

# CHAPTER:--7

## *COORDINATE GEOMETRY*

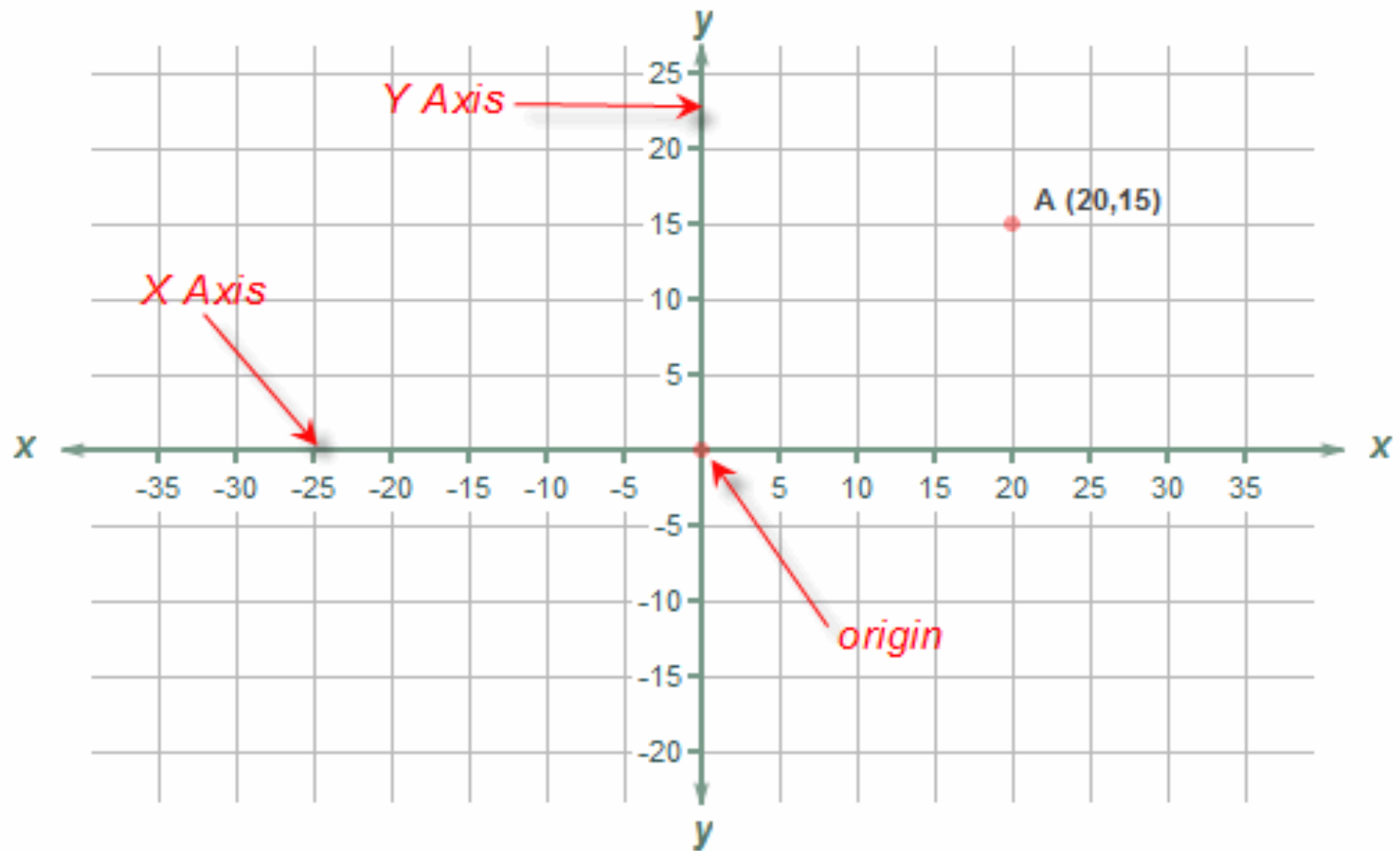
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# Introduction to Coordinate Geometry

A system of geometry where the position of points on the plane is described using an ordered pair of numbers.

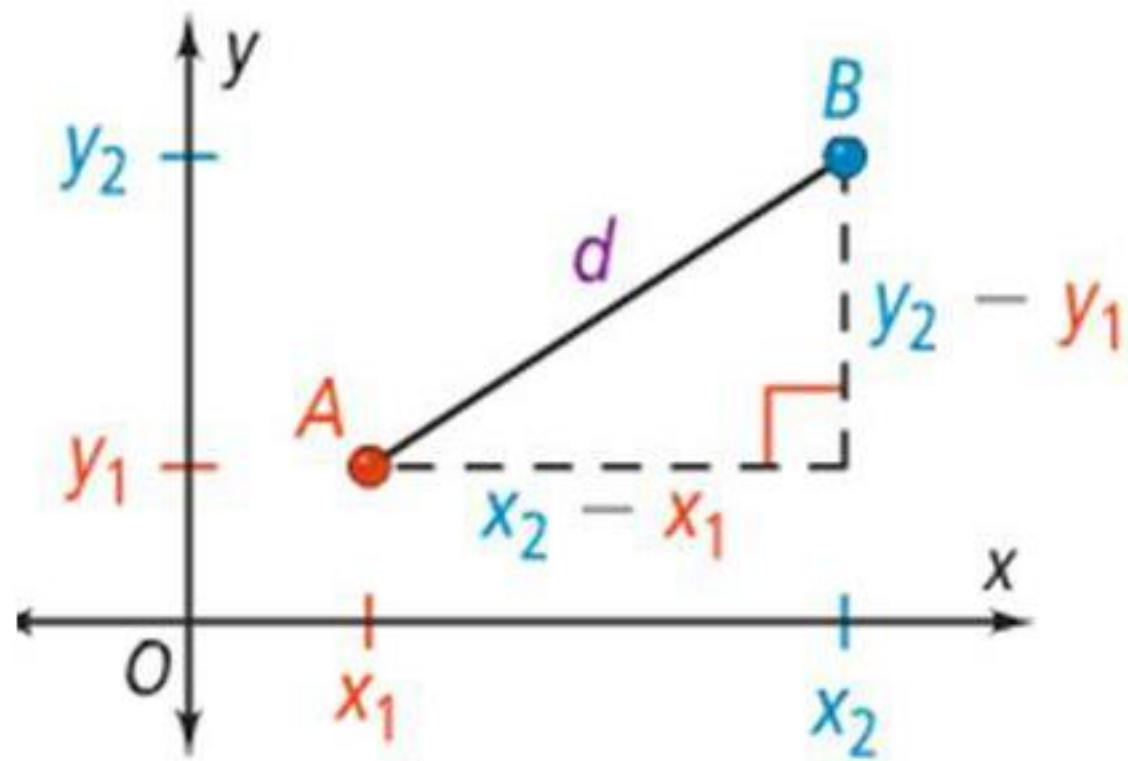
# The Coordinate Plane



# DISTANCE FORMULA:--

The length of a line segment joining A and B is the distance between two points and is

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

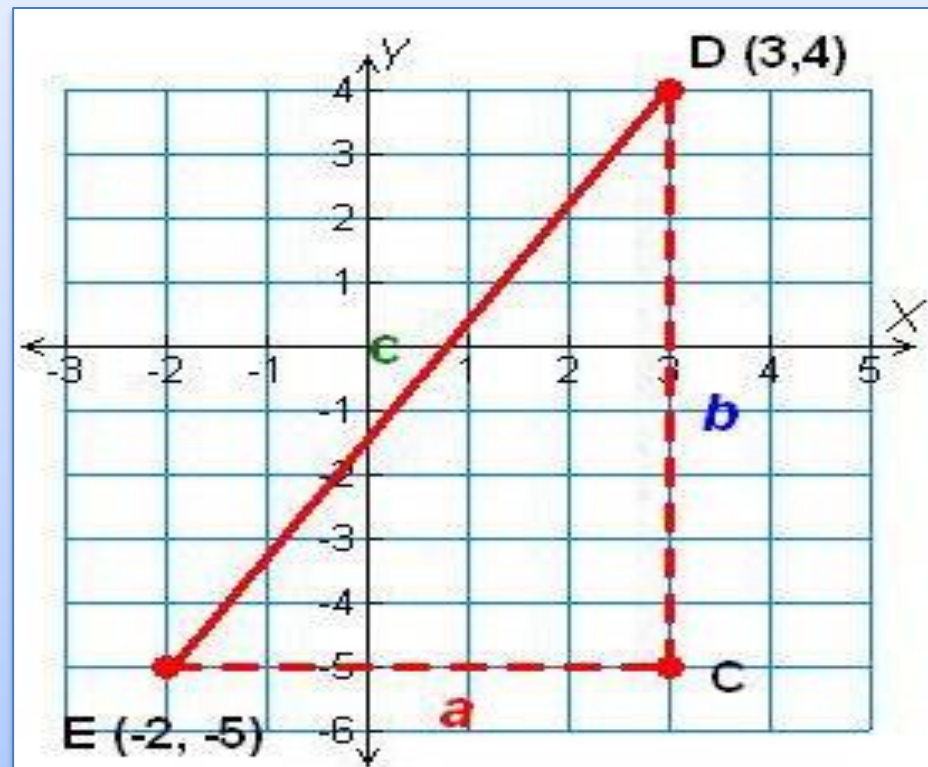


## Example

*Find the distance between the points D and E, in the given figure.*

**SOLUTION:--**

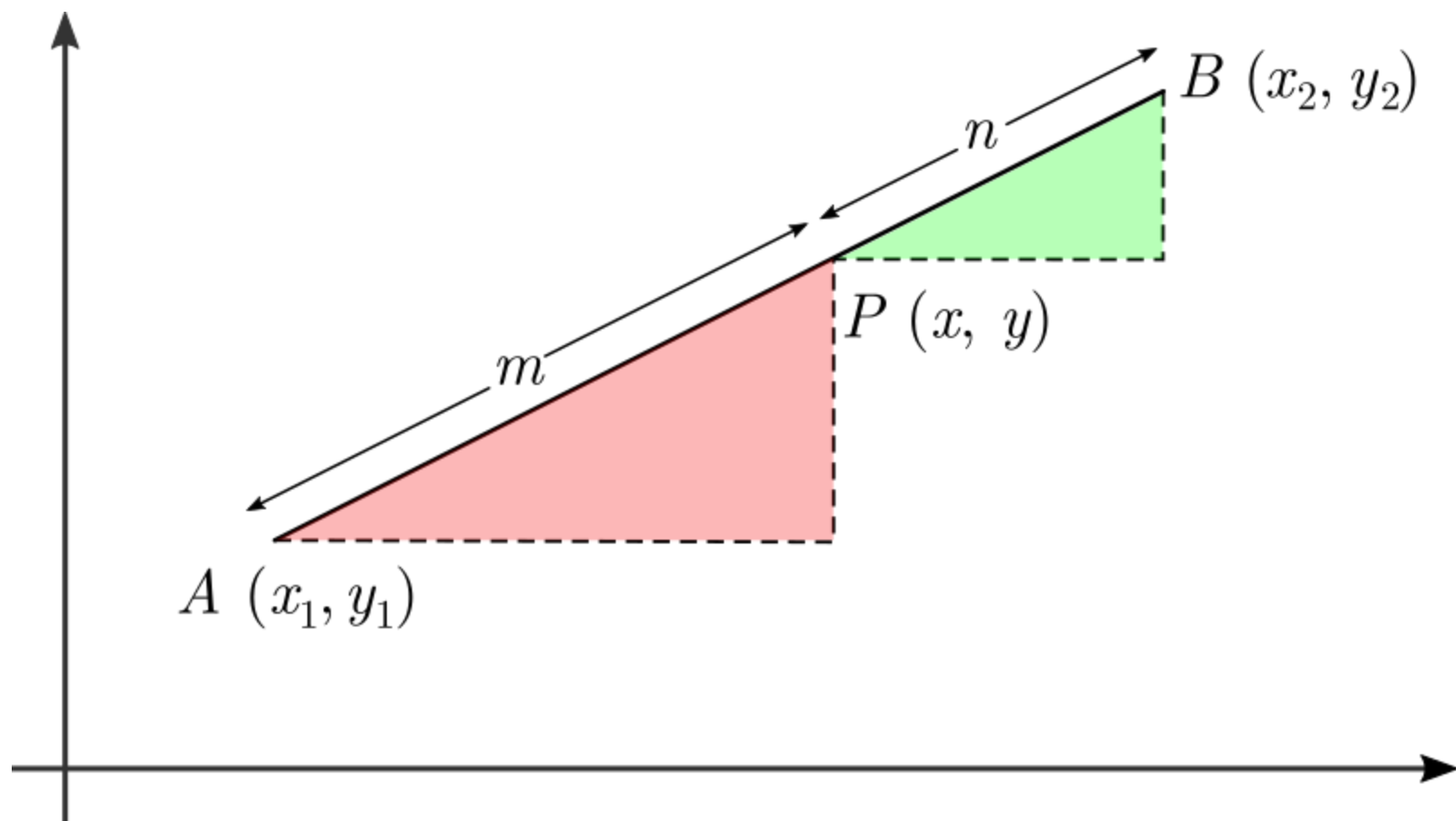
$$\begin{aligned} DE &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{[(-2) - 3]^2 + [(-5) - 4]^2} \\ &= \sqrt{(-5)^2 + (-9)^2} \\ &= \sqrt{25 + 81} \\ &= \sqrt{106} \\ &\approx 10.3 \end{aligned}$$



# Section Formula

If  $P(x, y)$  is any point on the line segment  $AB$ , which divides  $AB$  in the ratio of  $m:n$ , then the coordinates of the point  $P(x, y)$  will be

$$x = \frac{mx_2 + nx_1}{m + n}, y = \frac{my_2 + ny_1}{m + n}$$



**Example :--** Find the coordinates of the point which divides AB, where A and B have the coordinates (2,4) and (4,6) respectively, in the ratio 1:3

**SOLUTION :-- BY USING SECTION FORMULA**

$$x = \frac{1 \times 4 + 3 \times 2}{1 + 3} = \frac{5}{2}$$

$$y = \frac{1 \times 6 + 3 \times 4}{1 + 3} = \frac{9}{2}$$

Therefore the coordinates of the required point are  $(\frac{5}{2}, \frac{9}{2})$

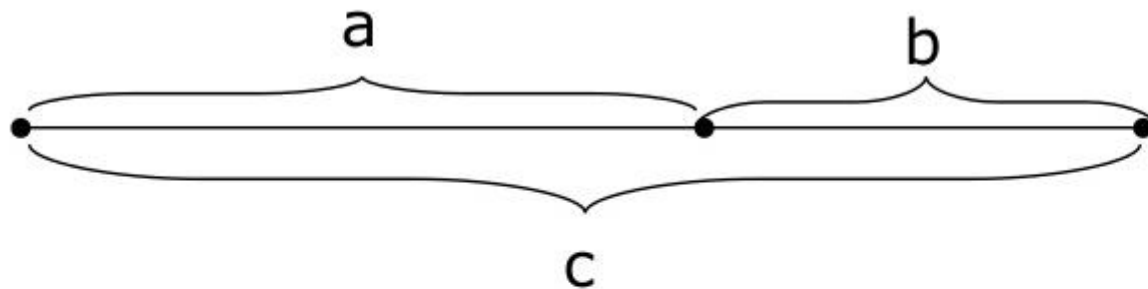
# Mid-Point Formula

If  $P(x, y)$  is the mid-point of the line segment  $AB$ , which divides  $AB$  in the ratio of  $1:1$ , then the coordinates of the point  $P(x, y)$  will be

$$x = \frac{x_2 + x_1}{2}, y = \frac{y_2 + y_1}{2}$$

# Collinearity of Three Points

Use Distance Formula



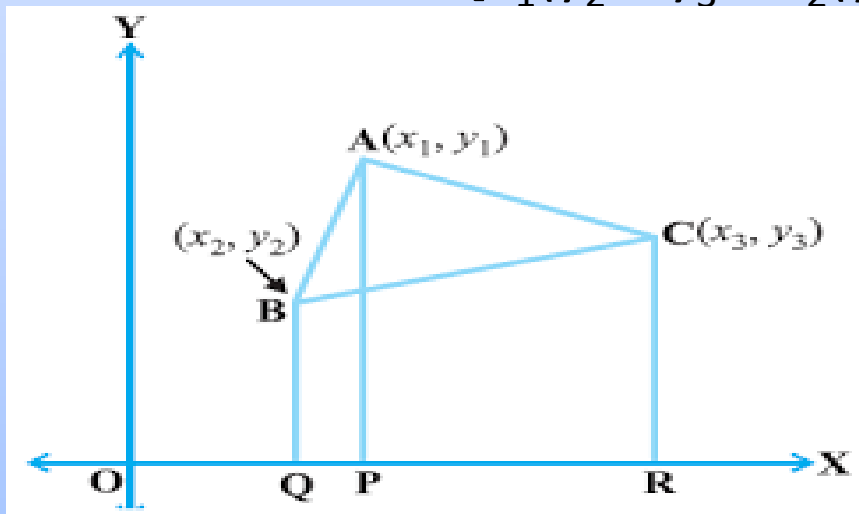
Show that  $a+b = c$

# AREA OF A TRIANGLE

Here ABC is a triangle with vertices  $A(x_1, y_1)$ ,  $B(x_2, y_2)$  and  $C(x_3, y_3)$ . To find the area of the triangle we need to draw AP, BQ and CR perpendiculars from A, B and C, respectively, to the x-axis. Now we can see that ABQP, APRC and BQRC are all trapeziums.

Area of triangle ABC = Area of trapezium ABQP + Area of trapezium APRC – Area of trapezium BQRC.

$$= \frac{1}{2} [x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$



**EXAMPLE:-** Find the area of the triangle whose vertices are:  
 $(2, 3), (-1, 0), (2, -4)$

**SOLUTION : --** Let the vertices of the triangle be

A  $(2, 3)$ , B  $(-1, 0)$  and C  $(2, -4)$

Here,  $x_1 = 2, y_1 = 3$

$x_2 = -1, y_2 = 0$

$x_3 = 2, y_3 = -4$

$$\therefore \text{Area of } \Delta = \frac{1}{2} [x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2)].$$

$$\therefore \text{Area of } \Delta ABC = \frac{1}{2} [2(0 - (-4)) + (-1)(-4 - (3)) + 2(3 - 0)].$$

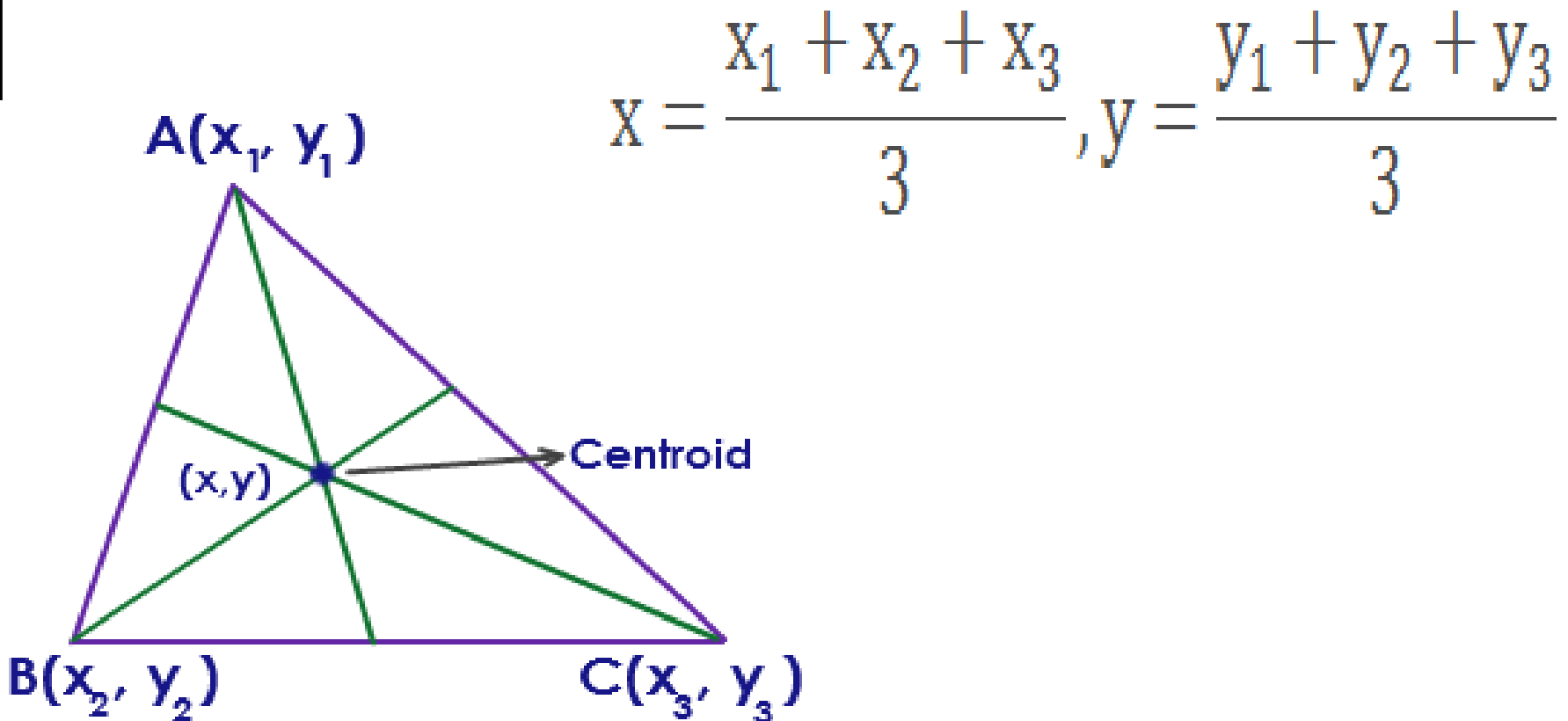
$$= \frac{1}{2} [2(0 + 4) + (-1)(-4 - (3)) + 2(3)].$$

$$= \frac{1}{2} [8 + 7 + 6].$$

$$= \frac{1}{2} [21] = \frac{21}{2} \text{ sq. units.}$$

# CENTROID OF TRIANGLE

Centroid of a triangle is the point where all the three medians of the triangle meet with each other.



## Example

If the coordinates of the centroid of a triangle are (1, 3) and two of its vertices are (- 7, 6) and (8, 5), then what will be the third vertex of the triangle?

### Solution

Let the third vertex of the triangle be P(x, y)

Since the centroid of the triangle is (1, 3)

Therefore,

$$\begin{aligned}\frac{-7+8+x}{3} &= 1 \\ x &= 2 \\ \frac{6+5+y}{3} &= 3 \\ y &= -2\end{aligned}$$

Thank  
you

