# 3 Coordinate Geometry

▶ **Cartesian System:** The system used to describe the position of a point in a plane. In this system, two mutually perpendicular lines are required, one is horizontal XOX′ called *X*-axis and the other is vertical YOY′ called *Y*-axis.

▶ **Cartesian Plane:** The plane in cartesian system is called cartesian plane and the lines in it are called coordinate axes.

▶ **Origin:** It is the point of intersection of the axes and is denoted by O. Its coordinates are (0, 0).
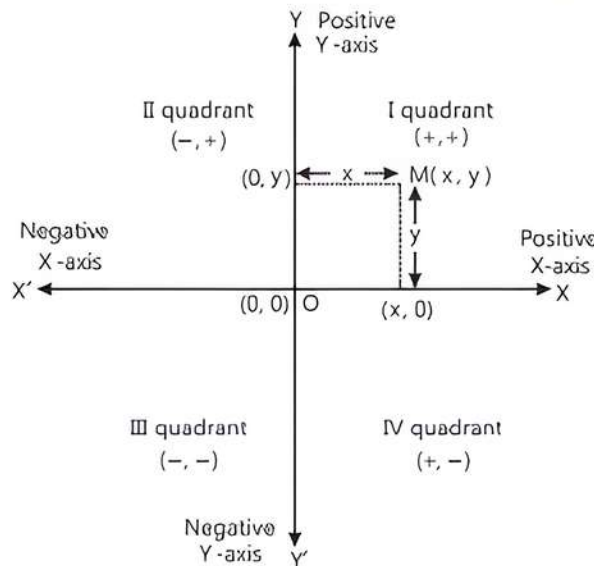
▶ **Positive and Negative Directions:**

1. The positive numbers lie in the directions OX and OY are said to be positive directions of *X*-axis and *Y*-axis respectively.
2. The negative numbers lie in the directions OX′ and OY′ are said to be negative directions of *X*-axis and *Y*-axis respectively.

Knowledge BOOSTER

1. *In stating the coordinates of a point in cartesian plane, the x-coordinate comes first and then the y-coordinate. We place the coordinates in brackets, i.e., (x, y).*
2. *The order of x and y is important in the coordinate (x, y). So, (x, y) is called an ordered pair.*
3. *Ordered pair (x, y) ≠ Ordered pair (y, x), if x ≠ y*
4. *Ordered pair (x, y) = Ordered pair (y, x), if x = y*
5. *The coordinates describe a point in the plane uniquely.*

▶ **Quadrants:** The coordinate-axes divide the plane into four parts called quadrants, numbered I, II, III and IV are in anti-clockwise from OX.

The sign of these quadrants are I (+, +), II (−, +), III (−, −) and IV (+, −).

▶ **Coordinates of a Point:** The coordinates of a point M in the cartesian plane is represented by M(*x*, *y*) where *x* is abscissa and *y* is ordinate.

1. Abscissa (*x*-coordinate) = Perpendicular distance of a point from *Y*-axis.
2. Ordinate (*y*-coordinate) = Perpendicular distance of a point from *X*-axis.
3. Coordinates of a point on *X*-axis are (*x*, 0).
4. Coordinates of a point on *Y*-axis are (0, *y*).

Knowledge BOOSTER

Mirror Image of a Point: It is just a reflection of that point about the mirror. The image of different points under different mirrors are:

| Point	Mirror image about *X*-axis	Mirror image about *Y*-axis	Mirror image about origin
(x, y)	(x, −y)	(−x, y)	(−x, −y)
(−x, y)	(−x, −y)	(x, y)	(x, −y)
(−x, −y)	(−x, y)	(x, −y)	(x, y)
(x, −y)	(x, y)	(−x, −y)	(−x, y)

Practice Exercise

Multiple Choice Questions

Q 1. The point which lies on Y-axis at a distance of 4 units in the negative direction of Y-axis is:
a. (0, 4)
b. (4, 0)
c. (0, −4)
d. (−4, 0)

Q 2. Which point lies on X-axis?
a. (3, 2)
b. (−3, 2)
c. (2, 0)
d. (−1, −2)

Q 3. Which point lies on Y-axis?
a. (1, 3)
b. (0, 3)
c. (5, 2)
d. (−2, −3)

Q 4. Which point lies to the right of Y-axis?
a. (0, 3)
b. (−2, −1)
c. (3, 5)
d. (−3, −2)

Q 5. The perpendicular distance of the point P(2, 5) from the Y-axis is:
a. 5
b. 2
c. 3
d. 4

Q 6. Which point lies on the left of Y-axis?
a. (2, 0)
b. (−2, −4)
c. (5, 2)
d. (3, 6)

Q 7. Which point lies above X-axis?
a. (−1, 2)
b. (2, 0)
c. (−1, −5)
d. (0, −3)

Q 8. If the coordinates of two points are P(−2, 3) and Q(−3, 5), then (abscissa of P) − (abscissa of Q) is:
a. −5
b. 1
c. −1
d. −2

Q 9. The ordinate of a point is negative in:
a. II and III quadrants
b. III quadrant only
c. III and IV quadrants
d. IV quadrant only

Q 10. Which point lies in IV quadrant?
a. (−3, −4)
b. (2, −4)
c. (−2, 3)
d. (0, 1)

Q 11. If $(x + 3, 5) = (6, y − 3)$, then coordinates (x, y) are:
a. (−3, 2)
b. (−3, 8)
c. (−3, −8)
d. (3, 8)

Q 12. If the points $P(0, −2), Q(0, 4)$ and $R(a − 5, 6)$ are lie on Y-axis, then the value of a is:
a. −5
b. 5
c. 6
d. 4

Q 13. The coordinates of any point on the Y-axis are of the form $(0, k)$, where $|k|$ is distance of the point from the :
a. X-axis
b. Y-axis
c. (0, 1)
d. (0, 5)

Q 14. The distance of the points (0, 3) and (0, − 5) from Y-axis is:
a. 8
b. 3
c. − 5
d. 0

Q 15. The distance between the points A(3, 5) and B(− 8, 5) is:
a. 11
b. 5
c. 10
d. 12

Q 16. The image of point (−3, 4) with respect to X-axis is:
a. (−3, −4)
b. (3, 4)
c. (−3, 0)
d. (3, −4)

Q 17. The image of a point P(− 8, 5) with respect to the Y-axis is:
a. (− 8, 5)
b. (8, 5)
c. (− 8, 0)
d. (0, 5)

Q 18. Which of the points P(−1,1), Q (3,−4), R(1,−1), S(−2,−3) and T(−4, 4) lie in the IV quadrants?
a. *P* and *T*
b. *Q* and *R*
c. only *S*
d. *P* and *R*

Q 19. In the following graph, the coordinates of A are:
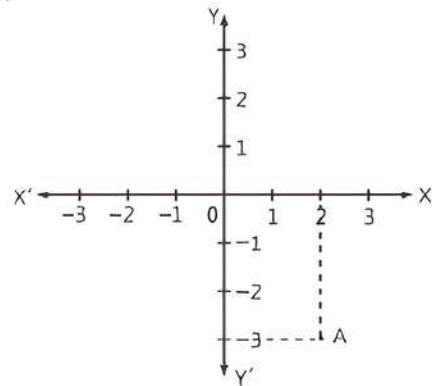
a. (2, 3)
b. (2, − 3)
c. (− 2, 3)
d. (− 2, − 3)

Assertion & Reason Type Questions

Directions (Q. Nos. 20-23): *In the following questions, a statement of Assertion (A) is followed by a statement of a Reason (R). Choose the correct option:*
a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
c. Assertion (A) is true but Reason (R) is false.
d. Assertion (A) is false but Reason (R) is true.

Q 20. Assertion (A): The point (−3, 0) lies on Y-axis and (0, 4) lies on X-axis.
Reason (R): Every point on the X-axis has zero distance from X-axis and every point on the Y-axis has zero distance from Y-axis.

Q 21. Assertion (A): The ordinate of a point (3, 7) is 7.

Reason (R): The perpendicular distance of a point from X-axis is said to be an ordinate.

Q 22. Assertion (A): A point whose abscissa is 3 and ordinate is -4 lies in IV quadrant.

Reason (R): A point whose sign is the form of $(-, +)$ lies in the IInd quadrant.

Q 23. Assertion (A): If the ordinate of a point is equal to its abscissa, then the point lies either in the Ist quadrant or in the IInd quadrant.

Reason (R): A point having both coordinates are negative, will lie in IIIrd quadrant.

💡 Fill in the Blanks Type Questions ↘

Q 24. If the abscissa is negative and the ordinate is zero, then that point lies on .... X-axis.

Q 25. The point of intersection of X and Y-axes is called ....

Q 26. The distance of the point $(-4, -2)$ from Y-axis is .... units.

Q 27. The coordinates of the point which lies on Y-axis and is at a distance of 3 units above X-axis is ....

Q 28. The coordinates of point(s) of the plane which do not belong to any of the quadrants is/are ....

💡 True/False Type Questions ↘

Q 29. Abscissa of all the points on the X-axis is any number.

Q 30. The coordinates of a point whose ordinate is $-\dfrac{1}{2}$ and abscissa is 1 is $\left(-\dfrac{1}{2}, 1\right)$.

Q 31. The distance of the point (3, 0) from X-axis is 3 units.

Q 32. The point $(-2, -1)$ lies in II quadrant.

Solutions

1. (c) $(0, -4)$

2. (c) In X-axis, y-coordinate is zero. So, point on X-axis is (2, 0).

3. (b) In Y-axis, x-coordinate is zero. So, point on Y-axis is (0, 3).

4. (c) In right side of Y-axis, x-coordinate is positive and y-coordinate is positive/negative.

   So, point (3, 5) lies to the right of Y-axis.

5. (b) The perpendicular distance from P to the Y-axis = The absolute value of x coordinate in point P = 2.

6. (b) In left side of Y-axis, x-coordinate is negative and y-coordinate is positive/negative.

   So, point $(-2, -4)$ lies on the left side of Y-axis.

7. (a) In above X-axis, y-coordinate is positive and x-coordinate is positive/negative.

   So, point $(-1, 2)$ lies above X-axis.

8. (b) (Abscissa of P) − (Abscissa of Q)

$$= -2 - (-3)$$
$$= -2 + 3 = 1$$

9. (c) III and IV quadrants.

10. (b) In IV quadrant, x-coordinate is positive and y-coordinate is negative.

    So, required point is $(2, -4)$.

11. (d) Given $(x + 3, 5) = (6, y - 3)$

    Compare the x and y-coordinates both sides, we get

$$x + 3 = 6 \quad \text{and} \quad 5 = y - 3$$
$$\Rightarrow \qquad x = 3 \quad \text{and} \quad y = 8$$

    Hence, coordinates of (x, y) are (3, 8).

12. (b) Given point $R(a - 5, 6)$ lies on Y-axis.

    Therefore x-coordinate should be equal to zero.

$$\therefore \qquad a - 5 = 0 \quad \Rightarrow \quad a = 5.$$

13. (a) In point $(0, k)$, $|k|$ is the distance from the X-axis.

14. (d) In given points (0, 3) and $(0, -5)$, x coordinate is zero, so both points lies on Y-axis. Therefore the distance from these points to the Y-axis is zero.

15. (a)

💡 TiP

In both points, if y-coordinates are equal then the distance between two points is equal to the sum of the absolute values of both x-coordinates (i.e $(|x_1| + |x_2|)$

In given points $A(3, 5)$ and $B(-8, 5)$, both y-coordinates has same value. So, the distance between two points is $|3| + |-8| = 3 + 8 = 11$

16. (a)

💡 TiP

The image of a point (a, b) with respect to X-axis is $(a, -b)$.

The image of a point $(-3, 4)$ with respect to X-axis is $(-3, -4)$.

17. (b) The image of a point $(-8, 5)$ with respect to the Y-axis is (8, 5).

18. (b)

💡 TiP

Any point having x-coordinate is positive and y-coordinate is negative, that point lies in IV quadrant.

In the given points, only points Q(3, − 4) and R(1, −1) has *x*-coordinate positive and *y*-coordinate negative. So, it lies in IV quadrant.

19. (b) The coordinates of A are (2, −3).

20. (d) **Assertion (A):** Point (−3, 0) has *y*-coordinate zero, so it lies on *X*-axis. And point (0, 4) has *x*-coordinate zero so it lies on *Y*-axis.

    Thus, Assertion (A) is false.

    Reason (R): It is true to say that every point on the *X*-axis has zero distance from *X*-axis and every point on the *Y*-axis has zero distance from *Y*-axis.

    Hence, Assertion (A) is false but Reason (R) is true.

21. (a) **Assertion (A):** It is true to say that the ordinate of a point (3, 7) is 7, which is perpendicular distance from point to the *X*-axis.

    Reason (R): It is also true to say that the perpendicular distance of a point from *X*-axis is said to be an ordinate.

    Hence, both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

22. (b) **Assertion (A):** It is true to say that point (3, − 4) lies in IV quadrant.

    Reason (R): It is also true to say that point having sign of the form (−, +) lies in the II quadrant.

    Hence, both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

23. (d) **Assertion (A):** If the ordinate of a point is equal to its abscissa, then point lies either in the Ist quadrant or in the IInd quadrant.

    So, Assertion (A) is false.

    Reason (R): It is true to say that a point having both coordinates are negative, it will be in IIIrd quadrant.

    Hence, Assertion (A) is false but Reason (R) is true.

24. negative

25. origin

26. The distance of the point (− 4, − 2) from Y-axis is positive value of *x*-coordinate *i.e.,* 4.

27. In *Y*-axis, *x*-coordinate is zero. Therefore the coordinate of required point is (0, 3).

28. (0, 0)

29. True   30. False

31. False

32. False

    Point (−2, −1) has both coordinates are negative so it lies in III quadrant.

    Hence, given statement is false.

Case Study 1

A new year party is organised by Anil on 31st December. Anil invites some of his friends to have some fun and wants to enjoy the delicious food. Among all of the friends, four friends Reena, Vishal, Anshul and Ashwani are standing at positions A(3, 5), B(− 3, 5), C(− 3, − 5) and D(3,− 5) respectively.

On the basis of the above information, solve the following questions:

Q 1. The position of given points are shown below. The perimeter of this figure is:
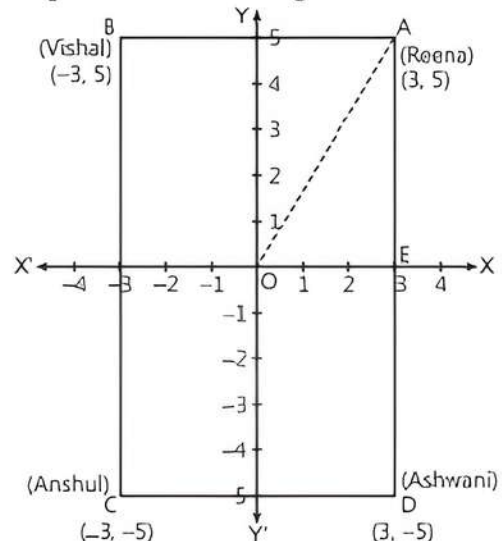
    a. 30   b. 32   c. 16   d. 20

Q 2. Anshul stands on the quadrant:

    a. II   b. I   c. III   d. IV

Q 3. The distance between Reena and Vishal is:

    a. 10   b. 0   c. 6   d. 8

Q 4. Area of rectangle ABCD is:

    a. 50 sq. units   b. 60 sq. units
    c. 65 sq. units   d. 55 sq. units

Q 5. The distance of Reena from origin is:

    a. $\sqrt{34}$ units   b. $\sqrt{30}$ units
    c. $\sqrt{39}$ units   d. $\sqrt{29}$ units

Solutions

1. (b) In rectangle ABCD,
   length (l), AD = 5 + 5 = 10 units
   and breadth (b), CD = 3 + 3 = 6 units
   ∴ Perimeter of a rectangle ABCD = 2 ($l + b$)
   = 2(10 + 6) = 2 × 16 = 32 units.
   So, option (b) is correct.

2. (c) Since, Anshul stands at the point C(– 3, – 5). It is clear from the graph that point C lies in III quadrant.
   So, option (c) is correct.

3. (c) The distance between Reena and Vishal is
   AB = |– 3| + 3 = 3 + 3 = 6
   So, option (c) is correct.

4. (b) Area of rectangle ABCD = length × breadth
   = 10 × 6 = 60 sq. units
   So, option (b) is correct.

5. (a) The distance of Reena from origin is
   $$OA = \sqrt{(OE)^2 + (AE)^2}$$
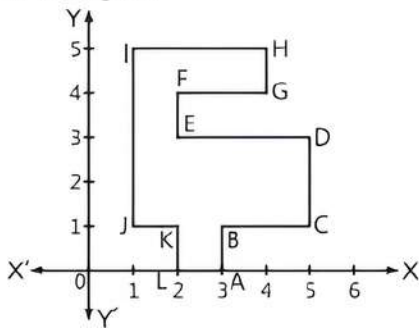   [Using Pythagoras theorem]
   $$= \sqrt{(3)^2 + (5)^2} = \sqrt{9 + 25} = \sqrt{34} \text{ units}$$
   So, option (a) is correct.

Case Study 2

Municipality constructed a zig-zag cycle track so that the person enjoys the ride of bicycle as well as make himself fit and healthy. It starts from point A to B then B to C .... and so on and finally returns at the starting point A, which is as shown in the figure.

On the basis of the above information, solve the following questions:

Q 1. The coordinates of point B are:
a. (1, 3)　　b. (3, 1)　　c. (– 1, – 3)　　d. (– 1, 3)

Q 2. Points E and F has same:
a. y-coordinate
b. x-coordinate
c. x and y-coordinate
d. x-coordinate or y-coordinate

Q 3. The distance between points C and D is:
a. 5 units　　b. 2 units　　c. 4 units　　d. 6 units

Q 4. The ordinate of point I is:
a. 5　　　b. 4　　　c. 3　　　d. 6

Q 5. The distance between points B and D is:
a. 2　　　b. $\sqrt{2}$　　　c. $2\sqrt{2}$　　　d. 3

Solutions

1. (b) The distance of point B from Y-axis is 3 units in positive direction of X-axis and the distance of B from X-axis is 1 unit in positive direction of Y-axis. Hence, coordinates of point B are (3, 1).
   So, option (b) is correct.

2. (b) It is clear from the figure that EF is parallel to Y-axis. Hence both points has same x-coordinate.
   So, option (b) is correct.

3. (b) The distance between points C and D is 2 units.
   So, option (b) is correct.

4. (a) The ordinate of point I is 5.
   So, option (a) is correct.
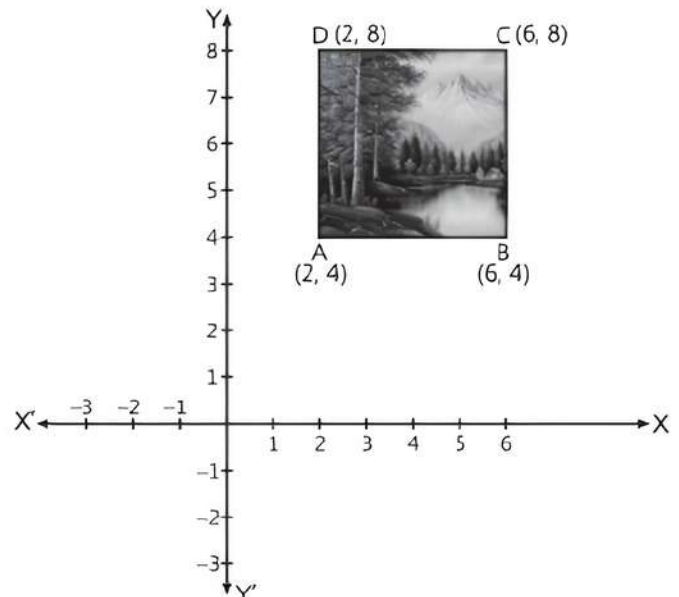
5. (c) The distance between points B and D is
   $$BD = \sqrt{(BC)^2 + (CD)^2}$$
   $$= \sqrt{(2)^2 + (2)^2} = 2\sqrt{1 + 1} = 2\sqrt{2}$$
   So, option (c) is correct.

Case Study 3

Vivek wants to purchase a painting for drawing room. First of all he puts a grid on the wall so that he could hang a painting on that area. The corner points of the grid are A(2, 4); B(6, 4); C(6, 8) and D(2, 8).

On the basis of the above information, solve the following questions:

Q 1. The shape of the painting is a:
a. rectangle　　　　b. square
c. trapezium　　　　d. parallelogram

Q 2. The area of given figure is:
- a. 6 sq. units
- b. 8 sq. units
- c. 16 sq. units
- d. 12 sq. units

Q 3. The coordinates of intersection point of diagonals are:
- a. (6, 4)
- b. (4, 6)
- c. (− 4, 6)
- d. (2, 2)

Q 4. The perimeter of a square is:
- a. 14 units
- b. 12 units
- c. 16 units
- d. 18 units

Q 5. The image of a point D(2, 8) with respect to X-axis is:
- a. (− 2, − 8)
- b. (− 2, 8)
- c. (8, 2)
- d. (2, − 8)

Solutions
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1. (b) From figure, $AB = CD = 4$
   and $AD = BC = 4$
   $AC = \sqrt{(AB)^2 + (BC)^2} = \sqrt{(4)^2 + (4)^2} = 4\sqrt{2}$
   Similarly, $BD = 4\sqrt{2}$
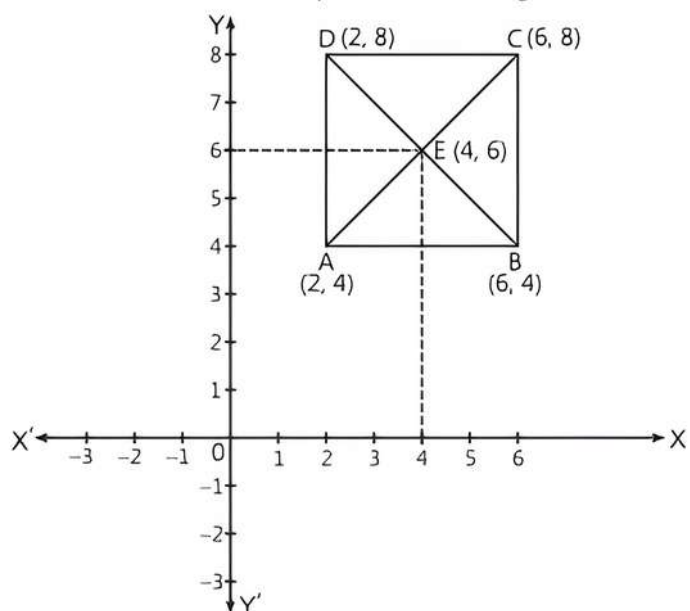   Since, all sides and diagonals of a figure are equal.
   So, ABCD forms a square.
   So, option (b) is correct.

2. (c) The area of given figure = Area of square
   $= (Side)^2$
   $= (4)^2$
   $= 16$ sq. units
   So, option (c) is correct.

3. (b) The intersection point of two diagonals is E.

   ∴ The coordinates of E are (4, 6).
   So, option (b) is correct.

4. (c) The perimeter of a square = 4(side)
 $= 4 \times 4 = 16$ units.
   So, option (c) is correct.

5. (d) The image of a point D(2, 8) with respect to X-axis is (2, − 8).
   So, option (d) is correct.

Case Study 4

Four friends Aakansha, Prabhat, Puneet and Lalit are sitting in a park at points A, B, C and D respectively. This park has been divided into small squares by drawing equally distanced horizontal and vertical lines. Consider XOX' and YOY' as coordinate axes.
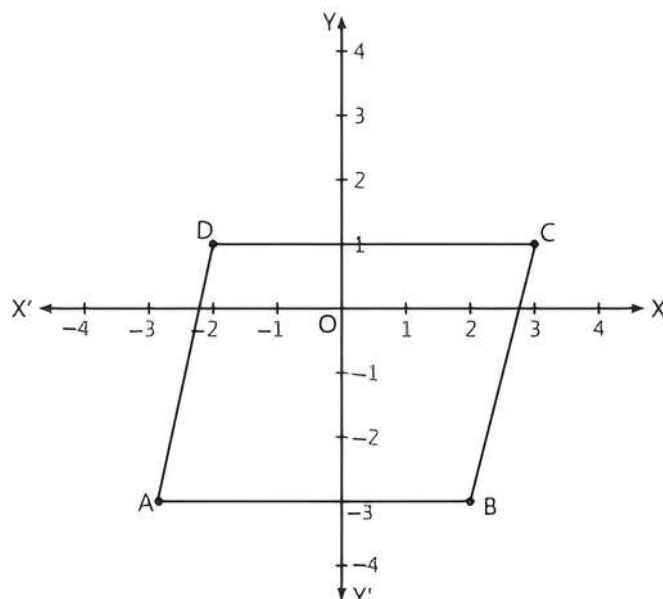
On the basis of the above information, solve the following questions:

Q 1. Find the coordinates of B.

Q 2. In which quadrant, point A is located?

**Q 3.** Find the image of a point A with respect to Y-axis.

Q 4. Find the area of figure.

Solutions
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1. The perpendicular distance of B from y is 2 in positive direction and perpendicular distance of B from X-axis is 3 in negative direction of Y-axis. Hence, coordinates of B are (2, − 3).

2. Point A is located in III quadrant.

3. The coordinate of point A is (− 3, − 3). The image of a point A(− 3, − 3) with respect to Y-axis (3, − 3).

4. Now, length of $AB = |-3| + 2$
   $= 3 + 2 = 5$
   Height = perpendicular distance of D from AB
   $= 4$
   ∴ Area of parallelogram = length × height
   $= 5 \times 4 = 20$ sq. units

Case Study 5

Annie Besant school provides good and quality education. The school also provides playing facilities to students for which they created two playground one is in the shape of rectangle and the other one is triangular in shape, which is as shown below.
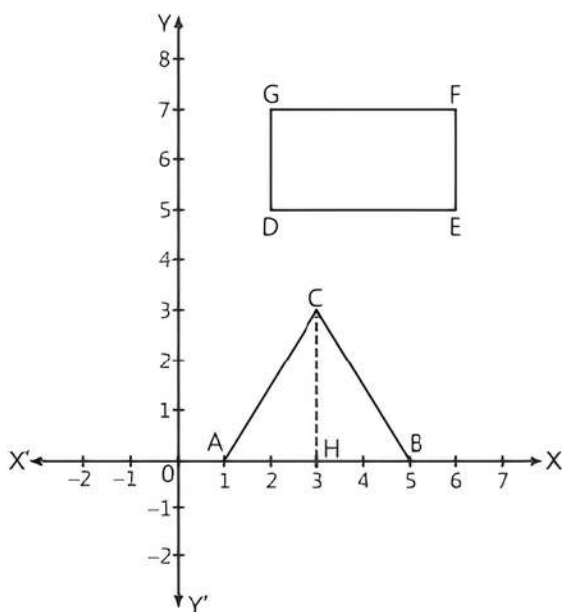
On the basis of the above information, solve the following questions:

Q 1. Find the altitude of the triangle ABC.

Q 2. Find the area of a triangle ABC.

Q 3. Find the coordinate of point F.

Q 4. Find the perimeter of a rectangle DEFG.

Q 5. Find the length of diagonal of a rectangle.

Solutions

1. The altitude of the triangle ABC is HC = 3 units

2. The area of a triangle $ABC = \dfrac{1}{2} \times AB \times HC$

$$= \dfrac{1}{2} \times 4 \times 3$$

$$= 6 \text{ sq. units}$$

3. The perpendicular distance from point F to the Y and X-axes are 6 and 7.

   Hence, coordinates of point F are (6, 7).

4. Length of rectangle $DE = 6 - 2 = 4$

   and width of rectangle $GD = 7 - 5 = 2$

   $\therefore$ Perimeter of a rectangle $= 2$ (length + width)

   $$= 2 (4 + 2) = 12 \text{ units}$$

5. Length of diagonal $= \sqrt{(DE)^2 + (EF)^2}$

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

   $$= \sqrt{16 + 4} = \sqrt{20}$$

   $$= 2\sqrt{5} \text{ units}$$

Very Short Answer Type Questions ↘

Q 1. Write ordinates of the following points: (3, 4), (4, 0), (2, −5), (3, −2).

Q 2. If y-coordinate of a point is zero, then where will this point lie in the coordinate plane?

Q 3. Find the perpendicular distance of the point (5, 7) from Y-axis.

Q 4. In which quadrants do the following points, lie?

   (i) (−6, 2)   (ii) (−5, −4)

Q 5. Find distances of points C(−3, −2) and D(5, 2) from X-axis and Y-axis.

Q 6. If the coordinates of the points A and B are A(−3, 4) and B(−6, 6), then find the difference of abscissa of A and abscissa of B.

Q 7. If $(a, b) = (0, -2)$, find the values of a and b.

Q 8. The points P(a, b) lies in the IV quadrant. Find which of a or b is greater?

Q 9. If the points A(2, 0), B(−6, 0) and C(3, a −3) lie on X-axis, then calculate the value of a.

Q 10. Where does the point in which abscissa and ordinate have different sign will lie?

Q 11. Find the reflection of the point (−3, −2) in Y-axis.

Q 12. Find one solution of $y - 5 = 0$ in a cartesian plane.

Q 13. Name the figure formed by joining the points (4, 0) and (0, 4) with coordinate axes in a cartesian plane.
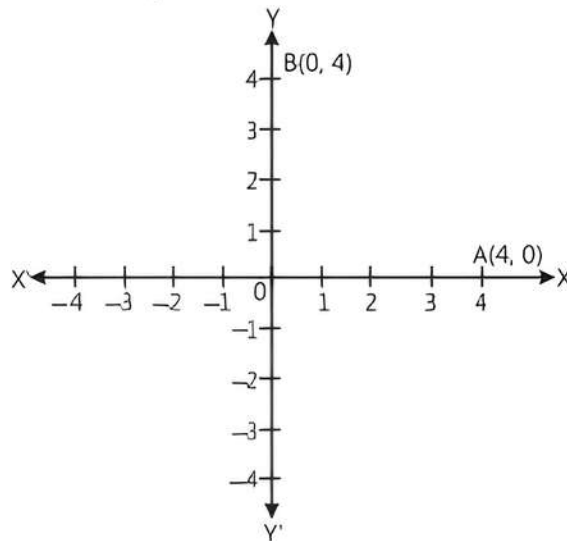

Short Answer Type-I Questions ↘

Q 1. (i) A point lies on X-axis at a distance of 9 units in positive direction from Y-axis. What are its coordinates?

   (ii) What will be the coordinates of a point if it lies on Y-axis at a distance of 9 units in negative direction from X-axis?

Q 2. Write the coordinates of A, B, C and D from the following figure.
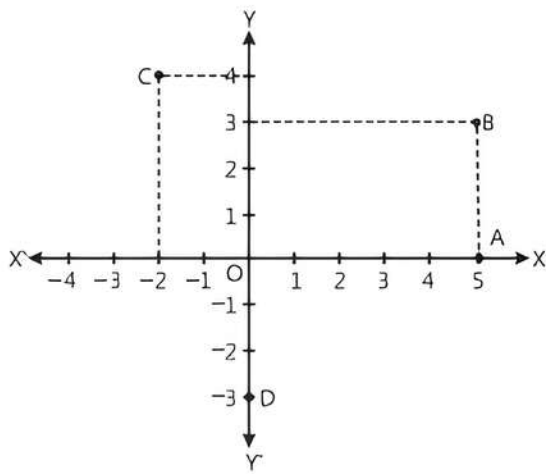
**Q 3.** In figure, LM is a line parallel to the Y-axis at a distance of 2 units.

(i) What are the coordinates of the points P and Q?

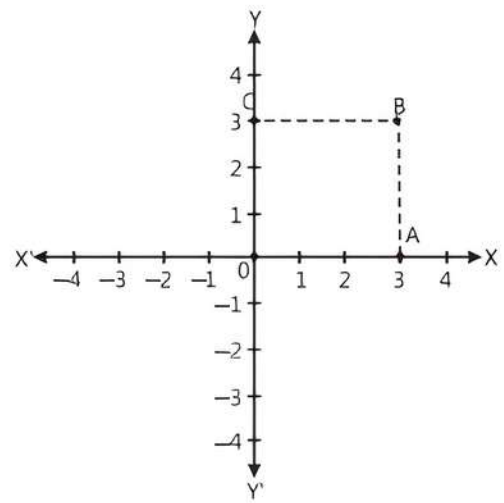(ii) What is the difference between the abscissa of the points L and M?

Q 7. (i) Name the figure MNOP.

(ii) Find the perimeter of figure.
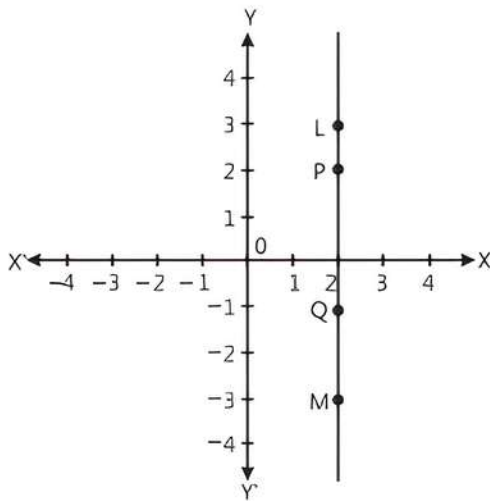
Q 4. Which of the following points lie on (i) X-axis, (ii) Y-axis?

A (0, 2), B(5, 6), C(23, 0), D(0, 23), E (0, 4), F(6, 0), G(3, 0).

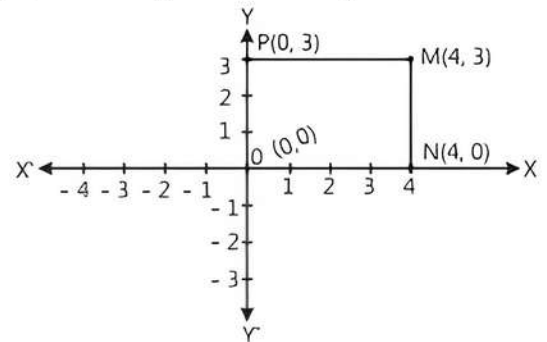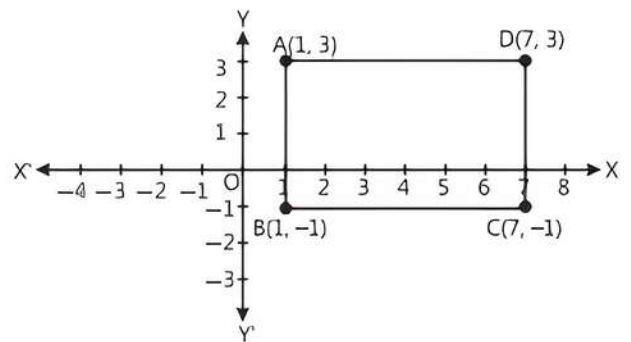**Q 5.** Find the area of △AOB. Given mirror image of A′ and B′ on X-axis are respectively A and B.
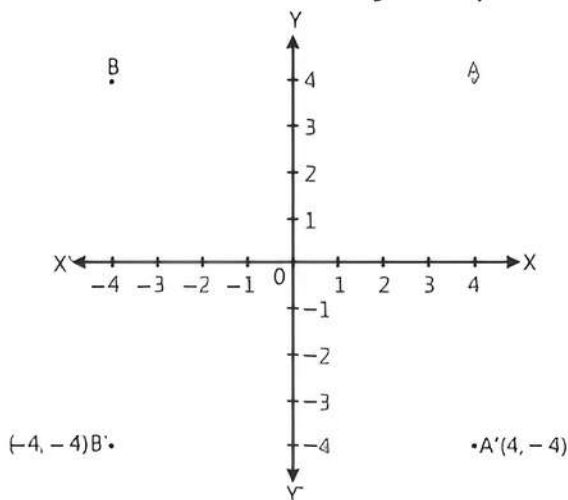
Q 6. In the following figure, write the coordinates of its vertices. Also, find the area of figure.

Q 8. Write coordinates of point of intersection of diagonals. Also find the area of figure.

Short Answer Type-II Questions ↘
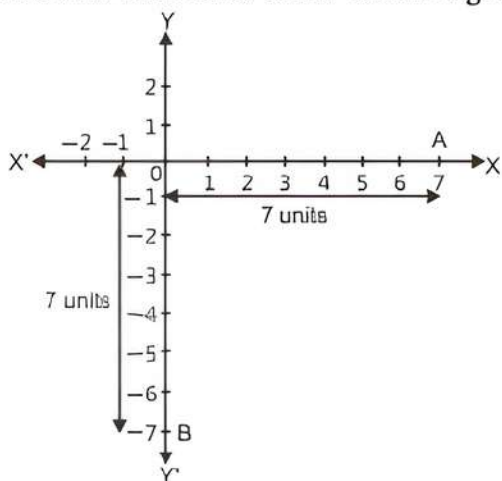
Q 1. Write the coordinates of the point:

(i) which lies on X and Y-axes both.

(ii) whose abscissa is 5 and ordinate is 6.

(iii) whose ordinate is 6 and which lies on Y-axis.

(iv) whose ordinate is 3 and abscissa is −7.

(v) whose abscissa is 3 and which lies on X-axis.

(vi) whose abscissa is 4 and ordinate is 4.

Q 2. Write the coordinates of the vertices of a rectangle whose length and breadth are 5 and 3 units, respectively such that one vertex at the origin, the longer side lies on the X-axis and one of the vertices lies in III quadrant. Also, find the length of diagonal AC.
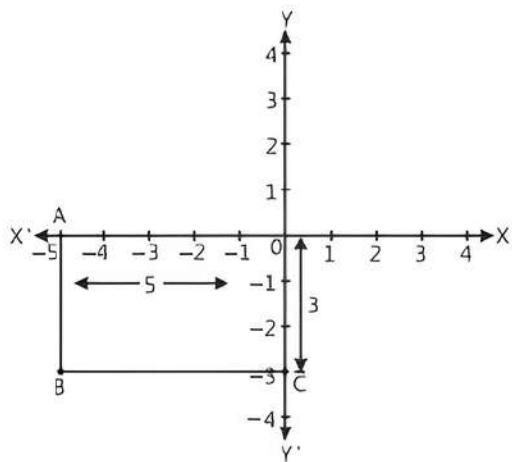
Q 3. A point lies on positive direction of X-axis at a distance of 7 units from the Y-axis. What are its coordinates? What will be the coordinates, if it lies on negative direction of Y-axis at a distance of 7 units from X-axis? If both points are joined, then find the area of the so formed figure.
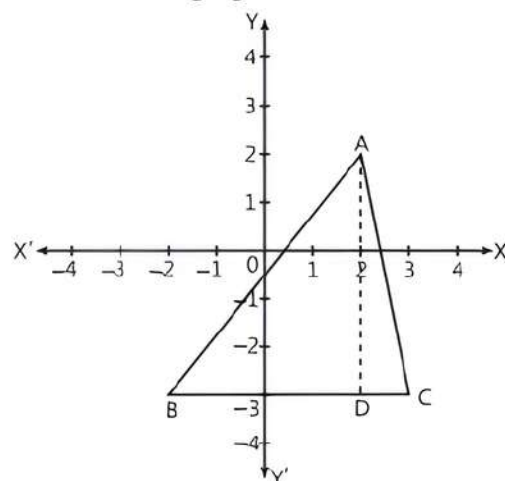

Q 4. Write the coordinates and name of the following figure. Find the area of the figure.
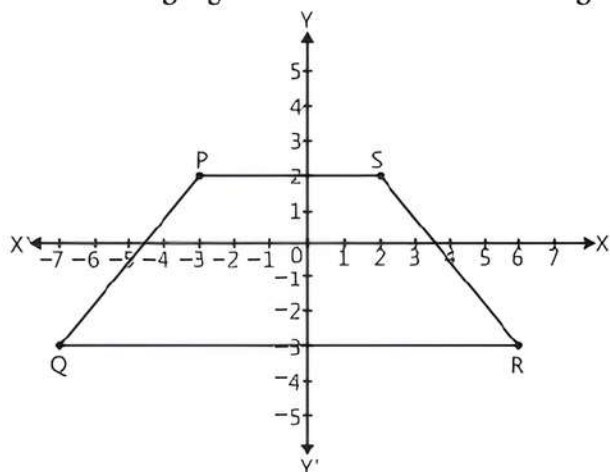
Q 5. In figure, △ABC is an equilateral triangle with coordinates of B and C as (−4, 0) and (4, 0). Find the coordinates of the vertex A.
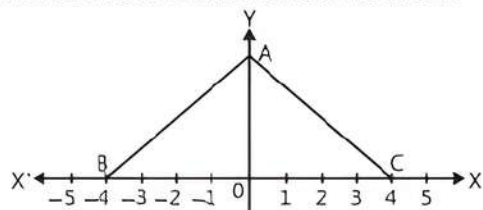
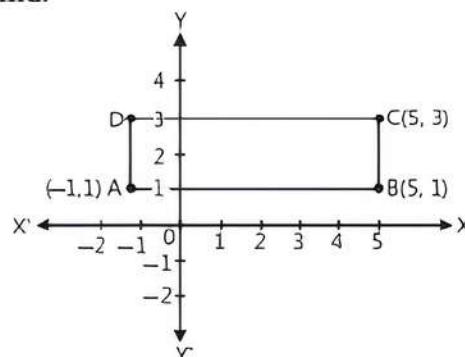**Q 6.** Let A, B and C are the three vertices of a triangle in the following figure.

(i) Write the coordinates of the vertices of a △ABC.
(ii) Find the altitude of a △ABC from vertex A.
(iii) Find the area of △ABC.

💡 Long Answer Type Questions ↘

Q 1. In the following figure, ABCD is a rectangle. Find:

(i) the fourth vertex of a rectangle.
(ii) the length of diagonal BD.
(iii) the area of a rectangle.
(iv) the perimeter of a rectangle.

Q 2. In the following figure, write the coordinates of the figure. Also, write the name of figure and find area of figure.
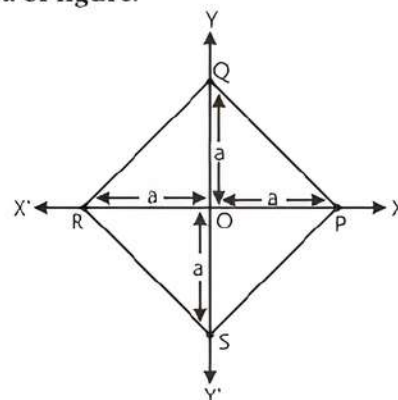
Q 3. The three vertices of a square ABCD are A(−1, 1), B(3, 1) and C(3, − 3). Find the coordinate of D. Also find the area of square and perimeter of ABCD.

Solutions

Very Short Answer Type Questions

1. The ordinates i.e., y-coordinate of the given points are 4, 0, –5 and –2.

2. This point will lie on the X-axis.

3. Perpendicular distance of the point from Y-axis $=$ x-coordinate of point $(5, 7) = 5$.

4. (i) Point $(-6, 2)$ has x-coordinate is negative and y-coordinate is positive so it lies in II quadrant.
   (ii) Point $(-5, -4)$ has both coordinates are negative, so it lies in III quadrant.

5. Distances of point $C(-3, -2)$ from X-axis is 2 units in the negative direction and from Y-axis is 3 units in the negative direction. Distances of point $D(5, 2)$ from X-axis is 2 units in the positive direction and from Y-axis is 5 units in the positive direction.

6. (Abscissa of A) $-$ (Abscissa of B) $= -3 - (-6) = 3$

7. Given, $(a, b) = (0, -2)$
   Compare x and y-coordinates both sides.
   $\therefore \quad a = 0$ and $b = -2$

8. Since, $P(a, b)$ lies in the IV quadrant.
   $\therefore \quad a > 0$ and $b < 0$
   Hence, $a > b$

9. Since point $C(3, a - 3)$ lies on X-axis.
   i.e., ordinate of point $C = 0$
   $\therefore \quad a - 3 = 0 \Rightarrow a = 3$
   Hence, the value of a is 3.

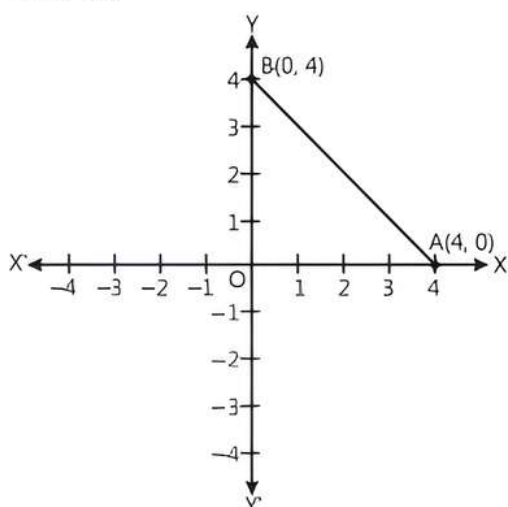10. Such a point will lie in II and IV quadrants.

11.

> **TiP**
> In reflection of point with respect to Y-axis, the sign of x-coordinate will be changed.

The reflection of $(-3, -2)$ in Y-axis is $(3, -2)$.

12. Given, $y - 5 = 0 \Rightarrow y = 5$
    Hence, one solution can be $(0, 5)$ or $(1, 5)$ or $(2, 5)$ or so on.

13.

The figure formed AOB is a right-angled triangle.

Short Answer Type-I Questions

1. (i) Since the point lies on X-axis at a distance of 9 units in positive direction from Y-axis, hence, its coordinates are $(9, 0)$.
   (ii) Since the point lies on Y-axis at distance of 9 units in negative direction from X-axis, hence, its coordinates are $(0, -9)$.

2. Point A lies on positive X-axis at a distance of 5 units from origin.
   $\therefore$ Coordinates of A are $(5, 0)$.
   Point B is at a perpendicular distance of 5 units from Y-axis and 3 units from X-axis in I quadrant.
   $\therefore$ Coordinates of B are $(5, 3)$.
   Point C is at a perpendicular distance of 2 units from Y-axis and 4 units from X-axis in II quadrant.
   $\therefore$ Coordinates of C are $(-2, 4)$.
   Point D lies on negative Y-axis at a distance of 3 units from origin.
   $\therefore$ Coordinates of D are $(0, -3)$.

3. (i) Point P is at a perpendicular distance of 2 units from X-axis and Y-axis both in I quadrant.
   $\therefore$ Coordinates of P are $(2, 2)$.
   Point Q is at a perpendicular distance of 2 units from Y-axis and 1 unit from X-axis in IV quadrant.
   $\therefore$ Coordinates of Q are $(2, -1)$.
   (ii) Coordinates of L are $(2, 3)$ and that of M are $(2, -3)$.
   Abscissa of L $= 2$
   Abscissa of M $= 2$
   $\therefore$ Required difference $= 2 - 2 = 0$

4. (i) Points with y-coordinate 0 lie on X-axis.
   $\therefore$ Points C, F and G will lie on X-axis
   (ii) Points with x-coordinate 0 lie on Y-axis.
   $\therefore$ Points A, D and E will lie on Y-axis.

5.

> **TR!CK**
> The mirror image of (a, b) on X-axis is $(a, -b)$.

Mirror image of A′ on X-axis is A$(4, 4)$ and mirror image of B′ on X-axis is B$(-4, 4)$.

Area of $\triangle AOB = \frac{1}{2} \times AB \times OC$

$= \frac{1}{2} \times 8 \times 4 = 16$ sq. units.
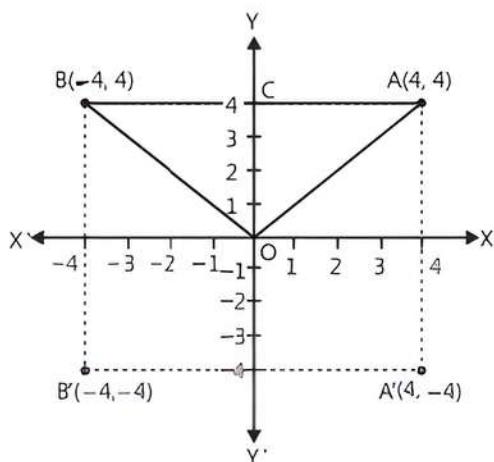
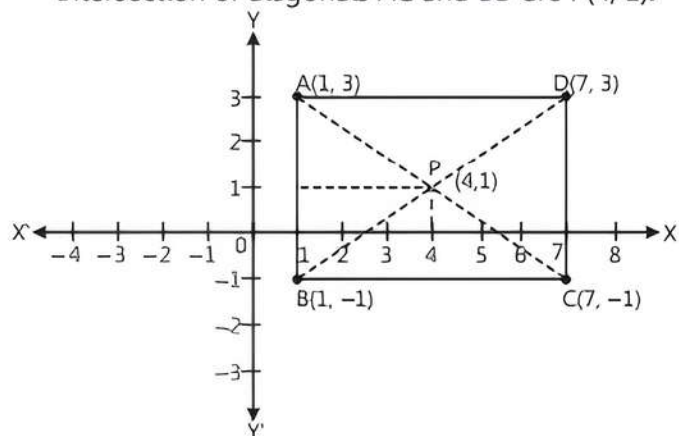**6.** The vertices of square OABC are O (0, 0), A (3, 0), B (3, 3) and C (0, 3).

Area of square OABC = (Side)^2
$$= (OA)^2 = (3)^2 = 9 \text{ sq. units}$$

7. (i) Given figure is a rectangle.

(ii) Perimeter of rectangle MNOP
$$= 2 (ON + OP) = 2 (4 + 3)$$
$$= 2 \times 7 = 14 \text{ units}$$

8. Join AC and BD. The coordinates of the point of intersection of diagonals AC and BD are P(4, 1).

Given figure is a shape of rectangle. Therefore
Area of rectangle ABCD = BC × CD
$$= 6 \times 4 = 24 \text{ sq. units.}$$

Short Answer Type–II Questions

1. (i) A point which lies on both X and Y-axes is origin with coordinates (0, 0).

(ii) A point with abscissa 5 and ordinate 6 is (5, 6).

(iii) A point which lies on Y-axis has x-coordinate 0. So, the coordinates of such a point with ordinate 6 are (0, 6).

(iv) A point with abscissa –7 and ordinate 3 is (–7, 3).

(v) A point with abscissa 3 and that lies on X-axis has $y = 0$. So, the coordinates are (3, 0).

(vi) A point with abscissa 4 and ordinate 4 is (4, 4).

2. Given, length of rectangle = 5 units

Breadth of rectangle = 3 units

The vertices of given rectangle are O (0, 0), A (–5, 0), B (–5, –3) and C (0, –3).

By using Pythagoras theorem,

∴ Length of diagonal AC = $\sqrt{(AB)^2 + (BC)^2}$

$$= \sqrt{(3)^2 + (5)^2} = \sqrt{9 + 25}$$
$$= \sqrt{34} \text{ units}$$

3. From figure, coordinates of A and B are (7, 0) and (0, –7).

When we join points A (7, 0) and B (0, –7), the formed figure is triangle and

area of △ AOB

$$= \frac{1}{2} \times OA \times OB = \frac{1}{2} \times 7 \times 7 = \frac{49}{2} \text{ sq. units}$$

4. The coordinates of the given figure are P (–3, 2), Q (–7, –3), R (6, –3) and S (2, 2).

The name of given figure is trapezium.

┌─ **TR!CK** ──────────────────────────┐

Area of trapezium = $\frac{1}{2}$ (Sum of parallel sides)× Altitude

└──────────────────────────────────────┘

∵ Area of trapezium PQRS

$$= \frac{1}{2} (PS + QR) \times Altitude$$

$$= \frac{1}{2} (5 + 13) \times 5$$

$$= \frac{1}{2} \times 18 \times 5 = 45 \text{ sq. units}$$

5. Given, the coordinates of B are (–4, 0) and C are (4, 0).

Here, BC = $|4 - (-4)| = |4 + 4| = |8| = 8$

∵ △ABC is an equilateral triangle.

∴ AB = AC = BC = 8 units

In right-angled △ BOA,

AB = 8 units and BO = 4 units

∴ $AB^2 = OA^2 + OB^2$ [By Pythagoras theorem]

⇒ AO = $\sqrt{AB^2 - BO^2}$

$$= \sqrt{8^2 - 4^2} = \sqrt{64 - 16}$$

$$= \sqrt{48} = 4\sqrt{3}$$

∴ Ordinate of point A is $4\sqrt{3}$ and it lies on Y-axis.

So, its abscissa is 0.

Hence, the coordinates of the vertex A are $(0, 4\sqrt{3})$.

6. (i) The coordinates of the vertices of a △ABC are A (2, 2), B (–2, –3) and C (3, –3).

(ii) The altitude of a △ABC is AD = 5 units

(iii) Area of △ABC = $\frac{1}{2} \times BC \times AD$

$$= \frac{1}{2} \times 5 \times 5 \quad [\because BC = |-3| + 2 = 5]$$

$$= \frac{25}{2} \text{ sq. units}$$

Long Answer Type Questions

1. (i) Since, given figure is a rectangle.
   So, from the figure, the coordinates of the fourth vertex are D (−1, 3).

   (ii) Length of diagonal $BD = \sqrt{(AB)^2 + (AD)^2}$

   [By using Pythagoras theorem]
   $$= \sqrt{(4)^2 + (2)^2}$$
   $$= \sqrt{16 + 4} = \sqrt{20}$$
   $$= 2\sqrt{5} \text{ sq. units}$$

   (iii)

   ┌─ **TR!CK** ─────────────────────────┐
   Area of rectangle = Length × Breadth
   └──────────────────────────────────────┘

   Now area of rectangle $\approx AB \times BC$
   $$= 6 \times 2 = 12 \text{ sq. units}$$

   (iv) Perimeter of a rectangle
   $$= 2 (AB + BC)$$
   $$= 2 (6 + 2)$$
   $$= 2 \times 8 = 16 \text{ units}$$

2. The coordinates of vertices of given figure are P (a, 0), Q (0, a), R (−a, 0) and S (0, −a).
   In right-angled Δ ROQ,
   $$RQ^2 = OR^2 + OQ^2 = a^2 + a^2 = 2a^2$$
   $$\Rightarrow RQ = a\sqrt{2} \text{ units}$$
   Similarly, QP = PS = RS = $a\sqrt{2}$ units
   Also, PR = QS = 2a units
   So, the formed quadrilateral PQRS is a square.
   Area of square = (Side)^2
   $$= (PQ)^2$$
   $$= (a\sqrt{2})^2$$
   $$= 2a^2 \text{ sq. units}$$

3. Abscissa of D = Abscissa of A = −1
   Ordinate of D = Ordinate of C = −3
   Hence, fourth coordinate D is (−1, −3)
   Here, side of a square is 4 units
   ∴ Area of square ABCD = (4)^2 = 16 sq. units
   and perimeter of a square ABCD
   $$= 4 \times \text{Side}$$
   $$= 4 \times 4$$
   $$= 16 \text{ units}$$

Chapter Test

Multiple Choice Questions

Q 1. Which point lies to the right side of Y-axis?
   a. (0, 5)   b. (− 3, 5) c. (4, 7)   d. (− 4, − 4)

Q 2. Which point lies in III quadrant?
   a. (3, 5)   b. (− 3, − 5) c. (4, − 5)   d. (− 3, 5)

Assertion and Reason Type Questions

Directions (Q. Nos. 3-4) *In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option:*
   a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
   b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
   c. Assertion (A) is true but Reason (R) is false.
   d. Assertion (A) is false but Reason (R) is true.

Q 3. Assertion (A): The abscissa of a point (− 2, 5) is − 2.
   Reason (R): The perpendicular distance of a point from Y-axis is said to be an abscissa.

Q 4. Assertion (A): A point whose abscissa is 4 and ordinate is − 7 lies in IV quadrant.
   Reason (R): A point whose sign is the form of (−, +) lies in III quadrant.

Fill in the Blanks

**Q 5.** If the abscissa is zero and the ordinate is negative, then that point lies on ....

Q 6. The distance of the point (− 3, 8) from X-axis is
   ....

True/False

Q 7. Ordinate of all the points on the Y-axis is any number.

Q 8. The distance of the point (7, 0) from X-axis is 7 units.

Case Study Based Question

Q 9. The diagram shows the position of three electric poles P, Q and R were installed in a school park. Instead of them, some parts of the park was not lightning. So, the management of the school decided to install one more pole at point S in such a way that it forms a rectangle and lightened the maximum area of the park.
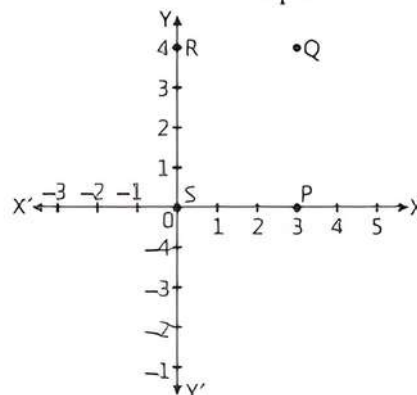
On the basis of the above information, solve the following questions:

(i) What is the ordinate of the location of pole Q?

(ii) Find the distance between the poles Q and S.

OR

Find the area covers by all four poles.

(iii) Write the coordinates of the pole S to be installed.
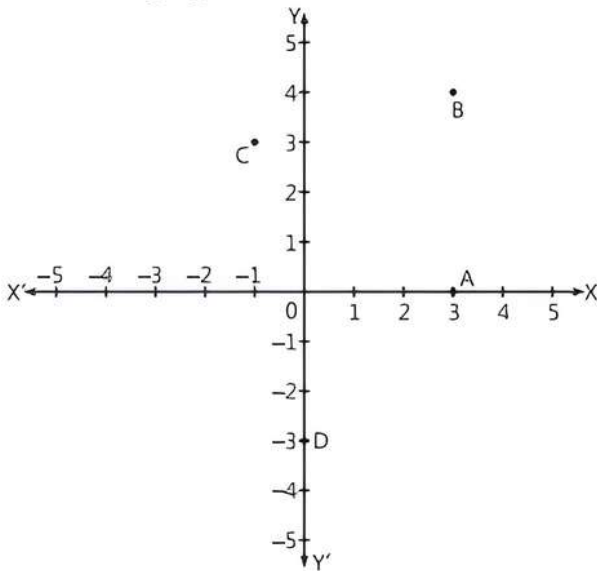
Very Short Answer Type Questions

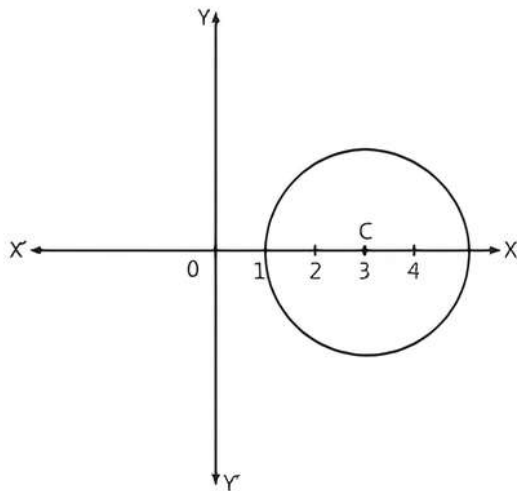**Q 10.** Find the reflection of the point $(-5, 4)$ in Y-axis.

Q 11. Write the abscissa of the following points $A(4, 6)$, $B(5, 7)$, $C(7, 3)$.

Short Answer Type-I Questions

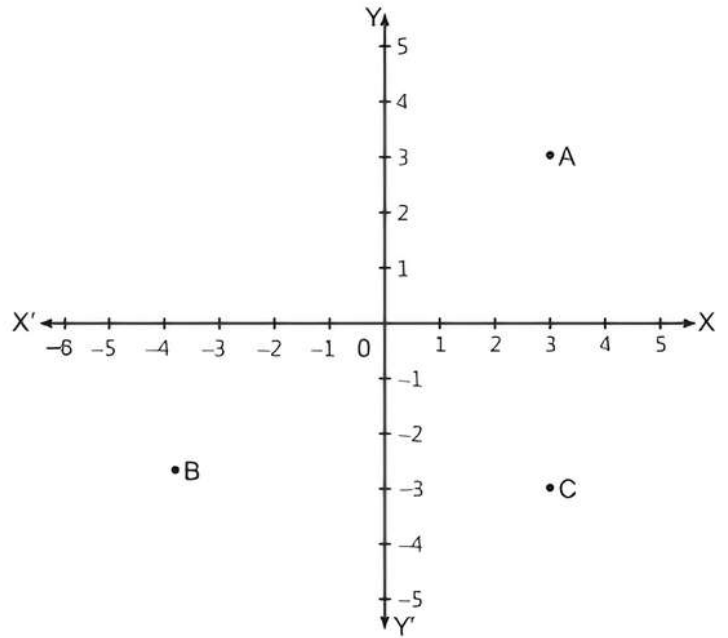**Q 12.** Write the coordinates of A, B, C and D of the following figure.

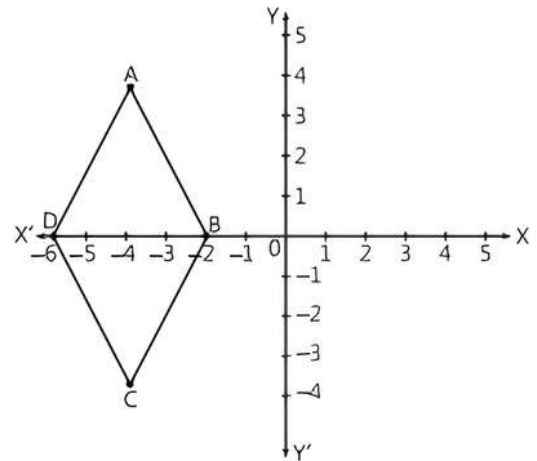**Q 13.** Write the coordinate of centre of circle. Also, find the area of circle.

Short Answer Type-II Questions

Q 14. Write the coordinates of vertices of a figure. Determine the area of the figure.

Q 15. Write the coordinates of the vertices of a figure. Also, name the type of quadrilateral and find its area.

Long Answer Type Question

Q 16. Write the coordinates of vertices of given figure and find the coordinates of the point of intersection of the diagonals. Also, find the area of the figure.