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“CLASS 10th”

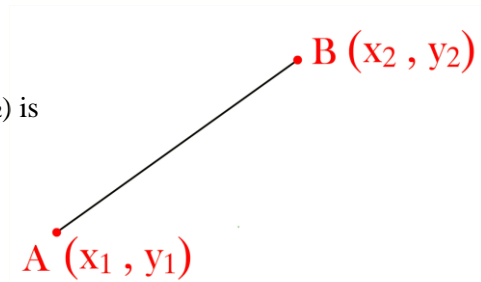
COORDINATE GEOMETRY

FORMULA/CONCEPT LIST

1. Distance Formula:

The distance between two points A (x_1, y_1) and B (x_2, y_2) is

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



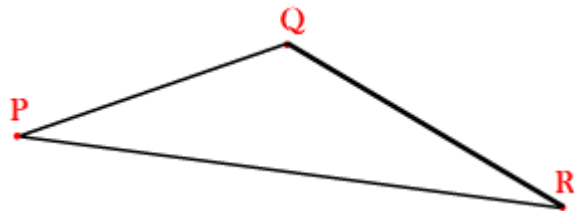
Case 1: Triangle will be formed by given 3 points or not.

- Find the sides of the triangle using distance formula.
- Use sum property of the triangle: The sum of the lengths of any two sides of a triangle is greater than the third side.

$$PQ + QR > PR$$

$$PQ + PR > QR$$

$$QR + PR > PQ$$



Case 2: Which type of Triangle will be formed by joining given 3 points.

- Equilateral Triangle: All the 3 sides of the triangle are equal.
- Isosceles Triangle: 2 sides of the triangle are equal.
- Right angled Triangle: Use Pythagoras theorem.

Case 3: Whether the given 3 points are collinear or not.

The points are collinear if they satisfy the equation:

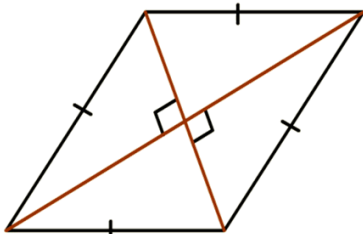


$$AB + BC = AC$$

Use distance formula to calculate the distance between points.

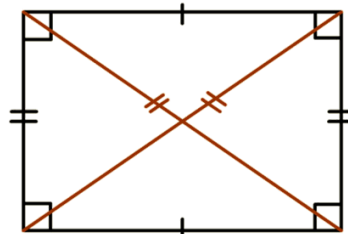
Case 4: Which type of Quadrilateral will be formed by joining 4 given points.

Find the sides of the quadrilateral using distance formula.



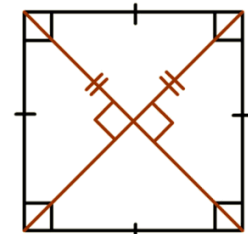
Rhombus

All sides are equal
 Diagonals
 - Perpendicular Bisector



Rectangle

Opposite sides are equal
 All angles are equal
 Diagonals
 - Equal

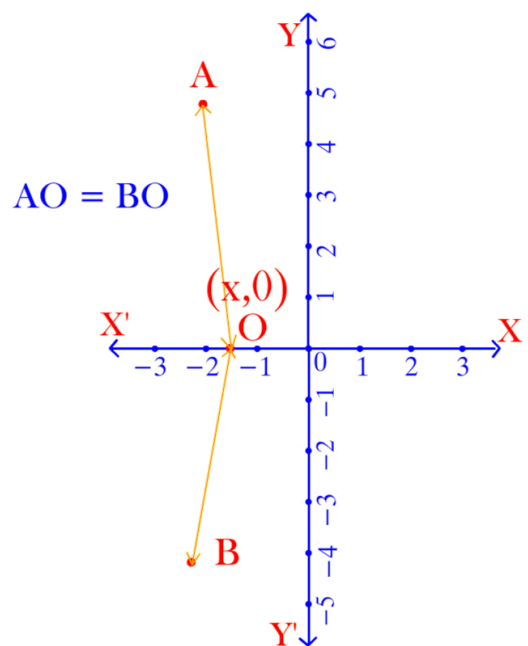
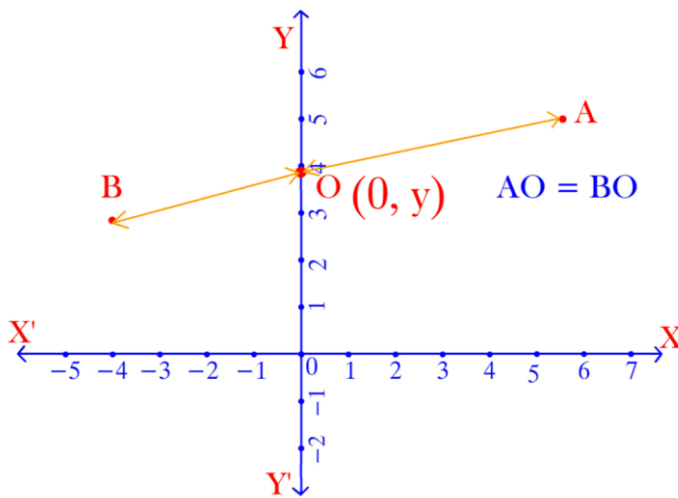


Square

All sides are equal
 All angles are equal
 Diagonals
 - Perpendicular Bisector
 - Equal

Case 5: 2 given points are equidistant from X axis or Y axis.

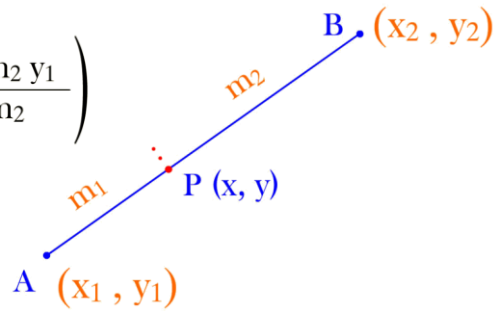
- Assume point O on x axis and y axis respectively which is equidistant from point A and B, so $OA = OB$.
- Point on x axis will have y coordinate 0, so coordinate of O will be $(x, 0)$
- point on y axis will have x coordinate 0, so coordinate of O will be $(0, y)$
- Use distance formula and equate $AO = OB$



2. Section formula

The coordinates of the point P which divides the line segment joining the points A (x_1, y_1) and B (x_2, y_2) internally in the ratio $m_1 : m_2$ are

$$P(x, y) = \left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \right)$$



Mid-Point Section formula:

When the point P is at the mid-point of AB.

$$m_1 : m_2 = 1 : 1$$

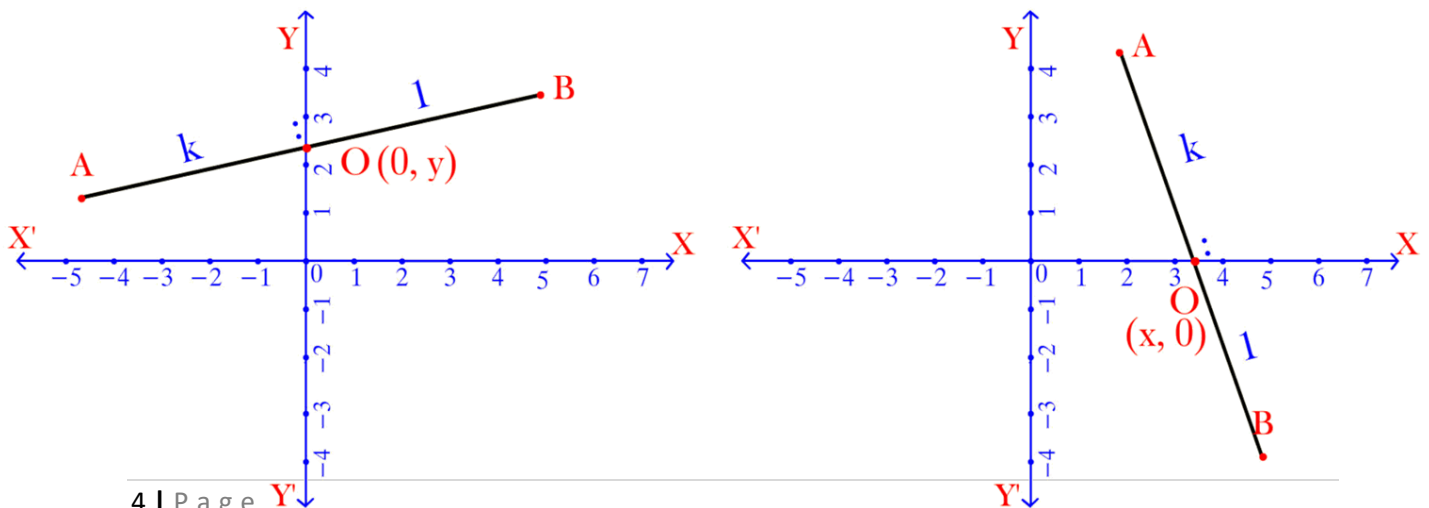
$$P(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Case 1: Find the ratio in which point P is dividing the line segment AB into certain ratio.

Assume the ratio as $k:1$, and use the section formula.

Case 2: Find the ratio in which x axis or y axis divides the line segment AB into certain ratio.

- Assume point O on x axis and y axis respectively which is equidistant from point A and B, so $OA = OB$.
- Point on x axis will have y coordinate 0, so coordinate of O will be $(x, 0)$
- point on y axis will have x coordinate 0, so coordinate of O will be $(0, y)$
- Use distance formula and equate $AO = OB$



Case 3: Missing dimension in Quadrilateral.

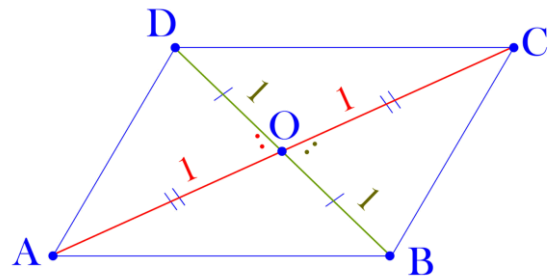
The diagonals of a parallelogram bisect each other.

So, $AO = OC$ and $BO = OD$.

$AO : OC = 1 : 1$

$BO : OD = 1 : 1$

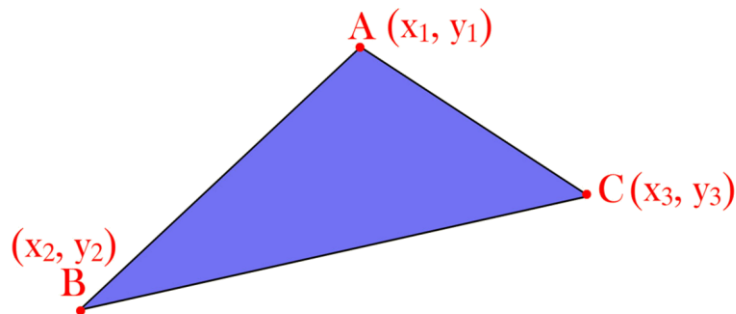
Use midpoint section formula to find the missing dimensions.



3. Area of Triangle

The area of a triangle with vertices $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ is

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



Case 1: Triangle formed by the given 3 collinear points.

No Triangle is possible with 3 collinear points.

So, the area of Triangle = 0

Case2: Finding area of Quadrilateral.

Quadrilateral is composed of 2 triangles. Find the area of triangles separately and add them to get the final area of the quadrilateral. Same can be applied on polygons, which are also composed of triangles.

NOTES: