

NTSE

NCERT Solutions for Class 10
MATHS – Coordinate Geometry



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1. Find the distance between the following pairs of points :
(i) (2, 3), (4, 1) (ii) (-5, 7), (-1, 3) (iii) (a, b), (-a, -b)

Sol. (i) Let the given points be $P(2, 3)$ and $Q(4, 1)$.

Then $x_1 = 2, y_1 = 3, x_2 = 4$ and $y_2 = 1$

$$\begin{aligned}\therefore \text{Distance } PQ &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(4 - 2)^2 + (1 - 3)^2} \\ &= \sqrt{(2)^2 + (-2)^2} \\ &= \sqrt{4 + 4} \\ &= \sqrt{8} = 2\sqrt{2} \text{ Units.}\end{aligned}$$

- (ii) Let the given points be $P(-5, 7)$ and $Q(-1, 3)$.

Then $x_1 = -5, y_1 = 7, x_2 = -1$ and $y_2 = 3$

$$\begin{aligned}\therefore \text{Distance } PQ &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(-1 + 5)^2 + (3 - 7)^2} \\ &= \sqrt{(4)^2 + (-4)^2} \\ &= \sqrt{16 + 16} \\ &= \sqrt{32} = 4\sqrt{2} \text{ Units.}\end{aligned}$$

- (iii) Let the given points be $P(a, b)$ and $Q(-a, -b)$.

Then $x_1 = a, y_1 = b, x_2 = -a$ and $y_2 = -b$

$$\begin{aligned}\therefore \text{Distance } PQ &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(-a - a)^2 + (-b - b)^2} \\ &= \sqrt{(-2a)^2 + (-2b)^2} \\ &= \sqrt{4a^2 + 4b^2} \\ &= 2\sqrt{a^2 + b^2} \text{ Units.}\end{aligned}$$

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2. Find the distance between the points (0, 0) and (36, 15).

Sol. Let points be $A(0,0)$ and $B(36,15)$

The distance between two points is

$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(36-0)^2 + (15-0)^2}$$

$$= \sqrt{1296 + 225} = \sqrt{1521} = 39 \text{ units}$$

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

Sol. Let points be $A(5,-2)$, $B(6,4)$ and $C(7,-2)$

$$AB = \sqrt{(6-5)^2 + (4+2)^2} = \sqrt{1+36} = \sqrt{37}$$

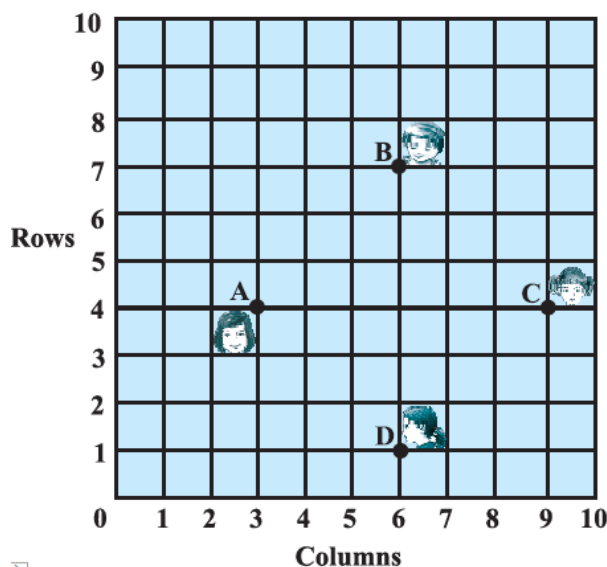
$$BC = \sqrt{(7-6)^2 + (-2-4)^2} = \sqrt{1+36} = \sqrt{37}$$

$$AC = \sqrt{(7-5)^2 + (-2+2)^2} = \sqrt{4+0} = 2$$

Here, $AB = BC$

$\triangle ABC$ is an isosceles triangle.

4. In a classroom, 4 friends are seated at the points A, B, C and D as shown in Figure. Champa and Chameli walk into the class and after observing for a few minutes Champa asks Chameli, "Don't you think ABCD is a square?" Chameli disagrees. Using distance formula, find which of them is correct.



Sol. From the figure, let the points along with coordinates be $A(3,4)$, $B(6,7)$, $C(9,4)$ and $D(6,1)$.
Then by distance formula, we have

**Success
STORY**

I still wonder how one man has such a deep understanding of an examination. It becomes the truth what ever Vipin Sir says about NTSE.

M. Pareek

An
NTSE Scholar
IIT-JEE (Adv.) AIR-3

Mukesh Pareek



$$AB = \sqrt{(6-3)^2 + (7-4)^2} = \sqrt{18} = 3\sqrt{2}.$$

$$BC = \sqrt{(9-6)^2 + (4-7)^2} = \sqrt{18} = 3\sqrt{2}.$$

$$CD = \sqrt{(6-9)^2 + (1-4)^2} = \sqrt{18} = 3\sqrt{2}.$$

$$DA = \sqrt{(3-6)^2 + (4-1)^2} = \sqrt{18} = 3\sqrt{2}.$$

Also, diagonal $AC = \sqrt{(9-3)^2 + (4-4)^2}$

$$= \sqrt{(6)^2 + (0)^2} = \sqrt{36} = 6.$$

and diagonal $BD = \sqrt{(6-6)^2 + (1-7)^2} = \sqrt{(0)^2 + (-6)^2} = \sqrt{36} = 6.$

$\therefore AB = BC = CD = DA = 3\sqrt{2}$ and diagonals $AC = BD = 6$

Thus, ABCD is a square and Champa is correct.

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

Sol. Let $A(2, -5)$ and $B(-2, 9)$ be the given points.

Also let $P(x, 0)$ be the point on x-axis such that

$$PA = PB$$

Then $PA^2 = PB^2$

$$\Rightarrow (x-2)^2 + (0+5)^2 = (x+2)^2 + (0-9)^2$$

$$\Rightarrow (x-2)^2 - (x+2)^2 = 81 - 25$$

$$\Rightarrow (x-2+x+2)(x-2-x-2) = 56$$

$$\Rightarrow (2x)(-4) = 56$$

$$\Rightarrow -8x = 56$$

$$\Rightarrow x = -7$$

Hence, the required point is $(-7, 0)$.

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

Sol. Points $P(2, -3), Q(10, y)$ and $PQ = 10$ units

The distance between two points is

$$\begin{aligned} \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} &= PQ \Rightarrow \sqrt{(10 - 2)^2 + (y + 3)^2} = 10 \\ \Rightarrow 64 + y^2 + 9 + 6y &= 100 \Rightarrow y^2 + 6y + 73 - 100 = 0 \\ \Rightarrow y^2 + 6y - 27 &= 0 \Rightarrow y^2 + 9y - 3y - 27 = 0 \\ \Rightarrow y(y + 9) - 3(y + 9) &= 0 \Rightarrow (y - 3)(y + 9) = 0 \\ \Rightarrow y - 3 = 0 \text{ or } y + 9 &= 0 \\ \Rightarrow y = 3 \text{ or } -9 \end{aligned}$$

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

Sol. Let the coordinates of point C be (x, y) .



$$x\text{-coordinate of } C = \frac{mx_2 + nx_1}{m+n} = \frac{2 \times 4 + 3 \times (-1)}{2+3} = \frac{8-3}{5} = 1.$$

$$y\text{-coordinate of } C = \frac{my_2 + ny_1}{m+n} = \frac{2 \times (-3) + 3 \times (7)}{2+3} = \frac{-6+21}{5} = 3.$$

Hence, the coordinates of C are $(1, 3)$.

8. Find the area of the triangle whose vertices are :

(i) $(2, 3), (-1, 0), (2, -4)$

(ii) $(-5, -1), (3, -5), (5, 2)$

Sol. (i) Here, $x_1 = 2, y_1 = 3, x_2 = -1, y_2 = 0, x_3 = 2$ and $y_3 = -4$

\therefore Area of triangle

$$\begin{aligned} &= \frac{1}{2} [x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)] \\ &= \frac{1}{2} [2(0 + 4) + (-1)(-4 - 3) + 2(3 - 0)] \\ &= \frac{1}{2} [8 + 7 + 6] = \frac{21}{2} = 10.5 \text{ sq units.} \end{aligned}$$

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(ii) Area of triangle
Here, $x_1 = -5, y_1 = -1, x_2 = 3, y_2 = -5, x_3 = 5, y_3 = 2$

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

$$= \frac{1}{2} [\{-5(-5 - 2)\} + \{3(2 + 1)\} + \{5(-1 + 5)\}]$$

$$= \frac{1}{2} [35 + 9 + 20] = \frac{1}{2} \times 64 = 32 \text{ sq units.}$$

9. In each of the following find the value of 'k', for which the points are collinear.

- (i) $(7, -2), (5, 1), (3, k)$
(ii) $(8, 1), (k, -4), (2, -5)$

Sol. (i) Points $A(7, -2), B(5, 1), C(3, k)$

For collinear points,
Area of $\triangle ABC = 0$

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

$$\Rightarrow \frac{1}{2} [7(1 - k) + 5(k + 2) + 3(-2 - 1)] = 0$$

$$\Rightarrow 7 - 7k + 5k + 10 - 9 = 0$$

$$\Rightarrow k = \frac{8}{2}$$

$$\Rightarrow k = 4$$

(ii) $A(8, 1), B(k, -4), C(2, -5)$

For collinear points, Area of $\triangle ABC = 0$

$$\Rightarrow \frac{1}{2} [8(-4 + 5) + k(-5 - 1) + 2(1 + 4)] = 0$$

$$\Rightarrow 8 - 6k + 10 = 0$$

$$\Rightarrow 6k = 18$$

$$\Rightarrow k = 3$$

**Did you
know?**



- 10.** You have studied in Class IX, (Chapter 9, Example 3), that a median of a triangle divides it into two triangles of equal areas. Verify this result for $\triangle ABC$ whose vertices are $A(4, -6)$, $B(3, -2)$ and $C(5, 2)$.

Sol. Let AD be the median of $\triangle ABC$.

Then

Coordinates of mid-point $D = \left(\frac{3+5}{2}, \frac{-2+2}{2} \right) = (4, 0)$

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

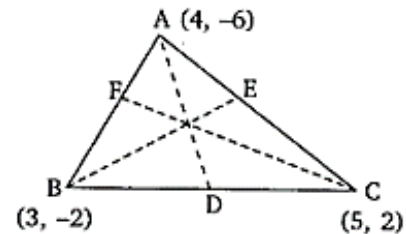
Area of $\triangle ABD = \frac{1}{2} [4(-2 - 0) + 3(0 + 6) + 4(-6 + 2)]$
 $= \frac{1}{2} [-8 + 18 - 16]$
 $= \frac{1}{2} [-6]$
 $= -3 \text{ sq units.} \quad \dots(i)$

Area of $\triangle ADC$
 $= \frac{1}{2} [4(0 - 2) + 4(2 + 6) + 5(-6 - 0)]$
 $= \frac{1}{2} [-8 + 32 - 30]$
 $= \frac{1}{2} [-6]$
 $= -3 \text{ sq units.} \quad \dots(ii)$

From equations (i) and (ii), we have:

Area of $\triangle ABD = \text{Area of } \triangle ADC$

Similarly, we can show for the other medians. Hence, verified.



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