

Class 9th Math Exercise No.7.3

Q.1 If the houses of two friends are represented by coordinates (2,6) and (9,12) on a grid. Find the straight line distance between their houses if the grid units represent kilometres?

Solution

Let house A(2,6)

House B(9, 12)

We know that

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \text{ putting values}$$

$$\therefore \overline{AB} = \sqrt{(9-2)^2 + (12-6)^2}$$

$$\therefore \overline{AB} = \sqrt{(7)^2 + (6)^2}$$

$$\therefore \overline{AB} = \sqrt{49+36}$$

$$\therefore \overline{AB} = \sqrt{85} \approx 9.22 \quad (\because 1 \text{ unit} = km)$$

Thus distance between the houses is 9.22 Km .

Q. 2 Consider a straight trail (represented by coordinate plane) that starts at point (5,7) and ends at point (15,3). What is the coordinate of the midpoint?

Solution:

Let end points be A(5,7), B(15,3)

Let midpoint $M(x_m, y_m) =$

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$\therefore M\left(\frac{5+15}{2}, \frac{7+3}{2}\right)$$

$$\therefore M\left(\frac{20}{2}, \frac{10}{2}\right)$$

$$\therefore M(10,5)$$

Q. 3 An architect is designing a park with two buildings located at (10,8) and (4,3) on the grid. Calculate the straightline distance between the buildings. Assume the coordinates are in meters.

Solution:

Let A and B represents the locations of two buildings. A(10,8), B(4,3).

By using distance formula.

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

putting values

$$\begin{aligned}
 \sqrt{(4-10)^2 + (3-8)^2} \\
 \sqrt{(-6)^2 + (-5)^2} \\
 \sqrt{36+25} \\
 \sqrt{61} \quad \because 1 \text{ unit} = 1 \text{ meter}
 \end{aligned}$$

Thus distance between two building is 7.81 meters.

Q. 4 A delivery driver needs in calculate the distance between two delivery locations. One location is at (7,2) and the other at (12,10) on the city grid map, where each unit represents kilometers. What is the distance between the two locations?

Solution:

Let A and B represent two locations.

$$A(7,2), B(12,10)$$

By using distance formula.

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

putting values

Since, 1 grid unit = 1 km.

So distance between two location is 9.43 km

Q. 5 The start and end points of a race track are given by coordinates (3,9) and (9,13). What is the midpoint of the track?

Solution:

Let start point be A(3,9) end point be B(9,13)

Let midpoint of track be $M(x_m, y_m)$.

$$M(x_m, y_m) = M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Putting values

$$M\left(\frac{3+9}{2}, \frac{9+13}{2}\right)$$

$$M\left(\frac{12}{2}, \frac{22}{2}\right)$$

$$M(6,11)$$

Thus coordinates of midpoint of track are M(6,11)

Q. 6 The coordinates of two point on a road are A(3,4) and B(7,10). Find the midpoint

of the road.

Solution:

Two points on the road $A(3,4), B(7,10)$ By using midpoint formula.

$$M(x_m, y_m) = M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

putting values

$$M\left(\frac{3+7}{2}, \frac{4+10}{2}\right)$$

$$M\left(\frac{10}{2}, \frac{14}{2}\right)$$

$$M(5,7)$$

Thus midpoint of two points on the road is $m(5,7)$. Q. 7 A ship is navigating from port A located at $(12^\circ N, 65^\circ W)$ to port B at $(20^\circ N, 45^\circ W)$. If the ship travels along the shortest path on the surface of the Earth, calculate the straight line distance between the points.

Solution

Location of port A $(12^\circ N, 65^\circ W) = (x_1, y_1)$ Location of port B $(20^\circ N, 45^\circ W) = (x_2, y_2)$

By using distance formula

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

$$\overline{AB} = \sqrt{(20 - 12)^2 + (45 - 65)^2}$$

$$\overline{AB} = \sqrt{(8)^2 + (-20)^2} = \sqrt{64 + 400}$$

$$\sqrt{464} = 21.54 \text{ units.}$$

Q. 8 Farah is fencing around a rectangular field with corners at $(0,0), (0,5), (8,5)$ and $(8,0)$. How much fencing material will she need to cover the entire perimeter of the field?

Solution:

Let coordinates of corners of rectangular field be $A(0,0), B(0,5), C(8,5), D(8,0)$. first we find the length and width of rectangular field

Using the distance formula

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

Finding length AB

$$\overline{AB} = \sqrt{(0-0)^2 + (5-0)^2} = \sqrt{0+25}$$

$$\sqrt{0+25} = \sqrt{25} = 5 \text{ units}$$

Finding width $\overline{BC}$

$$\begin{aligned}\overline{BC} &= \sqrt{(8-0)^2 + (5-5)^2} = \sqrt{(8)^2 + (0)} \\ &= \sqrt{64+0} = \sqrt{64} = 8 \text{ units}\end{aligned}$$

Finding perimeter

$$\text{Perimeter } P = 2(l+w) = 2[5+8] = 2(13) = 26 \text{ units}$$

Thus 26 units facing material is required to cover the perimeter of the field.

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Q. 9 An airplane is flying from city X at $(40^\circ N, 100^\circ W)$ to city Y at $(50^\circ N, 80^\circ W)$. Use coordinate geometry, to calculate the shortest distance between these cities.

Solution

By using distance formula,

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

putting the values

$$\begin{aligned}\overline{XY} &= \sqrt{(50-40)^2 + (80-100)^2} \\ &= \sqrt{(10)^2 + (-20)^2} \\ &= \sqrt{100+400} \\ &= \sqrt{500} \\ &= \sqrt{100 \times 5} \\ &= 10\sqrt{5} \approx 22.4 \text{ units}\end{aligned}$$

Q. 10 A land surveyor is marking out a rectangular

plot of land with corner at $(3,1)$, $(3,6)$, $(8,6)$, and $(8,1)$. Calculate the perimeter.

Solution

Let coordinates of corner are $A(3,1)$, $B(3,6)$, $C(8,6)$, $D(8,1)$

First we find length and width of rectangular plot by using the distance formula.

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

Finding length $\overline{AB}$

$$\begin{aligned}\overline{AB} &= \sqrt{(3-3)^2 + (6-1)^2} \\ &= \sqrt{(0)^2 + (5)^2} \\ &= \sqrt{0+25} = \sqrt{25} = 5 \text{ units}\end{aligned}$$

Finding width $\overline{BC}$

$$\begin{aligned} & \sqrt{(8-3)^2 + (6-6)^2} \\ \text{Length of } \overline{BC} &= \sqrt{(5)^2 + (0)^2} = \sqrt{25+0} = \sqrt{25} = 5 \end{aligned}$$

units

We observe that rectangular plot is a square Finding perimeter

$$\text{Perimeter} = 4 \times \overline{AB} = 4(5 \text{ units})$$

Q. 11 A landscaper needs to install a fence around a rectangular garden. The garden has its corners at the coordinates: $A(0,0)$, $B(5,0)$, $C(5,3)$, and $D(0,3)$. How much fencing is required?

Solution:

First we find the length and width of rectangle using distance formula.

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

Length of side $\overline{AB}$: $A(0,0)$, $B(5,0)$

$$L = \overline{AB} = \sqrt{(5-0)^2 + (0-0)^2}$$

$$\begin{aligned} & \sqrt{(5)^2 + (0)^2} \\ & \sqrt{25+0} = \sqrt{25} \\ & 5 \text{ units} \end{aligned}$$

Length of side $\overline{BC}$: $B(5,0)$, $C(5,3)$

$$W = \overline{BC} = \sqrt{(5-5)^2 + (3-0)^2}$$

$$\begin{aligned} & \sqrt{(0)^2 + (3)^2} = \sqrt{9} = 3 \\ & 3 \end{aligned}$$

We know that fencing required is equal to the perimeter of rectangular garden. So

$$\text{Perimeter} = 2(L + W)$$

$$P = 2[5+3] \quad P = 2(8) \quad P = 16 \text{ units}$$