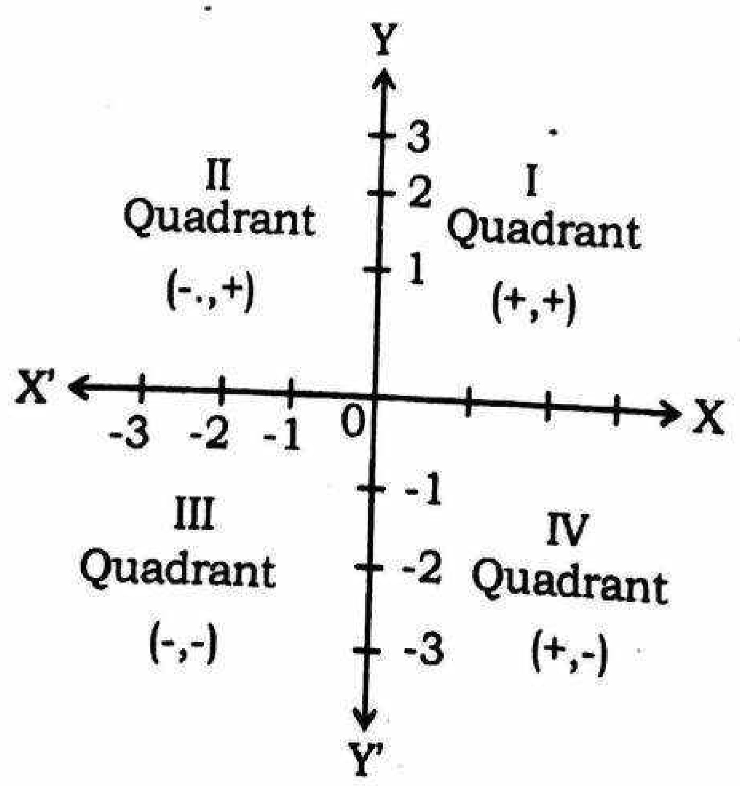
3 Graphic Represention of straight lines

CHAPTER

- **Ordered Pair :** A pair of numbers a and b listed in a specific order with a at the first place and b at the second place is called an ordered pair (a, b)
  Note that $(a, b) \neq (b, a)$
  Thus (3, 5) is one ordered pair and (5, 3) is another ordered pair.

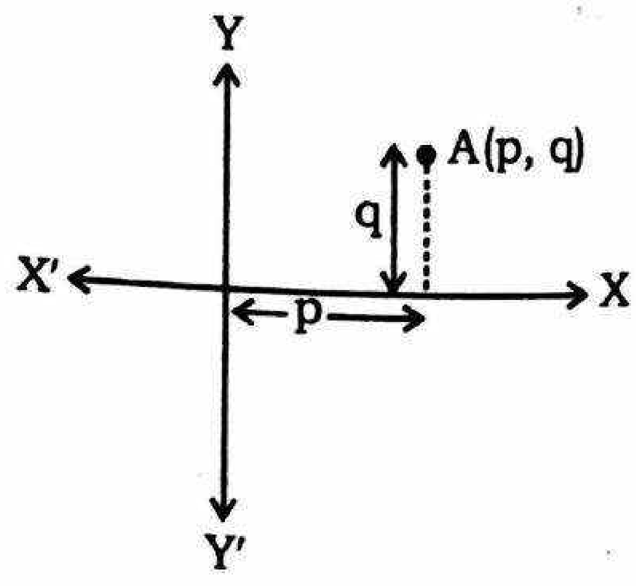
Cartesian co-ordinate system :

- **Rectangular Co-ordinate System :** Let X' OX and Y'OY be two mutually perpendicular lines through any point O in the plane of the paper. Point O is known as the origin. The line X'OX is called the x-axis or axis of x; the line Y'OY is known as the y-axis or axis of y, and the two lines taken together are called the co-ordinate axes or the axes of co-ordinates.



Region	Quad-rant	Nature of X and Y	Signs of co-ordin-ate
XOY	I	$x > 0, y > 0$	(+, +)
YOX'	II	$x < 0, y > 0$	(- , +)
X'OY'	III	$x < 0, y < 0$	(-, -)
Y'OX	IV	$x > 0, y < 0$	(+, -)

- **Co-ordinates of a Point in a Plane :**
  Let A be a point in a plane.
  Let the distance of A from the y-axis = p units
  And, the distance of A from the x- axis = q units
  Then, we say that the co-ordinates of A are (p, q).
  p is called the **x**-coordinates or abscissa of A
  q is called the **y**-coordinate, or ordinate of A.



Example : Draw the lines XOX' and YOY' as axes on the plane of a paper and plot the points given below :

(i) A(3, 7) (ii) B(–4, 3)

(iii) C(–5, –2) (iv) D(3, –5)

Sol : Let XOX' and YOY' be the co-ordinate axes.

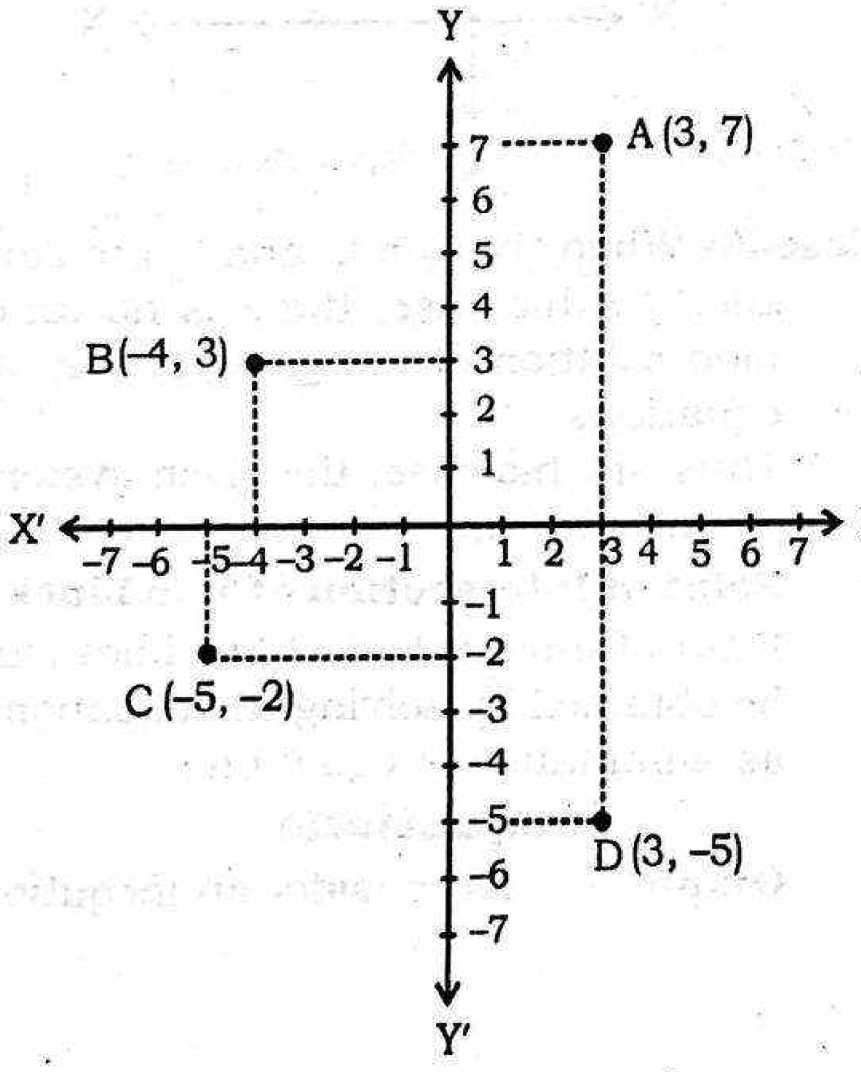
Fix a convenient unit of length and starting from O, mark equal distances on OX, OX', OY and OY'. Use the convention of signs.

(i) Starting from O, take +3 units on the x-axis and then +7 units on the y-axis to obtain the point A(3, 7).

(ii) Starting from O, take – 4 units on the x-axis and then +3 units on the y-axis to obtain the point B(– 4, 3).

(iii) Starting from O, take – 5 units on the x-axis and then – 2 units on the y-axis to obtain the point C(–5, –2)

(iv) Starting from O, take + 3 units on the x-axis and then – 5 units on the y-axis to obtain the point C(3, –5)



- **Cordinates of a Point on the x-axis:** Every point on the x-axis is at a distance of 0 unit from the x-axis. So, its ordinate is zero. Thus, the co-ordinates of every point on the x-axis are of the form $(x, 0)$

- **Co-ordinate of a Point on the y-axis:** Every point on the y-axis is at a distance of zero (0) unit from the y-axis. So, its abscissa is 0. Thus, the co-ordinates of every point on the y-axis are of the form $(0, y)$.

- **Plotting Linear Graphs :** If the rule for a relation between two variables is given, then the graph of the relation can be drawn by constructing a table of values. To plot a straight line graph we need to find the coordinates of at least two points that fit the rule.

- **Graph of $y = mx + c$**

Exapmple : Draw the graph of the equation $y = 3x + 2$:

Sol. Construct a table and choose simple x values.

x	–2	–1	0	1	2
y					

In order to find the y - values for the table, substitute each x - values into the rule $y = 3x + 2$.

when $x = -2$, $y = 3(-2) + 2$
$= -6 + 2$
$= -4$

when $x = -1$, $y = 3(-1) + 2$
$= -3 + 2$
$= -1$

when $x = 0$, $y = 3(0) + 2$
$= 0 + 2 = 2$

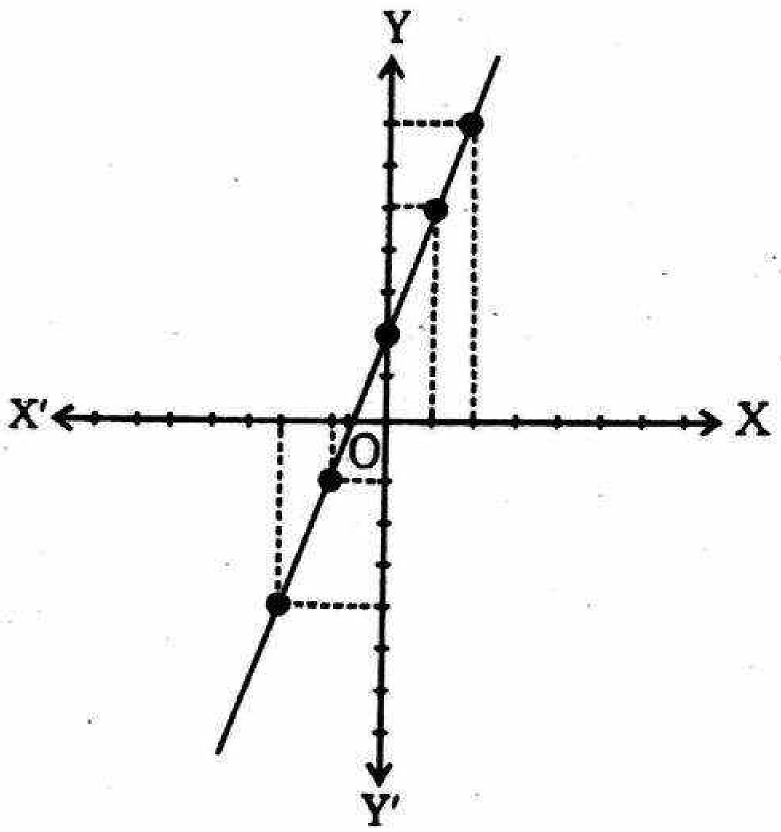
when $x = 1$, $y = 3 \times 1 + 2$
$= 3 + 2 = 5$

when $x = 2, y = 3 \times 2 + 2$
$= 6 + 2 = 8$

The table of values obtained after entering the values of y is as follows:

x	-2	-1	0	1	2
y	-4	-1	2	5	8

Now, Draw a Cartesian plane and plot the points. Then join the points with a ruler to obtain a straight line graph.



- **Solving Simultaneous Linear Equation (Graphical Method) :**
  Let the given system of linear equations be

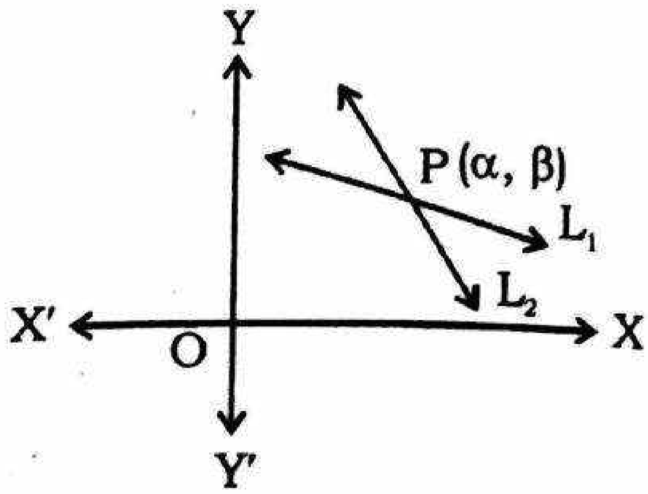
  $a_1x + b_1y + c_1 = 0$ ....(i)

  $a_2x + b_2y + c_2 = 0$ ....(ii)

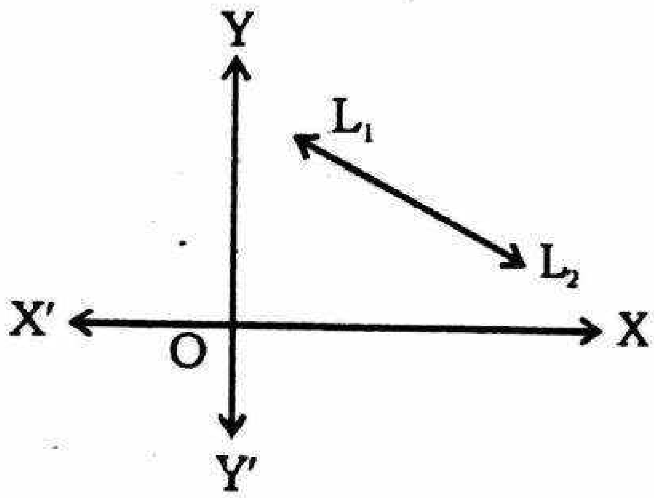
  On the same graph paper, we draw the of graph each one of the given linear equations.
  Each such graph is always a straight line.
  Let the lines L_1 and L_2 represent the graph of (i) and (ii) respecitvely.
  Now, the following cases arise :

Case -1. When the lines L_1 and L_2 intersect at a point $P(\alpha, \beta)$

Then, $x = \alpha$, $y = \beta$ is the unique solution of the given system of equations.



Case-2 . When the lines L_1 and L_2 are coincident.
Then, given system of equations has infinitely many solutions.



Case-3. When the line L_1 ans L_2 are parallel. In this case, there is no common solution of the givne system of equations.
Thus, in this case, the given system is inconsistent.

- **Point of Intersection of Two Lines :**
  Point of intersection of two lines can be obtained by solving the equations as simultaneous equations.

Inequations

Graph : Let us consider an ineqution

$ax + by \le c$.

Step 1. Consider the equation $ax + by = c$. Draw the graph of this equation, which is a line.

In case of strict inequalities < or > draw the line dotted, otherwise mark it thick.

Step 2. Choose a point [if possible (0, 0)], not lying on this line. Substitute its coordinates in the given inequations. If this point satisfies the given inequation, then shade the portion of the plane which contains the choosen point, otherwise shade the portion which does not contain this point.

The shaded portion represents the solution set. The dotted line is not a part of the solution set, while thick line is a part of it.

Example : Graph of the inequation $2x - y \ge 1$?

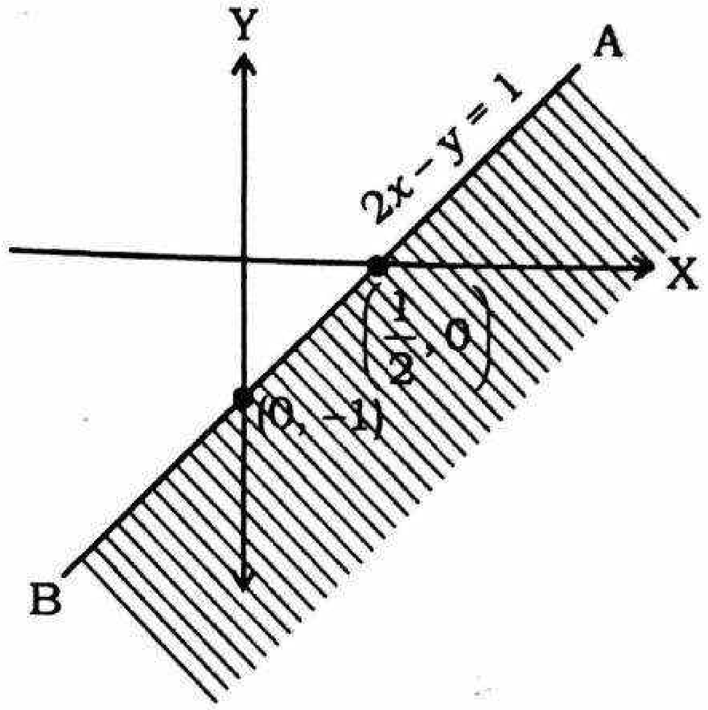
Sol : Consider the equation $2x - y = 1$

or $\frac{x}{1/2} + \frac{y}{-1} = 1$

i.e. x-intercept = 1/2 and y-intercept = −1

i.e. it meets x-axis at (1/2, 0) and y-axis at (0, − 1)

Join these two point with a thick line AB.



Now, consider (0, 0) put (0, 0) in the given inequation.

L.H.S = $2 \times 0 - 0 \ne$ R.H.S

i.e. it does not satisfy $2x - y \ge 1$.

So, shade the portion of the plane not containing (0, 0).

Shaded portion constitutes the solution set.

Note : The area bounded by $|x| + |y| = k$ is $2k^2$.

Exercise
LEVEL - 1

1. The point (6, –3) lies in the quadrant:
   (a) First (b) Second
   (c) Third (d) Fourth
2. If $x < 0$ and $y > 0$, then the point (x, y) lies in :
   (a) quadrant I (b) quadrant II
   (c) quadrant III (d) quadrant IV
3. Which of the following points lies on the line $y = 3x + 5$?
   (a) (2, 11) (b) (3, 15)
   (c) (4, 19) (d) (5, 15)
4. The co-ordinates of a point situated on x-axis at a distance of 7-units from y-axis is :
   (a) (0, 7) (b) (7, 0)
   (c) (7, 7) (d) (– 7, 7)

11. Graphical equation of the line $x = 0$ represents :
   (a) y-axis (b) x-axis
   (c) origin (d) both x-axis and y-axis
12. The graph of the line line $x = 5$ is parallel to :
   (a) x-axis (b) y-axis
   (c) both x-axis and y-axis
   (d) none of these
13. The graph of the line $x = -3$ is parallel to :
   (a) x-axis (b) y - axis
   (c) both x - axis and y-axis
   (d) none of these
14. when we draw the graph of $y = 2$, the line is parallel to :
   (a) x - axis (b) y - axis
   (c) both x- axis and y - axis
   (d) none of these

19. When we plot the points (4, 3), (0, 0) and (– 4, –3) on the graph paper, then the graph shows :
(a) straight line (b) curve
(c) zig-zag line
(d) None of these

20. The equation of the line which passes through the origin is :
(a) $3x + 4y = 5$ (b) $3x + 4y = 7$
(c) $3y + 4x = 0$
(d) None of these

21. If we plot the points (4, 3), (–3, 3), (–3, –2), (– 4, –2) on the graph paper, the shape formed is :
(a) parallelogram (b) rectangle
(c) square (d) rhombus

22. If the side of a figure are represented by $x = 2, x = -2, y = 2, y = -2$ then the graph shows :
(a) Rhombus (b) Rectangle
(c) Parallelogram (d) Sqaure

23. If a straight line $ax + by = c$ meets x-axis at P and y-axis at Q. Then area of the triangle OPQ where O is the point of intersection of co-ordinate axes is :
(a) $\frac{c^2}{ab}$ (b) $\frac{c^2}{2ab}$
(c) $\frac{c^2}{a^2b}$ (d) $\frac{c^2}{ab^2}$

24. The line passing through the points (–3, 7) and (4, 6) :
(a) cut x-axis only
(b) cuts y-axis only
(c) cuts both the axes
(d) does not cut any axes.

25. For what value of k will the equations $x + 2y + 6 = 0$ and $3x + ky + 18 = 0$ represent coincident lines ?
(a) $k = 8$ (b) $k = 4$
(c) $k = 5$ (d) $k = 6$

26. The value of k for which the system of equations $x + 3y + 7 = 0$, $4x + ky + 19 = 0$ has no solution is :
(a) $k = 6$ (b) $k = -12$
(c) $k = 12$ (d) $k = 8$

27. The pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ in two variables represents pair straight lines which are intersecting , if :
(a) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
(b) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
(c) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
(d) $\frac{a_1}{a_2} \neq \frac{c_1}{c_2} = \frac{b_1}{b_2}$

28. The point of the form (b, b) always lies on the straight lines :
(a) $y = b$ (b) $x - y = 0$
(c) $x = b$ (d) $x + y = 0$

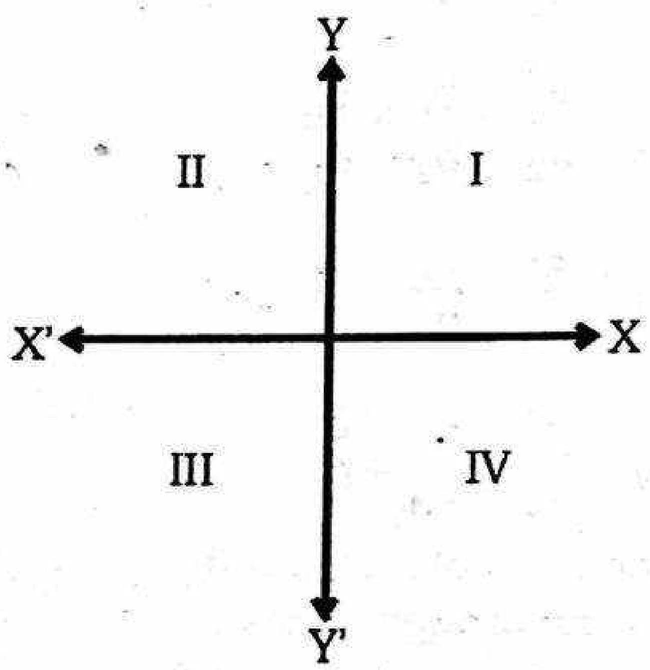
29. The straight lines $2x + y = 4$ and $x - 3y = 9$ intersect at a point, the point of intersection is :
(a) (3, –2) (b) (–3, 2)
(c) (2, –3) (d) (–2, 3)

30. The value of k for which the system of equations $kx + y = 7$, $9x + 3y = 17$ has a unique solution :
(a) $k = 3$ (b) $k = 0$
(c) $k \neq 3$ (d) $k \neq 0$

Exercise
LEVEL - 2

1. When we plot the points A (–1, 2), B(–1, –2) and C(2, –2) on a graph paper, the figure formed by these points is :
   (a) right angled triagnle
   (b) scalene triangle
   (c) equilateral triangle
   (d) isosceles triangle

2. If $ab > 0$ and the point (a, b) lies in the third quadrant in which the point $(-b, -a)$ lies is :

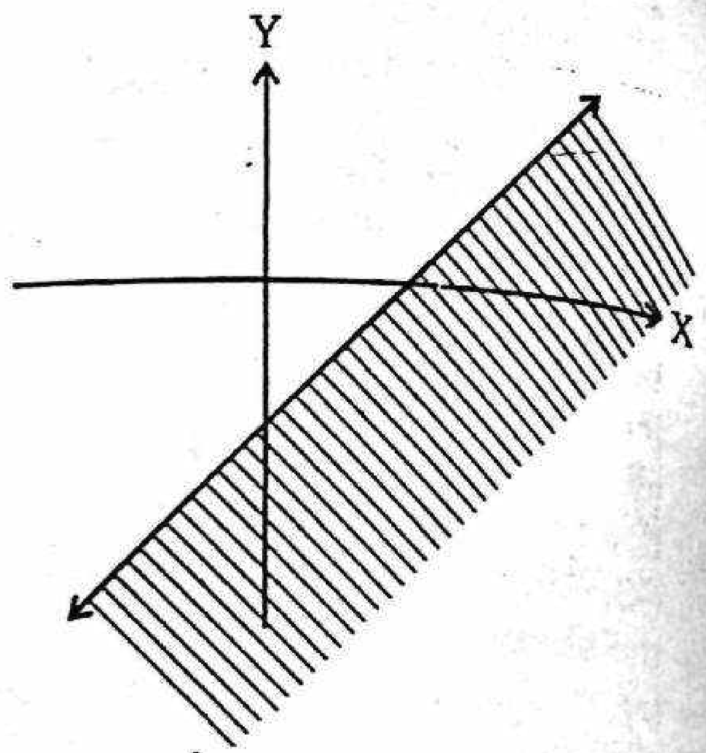


   (a) I (b) II
   (c) III (d) IV

3. The area of the triangle formed by the lines $5x + 7y = 35$, $4x + 3y = 12$ abd x-axis is :
   (a) $\frac{160}{13}$ sq.unit (b) $\frac{150}{13}$ sq.unit
   (c) $\frac{140}{13}$ sq.unit (d) 10 sq. unit

4. The area of triangle formed by the lines $3x - 6y = 12$, $3x - y = 3$ and x-axis is :
   (a) 5.4 sq. units (b) 2.7 sq. units
   (c) 4.5 sq. units (d) 3.6 sq. units

5. The shaded region represents :



   (a) $y \geq x$ (b) $y \leq -x$
   (c) $y \leq x$ (d) $y \geq -x$

6. The three vertices of ΔABC are A (2, 4), B(–3, 2), C(4, 2). The area is :
   (a) 7 sq. units (b) 9 sq. units
   (c) 14 sq. units (d) 10 sq. units

7. If we plot the point A(4, 11) and B (–2, 3) on graph, then the distance between them is :
   (a) 15 (b) 9
   (c) 12 (d) 10

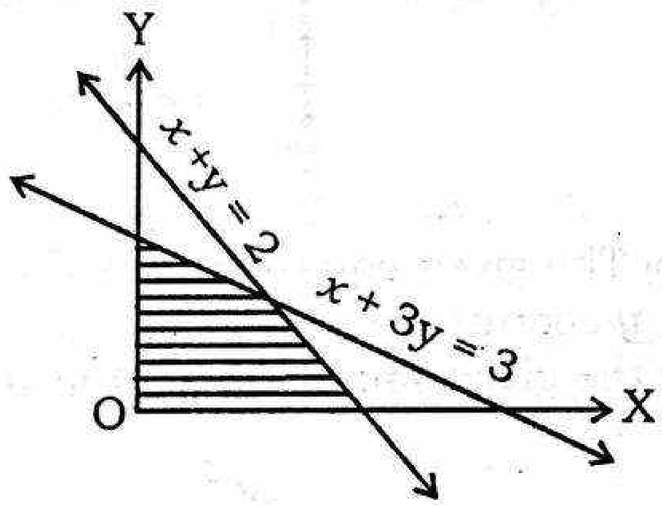
8. Find the area of the region bounded by lines $3x + 4y = 24$, $x + y = 2$ and the coordinate axes :
   (a) 25 sq. units (b) 24 sq.units
   (c) 22 sq. units (d) 20 sq. units

9. Find the area of the region bounded by lines $3x + 4y = 12$, $6x + 8y = 60$, $x = 0$ and $y = 0$:
   (a) 37.5 sq. units
   (b) 31.5 sq.units
   (c) 25 sq. units
   (d) 32 sq. units

10. The area of the region bounded by the lines $x - y = 0$, $x + 2y = 0$ and $y = 3$ is:
(a) 17 sq. units
(b) 6.75 sq.units
(c) 27 sq. units
(d) 13.5 sq. units

11. The region specified by $x \geq 0, x + y \geq 0$ includes :
(a) 1st quadrant
(b) 2nd quadrant
(c) 3rd quadrant
(d) 4th quadrant

12. The shaded region in the given figure is the solution set of the inequalities :



(a) $x + y \leq 2,\ x + 3y \geq 3,\ x \geq 0,\ y \geq 0$
(b) $x + y \geq 2,\ x + 3y \geq 3,\ x \geq 0,\ y \geq 0$
(c) $x + y \geq 2,\ x + 3y \leq 3,\ x \geq 0,\ y \geq 0$
(d) $x + y \leq 2,\ x + 3y \leq 3,\ x \geq 0,\ y \geq 0$

13. Area of the rectangular region $2 \leq x \leq 5, -1 \leq y \leq 3$ is :
(a) 9 sq. units (b) 12 sq. units
(c) 15 sq. unit (d) 20 sq. units

14. Graph of the inequation $2x - 5y \geq 5$ in cartesian plane is :
(a) above the line $2x - 5y = 5$
(b) below the line $2x - 5y = 5$
(c) on & below the line $2x - 5y = 5$
(d) on & above the line $2x - 5y = 5$

Exercise
LEVEL - 3

1. Find the area bounded by $|x| + |y| = 6$
(a) 72 sq. units (b) 48 sq. units
(c) 54 sq. units (d) 84 sq. units

2. The area of the region bounded by $y = |x| - 1$ and $y = 1 - |x|$
(a) 3 sq. units (b) 4 sq. units
(c) 2 sq. units (d) 1 sq. unit

Hints and Solutions

LEVEL - 1

1.(d) The point (6, –3) lies in the fourth quadrant.

2.(b) If $x < 0$ & $y > 0$, (x, y) lies in quadrant II

3.(a) When $x = 2$, $y = 3 \times 2 + 5 = 6 + 5 = 11$

So, (2, 11) lies on $y = 3x + 5$

4.(b) Clearly, the point of x-axis has ordinate 0 and abscissa 7

So, the point is (7, 0)

5.(c) Clearly, the point is (0, –8).

6.(a) $2x + 7y = 1$ ....(i)

$4x + 5y = 11$ ....(ii)

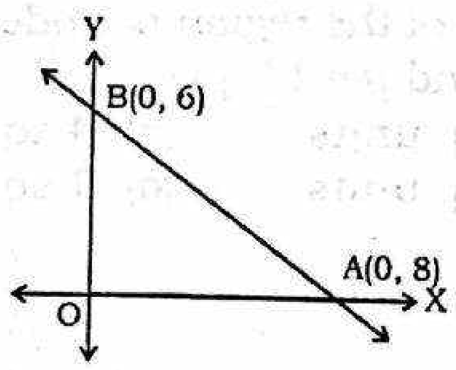
On solving (i) and (ii), we get $x = 4$ and $y = -1$

∴ Required point of intersection = (4, –1)

7.(c) When $x = 4 \Rightarrow y = 2 \times 4 + 3 = 11$

So, (4, 11) lies on $y = 2x + 3$ but (4, 10) does not lie on it.

8.(d)



Clearly, OA = 8 units and OB = 6 units

$$\therefore \text{ ar}(\Delta OAB) = \frac{1}{2} \times OA \times OB$$

$$= \frac{1}{2} \times 8 \times 6 = 24 \text{ sq. units}$$

9.(b) at y - axis, $x = 0$

∴ $2 \times 0 - 3y = 6 \Rightarrow y = -2$

∴ Required point (0, – 2)

10.(c) at x-axis, $y = 0$

∴ $4x + 7 \times 0 = 12 \Rightarrow x = 3$

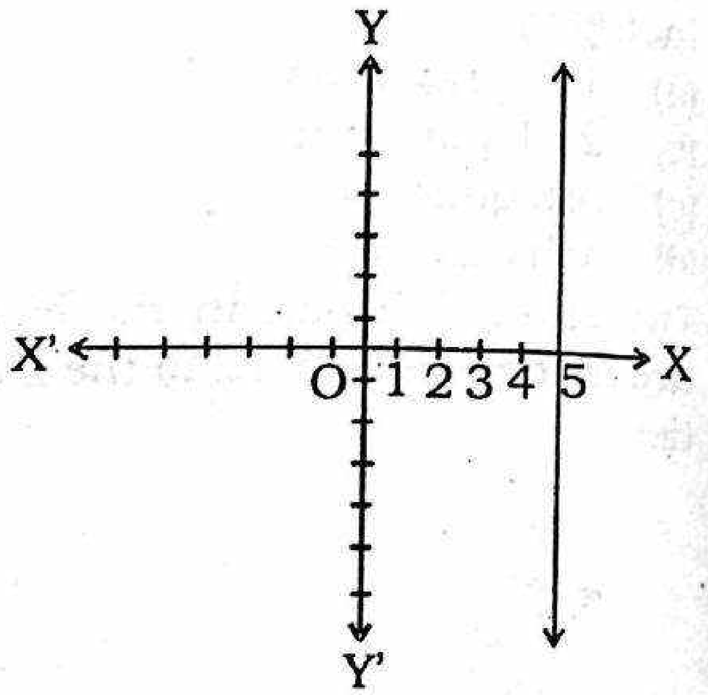
∴ Required point = (3, 0)

11.(a) The equation of y-axis is $x = 0$

12.(b) The given equation is $x = 5$.

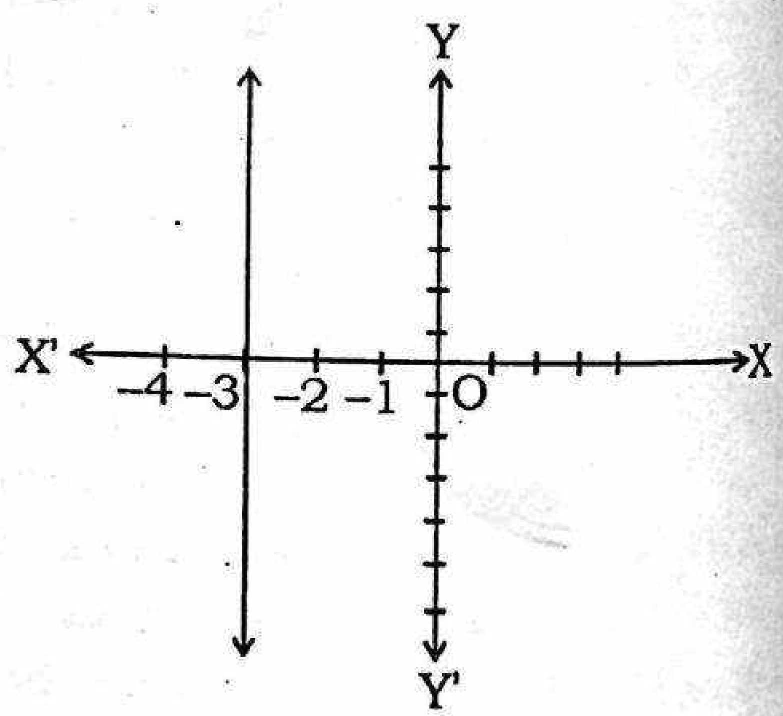
Here, y-coordinate is 0.

So, the given line is parallel to y-axis



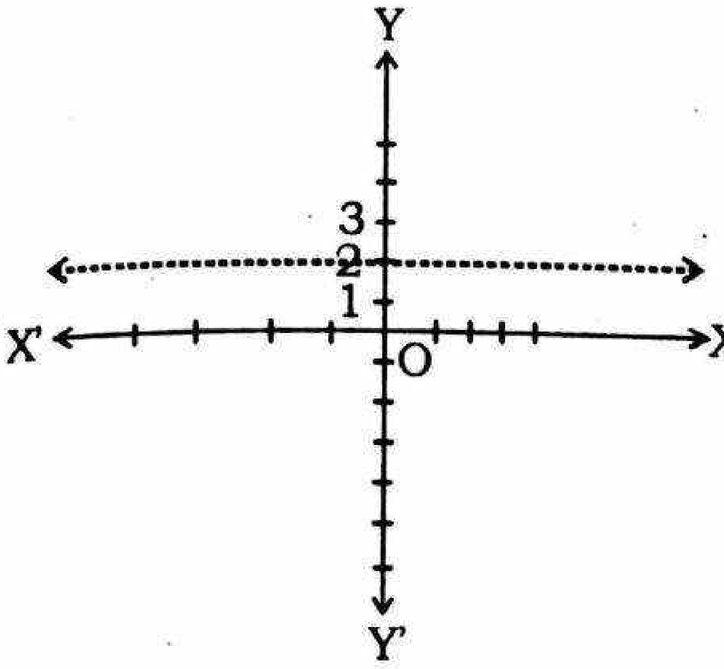
13.(b) The given equation is $x = -3$ Here y-coordinate is 0.

So, the given line is parallel to y-axis



14.(a) The given equation is $y = 2$, here x-coordinate is 0.

So, the given line is parallel to x-axis.



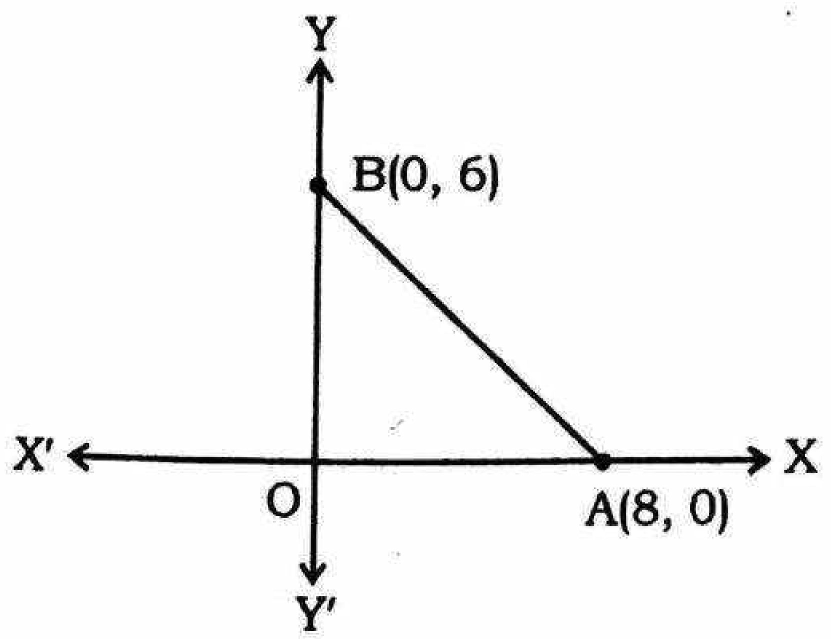
15.(c) Point $\left(3, \frac{11}{2}\right)$ will satisfy the given equation.

$\therefore \quad 2 \times \frac{11}{2} = a \times 3 + 5 \Rightarrow 6 = 3a$ or $a = 2$

16.(a) Point $\left(3, \frac{5}{2}\right)$ will satisfy the given equation.

$\therefore \quad 2 \times \frac{5}{2} = a \times 3 - 5 \Rightarrow 3a = 10$ or $a = \frac{10}{3}$

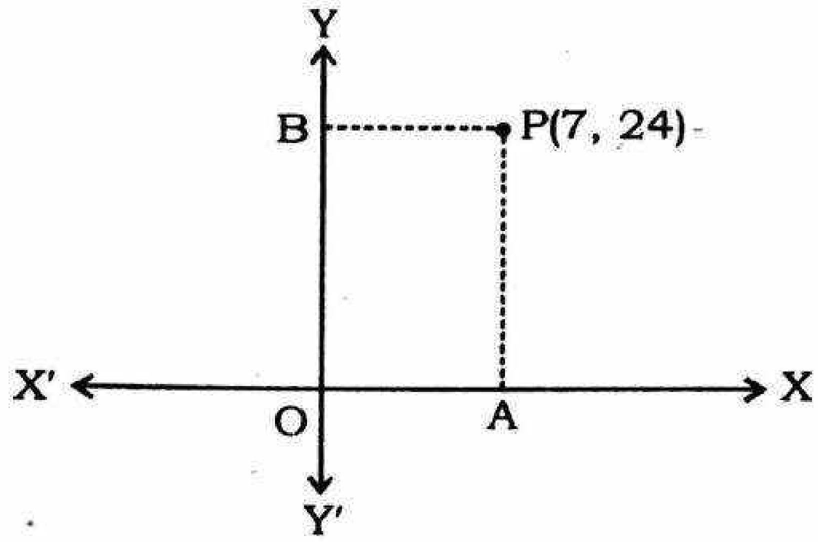
17.(d)



$\therefore$ Required distance $= AB = \sqrt{(OA)^2 + (OB)^2}$

$= \sqrt{8^2 + 6^2} = 10$ units

18.(b)

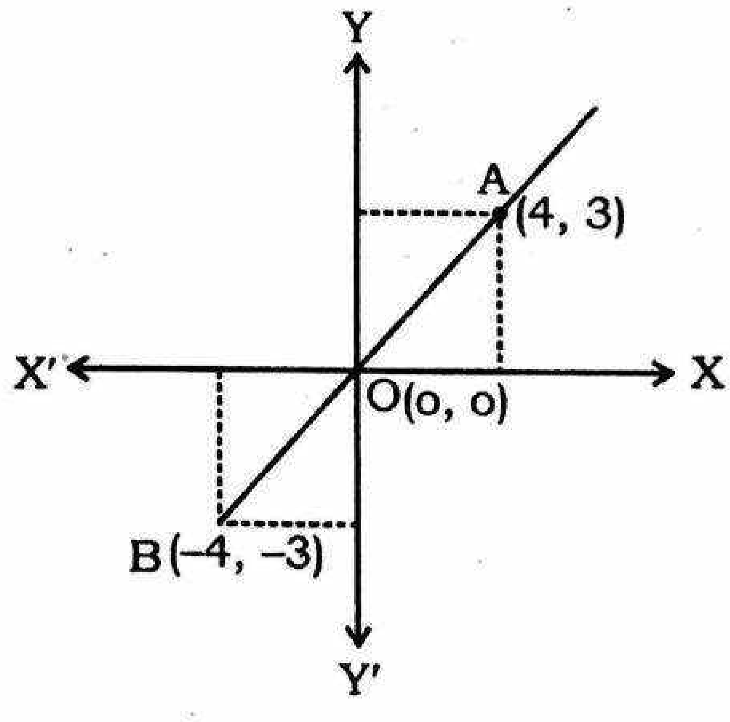


Clearly, OA = 7, AP = 24

$\therefore OP^2 = OA^2 + AP^2 = 7^2 + 24^2 \Rightarrow 625$

$\therefore OP = \sqrt{625} = 25$

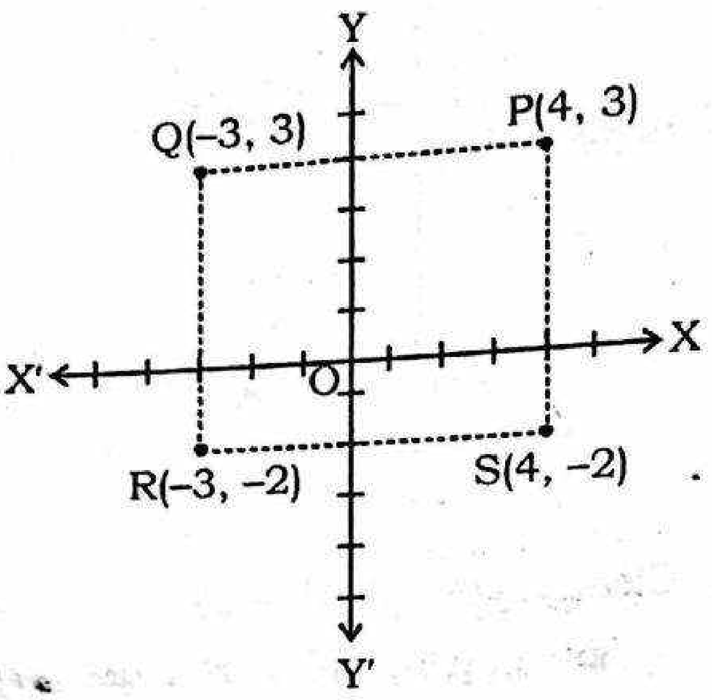
19.(a) This graph shows AB is a straight line which passes through the origin.



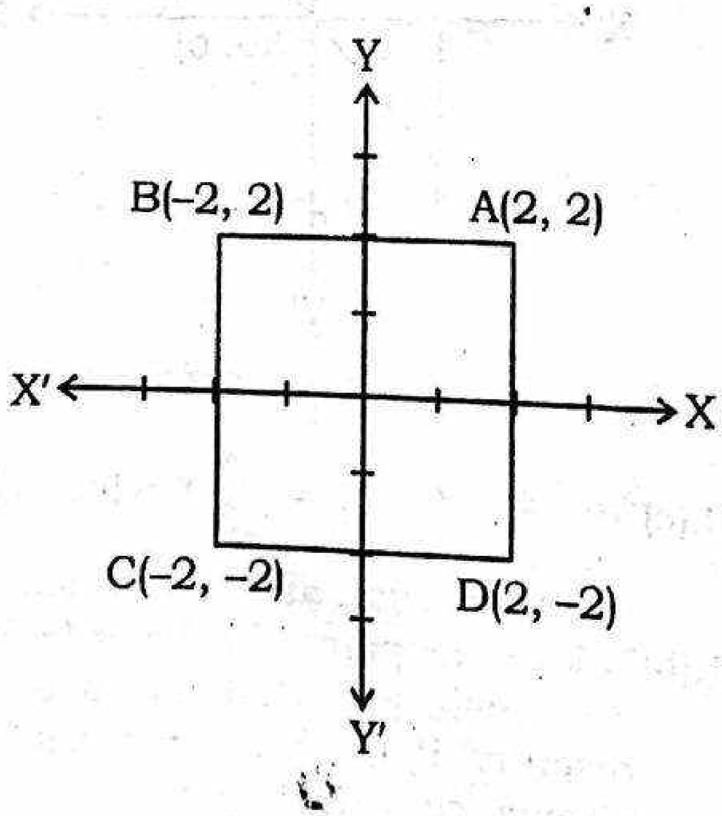
20.(c) $3y + 4x = 0$ or $y = -\frac{4}{3}x$ which passes through origin as(0, 0) satisfy it.

21.(b) Taking the points in the order given, it is easily seen that they are represented P, Q, R, S. Then the shape shows rectangle (PQRS) having sides.

PS = QR = 3 - (-2) = 5
PQ = SR = 4 - (-3) = 7



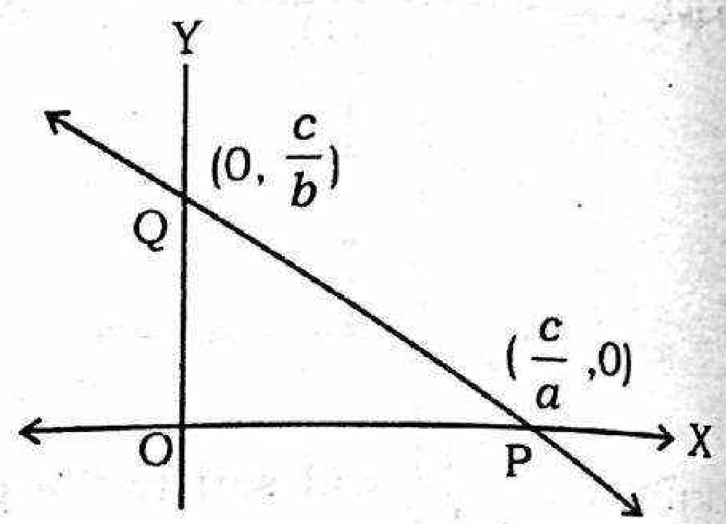
22.(d) The graph of $x = 2$ will be a line parallel to y-axis at a distance of 2 units to its right.
Similarly, the graph of $x = -2$ will be a line parallel to y-axis at a distance of 2 units to its left.
and $y = 2$ and $y = -2$ will be the lines parallel to x-axis at a distance of 2 units to its right and 2 units to its left respectively.
Thus ABCD is a square having each side of 4 units.



23.(b) The equation is - $ax + by = c$ (given)

When $x = 0 \Rightarrow by = c$ or $y = \frac{c}{b}$

When $y = 0 \Rightarrow ax = c$ or $x = \frac{c}{a}$

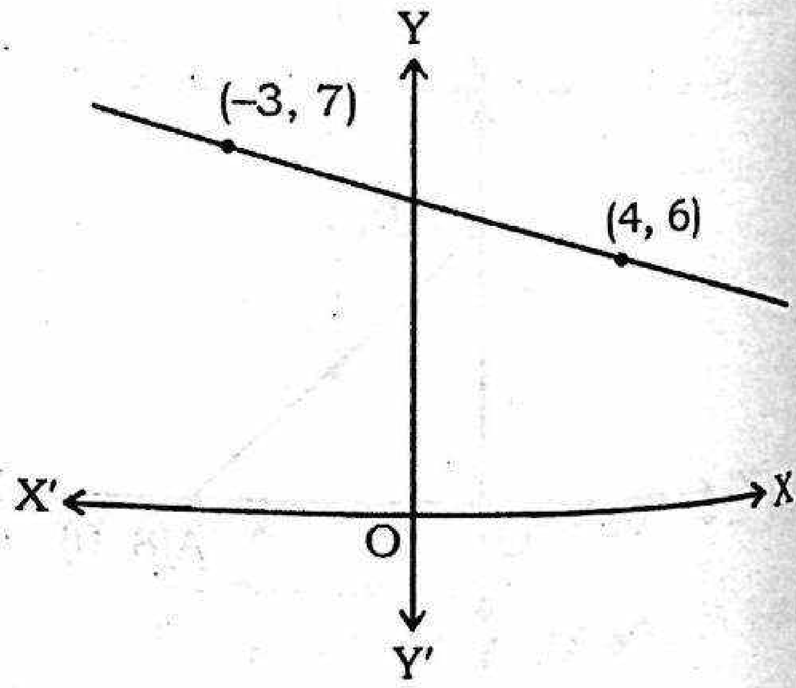


Clearly, $OP = \frac{c}{a}$, $OQ = \frac{c}{b}$

$\therefore$ $ar(\Delta OPQ) = \frac{1}{2} \times OP \times OQ$

$= \frac{1}{2} \times \frac{c}{a} \times \frac{c}{b} = \frac{c^2}{2ab}$

24.(b) (–3, 7) lies in second quadrant and (4, 6) lies in first quadrant.



25.(d) The given equations are of the form $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$.

These will represent coincident lines it they have infinitely many solutions.

The condition for which is

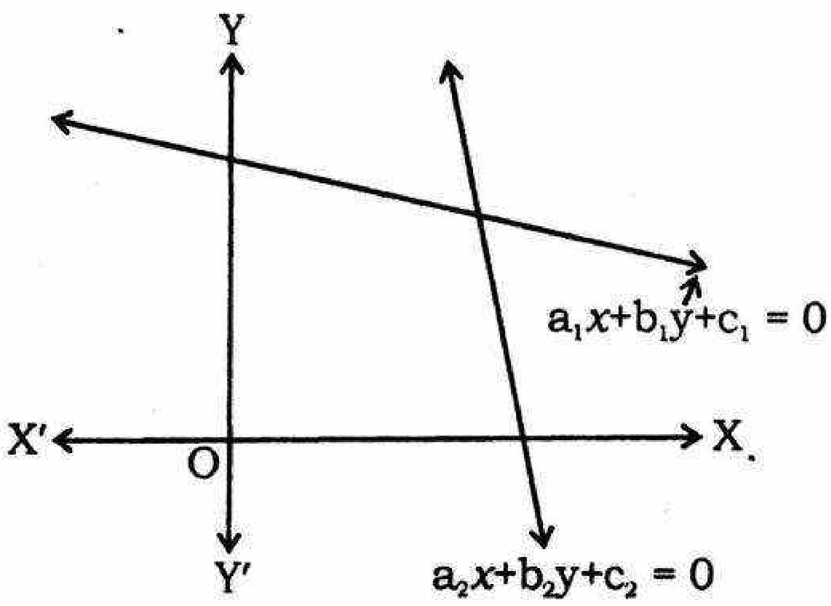
$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow \frac{1}{3} = \frac{2}{k} = \frac{6}{18} \Rightarrow k = 6$$

26.(c) $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2=0$ will have no solution if

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$$\Rightarrow \frac{1}{4} = \frac{3}{k} \Rightarrow k = 12$$

27.(a)



Given that lines are intersecting i.e. they have unique solution.

$$\therefore \frac{a_1}{a_2} \neq \frac{b_1}{b_2}.$$

28.(b) The point (b, b) always lies on the line $x - y = 0$

29.(a) $2x + y = 4$ ....(i)

$x - 3y = 9$ ....(ii)

$3 \times$ (i) + (ii) we get

$\Rightarrow 7x = 21 \Rightarrow x = 21/7 \Rightarrow x = 3$

From (i),

$y = 4 - 6 \Rightarrow y = -2$

The straight lines intersect at (3, –2)

Alternatively ;

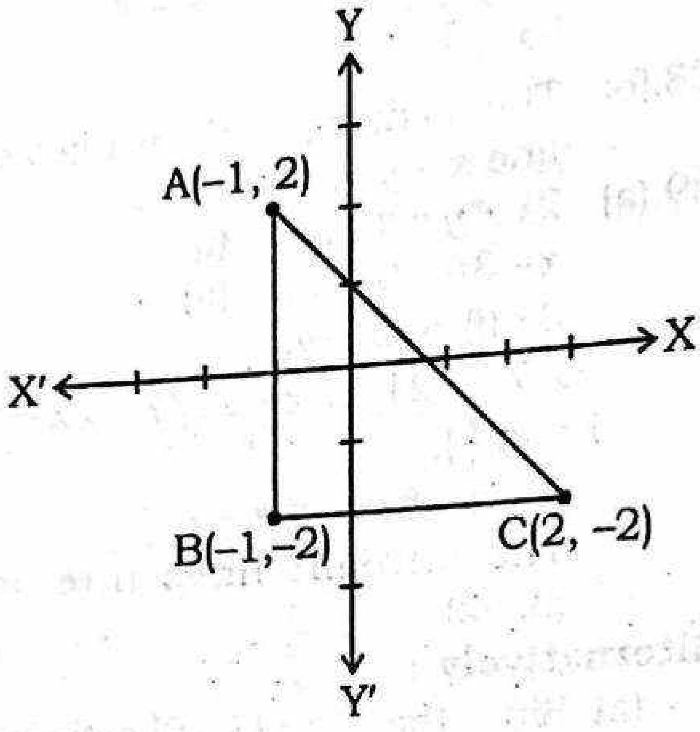
(a) Since the point (3, –2) satisfies both the equations. Put the values of x, y in the given equations. You get LHS = RHS

30.(c) $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has a unique solution if

$$\therefore \frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow \frac{k}{9} \neq \frac{1}{3} \Rightarrow k \neq 3$$

LEVEL - 2

1.(a)



Here, AB = 4, BC = 3

and AC $= \sqrt{(2+1)^2+(2+2)^2}$

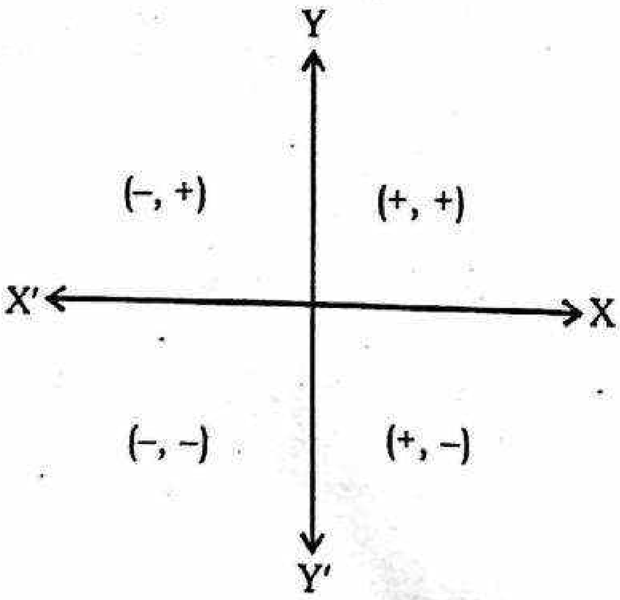
$= \sqrt{9+16}$

$= 5$

i.e. $AC^2 = AB^2 + BC^2$

hence, the figure represents right angled triangle.

2.(c)



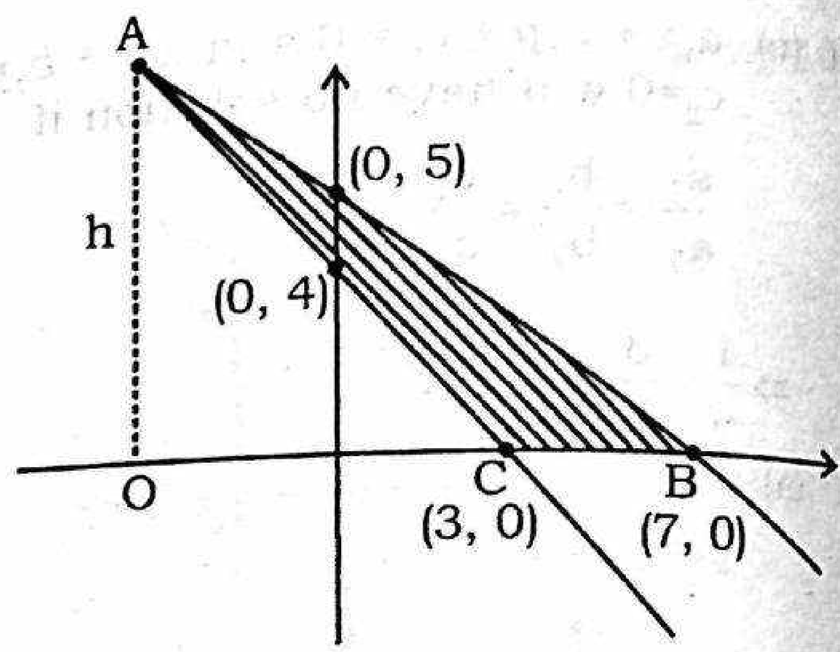
ab > 0

Hence, a and b are both positive or negative.

∴ If (a, b) lies in third quadrant, (–b, –a) will lie in first quadrant.

3.(a) $5x + 7y = 35$ or $\frac{x}{7}+\frac{y}{5}=1$.........(i)

and $4x + 3y = 12$ or $\frac{x}{3}+\frac{y}{4}=1$.........(ii)



∴ Base of Δ ABC = BC = 7 – 3 = 4 unit
let height (OA) = h

from(i) and (ii) we get $y = \frac{80}{13}$

∴ $ar(\Delta\, ABC) = \frac{1}{2}\times 4\times\frac{80}{13} = \frac{160}{13}$ sq.unit

4.(b) $3x - 6y = 12$ ....(i)
$3x - y = 3$ ....(ii)
(i) – (ii) we get, $-5y = 9$ or $y = -\frac{9}{5}$

⇒ Height of traingle $= \left|\frac{-9}{5}\right| = \frac{9}{5}$

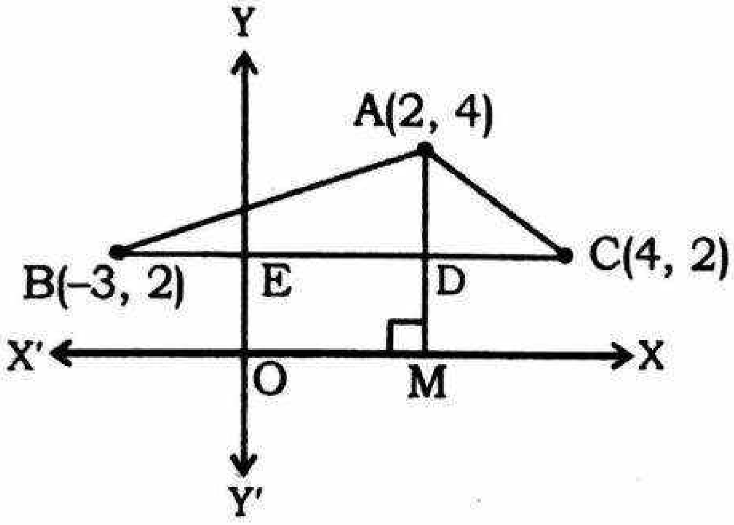
put $y = 0$ in (i), we get $x = 4$
i.e. point of intersection of (i) on x-axis = (4,0)
put $y = 0$ in (ii), we get $x = 1$
i.e. point of intersection of (ii) on x-axis = (1, 0)

∴ Base = 4 – 1 = 3

∴ Area $= \frac{1}{2}\times 3\times\frac{9}{5} = \frac{27}{10} = 2.7$sq.unit

5.(c) Consider any point in the shaded portion
let (3, –3)
i.e. $x = 3$, $y = -3 \Rightarrow -3 < 3$ i.e. $y < x$
& when $x = 3$, $y = 3 \Rightarrow 3 = 3$ i.e. $y = x$
$\therefore y \le x$

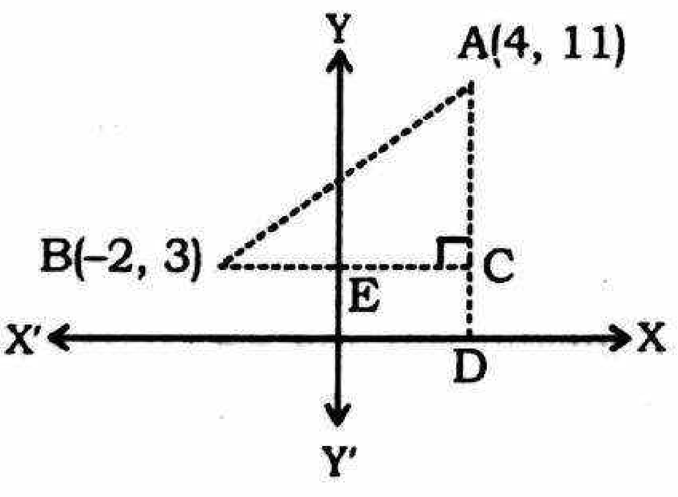
6.(a) Draw AM $\perp$ x-axis meeting BC at D.
Now, BC = BE + EC = 3 + 4 = 7 units



and AD = AM – DM = 4 – 2 = 2 units
$\therefore$ ar(Δ ABC)

$$= \frac{1}{2} \times BC \times AD = \frac{1}{2} \times 7 \times 2 = 7 \text{ sq.units}$$

7.(d)



AC = AD – CD = 11 – 3 = 8 & BC = BE + EC = 2 + 4 = 6

$$\therefore AB = \sqrt{8^2 + 6^2} = 10$$

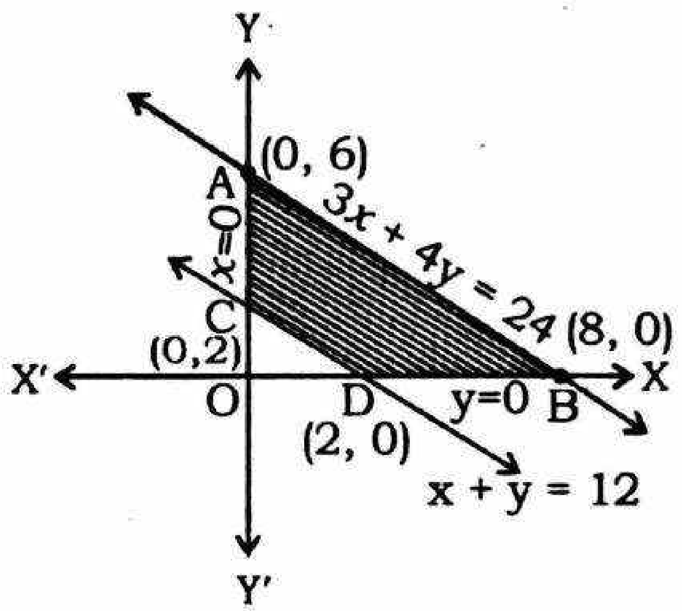
Alternatively ;
Required distance =

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

$$\therefore AB = \sqrt{(4+2)^2 + (11-3)^2} = \sqrt{6^2 + 8^2}$$

or $AB = \sqrt{100} = 10$

8.(c) $3x + 4y = 24$ or $\frac{x}{8} + \frac{y}{6} = 1$
i.e. it passes through (8, 0) and (0, 6)



Now, $x + y = 2$
put $x = 0$, $0 + y = 2$ or $y = 2$
again put $y = 0$, we get $x = 2$
i.e. it passes through (2, 0) & (0, 2)
$\therefore$ the required region is ABDC
Now, ar(ΔAOB)

$$= \frac{1}{2} \times OB \times OA = \frac{1}{2} \times 8 \times 6 = 24 \text{ sq.units}$$

and ar(Δ OCD)

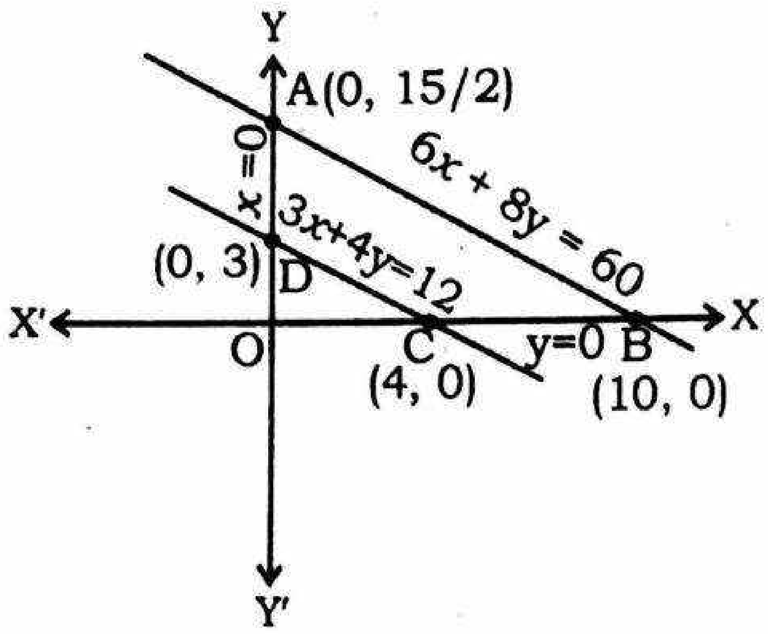
$$= \frac{1}{2} \times OD \times OC = \frac{1}{2} \times 2 \times 2 = 2 \text{ sq.units}$$

$\therefore$ ar (□ABDC) = 24 – 2 = 22 sq. units

9.(b) $3x + 4y = 12$ or $\frac{x}{4} + \frac{y}{3} = 1$
i.e. it passes through (4, 0) and (0, 3)
Similarly, $6x + 8y = 60$ or

$$\frac{x}{10} + \frac{y}{15/2} = 1$$

i.e. it passes through (10, 0) and (0, 15/2)



$\therefore$ the required region is ABCD

Now, $ar(\Delta\ OAB) = \frac{1}{2} \times 10 \times \frac{15}{2}$

$= 37.5$ sq.units

and $ar(\Delta\ ODC) = \frac{1}{2} \times 4 \times 3$

$= 6$ sq.units

$\therefore ar(\square ABCD) = 37.5 - 6$

$= 31.5$ units

10.(d) $x - y = 0$ or $x = y$

i.e. when $y = 3 \Rightarrow x = 3$

and $x + 2y = 0$

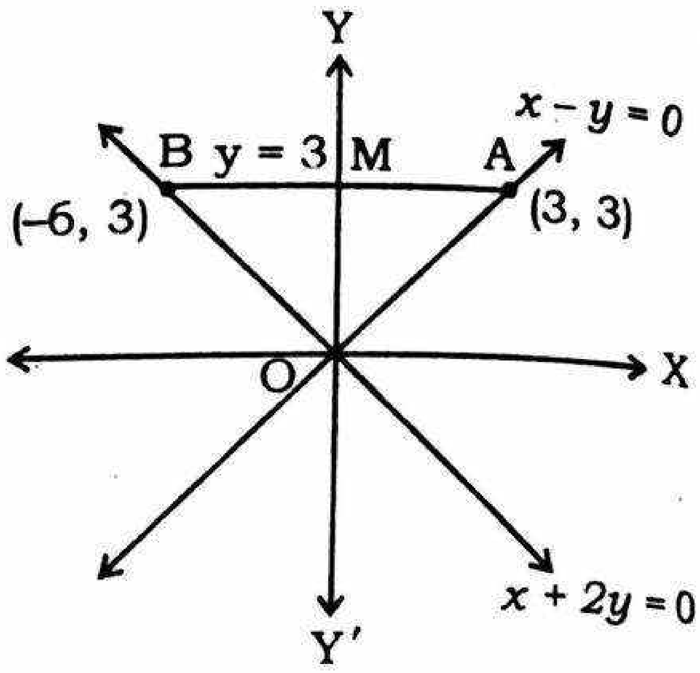
when $y = 3 \Rightarrow x = -6$

$\therefore$ the required region is a Δ OAB

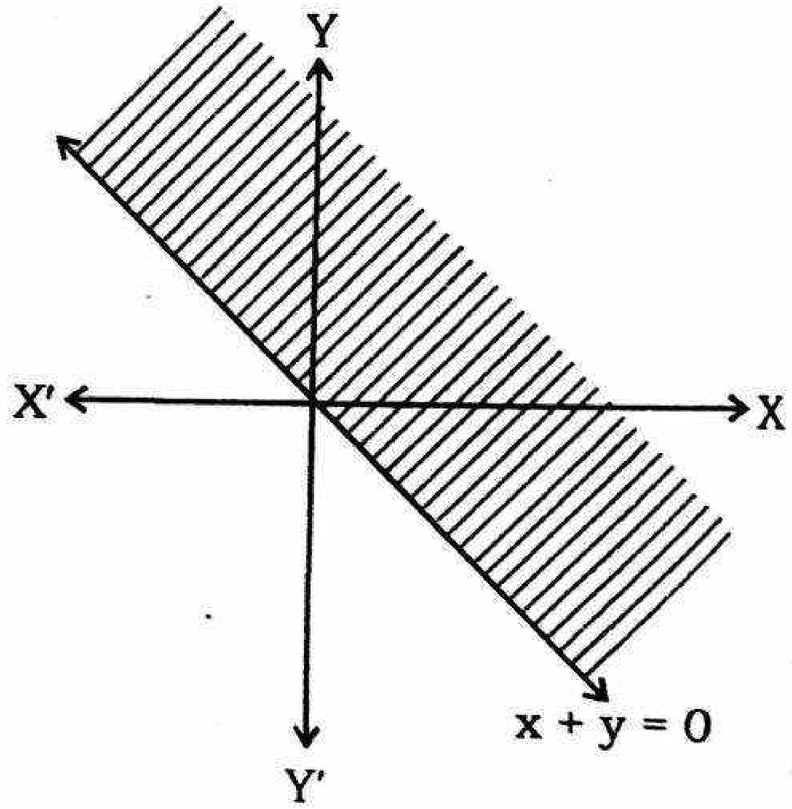
$\therefore ar(\Delta\ OAB) = \frac{1}{2} \times AB \times OM$

$= \frac{1}{2} \times 9 \times 3$

$= \frac{27}{2} = 13.5$ sq.units



11.(a)



Consider the line $x + y = 0$

when, $x = 0$, $y = 0$ and

when, $x = 1$, $y = -1$

Now join the points (0, 0) & (1, –1) to get a line $x + y = 0$

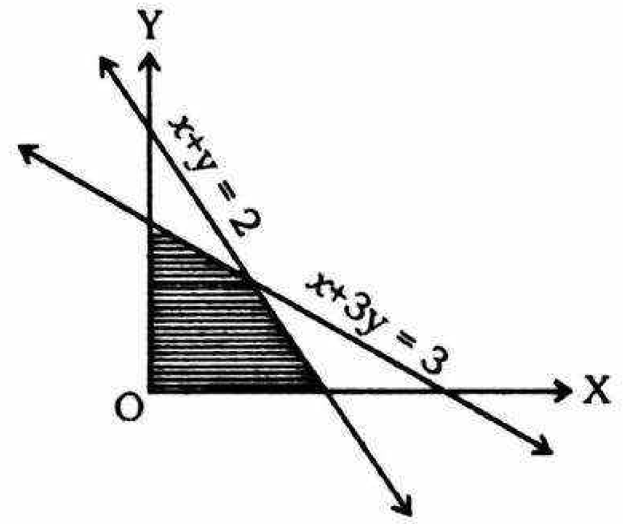
Now, consider any point (1, 1)

Clearly (1, 1) satisfies the inequality, $x + y \geq 0$

Shade the part of the plane containing (1, 1)

when $x \geq 0$, clearly, the first quadrant will be include as a whole.

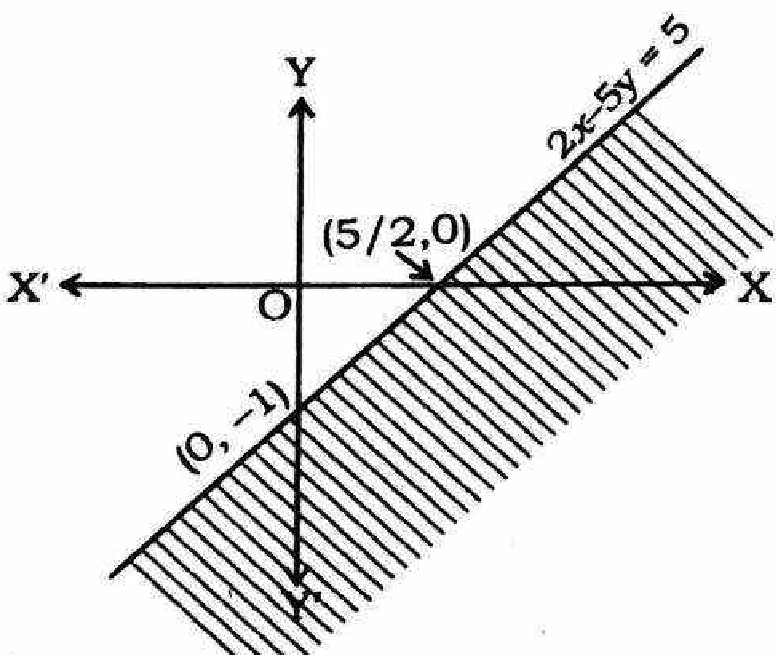
12.(d) Clearly (0, 0) satisfies $x + 3y \le 3$ and (0, 0) satisfies $x + y \le 2$



Clearly, shaded region is the portion common to the line $x + 3y = 3$ & below it and that of the line $x + y = 2$ and below it.
So shaded region is the solution set of (d)

13.(b) Clearly, the region is a rectangle bounded by the lines $x = 2$, $x = 5$, $y = -1$ & $y = 3$
Clearly, the length of rectangle = 5 − 2 = 3 units
and the breadth of rectangle = 3 − (−1) = 4 units
∴ Area of the rectangle = 3 × 4
= 12 sq.unit.

14.(c) $2x - 5y = 5$, or $\frac{x}{5/2} + \frac{y}{-1} = 1$



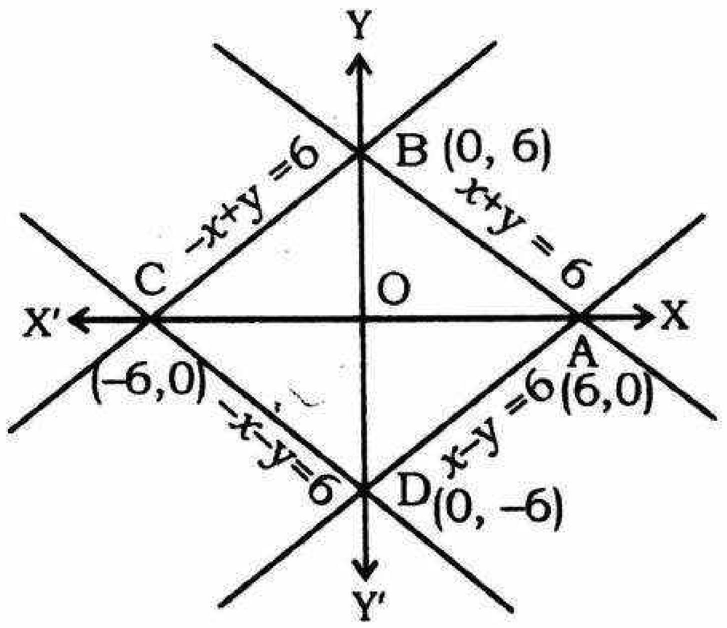
i.e. it passes through (5/2, 0) & (0, −1). Plot these points and join them with a thick line.
Clearly, (0, 0) does not satisfy $2x - 5y \ge 5$.
∴ Shade the portion of the plane not containing (0, 0)
So, required graph is on & below the line $2x - 5y = 5$

LEVEL - 3

1.(a) As we know, area bounded by $|x| + |y| = k$ is $2k^2$
∴ area bounded by $|x| + |y| = 6$ is 2×6^2 = 72 sq. units

Alternatively :

$|x| + |y| = 6$, this represents four lines -
$x + y = 6$, $x - y = 6$, $-x + y = 6$ and $-x - y = 6$



Hence, the required region is ABCD.

Now $ar(\Delta OAB) = \frac{1}{2} \times OA \times OB$

$= \frac{1}{2} \times 6 \times 6$

$= 18$

∴ $ar(\square ABCD) = 4 \times ar(\Delta OAB)$
$= 4 \times 18$
$= 72$ sq. units

2.(c) $y = |x| - 1$ represents two lines.

$y = x - 1$ ....(i)

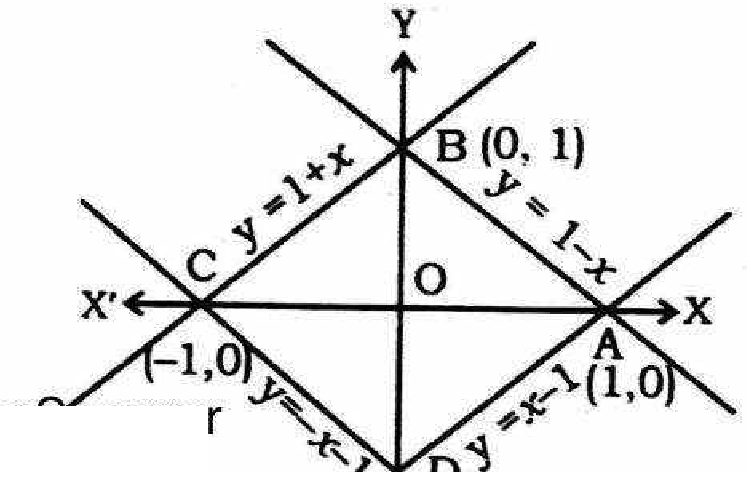
and $y = -x - 1$ ....(ii)

Similarly, $y = 1 - |x|$ represents two lines

$y = 1 - x$ ....(iii)

and $y = 1 + x$ ....(iv)

Now, draw the graph of (i), (ii), (iii) & (iv)



Answer-Key

LEVEL - 1

1. (d)	2. (b)	3. (a)
4. (b)	5. (c)	6. (a)
7. (c)	8. (d)	9. (b)
10. (c)	11. (a)	12. (b)
13. (b)	14. (a)	15. (c)
16. (a)	17. (d)	18. (b)
19. (a)	20. (c)	21. (b)
22. (d)	23. (b)	24. (b)
25. (d)	26. (c)	27. (a)
28. (b)	29. (a)	30. (c)

LEVEL - 2

1. (a)	2. (c)	3. (a)
4. (b)	5. (c)	6. (a)
7. (d)	8. (c)	9. (b)