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Batch: C1-1	Roll No.: **16010123012**	Experiment No**.: 10**
Marks:		
Signature of Lab Teacher with date:		

1) Problem statement

   A line ABCD with segments AB, BC and CD. The co-ordinates of the points A, B, C, D are (2,1), (3,3), (5,3), (5,5). Determine the position of the centroid of the composite line.

2) Analytical solution of the problem

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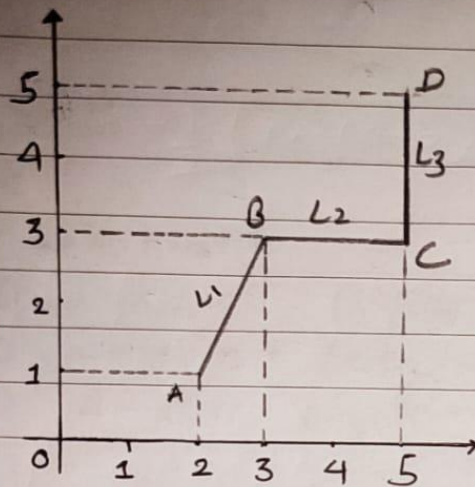
$$L_1 = \sqrt{(3-2)^2 + (3-1)^2}$$

$$= \sqrt{5} \implies 2.236 \text{ cm}$$

$$L_2 = 5-3$$

$$= 2 \text{ cm}$$

$$L_3 = 5-3 \implies 2 \text{ cm}$$

Coordinates of Midpoint of line segments are

$$x_1 = (3+2)/2 \implies 2.5 \text{ cm}$$

$$y_1 = (3+1)/2 \implies 2 \text{ cm}$$

$$x_2 = (5+3)/2 = 4 \text{ cm} \quad ; \quad y_2 = 3 \text{ cm}$$

$$x_3 = 5 \text{ cm} \quad ; \quad y_3 = (5+3)/2 = 4 \text{ cm}$$

∴

$$\bar{x} = \frac{L_1 x_1 + L_2 x_2 + L_3 x_3}{L_1 + L_2 + L_3} = \frac{2.236 \times 2.5 + 2 \times 4 + 2 \times 5}{2.236 + 2 + 2}$$

$$= \frac{23.59}{6.236} \longrightarrow 3.78 \text{ cm}$$

$$\bar{y} = \frac{L_1 y_1 + L_2 y_2 + L_3 y_3}{L_1 + L_2 + L_3} = \frac{2.236 \times 2 + 2 \times 3 + 2 \times 4}{6.236}$$

$$= \frac{18.476}{6.236} \longrightarrow 2.96 \text{ cm}$$

The Coordinates of Centroid are (3.78, 2.96) cm

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3) Screenshots of the work done in software showing input parameters, coding, graphs, results etc.

```python
def centroid(points):
    points = sorted(points)
    lengths = []
    Lx = []
    Ly = []

    for i in range(len(points)-1):
        lenght = ((points[i+1][0] - points[i][0])**2 + (points[i+1][1] - points[i][1])**2)**0.5
        lengths.append(lenght)

        midpoint = ((points[i+1][0] + points[i][0])/2,(points[i+1][1] + points[i][1])/2)

        Lx.append(lenght * midpoint[0])
        Ly.append(lenght * midpoint[1])

    return (round((sum(Lx)/sum(lengths)),2),round((sum(Ly)/sum(lengths)),2))

n= int(input("Enter Number of Points: "))
points = []
for i in range(n):
    points.append(tuple(map(int,input(f"Enter co ordinates of point number {i+1} (comma seperated):").split(","))))

print("The co ordinates of the centroid are", centroid(points))
```

4) Result

```
Enter Number of Points: 4
Enter co ordinates of point number 1 (comma seperated):2,1
Enter co ordinates of point number 2 (comma seperated):3,3
Enter co ordinates of point number 3 (comma seperated):5,3
Enter co ordinates of point number 4 (comma seperated):5,5
The co ordinates of the centroid are (3.78, 2.96)
```

5) Conclusion

   I have solved the above problem using Python Software and got the centroid (3.78, 2.96) which is equal to the centroid (3.73, 2.96) found by me using analytical method. Thus, successfully completing this experiment.
Centroid = (3.78, 2.96)

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