf{A} - \mathbf{D} \times \mathbf{D} - \mathbf{E}\right\| \tag{8}$$

Area of the triangle ΔBCF is given by

Ar(ΔBCF)

$$= \frac{1}{2}\left\|\mathbf{B} - \mathbf{C} \times \mathbf{C} - \mathbf{F}\right\| \tag{9}$$

substituiting (2) and (4) in (9),

$$= \frac{1}{2}\left\|\mathbf{A} - \mathbf{D} \times \mathbf{D} - \mathbf{E}\right\| \tag{10}$$

from (8) and (10),

$$\mathbf{Ar(ADE)} = \mathbf{Ar(BCF)} \tag{11}$$

The below python code realizes the above construction:
`https://github.com/9705701645/FWC/blob/main/lines4.py`