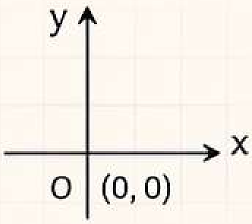
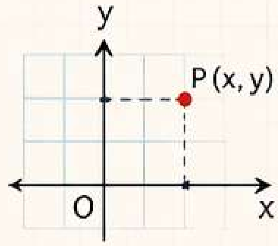
CLASS 9 MATHS
(GANITA MANJARI)

CHAPTER 1

Orienting Yourself : The Use of Coordinates

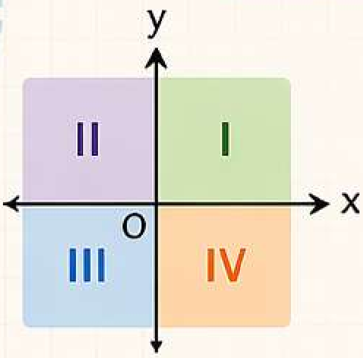




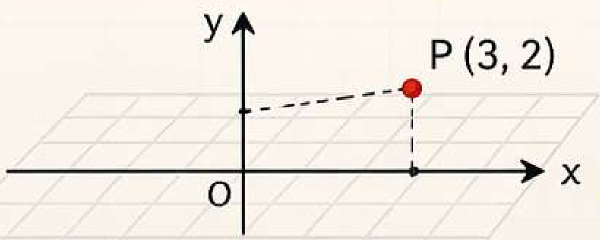
$x^2 + y^2 = r^2$

CHAPTER SUMMARY

NCERT SOLUTIONS



- Cartesian Plane
- Coordinates
- Quadrants
- Distance Formula
- Applications



CHAPTER 1

Orienting Yourself: The Use of Coordinates

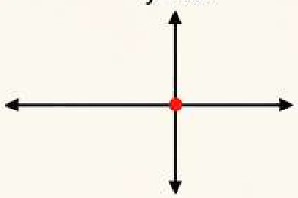
CHAPTER SUMMARY (CLASS 9)

1 COORDINATE SYSTEM BASICS

To locate a point in a plane, we use two perpendicular lines.

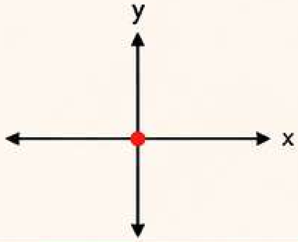
- Horizontal line → **x-axis**
- Vertical line → **y-axis**

Together, they form the **Cartesian plane (xy-plane)**.



2 ORIGIN

The point where both axes meet is called the **origin**.

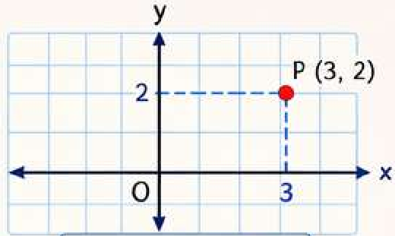


Coordinates of origin
(0, 0)

3 COORDINATES OF A POINT

Any point is written as **(x, y)**

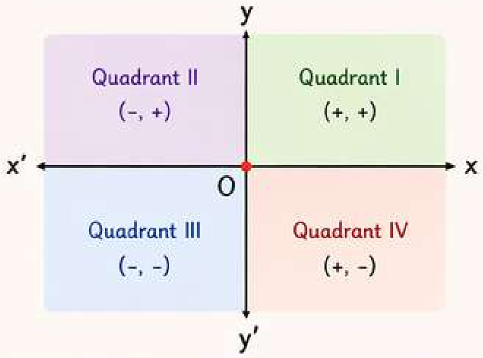
- **x-coordinate** → distance from y-axis
- **y-coordinate** → distance from x-axis



Example: (3, 2)

4 QUADRANTS

The coordinate plane is divided into 4 quadrants.

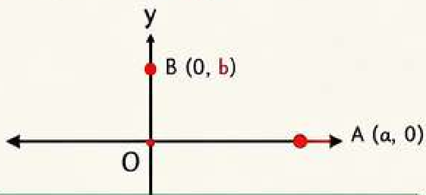


Quadrant	Sign of (x, y)
I	(+, +)
II	(–, +)
III	(–, –)
IV	(+, –)

First sign is for x, second sign is for y.

5 POINTS ON AXES

- On x-axis → **(x, 0)**
- On y-axis → **(0, y)**



Every point on x-axis has y = 0
Every point on y-axis has x = 0

6 IMPORTANT PROPERTY

- If x = y, then (x, y) = (y, x)
- If x ≠ y, then (x, y) ≠ (y, x)

Example:
(2, 2) = (2, 2) ✓
(3, 1) ≠ (1, 3) ✗

7 DISTANCE BETWEEN POINTS

a Same horizontal line ($y_1 = y_2$)

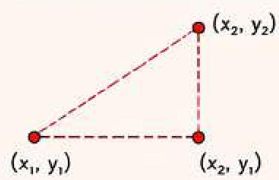
Distance = $|x_2 - x_1|$

b Same vertical line ($x_1 = x_2$)

Distance = $|y_2 - y_1|$

c Any two points (x_1, y_1) and (x_2, y_2)

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



(Based on Pythagoras theorem)

8 KEY IDEAS TO REMEMBER

- Coordinates help locate points accurately.
- Negative numbers are important to cover all quadrants.
- Geometry and algebra are connected through coordinates.
- Used in maps, navigation, design, graphics and more!

QUICK REVISION

Origin	Axes	Quadrants	Coordinates	Distance
(0, 0)	x-axis & y-axis	4 parts	(x, y)	Use formula

KEY TAKEAWAYS

- Coordinates help us find exact positions.
- They bring together geometry (shapes) and algebra (numbers).
- Used in real-life situations to solve practical problems.
- Practice with coordinates makes our thinking clear and logical!

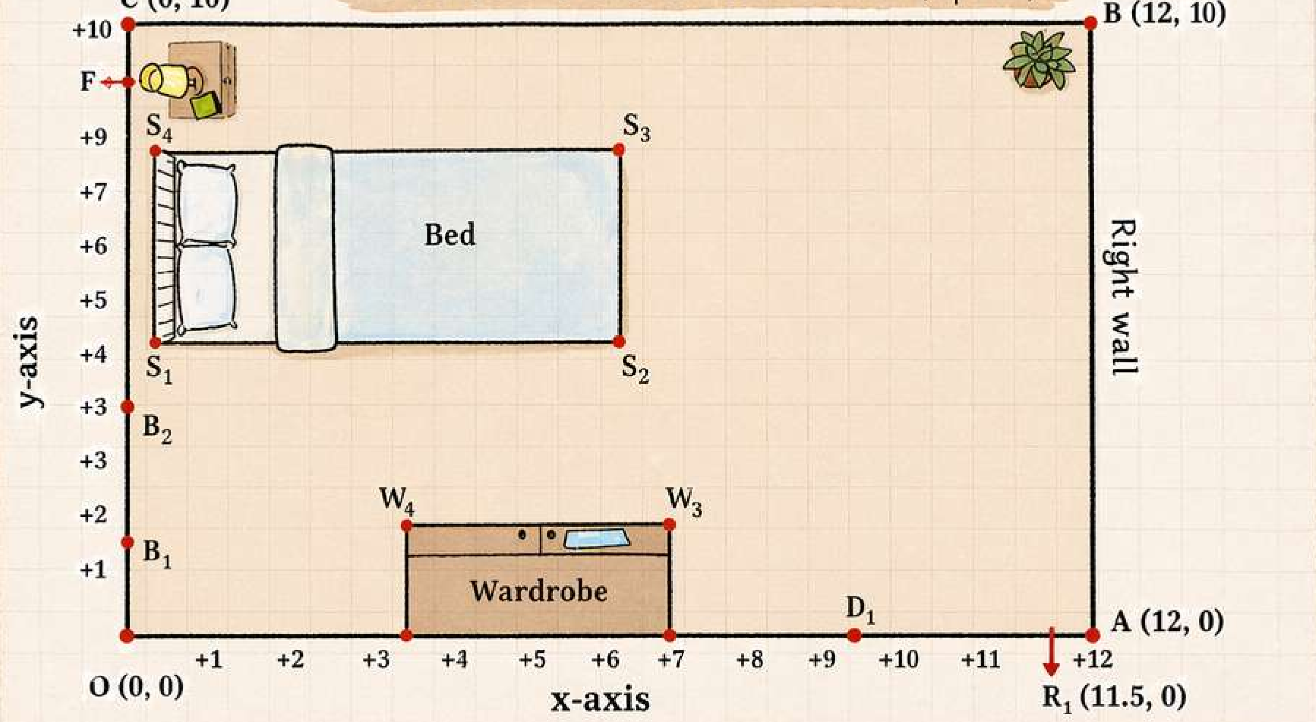
CHAPTER 1

Orienting Yourself: The Use of Coordinates

EXERCISE SET 1.1 – QUESTIONS & SOLUTIONS

Remember!
1 unit = 1 foot
(Scale used in Fig. 1.3)

FIGURE 1.3: SKETCH OF REIAAN'S ROOM (Top View)



i

If D_1R_1 represents the door, how far is the door from:

- the left wall (y-axis)
- the x-axis ?

SOLUTION

Distance from x-axis = 0 units (since the door lies on x-axis)

Distance from y-axis = x-coordinate of the door

Since R_1 = (11.5, 0), the door is: 11.5 units from y-axis

ANSWER:

- From y-axis: 11.5 units
- From x-axis: 0 units

ii

What are the coordinates of D_1 ?

SOLUTION

From the scale and markings in Fig. 1.3:

D_1 = (10, 0)

ANSWER:

D_1 = (10, 0)

iii

If R_1 = (11.5, 0), how wide is the door? Is it comfortable?

SOLUTION

Width = distance between D_1 and R_1

= 11.5 − 10 = 1.5 units

Since 1 unit = 1 foot, width = 1.5 ft

Interpretation:

- Standard door width ≈ 2.5 – 3 ft
- So this door is too narrow

ANSWER:

- Width = 1.5 ft
- ✗ Not comfortable
- ✗ Not suitable for wheelchair access

iv

Bathroom door: B_1 (0, 1.5), B_2 (0, 4)

Is it narrower or wider than the room door?

SOLUTION

Bathroom door width:

= 4 − 1.5 = 2.5 ft

Room door width = 1.5 ft

Comparison:

- Bathroom door = 2.5 ft
- Room door = 1.5 ft

ANSWER:

Bathroom door is wider than the room door.

KEY TAKEAWAYS

- Coordinates help us locate and measure real-life objects.
- We use the x-axis (horizontal) and y-axis (vertical).
- Distances from axes help us understand positions clearly.
- Math connects ideas with the real world!

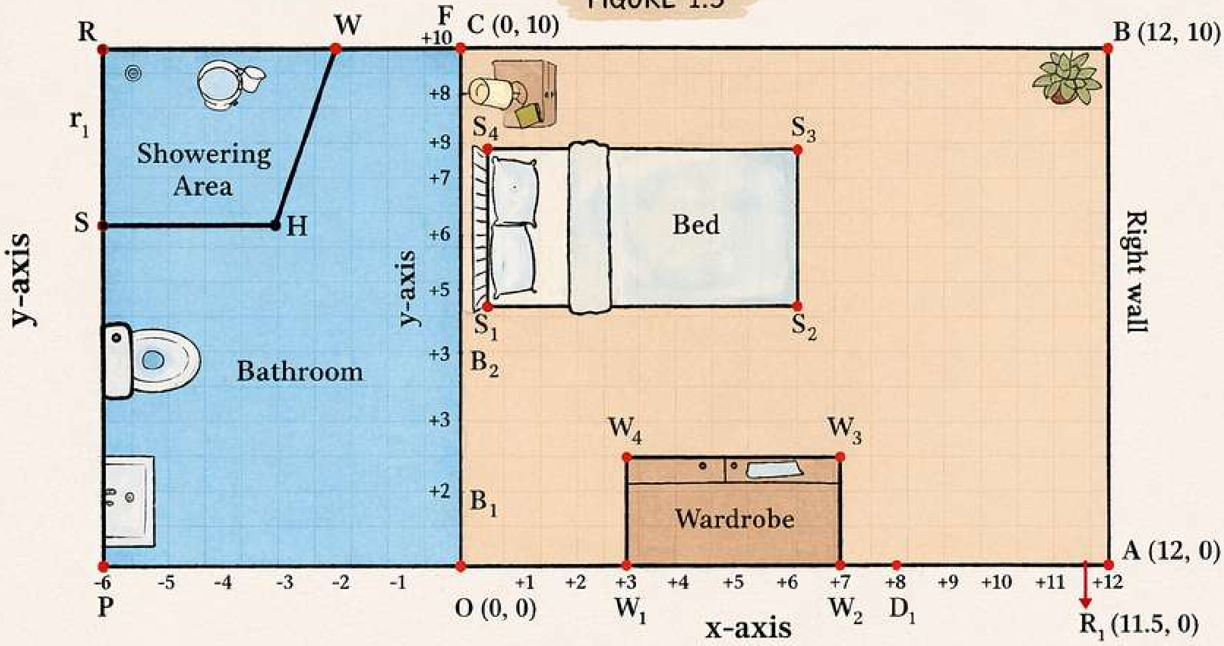
CHAPTER 1

Orienting Yourself: The Use of Coordinates

EXERCISE SET 1.2 – QUESTIONS & SOLUTIONS

Remember!
1 unit = 1 foot
(Scale used in Fig. 1.5)

FIGURE 1.5



1 Table feet at (8, 9), (11, 9), (11, 7)

(i) What are the coordinates of the fourth foot?

(ii) Is it a good spot?

(iii) What are its width, length and height?

SOLUTION

(i) x = 8 and 11
y = 9 and 7
Missing point = (8, 7)

ANSWER: (8, 7) ✓

(ii) Yes, it is a suitable spot.

ANSWER: Yes ✓

(iii) Width = 11 − 8 = 3 ft
Length = 9 − 7 = 2 ft
Height = cannot be determined from 2D

ANSWER:
Width = 3 ft
Length = 2 ft
Height = cannot be determined ✓

2 Bathroom door hinge at B_1, opens into bedroom.

Will the door hit the wardrobe in front of it?

What change would you suggest?

SOLUTION

Yes, the door may hit the wardrobe.

- Reduce the door width
- Or, change the direction in which the door opens

ANSWER: Suggested changes will avoid collision. ✓

3

(i) What are the coordinates of the corners of the bathroom: O, F, R, P ?

(ii) What is the shape of the area SHWR for showering?

(iii) A washbasin of size 3 ft × 2 ft and a toilet of size 2 ft × 3 ft are to be placed. What are the possible coordinates for their corners?

SOLUTION

(i) From Fig. 1.5:
O (0, 0)
F (0, 10)
R (−6, 10)
P (−6, 0)

ANSWER: O(0, 0), F(0, 10) R(−6, 10), P(−6, 0) ✓

(ii) Rectangular region ✓

ANSWER: Rectangle ✓

(iii) Example placement:
Washbasin (3 ft × 2 ft):
(−5, 1), (−2, 1), (−2, 3), (−5, 3)
Toilet (2 ft × 3 ft):
(−5, 4), (−3, 4), (−3, 7), (−5, 7)
(Any other valid placement within the bathroom is also acceptable.)

ANSWER: Any such set of coordinates is correct. ✓

4

(i) Plot the dining room of size 18 ft × 15 ft

SOLUTION

The corners are:
(0, 0), (18, 0), (18, 15), (0, 15)

ANSWER: (0, 0), (18, 0), (18, 15), (0, 15) ✓

(ii) Place a dining table of size 5 ft × 3 ft in the centre of the room. What are the coordinates of its corners?

SOLUTION

Centre of room = (9, 7.5)
Half length = 2.5, Half width = 1.5
Corners of the table:
(6.5, 6), (11.5, 6), (11.5, 9), (6.5, 9)

ANSWER: (6.5, 6), (11.5, 6), (11.5, 9), (6.5, 9) ✓

KEY TAKEAWAYS

- Coordinates help us locate objects accurately.
- We use the x-axis (horizontal) and y-axis (vertical).
- Real-life spaces need careful measurements and planning.
- Math connects ideas with the real world!

CHAPTER 1

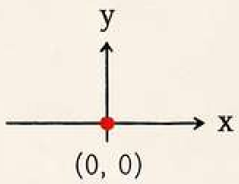
Orienting Yourself: The Use of Coordinates

END OF CHAPTER EXERCISES – Q.1 TO Q.8 (ANSWERS)

1
What are the coordinates of the point of intersection of the two axes?

SOLUTION

The x-axis and y-axis intersect at the origin.



ANSWER: (0, 0) ✓

2
Point W has x-coordinate −5. Predict coordinates of H on a line through W parallel to y-axis. Which quadrants can H lie in?

SOLUTION

- A line parallel to y-axis has the same x-coordinate.
- So, H = (−5, y)
- If $y > 0 \rightarrow$ Quadrant II
- If $y < 0 \rightarrow$ Quadrant III

ANSWER: Coordinates: (−5, y) Quadrants: II or III ✓

3
Points: R(3, 0), A(0, −2), M(−5, −2), P(−5, 2)

i Which two sides are perpendicular to each other?

SOLUTION: RA (vertical) is perpendicular to AM (horizontal).

ANSWER: RA ⊥ AM ✓

ii Which side is parallel to one of the axes?

SOLUTION: AM is parallel to the x-axis

ANSWER: AM ✓

iii Which are the mirror image points?

SOLUTION: M(−5, −2) and P(−5, 2) are mirror images in the x-axis.

ANSWER: M and P ✓

4
Plot the point Z(5, −6) and form a triangle with the axes. What are the lengths of its sides?

SOLUTION

- Point Z(5, −6) is in Quadrant IV.
- Join Z to the x-axis (5, 0) and to the y-axis (0, −6), and axes to form a right triangle.
- Horizontal side (along x-axis) = 5 units
- Vertical side (along y-axis) = 6 units
- Hypotenuse = $\sqrt{5^2 + 6^2} = \sqrt{61}$ units

ANSWER: Sides are 5 units, 6 units and $\sqrt{61}$ units. ✓

5
What if there were no negative numbers? Would we be able to locate all points in the plane?

SOLUTION

- Without negative numbers, we can only move in the positive direction of the axes.
- We will be able to locate points only in the first quadrant.
- Hence, we cannot locate all points in the plane.

ANSWER: No, we cannot locate all points in the plane. ✓

6
Check if M(−3, −4), A(0, 0) and G(6, 8) are collinear.

SOLUTION

Slope of MA $= \dfrac{0 - (-4)}{0 - (-3)} = \dfrac{4}{3}$

Slope of AG $= \dfrac{8 - 0}{6 - 0} = \dfrac{8}{6} = \dfrac{4}{3}$

Since slopes are equal, the three points lie on the same straight line.

ANSWER: Yes, M, A and G are collinear. ✓

7
Check if the points R(−5, −1), B(−2, −5) and C(4, −12) are collinear.

SOLUTION

Slope of RB $= \dfrac{-5 - (-1)}{-2 - (-5)} = \dfrac{-4}{3}$

Slope of BC $= \dfrac{-12 - (-5)}{4 - (-2)} = \dfrac{-7}{6}$

Since slopes are not equal, the points are not collinear.

ANSWER: No, R, B and C are not collinear. ✓

8
i Plot the points to form a right-angled isosceles triangle.

SOLUTION Example: (0, 0), (2, 0), (0, 2)
Forms a right-angled isocceles triangle with equal legs of 2 units.

ANSWER: Any correct example is acceptable. ✓

ii Plot the points to form an isooceles triangle in Quadrant III and IV.

SOLUTION Example: (−2, −2), (2, −2), (0, −5)
Two sides are equal: length = $\sqrt{20}$ units.

ANSWER: Any correct example is acceptable. ✓

KEY TAKEAWAYS

- Coordinates help us locate points precisely.
- Negative numbers are essential to cover the whole plane.
- Slopes help identify collinearity and relationships between points.
- Math connects ideas with the real world!

CHAPTER 1

Orienting Yourself: The Use of Coordinates

END OF CHAPTER EXERCISES – Q.9 TO Q.16 (ANSWERS)

9

Check whether M is the midpoint of line segment ST.

S	M	T	Midpoint?
(−3, 0)	(0, 0)	(3, 0)	Yes ✓
(2, 3)	(3, 4)	(4, 5)	Yes ✓
(0, 0)	(0, 5)	(0, −10)	No ✗
(−8, 7)	(0, −2)	(6, −3)	No ✗

SOLUTION

Use midpoint formula: $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Checked for each row as shown above.

ANSWER:
Row 1 – Yes ✓
Row 2 = Yes ✓
Row 3 = No ✗
Row 4 = No ✗

10

Find the coordinates of B if M (−7, 1) is the midpoint of A (3, −4) and B.

SOLUTION

Let B = (x, y)

Using midpoint formula:

$-7 = \frac{3 + x}{2} \Rightarrow -14 = 3 + x \Rightarrow x = -17$

$1 = \frac{-4 + y}{2} \Rightarrow 2 = -4 + y \Rightarrow y = 6$

ANSWER: B = (−17, 6)

11

Find the points that trisect the line segment joining A (4, 7) and B (16, −2).

SOLUTION

Points divide the segment in the ratios 1:2 and 2:1.

For 1:2:

$P = \left(\frac{2x_1 + 1x_2}{3}, \frac{2y_1 + 1y_2}{3}\right)$

$P = \left(\frac{2(4) + 16}{3}, \frac{2(7) + (-2)}{3}\right) = (8, 4)$

For 2:1:

$Q = \left(\frac{1x_1 + 2x_2}{3}, \frac{1y_1 + 2y_2}{3}\right)$

$Q = \left(\frac{4 + 2(16)}{3}, \frac{(7 + 2(-2)}{3}\right) = (12, 1)$

ANSWER:
Trisection points:
P = (8, 4)
Q = (12, 1)

12

(i) Show that the points A (1, −8), B (−4, 7) and C (−7, −4) lie on a circle. Find its radius.

SOLUTION

Distance from origin (0, 0):

$OA = \sqrt{1^2 + (-8)^2} = \sqrt{65}$

$OB = \sqrt{(-4)^2 + 7^2} = \sqrt{65}$

$OC = \sqrt{(-7)^2 + (-4)^2} = \sqrt{65}$

All points are at same distance $\sqrt{65}$ from origin. Hence, they lie on a circle with radius $\sqrt{65}$ units.

(ii) Check whether D (−5, 6) and E (0, 9) lie inside or outside the circle.

$OD = \sqrt{(-5)^2 + 6^2} = \sqrt{61} < \sqrt{65}$

⇒ Inside

$OE = \sqrt{0^2 + 9^2} = 9 > \sqrt{65}$

⇒ Outside

ANSWER:
i Radius = $\sqrt{65}$ units
ii D is inside the circle; E is outside the circle.

13

D (5, 1), E (6, 5) and F (0, 3) are respectively the midpoints of sides BC, CA and AB of a triangle ABC. Find the coordinates of A, B and C.

SOLUTION

Let A (x_1, y_1), B (x_2, y_2), C (x_3, y_3)

Midpoint formulas:

D (5, 1) = midpoint of BC

$\Rightarrow \left(\frac{x_2 + x_3}{2}, \frac{y_2 + y_3}{2}\right) = (5, 1)$ ... (1)

E (6, 5) = midpoint of CA

$\Rightarrow \left(\frac{x_1 + x_3}{2}, \frac{y_1 + y_3}{2}\right) = (6, 5)$ ... (2)

F (0, 3) = midpoint of AB

$\Rightarrow \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = (0, 3)$ ... (3)

Solving (1), (2) and (3):

A = (4, −1)
B = (6, 3)
C = (−2, 7)

ANSWER:
A (4, −1)
B (6, 3)
C (−2, 7)

14

(i) Conceptual point (4, 3): How many times will the line represented by y = −x + 5 intersect the X shown in Fig. 1.6?

ANSWER: 1 time

(ii) Conceptual point (3, 4): How many times will the line represented by y = x + 2 intersect the X shown in Fig. 1.6?

ANSWER: 1 time

15

(i) Screen size: 800 × 600

Circle A: centre (100, 150), radius 80

Circle B: centre (250, 230), radius 100

Check if any part of the circles lies outside the screen.

SOLUTION

Both circles are completely inside the screen (topmost y-values 230+100=330 < 600 and rightmost x-values 250+100=350 < 800).

ANSWER: No part of either circle lies outside the screen.

(ii) Do the circles intersect?

SOLUTION

Distance between centres:

$d = \sqrt{(250 - 100)^2 + (230 - 150)^2}$

$= \sqrt{(150^2 + 80^2} = \sqrt{28900} \approx 170$

Sum of radii = 80 + 100 = 180

Since $d < r_1 + r_2$, the circles intersect.

ANSWER: Yes, the circles intersect.

16

Check whether the points A (2, 1), B (−1, 2), C (−2, −1) and D (1, −2) are the vertices of a square. Also, find its area.

SOLUTION

Using distance formula, all sides are equal:

$AB = BC = CD = DA = \sqrt{10}$

Diagonals:

$AC = \sqrt{20}$, $BD = \sqrt{20}$

Diagonals are equal and adjacent sides are equal ⇒ square.

ANSWER:
Yes, they are vertices of a square.
Each side = $\sqrt{10}$ units
Area = $(\sqrt{10})^2 = 10$ square units

KEY TAKEAWAYS

- Midpoint formula helps find and verify midpoints.
- Section formula helps divide a line segment in parts.
- Distance formula helps in finding radius & collinearity.
- Coordinates help us solve real-life and geometrical problems!