CBSE Class 10 Mathematics
Important Questions
Chapter 7
Coordinate Geometry

---

1 Marks Questions

1. The distance between the point $(a,b),(-a,-b)$ **is**

$(a)\ 2\sqrt{a^2+b^2}$

$(b)\ 2\sqrt{a^2-b^2}$

$(c)\ \sqrt{a^2+b^2}$

$(d)\ \sqrt{a+b}$

Ans. $2\sqrt{a^2+b^2}$

---

3. The point $(5,-3)$ **lies in**

(a) 1st quadrant

(b) 2nd quadrant

(c) 3rd quadrant

(d) 4th quadrant

Ans. d) 4th quadrant

---

4. The distance between the points $(Cos\theta,\ Sin\theta)$ and $(Sin\theta,\ -\ Cos\theta)$ is

(a) $\sqrt{3}$

(b) 2

(c) 1

(d) $\sqrt{2}$

Ans. (d) $\sqrt{2}$

---

5. If $(1,2)$ $(4,y)$, $(x,6)$ and $(3,5)$ are the vertices of a parallelogram taken in order. Then (x,y) is

(a) (6, 2)

(b) (6, 3)

(c) (6, 4)

(d) (3, 4)

Ans.(b) (6, 3)

---

6. The coordinates of the point which divides the join of $(-1,7)$ and $(4,-3)$ in the ratio 2:3 is

(a) (1, 3)

(b) (2, 3)

(c) (3, 1)

(d) (1, 1)

Ans. (a) (1, 3)

---

7. The coordinates of a point A, where AB is the diameters of a circle whose centre $(2,-3)$ and B is $(1,4)$ is

(a) (3, -9)

(b) (2, 9)

(c) (3, -10)

(d) (4, 5)

Ans. (c) (3, -10)

---

8. If the area of a quadrilateral ABCD is zero, then the four points A, B, C, D are

(a) Collinear

(b) Not collinear

(c) Nothing can be said

(d) None of these

Ans. (a) Collinear

---

9. The valve of K if the points $A(2,3)$, $B(4,K)$ and $C(6,-3)$ are collinear is

(a) (1)

(b) (-1)

(c) (2)

(d) (0)

Ans. (d) (0)

---

10. The mid-point of the line segment joining $(2a,4)$ and $(-2,3b)$ is $(1,2a+1)$. The values of a and b is

(a) a=2, b=2

(b) a=1, b=3

(c) a=2, b=3

(d) a=1, b=1

Ans. (a) a=2, b=2

---

11. Coordinate of A and B are $(-3,\alpha)$ and $(1,\alpha+4)$. The mid-point of AB is $(-1,1)$. The value of α is

(a) (-1)

(b) (2)

(c) (3)

(d) (1)

Ans. (a) (-1)

---

12. The distance between $P(a,7)$ **and Q** $(1,3)$ **is 5. The value of a is**

(a) (4, 2)

(b) (-4, -2)

(c) (4, -2)

(d) (4, 1)

Ans. (c) (4, -2)

---

13. On which axis point $(-4,0)$ **lie**

(a) x-axis

(b) y-axis

(c) both

(d) none of these

Ans. (a) x-axis

---

14. The distance of the point $(-4,-6)$ **from the origin is**

$(a)\ \sqrt{53}$

$(b)\ 2\sqrt{13}$

$(c)\ 2\sqrt{12}$

$(d)\ \sqrt{13}$

Ans. (b) $2\sqrt{13}$

---

15. The coordinates of the mid-point of the line segment joining $(-5,4)$ **and** $(7,-8)$ **is**

(a) (1, -2)

(b) (1, 2)

(c) (1, 3)

(d) (-1, -2)

Ans. (a) (1, -2)

---

16. Two vertices of a ΔABC are $A(1,-1)$ and $B(5,1)$. If the coordinates of its centroid be $\left(\frac{5}{3},1\right)$, then the coordinates of the third vertex C is

(a) (-1, -3)

(b) (1, 3)

(c) (-1, 3)

(d) (1, 2)

Ans. (c) (-1, 3)

---

17. The abscissa of every point on y-axis is

(a) 0

(b) 1

(c) 2

(d) -1

Ans. (a) 0

---

18. The ordinate of every point on x-axis is

(a) 1

(b) 2

(c) 0

(d) -1

Ans. (c) 0

---

19. Find the distance between the following pairs of points:

(i) (2, 3), (4,1)

(ii) (−5, 7), (−1, 3)

(iii) (a, b), (−a, −b)

Ans. (i) Applying Distance Formula to find distance between points (2, 3) and (4,1), we get

d = $\sqrt{(4-2)^2+(1-3)^2}$

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

$=\sqrt{4+4}=\sqrt{8}=2\sqrt{2}$ units

(ii) Applying Distance Formula to find distance between points (−5, 7) and (−1, 3), we get

d = $\sqrt{[-1-(-5)]^2+(3-7)^2}$

$=\sqrt{(4)^2+(-4)^2}$

$=\sqrt{16+16}=\sqrt{32}=4\sqrt{2}$ units

(iii) Applying Distance Formula to find distance between points (a, b) and (−a, −b), we get

d = $\sqrt{(-a-a)^2+(-b-b)^2}$

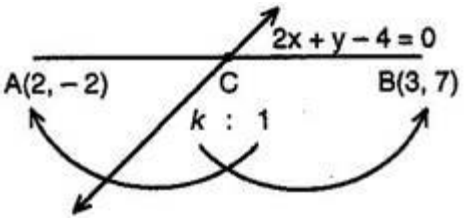
$=\sqrt{(-2a)^2+(-2b)^2}=\sqrt{4a^2+4b^2}$

$=\sqrt{4(a^2+b^2)}=2\sqrt{a^2+b^2}$

---

20. Determine the ratio in which the line 2x+y-4 = 0 divides the line segment joining the points A(2,-2) and B (3,7).

Ans. Let the line $2x+y-4=0$ divides the line segment joining A$(2,-2)$ and B (3, 7) in the ratio $k:1$ at point C. Then, the coordinates of C are $\left(\frac{3k+2}{k+1},\frac{7k-2}{k+1}\right)$.



But C lies on $2x+y-4=0$, therefore

$$2\left(\frac{3k+2}{k+1}\right)+\left(\frac{7k-2}{k+1}\right)-4=0$$

$\Rightarrow 6k+4+7k-2-4k-4=0$

$\Rightarrow 9k-2=0$

$\Rightarrow k=\frac{2}{9}$

Hence, the required ratio if 2 : 9 internally.

---

21. Find a relation between x and y if the points $(x, y), (1, 2)$ and $(7, 0)$ are collinear.

Ans. The points A(x, y), B (1, 2) and C (7, 0) will be collinear if

Area of triangle = 0

$\Rightarrow \frac{1}{2}\left[x(2-0)+1(0-y)+7(y-2)\right]=0$

$\Rightarrow 2x-y+7y-14=0$

$\Rightarrow 2x+6y-14=0$

$\Rightarrow x+3y-7=0$

2 Marks Questions

1. Find the distance between the point $A\left(at_1^2, 2at_1\right)$ $B\left(at_2^2, 2at_2\right)$.

$\Rightarrow$ **Ans.** $AB=\sqrt{\left(at_2^2-at_1^2\right)^2+\left(2at_2^2-2at_1^2\right)^2}$

$=\sqrt{a^2\left(t_2-t_1\right)^2\left(t_2+t_1\right)^2+4a^2\left(t_2-t_1\right)^2}$

$\Rightarrow =\sqrt{a^2\left(t_2-t_1\right)^2\left(t_2+t_1\right)^2+4a^2\left(t_2-t_1\right)^2}$

$=\sqrt{a^2\left(t_2-t_1\right)^2\left[\left(t_2+t_1\right)^2+4\right]}$

$\Rightarrow =a\left(t_2-t_1\right)\sqrt{\left(t_2+t_1\right)^2+4}$

$\Rightarrow$

---

2. Determine if the points $(1, 5), (2, 3)$ and $(-2, -11)$ collinear.

$\Rightarrow$ **Ans.** Let $A=(1,5),\ B=(2,3)\ and\ C=(-2,-11)$

$AB=\sqrt{(2-1)^2+(3-5)^2}=\sqrt{5}$

$\Rightarrow BC=\sqrt{(-11-3)^2+(-2-2)^2}=\sqrt{212}$

$AC = \sqrt{(-2-1)^2 + (-11-5)^2} = \sqrt{265}$

⇒ $AB + BC \neq AC$

⇒ Hence, A, B and C are not collinear.

⇒ ---

3. Prove that the points (3, 0), (4, 5), (-1, 4) and (-2, -1) taken in order form a rhombus.

⇒ **Ans.** Let $A\ (3,0),\ \ B\ (4,5),\ C\ (-1,4)\ \ and\ \ D\ (-2,-1)$

$AB = \sqrt{(4-3)^2 + (5-0)^2} = \sqrt{26}$

⇒ $BC = \sqrt{(-1-4)^2 + (4-5)^2} = \sqrt{26}$

$CD = \sqrt{(-2+1)^2 + (-1-4)^2} = \sqrt{26}$

⇒ $DA = \sqrt{(3+2)^2 + (0+1)^2} = \sqrt{26}$

⇒ Since AB = BC = CD = DA

⇒ Hence, ABCD is a rhombus.

⇒ ---

4. Show that (4, 4), (3, 5), (-1, 1) are vertices of a right-angled triangle.

⇒ **Ans.** Let A (4, 4), B (3, 5) and C (-1, 1)

⇒ $AB^2 = (3 - 4)^2 + (5 - 4)^2 = 2$

⇒ $AC^2 = (-1 - 4)^2 + (5 - 4)^2 = 34$

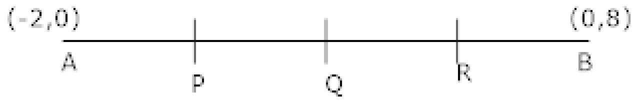
⇒ $BC^2 = (-1 - 3)^2 + (1 - 5)^2 = 32$

⇒ Since $AC^2 = AB^2 + BC^2$

⇒ Hence, ABC is a right-angled triangle.

⇒ ---

5. Find the coordinates of the points which divide the line segment joining the points (-2, 0) and (0, 8) in four equal parts.



⇒

⇒ **Ans.** Q is the mid-point of AB

⇒ Coordinate of $Q\left(\frac{-2+0}{2}, \frac{0+8}{2}\right)$ = (-1, 4)

⇒ Coordinate of $P = \left(\frac{-3}{2}, 2\right)$

⇒ Coordinate of $R = \left(\frac{-1}{2}, 6\right)$

⇒ ---

6. Find the area of the rhombus if its vertices are (3, 0), (4, 5), (-1, 4) and (-2, -1) taken in order.

⇒ **Ans.** Let A (3, 0), B (4, 5), C (-1, 4) and D (-2, -1)

$AC = \sqrt{(-1-3)^2 + (4-0)^2} = 4\sqrt{2}$

⇒ $BD = \sqrt{(-2-4)^2 + (-1-5)^2} = \sqrt{36+36} = 6\sqrt{2}$

⇒ Area of rhombus = $\frac{1}{2}d_1 \times d_2$

$= \frac{1}{2} AC \times BD$

⇒ $= \frac{1}{2} \times 4\sqrt{2} \times 6\sqrt{2} = 24$

⇒

---

7. If the coordinates A and B are (-2, -2) and (2, -4) respectively. Find the coordinates of P such that AP = $\frac{3}{7}AB$ and P lies on the line segment AB.

⇒ **Ans.** Coordinate of P are

⇒ 

$x = \frac{-2 \times 4 + 2 \times 3}{7} = \frac{-8+6}{7} = \frac{-2}{7}$

⇒ $y = \frac{-2 \times 4 + (-4) \times (3)}{7} = \frac{-8-12}{7} = \frac{-20}{7}$

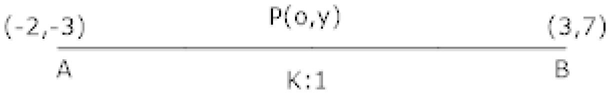
⇒

---

8. In what ratio is the line segment joining the points (-2, 3) and (3, 7) divided by the y-axis?

⇒ **Ans.** Let A (-2, -3) and B (3, 7)

⇒ P (0, y) and ratio be K:1

⇒ 

⇒ Coordinate of P are $\left(\frac{3k-2}{k+1}, \frac{7k-3}{k+1}\right)$

$\frac{3k-2}{k+1} = 0$

⇒ $\Rightarrow k = \frac{2}{3} or\ 2:3$

⇒

---

9. For what value of P are the points (2, 1) (p, -1) and (-1, 3) collinear?

⇒ **Ans.** For collinear

⇒ $\frac{1}{2}\left[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\right] = 0$

⇒ $\Rightarrow \frac{1}{2}\left[2(-1-3) + p(3-1) + (-1)(1+1)\right] = 0$

$\Rightarrow -5 + p = 0$

⇒ $\Rightarrow p = 5$

⇒

---

10. Find the third vertex of a Δ, if two of its vertices are at (1, 2) and (3, 5) and the centroid is at the origin.

⇒ **Ans.** Let third vertex of the Δ be (x, y)

$\frac{x+1+3}{3}=0, \quad \frac{y+2+5}{3}=0$

$x=-4, \ y=-7$

⇒ *Hence*, third vertex is $(-4, -7)$.

⇒ ___

11. In a seating arrangement of desks in a classroom, three students are seated at $A(3,1)$, $B(6,4)$ and $C(8,6)$ respectively. Are they seated in line?

⇒ **Ans.** $AB=\sqrt{(6-3)^2+(4-1)^2}=\sqrt{18}=3\sqrt{2}$

$BC=\sqrt{(8-6)^2+(6-4)^2}=\sqrt{4+4}=2\sqrt{2}$

$AC=\sqrt{(8-3)^2+(6-1)^2}=\sqrt{25+25}=5\sqrt{2}$

⇒ $AB+BC=AC$

⇒ Hence, they seated in a line.

⇒ ___

12. Show that $(1,1), (-1,-1), \left(\sqrt{3}, \sqrt{3}\right)$ are the vertices of an equilateral triangle.

⇒ **Ans.** Let $A(1,1), \ B(-1,-1), \ C\left(-\sqrt{3}, \sqrt{3}\right)$

$AB=\sqrt{(-1-1)^2+(-1-1)^2}=\sqrt{8}$

$BC=\sqrt{\left(-\sqrt{3}+1\right)2+\left(\sqrt{3}+1\right)2}=\sqrt{8}$

⇒ $CA=\sqrt{\left(1+\sqrt{3}\right)^2+\left(1-\sqrt{3}\right)^2}=\sqrt{8}$

⇒ Since AB = BC = CA, then ΔABC is equilateral triangle.

⇒ ___

13. Find the distance between the points (0, 0) and (36, 15).Also, find the distance between towns A and B if town B is located at 36 km east and15 km north of town A.

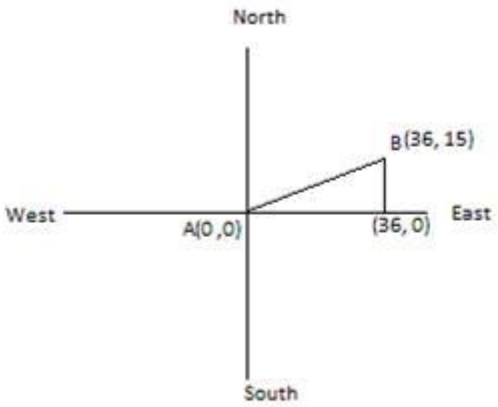
⇒ **Ans.** Applying Distance Formula to find distance between points (0, 0) and (36, 15), we get

⇒ d = $\sqrt{(36-0)^2+(15-0)^2}$

⇒ $=\sqrt{(36)^2+(15)^2}$

⇒ $=\sqrt{1296+225}=\sqrt{1521}=39$

⇒ Town B is located at 36 km east and 15 km north of town A. So, the location of town A and B can be shown as:



Clearly, the coordinates of point A are (0, 0) and coordinates of point B are (36, 15).

⇒ To find the distance between them, we use Distance formula:

⇒ d = $\sqrt{[36-0]^2+(15-0)^2}$

⇒ $=\sqrt{(36)^2+(15)^2}$

⇒ $=\sqrt{1296+225}=\sqrt{1521}=39km$

⇒

---

14. Determine if the points (1, 5), (2, 3) and (−2, −11) are collinear.

⇒ **Ans.** Let A = (1, 5), B = (2, 3) and C = (−2, −11)

⇒ Using Distance Formula to find distance AB, BC and CA.

⇒ AB = $\sqrt{[2-1]^2+(3-5)^2}$

⇒ $=\sqrt{(1)^2+(-2)^2}$

⇒ $=\sqrt{1+4}=\sqrt{5}$

⇒ BC = $\sqrt{[-2-2]^2+(-11-3)^2}$

⇒ $=\sqrt{(-4)^2+(-14)^2}$

⇒ $=\sqrt{16+196}=\sqrt{212}=2\sqrt{53}$

⇒ CA = $\sqrt{[-2-1]^2+(-11-5)^2}$

⇒ $=\sqrt{(-3)^2+(-16)^2}$

⇒ $=\sqrt{9+256}=\sqrt{265}$

⇒ Since AB + AC ≠ BC, BC + AC ≠ AB and AC ≠ BC.

⇒ Therefore, the points A, B and C are not collinear.

⇒

---

15. Check whether (5, −2), (6, 4) and (7, −2) are the vertices of an isosceles triangle.

⇒ **Ans.** Let A = (5, −2), B = (6, 4) and C = (7, −2)

⇒ Using Distance Formula to find distances AB, BC and CA.

⇒ AB = $\sqrt{[6-5]^2+[4-(-2)]^2}$

⇒ $=\sqrt{(1)^2+(6)^2}$

⇒ $=\sqrt{1+36}=\sqrt{37}$

⇒ BC = $\sqrt{[7-6]^2+(-2-4)^2}$

⇒ $=\sqrt{(1)^2+(-6)^2}$

⇒ $=\sqrt{1+36}=\sqrt{37}$

⇒ CA = $\sqrt{[7-5]^2+[-2-(-2)]^2}$

⇒ $=\sqrt{(2)^2+(0)^2}$

⇒ $=\sqrt{4+0}=\sqrt{4}=2$

⇒ Since AB = BC.

⇒ Therefore, A, B and C are vertices of an isosceles triangle.

⇒

---

16. Find the values of y for which the distance between the points P (2, −3) and Q (10, y) is 10 units.

⇒ **Ans.** Using Distance formula, we have

⇒ $10=\sqrt{(2-10)^2+(-3-y)^2}$

⇒ ⇒ $10=\sqrt{(-8)^2+9+y^2+6y}$

⇒ ⇒ $10=\sqrt{64+9+y^2+6y}$

⇒ Squaring both sides, we get

⇒ $100=73+y^2+6y$

⇒ ⇒ $y^2+6y-27=0$

⇒ Solving this Quadratic equation by factorization, we can write

⇒ ⇒ $y^2+9y-3y-27=0$

⇒ ⇒ $y(y+9)-3(y+9)=0$

⇒ ⇒ $(y+9)(y-3)=0$

⇒ ⇒ $y=3,-9$

⇒

---

17. Find a relation between x and y such that the point (x, y)is equidistant from the point (3, 6) and (−3, 4).

⇒ **Ans.** It is given that (x,y) is equidistant from (3, 6) and (−3, 4).

⇒ Using Distance formula, we can write

⇒ $\sqrt{(x-3)^2+(y-6)^2}$

⇒ $=\sqrt{[x-(-3)]^2+(y-4)^2}$

⇒ ⇒ $\sqrt{x^2+9-6x+y^2+36-12y}$

⇒ $=\sqrt{x^2+9+6x+y^2+16-8y}$

⇒ Squaring both sides, we get

⇒ ⇒ $x^2+9-6x+y^2+36-12y$

⇒ $=x^2+9+6x+y^2+16-8y$

⇒ $-6x-12y+45$

⇒ $=6x-8y+25$

⇒ $12x+4y=20$

⇒ ⇒ $3x+y=5$

⇒

---

18. Find the coordinates of the point which divides the join of (−1, 7) and (4, −3) in the ratio 2:3.

⇒ **Ans.** Let $x_1=-1$, $x_2=4$, $y_1=7$ and $y_2=-3$, $m_1=2$ and $m_2=3$

⇒ Using Section Formula to find coordinates of point which divides join of (−1, 7) and (4, −3) in the ratio 2:3, we get

⇒ $x=\frac{m_1x_2+m_2x_1}{m_1+m_2}$

⇒ $=\frac{2\times4+3\times(-1)}{2+3}=\frac{8-3}{5}=\frac{5}{5}=1$

⇒ $y=\frac{m_1y_2+m_2y_1}{m_1+m_2}$

⇒ $=\frac{2\times(-3)+3\times7}{2+3}=\frac{-6+21}{5}=\frac{15}{5}=3$

⇒ Therefore, the coordinates of point are (1,3) which divides join of (−1, 7) and (4, −3) in the ratio 2:3.

⇒

---

19. Find the ratio in which the line segment joining the points (−3, 10) and (6, −8) is divided by (−1, 6).

⇒ **Ans.** Let (−1, 6) divides line segment joining the points (−3, 10) and (6, −8) in k:1.

⇒ Using Section formula, we get

⇒ $-1=\frac{(-3)\times1+6\times k}{k+1}$

⇒ ⇒ -k − 1=(-3+6k)

⇒ ⇒ -7k=-2

⇒ ⇒ k= $\frac{2}{7}$

⇒ Therefore, the ratio is $\frac{2}{7}$:1 which is equivalent to 2:7.

⇒ Therefore, (−1, 6) divides line segment joining the points (−3, 10) and (6, −8) in 2:7.

⇒

---

20. Find the ratio in which the line segment joining A(1, −5) and B(−4, 5) is divided by the x−axis. Also find the coordinates of the point of division.

⇒ **Ans.** Let the coordinates of point of division be (x, 0) and suppose it divides line segment joining A(1, −5) and B(−4, 5) in k:1.

⇒ According to Section formula, we get

⇒ $x=\frac{1\times1+(-4)\times k}{k+1}=\frac{1-4k}{k+1}$ and $0=\frac{(-5)\times1+5k}{k+1}$ ... (1)

⇒ $0=\frac{(-5)\times1+5k}{k+1}$

⇒ ⇒ 5=5k

⇒ ⇒ k=1

⇒ Putting value of k in (1), we get

⇒ $x=\frac{1\times1+(-4)\times1}{1+1}=\frac{1-4}{2}=\frac{-3}{2}$

⇒ Therefore, point ($\frac{-3}{2}$, 0) on x−axis divides line segment joining A(1, −5) and B(−4, 5) in 1:1.

⇒

---

21. If (1, 2), (4, y), (x, 6) and (3, 5) are the vertices of a parallelogram taken in order, find x and y.

⇒ **Ans.** Let A = (1,2), B = (4,y), C= (x, 6) and D= (3, 5)

⇒ We know that diagonals of parallelogram bisect each other. It means that coordinates of midpoint of diagonal AC would be same as coordinates of midpoint of diagonal BD. … (1)

⇒ Using Section formula, the coordinates of midpoint of AC are:

⇒ $\frac{1+x}{2},\frac{2+6}{2}=\frac{1+x}{2},4$

⇒ Using Section formula, the coordinates of midpoint of BD are:

⇒ $\frac{4+3}{2},\frac{5+y}{2}=\frac{7}{2},\frac{5+y}{2}$

⇒ According to condition (1), we have

⇒ $\frac{1+x}{2}=\frac{7}{2}$

⇒ ⇒ (1+x)=7

⇒ ⇒ x=6

⇒ Again, according to condition (1), we also have

⇒ $4=\frac{5+y}{2}$

⇒ ⇒ 8=5+y

⇒ ⇒ y=3

⇒ Therefore, x=6 and y=3

⇒

---

22. Find the coordinates of a point A, where AB is the diameter of a circle whose centre is (2, −3) and B is (1, 4).

⇒ **Ans.** We want to find coordinates of point A. AB is the diameter and coordinates of center are (2, −3) and, coordinates of point B are (1, 4).

⇒ Let coordinates of point A are (x, y). Using section formula, we get

⇒ $2=\frac{x+1}{2}$

⇒ ⇒ 4=x+1

⇒ ⇒ x=3

⇒ Using section formula, we get

⇒ $-3=\frac{4+y}{2}$

⇒ ⇒ −6=4+y

⇒ ⇒ y=−10

⇒ Therefore, Coordinates of point A are (3, −10).

3 Marks Questions

1. If $A(-3,2)$, $B(a,b)$ and $C(-1,4)$ are the vertices of a isosceles triangle, show that $a+b=1$, if AB = BC.

Ans. $AB=BC$ (Given)

$\Rightarrow AB^2=BC^2$

$\Rightarrow (a+3)^2+(b-2)^2=(-1-a)^2+(4-b)^2$

$\Rightarrow a^2+9+6a+b^2+4-4b=1+a^2+2a+16+b^2-8b$

$\Rightarrow 4a + 4b = 4$
$\Rightarrow a + b = 1$

---

2. Find the value of P if the point $A(0,2)$ is equidistant from $(3,p)$ and $(p,3)$.

Ans. Let $B(3,p)$ and $C(p,3)$

AB = AC (Given)

$\Rightarrow AB^2 = AC^2$

$\Rightarrow (0-3)2 + (2-p)^2 = (p-0)^2 + (3-2)^2$
$\Rightarrow 9 + 4 + p^2 - 4p = p^2 + 1$

$\Rightarrow -4p = -12$
$\Rightarrow p = 3$

---

3. Find the centroid of the triangle whose vertices are $(4,-8)(-9,7)$ and $(8,13)$.

Ans. Let (x,y) be the coordinate of centroid

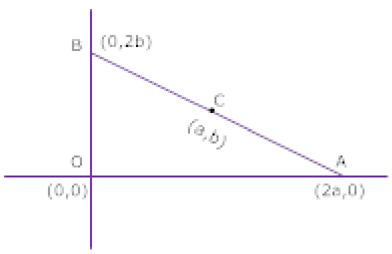
$x = \frac{x_1 + x_2 + x_3}{3}$
$= \frac{4-9+8}{3} = \frac{3}{3} = 1$

$y = \frac{y_1 + y_2 + y_3}{3}$
$= \frac{-8+7+13}{3} = \frac{20-8}{3} = 4$

Coordinate of centroid is $(1,4)$

---

4. Prove that in a right-angled triangle, the mid-point of the hypotenuse is equidistant from the vertices.



Ans. Let $A(2a,0), B(0,2b)$ and $O(0,0)$ are the vertices of right-angled triangle

Coordinate of $C\left(\frac{2a+0}{2}, \frac{0+2b}{2}\right)$

i.e. (a, b)

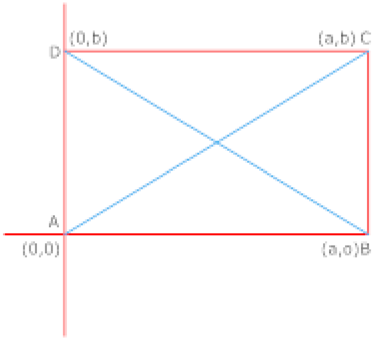
$$OC = \sqrt{a^2+b^2}$$
$$AC = \sqrt{a^2+b^2}$$
$$BC = \sqrt{a^2+b^2}$$

Hence, C is Equidistant from the vertices.

---

5. Prove that diagonals of a rectangle bisect each other and are equal.

Ans. Let ABCD be a rectangle take A as origin the vertices of a rectangle are $A(0,0), B(a,0), C(a,b), D(o,b)$



$$AC = \sqrt{(a-0)^2+(b-0)^2} = \sqrt{a^2+b^2}$$
$$BD = \sqrt{(0-a)^2+(0-b)^2} = \sqrt{a^2+b^2}$$
$$AC = BD$$

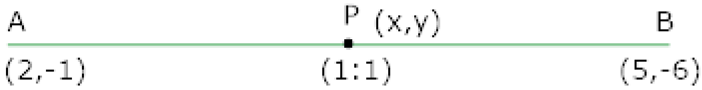
Mid-point of AC = $\left(\frac{0+a}{2}, \frac{0+b}{2}\right) = \left(\frac{a}{2}, \frac{b}{2}\right)$

Mid-point of BD = $\left(\frac{0+a}{2}, \frac{0+b}{2}\right) = \left(\frac{a}{2}, \frac{b}{2}\right)$

Mid-point of AC = Mid-point of BC

Hence proved.

6. The line joining the points $(2,-1)$ and $(5,-6)$ is bisected at P. If P lies on the line $2x+4y+k=0$, find the value of *k*.



Ans. Coordinate of $P=\left(\frac{2+5}{2},\frac{-1-6}{2}\right)=\left(\frac{7}{2},\frac{-7}{2}\right)$

P lies on equation $2x+4y+k=0$

$$\therefore \quad 2\left(\frac{7}{2}\right)+4\left(\frac{-7}{2}\right)+k=0$$
$$\Rightarrow \quad 7-14+k=0$$
$$\Rightarrow \quad k=7$$

---

8. The length of a line segment is 10. If one end point is $(2,-3)$ and the abscissa of the second end point is 10, show that its ordinate is either 3 or -9.

Ans. Let A (2, -3) be the first end point and B (10, y) be the second end point.

$$(10-2)^2+(y+3)^2=(10)^2$$

$$\therefore AB=10$$
$$\Rightarrow \sqrt{(10-2)^2+(y+3)^2}=10$$
$$\Rightarrow 8^2+y^2+9+6y=100$$

$$\Rightarrow 64+y^2+9+6y=100$$
$$\Rightarrow y^2+6y-27=0$$
$$\Rightarrow y^2+9y-3y-27=0$$

$$\Rightarrow y(y+9)-3(y+9)=0$$
$$\Rightarrow (y+9)(y-3)=0$$
$$\Rightarrow y=-9 \text{ or } y=3$$

---

9. Using section formula, show that the points $(-1,2)(5,0)$ and $(2,1)$ are collinear.

Ans. If points $A(-1,2)$, $B(5,0)$ and $(2,1)$ are collinear, then one point divides the join of other two in the same ratio. Let $C(2,1)$ divides the join of $A(-1,2)$ and $B(5,0)$ in the ratio K:1

$\therefore 2=\frac{5K-1}{K+1}$ and $1=\frac{0+2}{K+1}$

$2K+2=5K-1$ and $K+1=2$

$\mathrm{K}=1$ $\quad\quad$ $\mathrm{K}=1$

Hence Proved.

---

10. Find the relation between x and y such that the point (x,y) is equidistant from the points $(7,1)$ and $(3,5)$.

Ans. Let $P(x,y)$ be equidistant from the points $A(7,1)$ and $B(3,5)$

$AP=BP$ (Given)

$\Rightarrow AP^2=BP^2$

$\Rightarrow (x-7)^2+(y-1)^2=(x-3)^2+(y-5)^2$

$\Rightarrow x^2+49-14x+y^2+1-2y=x^2+9-6x+y^2+25-10y$

$\Rightarrow x-y=2$

---

11. Determine the ratio in which the line $2x+y-4=0$ divides the line segment joining the points $A(2,2)$ and $B(3,7)$.

Ans. Let the ratio be K: 1

Coordinate of P are $\left(\frac{3K+2}{K+1},\frac{7K-2}{K+1}\right)$

P lies on the line $2x+y-4=0$

$$\Rightarrow 2\left(\frac{3K+2}{K+1}\right)+\frac{7K-2}{K+1}-\frac{4}{1}=0$$

$$\Rightarrow 6K+4+7K-2-4K-4=0$$
$$\Rightarrow 9K-2=0$$
$$\Rightarrow K=\frac{2}{9}\ or\ 2:9$$

---

12. Show that the points $A(5,6)$, $B(1,5)$, $C(2,1)$ and $D(6,2)$ are the vertices of a square.

Ans. $AB=\sqrt{(1-5)^2+(5-6)^2}=\sqrt{17}$

$$BC=\sqrt{(2-1)^2+(1-5)^2}=\sqrt{17}$$
$$CD=\sqrt{(6-2)^2+(1-2)^2}=\sqrt{17}$$
$$DA=\sqrt{(5-6)^2+(6-2)^2}=\sqrt{17}$$

Diagonal $AC=\sqrt{(2-5)^2+(1-6)^2}=\sqrt{34}$

Diagonal $BD=\sqrt{(6-1)^2+(2-5)^2}=\sqrt{34}$

Hence proved.

---

13. If the point $P(x,y)$ is equidistant from the points $A(5,1)$ and $B(1,5)$, prove that $x=y$.

Ans. $PA=PB$ (Given)

$$\therefore PA^2=PB^2$$
$$\Rightarrow (5-x)^2+(1-y)^2=(1-x)^2+(5-y)^2$$
$$\Rightarrow 25+x^2-10x+1+y^2-2y=1+x^2-2x+25+y^2-10y$$

$$\Rightarrow -8x=-10y+2y$$
$$\Rightarrow -8x=-8y$$
$$\Rightarrow x=y$$

---

14. Find the point on the x–axis which is equidistant from (2, –5) and (–2, 9).

Ans. Let the point be (x, 0) on x–axis which is equidistant from (2, −5) and (−2, 9).

Using Distance Formula and according to given conditions we have:

$$\sqrt{[x-2]^2+[0-(-5)]^2}=\sqrt{[x-(-2)]^2+[(0-9)]^2}$$

$$\Rightarrow \sqrt{x^2+4-4x+25}=\sqrt{x^2+4+4x+81}$$

Squaring both sides, we get

$\Rightarrow x^2 + 4 - 4x + 25 = x^2 + 4 + 4x + 81$

$\Rightarrow -4x + 29 = 4x + 85$

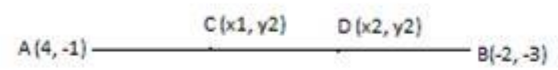
$\Rightarrow 8x = -56$

$\Rightarrow x = -7$

Therefore, point on the x–axis which is equidistant from (2, −5) and (−2, 9) is (−7, 0)

---

15. Find the coordinates of the points of trisection of the line segment joining (4, −1) and (−2, −3).



Ans. We want to find coordinates of the points of trisection of the line segment joining (4, −1) and (−2, −3).

We are given AC = CD = DB

We want to find coordinates of point C and D.

Let coordinates of point C be (x_1, y_1) and let coordinates of point D be (x_2, y_2).

Clearly, point C divides line segment AB in 1:2 and point D divides line segment AB in 2:1.

Using Section Formula to find coordinates of point C which divides join of (4, −1) and (−2, −3) in the ratio 1:2, we get

$$x_1=\frac{1\times(-2)+3\times 4}{1+2}=\frac{-2+8}{3}=\frac{6}{3}=2$$

$$y_1=\frac{1\times(-3)+2\times(-1)}{1+2}=\frac{-3-2}{3}=\frac{-5}{3}$$

Using Section Formula to find coordinates of point D which divides join of (4, −1) and (−2, −3) in the ratio 2:1, we get

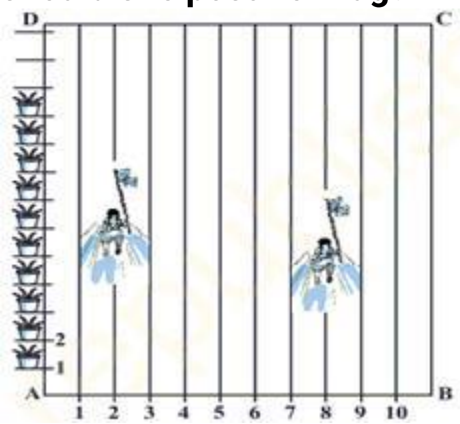
$$x_2 = \frac{2\times(-2)+1\times 4}{1+2} = \frac{-4+4}{3} = \frac{0}{3} = 0$$

$$y_2 = \frac{2\times(-3)+1\times(-1)}{1+2} = \frac{-6-1}{3} = \frac{-7}{3}$$

Therefore, coordinates of point C are (2, $\frac{-5}{3}$) and coordinates of point D are (0, $\frac{-7}{3}$).

---

16. To conduct sports day activities, in your rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AD. Niharika runs 14th of the distance AD on the 2nd line and posts a green flag. Preet runs 15th of the distance AD on the eighth line and posts a red flag. What is the distance between both the flags? If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag?



Ans. Niharika runs 14th of the distance AD on the 2nd line and posts a green flag.

There are 100 flower pots. It means, she stops at 25th flower pot.

Therefore, the coordinates of point where she stops are (2 m, 25 m).

Preet runs 15th of the distance AD on the eighth line and posts a red flag. There are 100 flower pots. It means, she stops at 20th flower pot.

Therefore, the coordinates of point where she stops are (8, 20).

Using Distance Formula to find distance between points (2 m, 25 m) and (8 m, 20 m), we get

$$d = \sqrt{(2-8)^2+(25-20)^2} = \sqrt{(-6)^2+5^2} = \sqrt{36+25} = \sqrt{61}m$$

Rashmi posts a blue flag exactly halfway the line segment joining the two flags.

Using section formula to find the coordinates of this point, we get

$x = \frac{2+8}{2} = \frac{10}{2} = 5$

$y = \frac{25+20}{2} = \frac{45}{2}$

Therefore, coordinates of point, where Rashmi posts her flag are (5, $\frac{45}{2}$).

It means she posts her flag in 5th line after covering $\frac{45}{2}$ = 22.5 m of distance.

---

17. If A and B are (–2, –2) and (2, –4) respectively, find the coordinates of P such that AP = $\frac{3}{7}$ AB and P lies on the line segment AB.

Ans. A = (–2, –2) and B=(2, –4)

It is given that AP= $\frac{3}{7}$ AB

PB=AB – AP=AB– $\frac{3}{7}$ AB= $\frac{4}{7}$ AB

So, we have AP:PB = 3:4

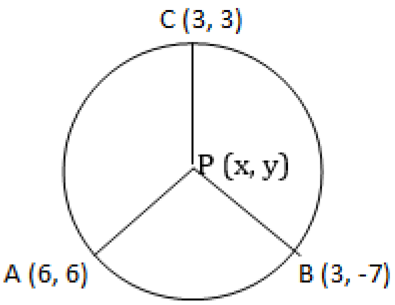
Let coordinates of P be (x, y)

Using Section formula to find coordinates of P, we get

$x = \frac{(-2)\times 4 + 2\times 3}{3+4} = \frac{6-8}{7} = \frac{-2}{7}$

$y = \frac{(-2)\times 4 + (-4)\times 3}{3+4} = \frac{-8-12}{7} = \frac{-20}{7}$

Therefore, Coordinates of point P are $\left(\frac{-2}{7}, \frac{-20}{7}\right)$.



a circle passing through the points $(6,-6), (3,-7)$ and $(3,3)$.

Ans. Let P (x, y), be the centre of the circle passing through the points A $(6,-6)$, B $(3,-7)$ and C (3, 3). Then AP = BP = CP.

Taking AP = BP

$\Rightarrow$ $AP^2 = BP^2$

$\Rightarrow (x-6)^2+(y+6)^2=(x-3)^2+(y+7)^2$

$\Rightarrow x^2-12x+36+y^2+12y+36=x^2-6x+9+y^2+14y+49$

$\Rightarrow -12x+6x+12y-14y+72-58=0$

$\Rightarrow -6x-2y+14=0$

$\Rightarrow 3x+y-7=0$ ....(i)

Again, taking BP = CP

$\Rightarrow$ $BP^2 = CP^2$

$\Rightarrow (x-3)^2+(y+7)^2=(x-3)^2+(y-3)^2$

$\Rightarrow x^2-6x+9+y^2+14y+49=x^2-6x+9+y^2-6y+9$

$\Rightarrow -6x+6x+14y+6y+58-18=0$

$\Rightarrow 20y+40=0$

$\Rightarrow y=-2$

Putting the value of y in eq. (i),

$3x+y-7=0$

$\Rightarrow 3x=9$

$\Rightarrow x=3$

Hence, the centre of the circle is $(3,-2)$.

---

4 Marks Questions

1. If the points (x,y) is equidistant from the points $(a+b,b-a)$ and $(a-b,a+b)$, prove that $bx=ay$.

Ans. Let $P(x,y)$, $A(a+b,b-a)$ and $B(a-b,a+b)$

$PA=PB \quad (\text{Given})$

$\Rightarrow PA^2=PB^2$
$\Rightarrow (a+b-x)^2+(b-a-y)^2=(a-b-x)^2+(a+b-y)^2$
$\Rightarrow a^2+b^2+x^2+2ab-2ax-2ax+b^2+a^2+y^2-2ab+2ay-2by$

$\Rightarrow a^2+b^2+x^2-2ab+2bx-2ax+a^2+b^2+y^2+2ab-2by-2ay$
$\Rightarrow 4ab-4bx-4ab=-2ay-2ay$
$\Rightarrow -4bx=-4ay$
$\Rightarrow bx=ay$

---

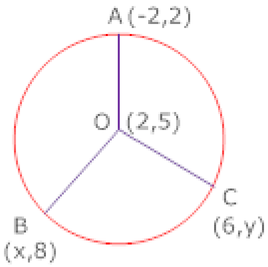
2. $(-2,2)$, $(x,8)$ and $(6,y)$ are three concyclic points whose centre is $(2,5)$. Find the possible value of x and y.

Ans. $OA=OB=OC=$ Radius of circle

$\Rightarrow OA^2=OB^2=OC^2$

$OB^2=OA^2$
$\Rightarrow (x-2)^2+(8-5)^2=(2+2)^2+(5-2)^2$
$\Rightarrow x^2+4-4x+9=16+9$
$\Rightarrow x^2-4x-12=0$

$\Rightarrow x^2-6x+2x-12=0$
$\Rightarrow x(x-6)+2(x-6)=0$
$\Rightarrow (x-6)(x+2)=0$
$\Rightarrow x=6 \text{ or } x=-2$



$OC^2 = OA^2$
$\Rightarrow (6-2)^2 + (y-5)^2 = (2+2)^2 + (5-2)^2$
$\Rightarrow (4)^2 + y^2 + 25 - 10y = 16 + 9$
$\Rightarrow y^2 - 10y + 16 = 0$

$\Rightarrow y^2 - 8y - 2y + 16 = 0$
$\Rightarrow y(y-8) - 2(y-8) = 0$
$\Rightarrow (y-8)y - 2 = 0$
$\Rightarrow y = 8 \; or \; y = 2$

10. Prove that the points $(a,a), (-a,-a)$ and $(-\sqrt{3}a, \sqrt{3}a)$ are the vertices of an equilateraltriangle. Calculate the area of this triangle.

Ans. Let $A(a,a),\ B(-a,-a)\ C(-\sqrt{3}a, \sqrt{3}a)$

$AB = \sqrt{(-a-a)^2 + (-a-a)^2} = \sqrt{8a^2} = 2\sqrt{2}a$
$AB = \sqrt{\left(-\sqrt{3}a + a\right)^2 + \left(\sqrt{3}a + a\right)^2} = 2\sqrt{2}a$
$AC = \sqrt{\left(-\sqrt{3}a - a\right)^2 + \left(\sqrt{3}a - a\right)^2} = 2\sqrt{2}a$

$\therefore AB = BC = AC = 2\sqrt{2}a$
$ar\Delta ABC = \frac{\sqrt{3}}{4} \times (side)^2$

$= \frac{\sqrt{3}}{4} \times \left(2\sqrt{2}a\right)$
$= 2\sqrt{3}a^2$

16. If, Q (0, 1) is equidistant from P (5, –3) and R (x, 6), find the values of x. Also, find the distances QR and PR.

Ans. It is given that Q is equidistant from P and R. UsingDistance Formula, we get

PQ = RQ

$\Rightarrow PQ^2 = RQ^2$

$\Rightarrow \sqrt{(0-5)^2+[1-(-3)^2]} = \sqrt{(0-x)^2+(1-6)^2}$

$\Rightarrow \sqrt{(-5)^2+[4^2]} = \sqrt{(x)^2+(-5)^2}$

$\Rightarrow \sqrt{25+16} = \sqrt{x^2+25}$

Squaring both sides, we get

$\Rightarrow 25+16=x^2+25$

$\Rightarrow x^2=16$

$\Rightarrow x=4,-4$

Thus, Q is (4, 6) or (−4, 6).

Using Distance Formula to find QR, we get

Using value of x = 4

QR= $\sqrt{(4-0)^2+[6-1^2]}$

$= \sqrt{16+25} = \sqrt{41}$

Using value of x = −4

QR= $\sqrt{(-4-0)^2+[6-1^2]}$

$= \sqrt{16+25} = \sqrt{41}$

Therefore, QR= $\sqrt{41}$

Using Distance Formula to find PR, we get

Using value of x = 4

PR= $\sqrt{(4-5)^2+[6-(-3)^2]}$

$= \sqrt{1+81} = \sqrt{82}$

Using value of x =−4

PR= $\sqrt{(-4-5)^2+[6-(-3)^2]}$

$= \sqrt{81+81} = \sqrt{162} = 9\sqrt{2}$

Therefore, x = 4, −4

QR= $\sqrt{41}$, PR= $\sqrt{82}, 9\sqrt{2}$

---

17. Find the coordinates of the points which divides the line segment joining A(−2, 2) and B(2, 8) into four equal parts.

Ans. A = (−2, 2) and B = (2, 8)

Let P, Q and R are the points which divide line segment AB into 4 equal parts.

Let coordinates of point P =(x_1, y_1), Q =(x_2, y_2) and R =(x_3, y_3)

We know AP = PQ = QR = RS.

It means, point P divides line segment AB in 1:3.

Using Section formula to find coordinates of point P, we get

$$x_1 = \frac{(-2)\times 3 + 2\times 1}{1+3} = \frac{-6+2}{4} = \frac{-4}{4} = -1$$

$$y_1 = \frac{2\times 3 + 8\times 1}{1+3} = \frac{6+8}{4} = \frac{14}{4} = \frac{7}{2}$$

Since, AP = PQ = QR = RS.

It means, point Q is the mid-point of AB.

Using Section formula to find coordinates of point Q, we get

$$x_2 = \frac{(-2)\times 1 + 2\times 1}{1+1} = \frac{-2+2}{2} = \frac{0}{2} = 0$$

$$y_2 = \frac{2\times 1 + 8\times 1}{1+1} = \frac{2+8}{2} = \frac{10}{2} = 5$$

Because, AP = PQ = QR = RS.

It means, point R divides line segment AB in 3:1

Using Section formula to find coordinates of point P, we get

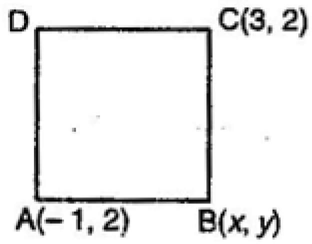
$$x_3 = \frac{(-2)\times 1 + 2\times 3}{1+3} = \frac{-2+6}{4} = \frac{4}{4} = 1$$

$$y_3 = \frac{2\times 1 + 8\times 3}{1+3} = \frac{2+24}{4} = \frac{26}{4} = \frac{13}{2}$$

Therefore, P=(−1, $\frac{7}{2}$), Q= (0, 5)and R =(1, $\frac{13}{2}$)

---

18. The two opposite vertices of a square are $(-1,2)$ and $(3,2)$. Find the coordinates of the other two vertices.



Ans. Let ABCD be a square and B(x,y) be the unknown vertex.

AB = BC

$\Rightarrow$ $AB^2 = BC^2$

$\Rightarrow (x+1)^2+(y-2)^2=(x-3)^2+(y-2)^2$

$\Rightarrow 2x+1=-6x+9$

$\Rightarrow 8x=8$

$\Rightarrow x=1$ ……….(i)

In ΔABC, $AB^2 + BC^2 = AC^2$

$\Rightarrow (x+1)^2+(y-2)^2+(x-3)^2+(y-2)^2=(3+1)^2+(2-2)^2$

$\Rightarrow 2x^2+2y^2+2x-4y-6x-4y+1+4+9+4=16$

$\Rightarrow 2x^2+2y^2-4x-8y+2=0$

$\Rightarrow x^2+y^2-2x-4y+1=0$ ……….(ii)

Putting the value of x in eq. (ii),

$1+y^2-2-4y+1=0$

$\Rightarrow y^2-4y=0$

$\Rightarrow y(y-4)=0$

$\Rightarrow y = 0$ or 4