Solution

LINEAR EQUATIONS

Class 10 - Mathematics

1. **(a)** unique solution

   Explanation:

   unique solution

2. **(c)** x = 2, y = 3

   Explanation:

   We have,

   $\frac{2x}{3} - \frac{y}{2} = -\frac{1}{6}$ …(i)

   $\frac{x}{2} + \frac{2y}{3} = 3$ …(ii)

   Now, multiplying (i) and (ii) by 6 we get:

   4x - 3y = - 1 …(iii)

   3x + 4y = 18 …(iv)

   Now, multiplying (iii) by 4 and (iv) by 3 and adding them we get:

   16x + 9x = - 4 + 54

   x = $\frac{50}{25}$ = 2

   Putting the value of x in (iv) we get:

   3 $\times$ 2 + 4y = 18

   y = $\frac{18-6}{4}$

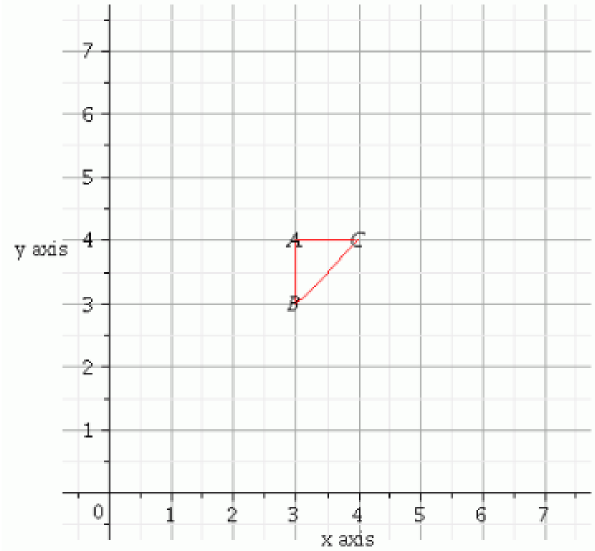
   y = 3

3. **(b)** 1/2 sq. unit

   Explanation:

   Given x = 3, y = 4 and x = y

   We have plotting points as (3,4), (3,3), (4,4) when x = y



   Therefore, area of $\triangle$ABC = $\frac{1}{2}$(Base $\times$ Height) = $\frac{1}{2}$ (AB $\times$ AC) = $\frac{1}{2}$ (1 $\times$ 1) = $\frac{1}{2}$

   Area of triangle ABC is $\frac{1}{2}$ square units.

4. **(a)** x - 2y = 0

   Explanation:

   According to question,

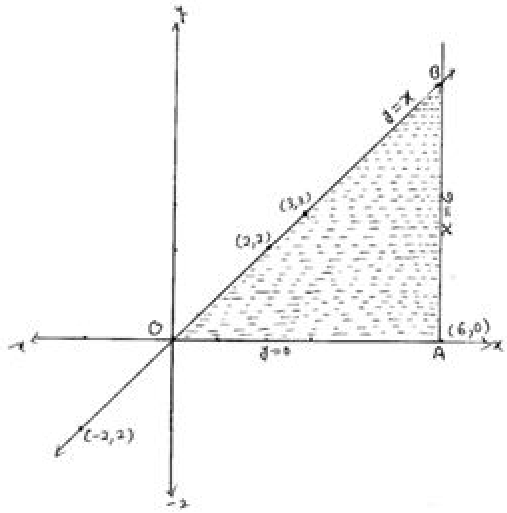
   2 x Cost of pen = Cost of notebook

$\Rightarrow$ 2y = x $\Rightarrow$ x - 2y = 0

5. **(a)** -25x + y = 700
   Explanation:
   Since, x litres is the extra quantity of milk and y be total expenditure on milk.
   $\therefore$ Required linear equation is,
   700 + 25x = y $\Rightarrow$ y - 25x = 700
   or -25x + y = 700

6. **(a)** 18 sq. units
   Explanation:
   The triangle formed by the lines y = x, x = 6 and y = 0 is shaded.
   The area of the shaded region, i.e., $x = y$
   We got a right-angled triangle with base 6 units and height 6 units
   Triangle OAB = $\frac{1}{2} \times$ OA $\times$ AB
   Hence the area of triangle = $\frac{1}{2} \times 6 \times 6$ = 18 sq.units

x	2	-2	3
y	2	-2	3



7. **(a)** is consistent with a unique solution
   Explanation:
   is consistent with a unique solution

8.
   (d) 87^o
   Explanation:
   Let x and y be the measures of $\angle$A and $\angle$B respectively.
   Now,$\angle$A +$\angle$B +$\angle$C = 18^o[By angle sum property]
   $\Rightarrow$x + y + 50^o = 180^o[Given,$\angle$C = 50^o]
   $\Rightarrow$x + y = 130^o ...(i)
   Also,$\angle$A -$\angle$B = $44^o$$\Rightarrow$x - y = 44^o ...(ii)
   Adding (i) and (ii), we get
   2x = $174^o$$\Rightarrow$x = $87^o$$\Rightarrow$$\angle$A = 87^o

9.
   (b) all real values except -6
   Explanation:
   For a unique intersecting point, we have $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
   $\therefore \frac{k}{3} \neq \frac{-2}{1} \Rightarrow k \neq -6$

10.

(b) y = (90° - x)

Explanation:

We have given, ∠A + ∠B = 90°

⇒ x + y = 90° ⇒ y = (90° - x)

11.

(b) parallel

Explanation:

We have,

6x - 2y + 9 = 0

And, 3x - y + 12 = 0

Here, a_1 = 6, b_1 = - 2 and c_1 = 9

a_2 = 3, b_2 = - 1 and c_2 = 12

$\frac{a1}{a2} = \frac{6}{3} = \frac{2}{1}, \frac{b1}{b2} = \frac{-2}{-1} = \frac{2}{1}$ and $\frac{c_1}{c_2} = \frac{9}{12} = \frac{3}{4}$

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

Hence, the given system has no solution and the lines are parallel.

12. **(a)** -15x + 9y = 5

Explanation:

For lines to be parallel

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

13.

(d) 2

Explanation:

The given system of equations is inconsistent,

3x + y = 1

(2k - 1)x + (k - 1)y = 2k + 1

If the system of equations is inconsistent, we have

$\frac{3}{2k-1} = \frac{1}{k-1} = \frac{1}{2k+1}$

Take,

$\frac{3}{2k-1} = \frac{1}{k-1}$

$\Rightarrow 3k - 3 = 2k - 1$

$\Rightarrow k = 2$

14.

(b) 25

Explanation:

25

15. **(a)** infinite number of solutions

Explanation:

When L_1 & L_2 are co-incident,

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

⇒ infinite number solution.

16. **(a)** unique solution

Explanation:

2x + 3y - 7 = 0

6x + 5y - 11 = 0

By Comparing with $a_1x + b_1y + c = 0$ and $a_2x + b_2y + c = 0$,

Here, $a_1 = 2$, $b_1 = 3$, $c_1 = -7$, and $a_2 = 6$, $b_2 = 5$, $c_2 = -11$

$\frac{a_1}{a_2} = \frac{2}{6} = \frac{1}{3}$

$\frac{b_1}{b_2} = \frac{3}{5}$

Since $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

Therefore, the system of equations has a unique solution.

17.

(c) 5 and 15

Explanation:

Let the two numbers be x and y

ATQ $\frac{x}{y} = \frac{1}{3}$

$\Rightarrow 3x = y$ ...(i)

Now again

If 5 is added to both numbers then no. becomes x + 5 and y + 5 respectively. AT 2nd Condition.

$\frac{x+5}{y+5} = \frac{1}{2}$.

$\Rightarrow 2(x + 5) = y + 5$

$\Rightarrow 2x + 10 = y + 5$

$\Rightarrow 2x - y + 10 - 5 = 0$

$\Rightarrow 2x - y + 5 = 0$

By Substitution Method

from. eq. (i) & (ii) we get

$2x - 3x + 5 = 0$.

$-x + 5 = 0$.

$x = 5$

put the value of x in eq. (i) we get

$y = 3x$

$= 3 \times 5$

$= 15$

$y = 15$

Hence the numbers are 5 and 15.

18.

(c) (5, 0)

Explanation:

If the graph of the linear equation $2x + 5y = 10$ meets the x-axis, then $y = 0$.

Substituting the value of $y = 0$ in equation $2x + 5y = 10$, we get

$2x + 5(0) = 10$

$\Rightarrow 2x = 10$

$\Rightarrow x = \frac{10}{2}$

$\Rightarrow x = 5$

So, the point of meeting is (5, 0)

19.

(d) inconsistent

Explanation:

$\frac{3x}{2} + \frac{5y}{3} - 7 = 0$ and $9x + 10y - 14 = 0$

on comparing with standard equation we get

$a_1 = \frac{3}{2}$

$a_2 = 9$

$b_1 = \frac{5}{3}$

$b_2 = 10$

$c_1 = 7$

$c_2 = -14$

$\frac{a_1}{a_2} = \frac{\frac{3}{2}}{9}$
$\frac{a_1}{a_2} = \frac{1}{6}$
$\frac{b_1}{b_2} = \frac{\frac{5}{3}}{10}$
$\frac{b_1}{b_2} = \frac{1}{6}$
$\frac{c_1}{c_2} = \frac{-7}{-14}$
$\frac{c_1}{c_2} = \frac{1}{2}$
$\therefore \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
Hence, pair of linear equation are inconsistent.

20.

(c) 2

Explanation:

For infinite Solution
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
$\frac{3}{6} = \frac{-1}{-k} = \frac{8}{16}$
$\frac{3}{6} = \frac{-1}{-k}$
$k = \frac{-6}{-3} = 2$

k = 2

21.

(b) 3

Explanation:

Since, (-3,2) is the solution of 5x + 3/cy = 3. So (-3, 2) satisfies it.

$\therefore$ 5 x (-3) + 3

$\Rightarrow -15 + 6k = 3 \Rightarrow k = \frac{18}{6} = 3$

22.

(d) (– 6, 0) and (4, 0)

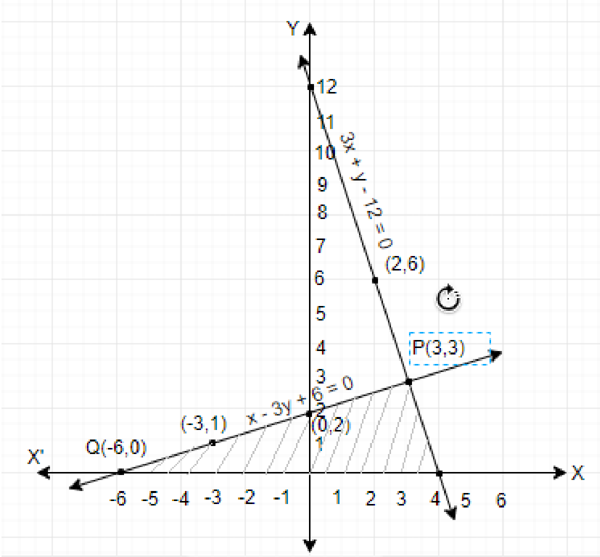
Explanation:

Here are the two solutions of each of the given equations. $3x + y - 12 = 0$,

x	4	3	2
y	0	3	6

$x - 3y + 6 = 0$

x	-6	0	-3
y	0	2	1



The triangle $\triangle$PQR is formed by the given two lines and x-axis. Therefore, both lines intersect the x-axis at (–6, 0) and at (4, 0).

23.

(c) 10

Explanation:

For a system of equations $a_1x + b_1y + c_1 = 0$; $a_2x + b_2y + c_2 = 0$ to have no solution, the condition to be satisfied is

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

$\Rightarrow \frac{1}{5} = \frac{2}{k} \neq \frac{-3}{7}$

$\therefore$ For k = 10, the given system of equation is inconsistent.

24.

(d) $\frac{33}{2}$

Explanation:

We have, 36x + 24y = 702

and 24x + 36y = 558

Simplifying above equations, we get

6x + 4y = 117 ...(i)

and 4x + 6y = 93 ...(ii)

Multiplying (i) by 3, (ii) by -2 and then adding, we get

18x + 12y - 8x - 12y = 351 -186

$\Rightarrow$10x = 165$\Rightarrow$x = $\frac{165}{10} = \frac{33}{2}$

$3x - 5y = 4$

$9x - 2y = 7$

$9x - 15y = 12$

25. $9x - 2y = 7$ ...(1)

$\quad - \quad + \quad -$

$-13y = 5 \Rightarrow y = \frac{-5}{13}$

From (1), x = $\frac{9}{13}$ $\therefore$ solution is $\left(\frac{9}{13}, \frac{-5}{13}\right)$

26. Given equation 3x + 4y - 8 = 0

Lines are parallel when $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\therefore$ One of the linear equation in two variables can be $6x + 8y + k = 0$ where k is constant not equal to -16.

27. n = 1

28. 2x + y = 13 ...(i)

4x - y = 17 ...(ii)

Solving (i) and (ii)
x = 5 & y = 3
x - y = 2

29. Let a number of humans be x and deer be y.
then, $x+y=39$ ....(i)
and $2x+4y=132$
$x+2y=66$ .....(ii)
On solving (i) and (ii), we get
$-y=-27$
$\Rightarrow$ y = 27, x = 12

30. $12x+17y=53$ ....(i)
and $17x+12y=63$ .....(ii)
Adding (i) and (ii), we get
$29x+29y=116$
$\Rightarrow$ x + y = 4

31. For unique solution $\frac{1}{3} \neq \frac{2}{\mathrm{k}}$
$\Rightarrow$ k $\neq$ 6

32. Given pair of equations,
x + 3y = 6, 2x - 3y = 12
Since $\frac{a_1}{a_2}=\frac{1}{2}$ and $\frac{b_1}{b_2}=\frac{3}{-3}$ = -1,
$\frac{c_1}{c_2}=\frac{-6}{-12}$ = $\frac{1}{2}$
$\therefore \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
$\therefore$ System is consistent.

33. $a_1=5,\ b_1=-8,\ c_1=1$ and $a_2=3,\ b_2=\ \frac{-24}{5}, c_2=\ \frac{3}{5}$
$\frac{a_1}{a_2}$ = $\frac{5}{3}$ ...(i)
$\frac{b_1}{b_2}$ =$\frac{-8}{-24/5}$ = $\frac{5}{3}$ ...(ii)
and $\frac{c_1}{c_2}$ = $\frac{1}{3/5}$ = $\frac{5}{3}$ ...(iii)
Form (i), (ii) and (iii)
$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$
$\therefore$The pair of equations has infinitely many solutions.

34. Yes, the point (x,0) lies on x-axis because the coordinate of any point on x-axis is zero.

35. In given figure, ABCD is a rectangle. Here we have to find out the values of x and y.
From given fig., x + y = 22 .. .(i)
and x - y = 16 ....(ii)
Adding (i) and (ii), we get
(x + y) + (x - y) = 22 + 16
x + y + x - y = 38
2x = 38
$\therefore$ x = 19
Substituting the value of x in equation (i), we get
19 + y = 22
y = 22 -19
$\therefore$ y = 3
Hence, x = 19 and y = 3

36. Let the fixed charges be ₹ x and the other charges be ₹ y per km.
As per given condition,
If a person travels 60 km, he pays ₹ 960
Then, x + 60y = 960 .... (i)
And for travelling 80 km, he pays ₹ 1260.
Then, x + 80y = 1260. .... (ii)
On subtracting (i) from (ii), we get

$20y = 300$
$\Rightarrow y = \frac{300}{20}$
$\Rightarrow$y = 15
Putting y = 15 in (i), we get
x + 60y = 960
x + (60 $\times$ 15) = 960
$\Rightarrow$ x = 960 - 900
$\Rightarrow$ x = 60.
Therefore, fixed charges = ₹ 60 and the rate per km = ₹ 15 per km.

37. Given pair of equations is
x -2y = 6 …(i)
and 3x-6y = 0 …(ii)
On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we get
Here, a_1 = 1, b_1 = - 2, c_1 = - 6;
And a_2 = 3, b_2 = - 6, c_2 = 0;
a_1 /a_2 = 1/3
b_1 /b_2 = - 2/ - 6 = 1/3
here $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ (parallel lines).
Hence, the lines represented by the given equations are parallel. Therefore, it has no solution. So, the given pair of lines is inconsistent.

38. Given, 2 x -y = 2 ..(i)
x + 3y = 15 ..(ii)
From eqn. (i), we get y = 2x - 2 ... (iii)
Substituting the value of y in eqn. (ii),
x + 3y = 15
x + 3(2x - 2) = 15
x + 6x - 6 = 15
7x = 15 + 6
or, 7x = 21
$\therefore$ x = 3
Substituting this value of x in (iii), we get
y = 2x - 2
y = 2 $\times$ 3 - 2
y = 6 - 2
y = 4
Hence the value of x and y of given equations are 3 and 4 respectively.

39. The Condition for no solution is : $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ (parallel lines)
Yes.
Given pair of equations are,
2x+4y - 3 = 0 and 6x + 12y - 6 = 0
Comparing with $a_1x + b_1y + c_1 = 0$; $a_2x + b_2y + c_2 = 0$
We get, a_1 = 2, b_1 = 4, c_1 = - 3;
And a_2 = 6, b_2 = 12, c_2 = - 6;
a_1 /a_2 = 2/6 = 1/3
b_1 /b_2 = 4/12 = 1/3
c_1 /c_2 = - 3/ - 6 = 1/2
Here, $a_1/a_2 = b_1/b_2 \neq c_1/c_2$, i.e., parallel lines
Hence, the given pair of linear equations has no solution.

40. **Step 1:** By substitution method, we pick either of the equations and write one variable in terms of the other.
7x – 15y = 2 ...(1)
and x + 2y = 3 ...(2)

Let us consider the Equation (2):
x + 2y = 3
and write it as x = 3 – 2y ...(3)
Step 2: Now substitute the value of x in Equation (1)
We get 7(3 – 2y) – 15y = 2
i.e., 21 – 14y – 15y = 2
i.e., – 29y = –19
Therefore y $= \frac{19}{29}$
Step 3: Substituting this value of y in Equation (3), we get
x $= 3 - 2\left(\frac{19}{29}\right) = \frac{49}{29}$
Therefore, the solution is x = $\frac{49}{29}$, y $= \frac{19}{29}$

41. Suppose the number of stamps of 20p each be x and
the number of stamps of 25p each be y.
According to the question,
$x + y = 47$ ....(i)
$20x + 25y = 1000$ ...(Since ₹10 = ₹1000 p)
$\Rightarrow 4x + 5y = 200$ .....(ii)
Multiplying (i) by 4,
$\Rightarrow 4x + 4y = 188$ ....(iii)
Subtracting (iii) from (ii),
$\Rightarrow y = 12$
Substituting $y = 12$ in (i), we get x = 35
Hence, the number of stamps of 20p are 35 and the number of stamps of 25 p are 12.
42. The given system of equations is:
$3x - 5y = -1$ ....(i)
$x - y = -1$ ....(ii)
From (ii), we get
$y = x + 1$
Substituting, $y = x + 1$ in (i), we get
$3x - 5(x + 1) = -1$
$\Rightarrow -2x - 5 = -1$
$\Rightarrow x = -2$
Putting x = -2 in y = x + 1 we get y = -1.
Hence, the solution of the given system of equations is x = -2 and y = -1.
43. Inconsistent
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
$\frac{1/a}{b} = \frac{1/b}{a} \neq \frac{c}{4ab}$
i.e., $\frac{1}{ab} = \frac{1}{ab} \neq \frac{c}{4ab}$
or $c \neq 4$
44. No
Condition for coincident lines is given by:
$a_1/a_2 = b_1/b_2 = c_1/c_2$;
Given pair of linear equations is
$3x + \frac{1}{7}y = 3$ and 7x + 3y = 7
Comparing with standard form, we get:
$a_1 = 3$, $b_1 = 1/7$, $c_1 = -3$;
And $a_2 = 7$, $b_2 = 3$, $c_2 = -7$;
$a_1/a_2 = 3/7$
$b_1/b_2 = 1/21$
$c_1/c_2 = -3/-7 = 3/7$

Here, $a_1/a_2 \neq b_1/b_2$.

Hence, the given pair of linear equations has a unique solution.

45. Let the cost price of one chair be ₹x and that of one table be ₹y.

Profit on a chair = 25%

$\therefore$ Selling price of one chair $= x + \frac{25}{100}x = \frac{125}{100}x$

Profit on a table = 10%

$\therefore$ Selling price of one table $= y + \frac{10y}{100} = \frac{110}{100}y$

According to the given condition, we have

$\frac{125}{100}x + \frac{110}{100}y = 1520 \Rightarrow 125x + 110y = 152000 \Rightarrow 25x + 22y = 30400$ ....(i)

If profit on a chair is 10% and on a table is 25%, then total selling price is ₹1535.

$\therefore \left(x + \frac{10}{100}x\right) + \left(y + \frac{25}{100}y\right) = 1535$

$\Rightarrow \quad \frac{110}{100}x + \frac{125}{100}y = 1535$

$\Rightarrow 110x + 125y = 153500$

$\Rightarrow 22x + 25y = 30700$ ....(ii)

Subtracting equation (ii) from equation (i), we get

$3x - 3y = -300 \Rightarrow$ x - y = -100 ....(iii)

Adding equation (ii) and (i), we get

47x + 47y = 61100 $\Rightarrow$ x + y = 1300 ....(iv)

Solving equations (iii) and (iv), we get

x = 600 and y = 700

Hence, the cost price of a chair is ₹600 and that of a table is ₹700

46. Let the stake money of first and second cock-owners be Rs x and Rs y respectively. Then,

$y - \frac{2}{3}x = 12$

$\Rightarrow$ 3y - 2x = 36

$\Rightarrow$ -2x + 3y = 36..................(i)

And, $x - \frac{3}{4}y = 12$

$\Rightarrow$ 4x - 3y = 48 ....(ii)

Multiplying equation (i) by 2, we get

- 4x + 6y = 72 ....(iii)

Adding equations (ii) and (iii), we get

4x - 3y - 4x + 6y = 48 + 72

-3y + 6y = 120

$\Rightarrow$ 3y = 120

$\Rightarrow y = \frac{120}{3} = 40$

Putting y = 40 in equation (ii), we get

4x- 3 $\times$ 40 = 48

$\Rightarrow$ 4x - 120 = 48

$\Rightarrow$ 4x = 48 + 120

$\Rightarrow$ 4x = 168

$\Rightarrow x = \frac{168}{4} = 42$

Hence, the stake of money of I^{st} cock-owner = 42 gold coins and, the stake of money of II^{nd} cock-owner = 40 gold coins.

47. According to question the given system of equations are

$\frac{x}{10} + \frac{y}{5} - 1 = 0$

$\Rightarrow \frac{x+2y-10}{10} = 0$

$\Rightarrow$ x + 2y = 10 ....(i)

And, $\frac{x}{8} + \frac{y}{6} = 15$

$\Rightarrow \frac{3x+4y}{24} = 15$

$\Rightarrow$ 3x + 4y = 360 ....(ii)

Multiplying equation (i) by 3, we get

3x + 6y = 30 ....(iii)

Subtracting equation (iii) from (ii), we get

3x + 4y - 3x - 6y = 360 - 30

-2y = 330

$\Rightarrow$ y = -165

Substitute the value of y = -165 in (i), we get

x + 2(-165) = 10

$\Rightarrow$ x - 330 = 10

$\Rightarrow$ x = 340

Now it is given that $y = \lambda x + 5$

$\Rightarrow -165 = \lambda \times 340 + 5$

$\Rightarrow 340\lambda = -170$

$\Rightarrow \lambda = \frac{-170}{340} = -\frac{1}{2}$

Hence, x = 340, y = -165 and $\lambda = -\frac{1}{2}$.

48. Let the cost of each bat and each ball be Rs.x and Rs. y respectively. Then, according to the equation, The pair of linear equations formed is

7x + 6y = 3800 .... (1)

3x + 5y = 1750 ...... (2)

From equation (2), 5y = 1750 - 3x

$y = \frac{1750-3x}{5}$ .... (3)

Substitute this value of y in equation (1), we get

$7x + 6\left(\frac{1750-3x}{5}\right) = 3800$

$\Rightarrow \quad 35x + 10500 - 18x = 19000$

$\Rightarrow \quad 17x + 10500 = 19000$

$\Rightarrow \quad 17x = 19000 - 10500$

$\Rightarrow \quad 17x = 8500$

$\Rightarrow \quad x = \frac{8500}{17} = 500$

Substituting this value of x in equation (3), we get

$y = \frac{1750-3(500)}{5} = \frac{1750-1500}{5} = \frac{250}{5} = 50$

Hence, the cost of each bat and each ball is Rs.500 and Rs.50 respectively.

Verification,

Substituting x = 500 and y = 50, we find that both the equations (1) and (2) are satisfied as shown below:

$7x + 6y = 7(500) + 6(50)$

$= 3500 + 300 = 3800$

$3x + 5y = 3(500) + 5(50)$

$= 1500 + 250 = 1750$. This verifies the solution.

49. The solution of pair of linear equations:

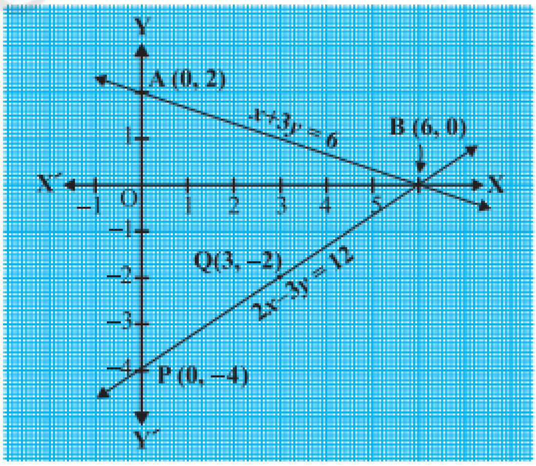
x + 3y = 6 and 2x – 3y = 12

x	0	6
$y = \frac{6-x}{3}$	2	0

and

x	0	3
$y = \frac{2x-12}{3}$	-4	-2

Plot the points A(0, 2), B(6, 0), P(0, – 4) and Q(3, – 2) on graph paper, and join the points to form the lines AB and PQ



We observe that there is a point B (6, 0) common to both the lines AB and PQ. So, the solution of the pair of linear equations is x = 6 and y = 0, i.e., the given pair of equations is consistent.

50. The given system of equations is

3x - 7y + 10 = 0 ....(i)

y - 2x - 3 = 0 .... (ii)

From (ii), we get

y - 2x - 3 = 0

or y = 2x + 3

Substituting y = 2x + 3 in (i), we get

⇒ 3x - 7(2x + 3) + 10 = 0

⇒ 3x - 14x - 21 + 10 = 0

⇒ -11x - 11 = 0

⇒ -11x = 11

$\Rightarrow x = \frac{11}{-11} = -1$

Putting x = -1 in (ii), we get

y - 2 × (-1) - 3 = 0

⇒ y +2 - 3 = 0

⇒ y - 1 = 0

⇒ y = 1

Hence, the solution of the given system of equations is x = -1, y = 1.

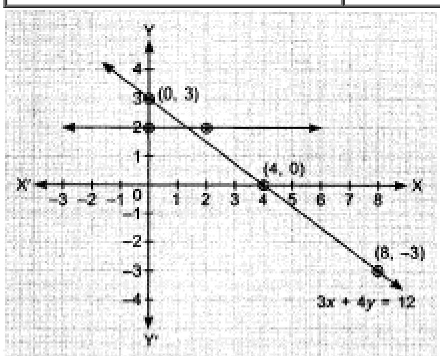
51. Given equations are $3x + 4y = 12$ and $y = 2$

Solution table for $3x + 4y = 12$ is

x	0	4	8
y	3	0	-3

Table for $y = 2$ is

x	0	1	2
y	2	2	2



∵ Lines intersect at one point $\left(\frac{4}{3}, 2\right)$

⇒ Pair of linear equations has a unique solution.

52. The given equations are

3x + 2y = 14

y = $\frac{14-3x}{2}$

when x = 0 , then y = 7

when x = 4, then y = 1

when x = 2 , then y = 4

Table for 3x + 2y = 14

x	0	4	2
y	7	1	4

And x - 4y = - 7

x = 4y -7

When y = 0 , then x = -7

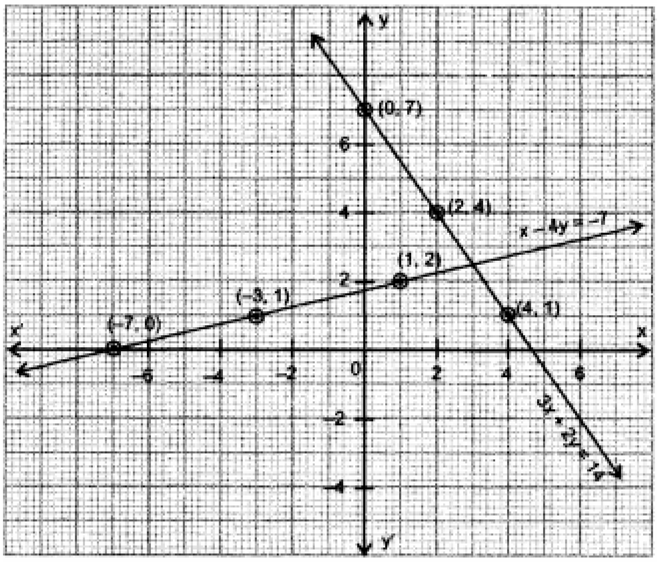
when y = 1, then x = -3

when y = 2, then x = 1

Table for x - 4y = - 7

x	-7	-3	1
y	0	1	2

Represent 3x + 2y = 14 and x - 4y = - 7 on graph paper.



The solution of given lines is x = 3, y = 2.5.

53. When y = x

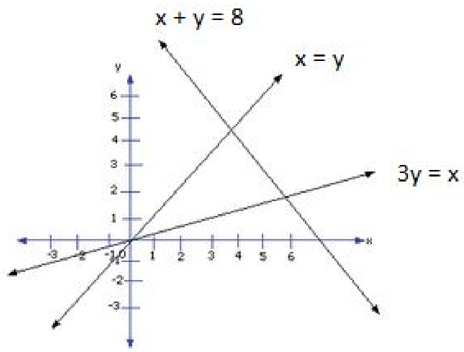
x	1	2
y	1	2

When 3y = x,

x	6	3
y	2	1

when x + y = 8 or y = 8 - x

x	4	5
y	4	3



Clearly, x = y and 3y = x, intersect at (0, 0)
x = y and x + y = 8, intersect at (4, 4)
and x + y = 8 and 3y = x, intersect at (6, 6)

54. The given equations are

$6x + 5y = 7x + 3y + 1 = 2(x + 6y - 1)$

Therefore,we have

$6x + 5y = 2(x + 6y - 1)$

$6x + 5y = 2x + 12y - 2$

$6x - 2x + 5y - 12y = -2$

$4x - 7y = -2$ ......(i)

Also,

$7x + 3y + 1 = 2(x + 6y - 1)$

$7x + 3y + 1 = 2x + 12y - 2$

$7x - 2x + 3y - 12y = -2 - 1$

$5x - 9y = -3$ ....(ii)

Multiplying (i) by 9 and (ii) by 7, we get

$36x - 63y = -18$ ......(iii)

$35x - 63y = -21$ .....(iv)

Subtracting (iii) and (iv),we get

$x = 3$

Substituting x = 3 in (i),we get

$\Rightarrow 4 \times 3 - 7y = -2$

$\Rightarrow -7y = -2 - 12$

$\Rightarrow -7y = -14$

$\Rightarrow$y = 2

$\therefore$ Solution is x = 3, y = 2

55. Let the numerator and the denominator be x & y respectively. Hence, the fraction is $\frac{x}{y}$.

Now, according to the question, we have

$\frac{x-2}{y+3} = \frac{1}{4}$

$\Rightarrow 4(x - 2) = y + 3$

$\Rightarrow 4x - 8 = y + 3$

$\Rightarrow 4x - y = 3 + 8$

$\Rightarrow 4x - y = 11 \ldots (i)$

Also according to the question, $\frac{x+6}{3y} = \frac{2}{3}$

$\Rightarrow \frac{3(x+6)}{3y} = 2$

$\Rightarrow x + 6 = 2y$

$\Rightarrow x - 2y = -6$ ...(ii)

Multiplying equation (i) by 2 & then subtracting equation (ii) from it, we get

$\Rightarrow$ 8x - x = 22 + 6

$\Rightarrow$ 7x = 28

$\Rightarrow x = \frac{28}{7} = 4$

Putting x = 4 in equation (ii), we get

$\Rightarrow$4 - 2y = -6

⇒ -2y = -6 - 4

⇒ -2y = -10

⇒ $y = \frac{-10}{-2} = 5$

Hence, the fraction is $\frac{4}{5}$.

56. Graph of $3x - y = 2$:

We have, $3x - y = 2 \Rightarrow y = 3x - 2$

When x = 2, we have

y = 3 × 2 - 2 = 4

When x = 1, we have

y = 3 × 1 - 2 = 1

x	2	1
y	4	1

Plotting the points $A(2,4)\ and\ B(1,1)$ on the graph paper and drawing a line passing through A and B, we obtain the graph of $3x - y = 2$ as shown in Fig.

Graph of $9x - 3y = 6$:

We have, $9x - 3y = 6$

⇒ $y = 9x - 6$

⇒ $y = \frac{9x-6}{3}$

When, x = 0, We have

$y = \frac{9\times0-6}{3} = -2$

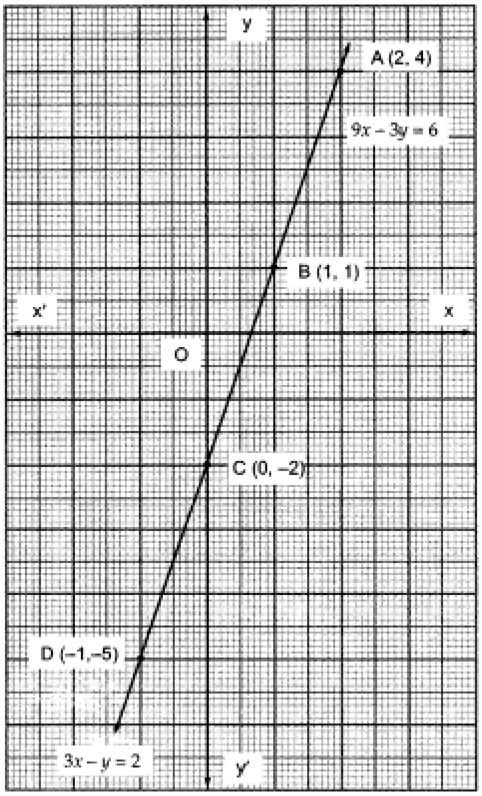
When x = -1, we have

$y = \frac{9\times-1-6}{3} = -5$

x	0	-1
y	-2	-5

Plotting the points $C(0,-2) and D(-1,-5)$ on the graph paper and drawing a line passing through these two points on the same graph paper we obtain the graph of

$9x - 3y = 6$. We find the C and D both lie on the graph of $3x - y = 2$. Thus, the graphs of the two equations are coincident. Hence, the system of equations has infinitely many solutions.



57. Given equations, 2x - 3y +13= 0 and 3x - 2y + 12 = 0.

Now, $2x - 3y + 13 = 0$

$\Rightarrow y = \frac{13+2x}{3}$

When x=1 then, y=5

When x=4 then, y=7

Thus, we have the following table giving points on the line 2x - 3y +13= 0.

x	1	4
y	5	7

Now, $3x - 2y + 12 = 0$

$\Rightarrow y = \frac{12+3x}{2}$

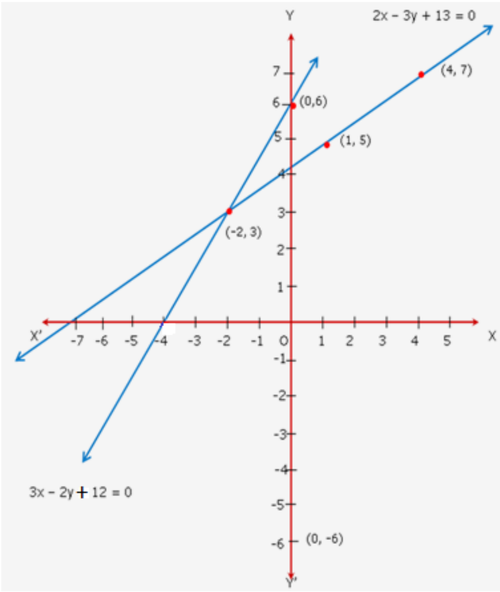
When x=0 then, y=6

When x=-2 then, y=3

Thus, we have the following table giving points on the line 3x - 2y + 12 = 0.

x	0	-2
y	6	3

Graph:



Since, the two graphs intersect at $(-2, 3)$.

Hence, $x = -2$ *and* $y = 3$.

58. Let the actual speed of the train be x km/hr and the actual time taken be y hours. Then,

Distance covered = (xy) km ... (i) [∵ Distance = Speed × Time]

If the speed is increased by 6 km/hr, then time of journey is reduced by 4 hours i.e., when speed is (x + 6) km/hr, time of journey is (y - 4) hours.

∴ Distance covered = (x + 6) (y - 4)

⇒ xy = (x + 6) (y - 4) [Using (i)]

⇒ -4x + 6y - 24 = 0

⇒ -2.x + 3y - 12 = 0 ... (ii)

When the speed is reduced by 6 km/hr, then the time of journey is increased by 6 hours i.e., when speed is (x - 6) km/hr, time of journey is (y + 6) hours.

∴ Distance covered = (x - 6) (y + 6)

⇒ xy = (x - 6) (y + 6) [Using (i)]

⇒ 6x - 6y - 36 = 0

⇒ x - y - 6 = 0 ... (iii)

Thus, we obtain the following system of equations:

- 2x + 3y - 12 = 0

x-y- 6 = 0

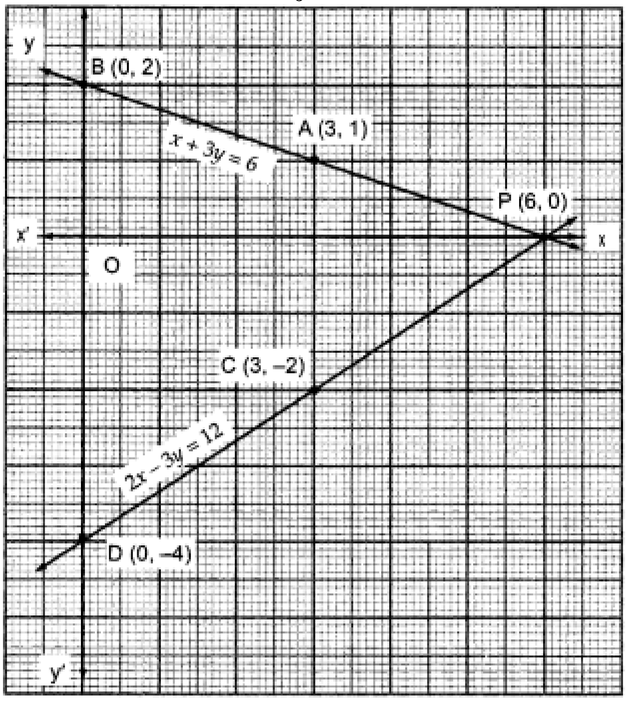
By using cross-multiplication, we have,

$\frac{x}{3\times-6-(-1)\times-12}=\frac{-y}{-2\times-6-1\times-12}=\frac{1}{-2\times-1-1\times3}$
$\Rightarrow \frac{x}{-30}=\frac{-y}{24}=\frac{1}{-1}$
⇒ x = 30 and y = 24.
Putting the values of x and y in equation (i), we obtain
Distance = (30 × 24) km = 720 km.
Hence, the length of the journey is 720 km.

59. Graph of the equation $x+3y=6$:
We have, $x+3y=6 \Rightarrow x=6-3y$
When y = 1, we have x = 6 - 3 =3
When y = 2, we have x = 6 - 6 = 0
Thus, we have the following table:

x	3	0
y	1	2

Plotting the points $A(3,1)$ *and* $B(0,2)$ and drawing a line joining them, we get the graph of the equation x + 3y = 6 as shown in Fig.
Graph of the equation $2x-3y=12$:
We have, $2x-3y=12 \Rightarrow y=\frac{2x-12}{3}$
When x=3, we have $y=\frac{2\times3-12}{3}=-2$



When x=0, we have $y=\frac{0-12}{3}=-4$

x	3	0
y	-2	-4

Plotting the points $C(3,-2)$ *and* $D(0,-4)$ on the same graph paper and drawing a line joining them, we obtain the graph of the equation $2x-3y=12$ as shown in Fig.
Clearly, two lines intersect at P(6, 0).
Hence, $x=6, y=0$ is the solution of the given system of equations.
Putting x = 6, y = 0 in $a=4x+3y$, we get
a = (4 × 6) + (3 × 0) = 24

60. The given systems of equations is
$x+2y=\frac{3}{2}$ ...(i)
$2x+y=\frac{3}{2}$ ...(ii)
Multiplying (i) by 1 and (ii) by 2, we get
$x+2y=\frac{3}{2}$ ...(iii)

4x + 2y = 3 ...(iv)

Subtracting (iii) from (iv), we get

$4x - x + 2y - 2y = 3 - \frac{3}{2}$

$\Rightarrow 3x = \frac{6-3}{2}$

$\Rightarrow 3x = \frac{3}{2}$

$\Rightarrow x = \frac{3}{2\times 3}$

$\Rightarrow x = \frac{1}{2}$

Putting $x = \frac{1}{2}$, in equation (iv),we get

$4 \times \frac{1}{2} + 2y = 3$

2 + 2y = 3

2y = 3 - 2

$\Rightarrow y = \frac{1}{2}$

Hence, Solution of the given of equation is $x = \frac{1}{2}, y = \frac{1}{2}$.

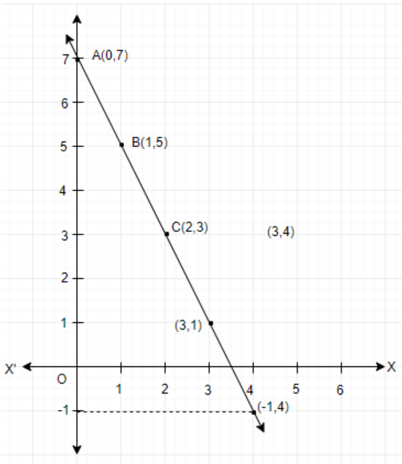
61. 2x + y = 7

⇒ y = 7 - 2x

x	0	1	2
y	7	5	3

(Steps)

i. Given equation.
ii. Write y in term s of x.
iii. Complete the table.
iv. Plot the points A(0, 7), B(1, 5) and C(2, 3) on the graph paper.
v. Join the points.
vi. Draw a horizontal line at y = -1. It intersects the line at x = 4.



vii. Draw a vertical line at x = -1.

In intersects the line AC at y = 9.

i. The point (3, 4) does not lie on the graph of the equation
ii. The point (3, 1) lies on the graph.
Hence, x = 3, y = 1 is a solution of the equation.
iii. When y = -1, x = 4
iv. When x = -1, y = 9.

62. Suppose the digits at units and tens place of the given number be x and y respectively.

$\therefore$ the number is $10y + x$.

The number is 4 more than 6 times the sum of the two digits.

$\therefore 10y + x = 6(x + y) + 4$

$\Rightarrow 10y + x = 6x + 6y + 4$

$\Rightarrow 6x + 6y - 10y - x = -4$

$\Rightarrow 5x - 4y = -4$ ....(i)

After interchanging the digits, the number becomes $10x + y$.

If 18 is subtracted from the number, the digits are reversed. Thus, we have
$(10y + x) - 18 = 10x + y$
$\Rightarrow 10x + y - 10y - x = -18$
$\Rightarrow 9x - 9y = -18$
$\Rightarrow 9(x - y) = -18$
$\Rightarrow x - y = \frac{-18}{9}$
$\Rightarrow x - y = -2$ ....(ii)
So, we have the systems of equations
$5x - 4y = -4,$
$x - y = -2$
Here x and y are unknowns. We have to solve the above systems of equations for x and y.
Multiplying the second equation by 5 and then subtracting from the first, we have
(5x - 4y) - (5x - 5y) = -4 - (-2 × 5)
$\Rightarrow 5x - 4y - 5x + 5y = -4 + 10$
$\Rightarrow y = 6$
Substituting the value of y in the second equation, we have
x - 6 = -2
⇒ x = 6 - 2
⇒ x = 4
Hence, the number is 10 $\times$ 6 + 4 = 64

63. Let the number of ₹ 50 notes and ₹ 100 notes be x and y respectively.
According to given condition,
Meena got 25 notes in all.
⇒ x + y = 25 ....(i)
and Meena withdraw ₹ 2000.
⇒ 50x + 100y = 2000 ....(ii)
Multiplying equation (i) by 50, we obtain:
50x + 50y = 1250 .... (iii)
Subtracting equation (iii) from equation (ii), we obtain:
(50x + 100y) - (50x + 50y) = 2000 - 1250
50x + 100y - 50x - 50y = 750
50y = 750
y = 15
Substituting the value of y in equation (i), we obtain:
x = 10
Hence, Meena received 10 notes of ₹ 50 and 15 notes of ₹ 100.

64. Suppose she inverted x in Scheme A and y in Scheme B. Then,
$\frac{8x}{100} + \frac{9y}{100} = 1860$ and $\frac{8y}{100} + \frac{9x}{100} = 1880$
⇒ 8x + 9Y = 186000 and 9x + 8y = 188000
Adding and subtracting these two equations, we obtain
17(x + y) = 374000 and -x + y = 2000
⇒ x + y = 22000 ....(i)
and -x + y = 2000 ....(ii)
On multiplying Eq. (i) by 9 and Eq. (ii) by 8 and then subtracting them, we get
17y = 1000 [(9 $\times$ 186) - (8 $\times$ 188)]
= 1000 (1674 - 1504) = 1000 $\times$ 170
17y = 170000 ⇒ y = 10000
On putting the value of y in Eq. (i), we get
8x + 9 $\times$ 10000 = 186000
8x = 186000 - 90000
8x = 96000
x = 12000
So, the money invested in scheme A = ₹ 12,000 and in scheme B = ₹ 10,000