CBSE Test Paper 04

Chapter 3 Pair of Linear Equation

1. The area of the triangle formed by y = x, x = 6 and y = 0 is **(1)**
   a. 18 sq. units
   b. 72 sq. units
   c. 36 sq. units
   d. 9 sq. units
2. The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has a unique solution if **(1)**
   a. $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
   b. $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
   c. None of these
   d. $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
3. The difference between two numbers is 26 and one number is three times the other. The numbers are **(1)**
   a. 39 and 13
   b. 30 and 10
   c. 36 and 12
   d. 36 and 10
4. If 2x – 3y = 11 and (a + b)x – (a + b – 3)y = 4a + b has infinite number of solutions, then **(1)**
   a. a = – 9 and b = 3
   b. a = – 9 and b = – 3
   c. a = 9 and b = 3
   d. a = 9 and b = – 3
5. A system of two linear equations in two variables is dependent consistent, if their graphs **(1)**

a. do not intersect at any point
b. cut the x – axis
c. intersect only at a point
d. coincide

6. Find the value of k so that the following system of equations has no solution:
$3x - y - 5 = 0, 6x - 2y + k = 0$ **(1)**

7. For what value of a the following pair of linear equation has infinitely many solution? **(1)**
$ax - 3y = 1$
$-12x + ay = 2$

8. For what value of k, the following pair of linear equations has infinitely many solutions? **(1)**
$10x + 5y - (k - 5) = 0$
$20x + 10y - k = 0$

9. The equation $ax^n + by^n + c = 0$ represents a straight line if **(1)**

10. Find whether the pair of linear equations $y = 0$ and $y = -5$ has no solution, unique solution or infinitely many solutions **(1)**

11. A and B each have a certain number of mangoes. A says to B, "if you give 30 of your mangoes, I will have twice as many as left with you." B replies, "if you give me 10, I will have thrice as many as left with you." How many mangoes does each have? **(2)**

12. Meena went to a bank to withdraw Rs.2000. She asked the cashier to give her Rs.50 and Rs.100 notes only. Meena got 25 notes in all. Find how many notes of Rs.50 and Rs.100 she received. **(2)**

13. Solve the system of equations: $x - 2y = 0, 3x + 4y = 20$. **(2)**

14. The ages of two friends Ani and Biju differ by 3 years. Ani's father Dharam is twice as old as Ani and Biju is twice as old as his sister Cathy. The ages of Cathy and Dharam differ by 30 year. Find the ages of Ani and Biju. **(3)**

15. Find the value of k for which the system of equations x + 2y = 5 ,3x + ky -15 = 0 has no solution. **(3)**

16. Solve for x and y: $\frac{2}{x}$ $\frac{3}{y} = 13, \frac{5}{x} - \frac{4}{y} = -2+$ **(3)**

17. Represent the following pair of equations graphically and write the coordinates of points where the lines intersect y-axis

x + 3y = 6

2x - 3y =12 **(3)**

18. The sum of the numerator and denominator of a fraction is 3 less than twice the denominator. If the numerator and the denominator both are decreased by 1, the numerator becomes half the denominator. Determine the fraction. **(4)**

19. Solve the following system of equations: **(4)**

x - y + z = 4

x - 2y - 2z = 9

2x + y + 3z = 1

20. Solve the following system of equations graphically:

x - 2y = 5

3x - 6y = 15 (**4)**

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Solution

1. 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., $x = y$

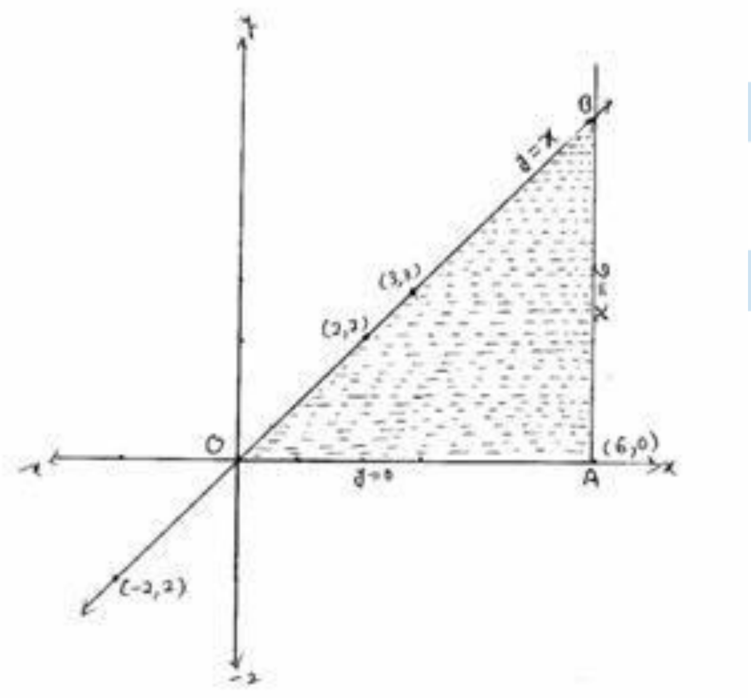
We got a right-angled triangle with base 6 units and height 6 units

Triangle OAB = $\frac{1}{2} \times$ OA $\times$ AB

Hence area of triangle =(1/2) $\times$ 6 $\times$ 6 = 18 sq units

= $\frac{1}{2} \times 6 \times 6$ = 18 sq.units

x	2	-2	3
y	2	-2	3



2. a. $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

Explanation: The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has a unique solution if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

3. a. 39 and 13

Explanation: Let the two numbers be x and y.

According to question, $x - y = 26$ and $x = 3y$

Putting the value of x in $x - y = 26$, we get $3y - y = 26 \Rightarrow y = 13$ And $x = 3 \times 13 = 39$ Therefore, the two numbers are 13 and 39.

4. a. a = -9 and b = 3

Explanation: Given:

$a_1 = 2, a_2 = (a + b), b_1 = -3, b_2 = -(a + b - 3), c_1 = 11$ and $c_2 = 4a + b$

Since the pair of given linear equations has infinitely many solutions,

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

$\Rightarrow \frac{2}{a+b} = \frac{-3}{-(a+b-3)} = \frac{11}{4a+b}$

Taking $\frac{2}{a+b} = \frac{-3}{-(a+b-3)} \Rightarrow 2(a + b - 3) = 3(a + b)$

$\Rightarrow 2a + 2b - 6 = 3a + 3b$

$\Rightarrow a + b = -6$ ....(i)

Taking $\frac{2}{a+b} = \frac{11}{4a+b} \Rightarrow 2(4a + b) = 11(a + b)$

$\Rightarrow 8a + 2b = 11a + 11b \Rightarrow a + 3b = 0$ ....(ii)

Subtracting eq. (ii) from eq. (i), we get

$-2b = -6 \Rightarrow b = 3$

Putting the value of b in eq. (i), we get

$a + 3 = -6 \Rightarrow a = -9$

5. d. coincide

Explanation: A system of two linear equations in two variables is dependent consistent, if their graphs coincide with each other i.e. they superimpose each other and all points in one line are also solution for the other line.

6. Given system of equations is ,3x - y - 5 = 0 and 6x - 2y + k = 0

Here $a_1 = 3$, $b_1 = -1$, $c_1 = -5$ and $a_2 = 6$, $b_2 = -2$, $c_2 = k$

For no solution $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\Longrightarrow \frac{3}{6} = \frac{1}{2} \neq \frac{-5}{k}$

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

$\Longrightarrow k \neq -10$

7. For infinitely many solutions,

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow \frac{a}{-12} = \frac{-3}{a} = \frac{1}{2}$

$\Rightarrow \frac{a}{-12} = \frac{-3}{a}$ and $\frac{-3}{a} = \frac{1}{2}$

$\Rightarrow a^2 = 36\ and\ a = -6$

$\Rightarrow a = \pm 6\ and\ a = -6$

For $a = -6$, pair of given linear equations has infinitely many solutions.

8. The system of linear equations

has infinite number of solutions if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$10x + 5y - (k-5) = 0$ and $20x + 10y - k = 0$

$\frac{a_1}{a_2} = \frac{10}{20} = \frac{1}{2}$

$\frac{b_1}{b_2} = \frac{5}{10} = \frac{1}{2}$

$\frac{c_1}{c_2} = \frac{-(k-5)}{-k} = \frac{k-5}{k}$

The system has infinite number of solutions,

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

$\Rightarrow k = 2k - 10$

$\Rightarrow k = 10$

9. n = 1

10. Since, given variable y has different values so, The pair of equations $y = 0$ and $y = -5$ has no solution.

Both the lines $y = 0$ and $y = -5$ are parallel to x-axis. Hence they do not have solution.

11. Assume A has x mangoes and B has y mangoes.

As per given condition if B gives 30 then A will have twice as many as left by B.

(x + 30) = 2(y - 30)

⇒x + 30 = 2y - 60

⇒ x = 2y - 90 ....(1)

And if A gives 10 mangoes to B, then B will have thrice as many as left by A.

3(x - 10) = (y + 10)

⇒ 3x = y + 40.....(2)

⇒ 3(2y - 90) = y + 40 (using x from Eq. 1)

⇒ 6y - 270 = y + 40

$\Rightarrow$ 6y - y = 310

$\Rightarrow$ y = 62

Put y = 62 in (1)

So, x = 124 - 90 = 34

Therefore A has 34 mangoes and B has 62 mangoes.

12. Let the number of Rs. 50 notes and Rs. 100 notes be x and y respectively.

According to given condition,

Meena got 25 notes in all.

$\Rightarrow$ x + y = 25 ....(i)

and Meena withdraw Rs.2000.

$\Rightarrow$ 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 Rs. 50 and 15 notes of Rs. 100.

13. The given equations are

x - 2y = 0 ....(i)

3x + 4y = 20 ....(ii)

Multiply (i) by 2, we get

2x - 4y = 0 ....(iii)

Add (ii) and (iii), we get

5x = 20

$\Rightarrow$ x = 4

Put x = 4 in (i), we get

4 - 2y = 0

$\Rightarrow$ 2y = 4

$\Rightarrow$y = 2

So, x = 4 and y = 2 is the solution of given equations.

14. Let the ages of Ani and Biju be x yr. and y yr, respectively.

According to the given condition,

$x - y = \pm 3$ ..(i)

Also, age of Ani's father Dharam = 2x years

And age of Biju's sister = $\frac{y}{2}$ years

According to the given condition,

$2x - \frac{y}{2} = 30$

or, $4x - y = 60$ .....(ii)

Case I : When $x - y = 3$ ......(iii)

On subtracting eqn. (iii) from eqn. (ii),

$3x = 57$

$\therefore x = 19$years

On putting $x = 19$ in eqn. (iii),

$19 - y = 3$

$\therefore$y = 16 years

Case II : When $x - y = -3$...(iv)

On subtracting eqn. (iv) from eqn. (ii),

$3x = 60 + 3$

$3x = 63$

$\therefore x = 21$ years

On putting $x = 21$ in eqn. (iv), we get

$21 - y = -3$

$\therefore y = 24$ years

Hence, Ani's age = 19 years or 21 years.

Biju age = 16 years or 24 years

15. The given system of equations is

$x + 2y - 5 = 0$ ...(i)

$3x + ky - 15 = 0$. ... (ii)

These equations are of the form

$a_1 x + b_1 y + c_1 = 0,\ a_2 x + b_2 y + c_2 = 0,$

where $a_1 = 1,\ b_1 = 2,\ c_1 = -5\ and\ a_2 = 3,\ b_2 = k,\ c_2 = -15$

$\therefore \quad \frac{a_1}{a_2} = \frac{1}{3}, \frac{b_1}{b_2} = \frac{2}{k}$ and $\frac{c_1}{c_2} = \frac{-5}{-15} = \frac{1}{3}$

Let the given system of equations have no solution.

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

$\Rightarrow \quad \frac{1}{3} = \frac{2}{k} \neq \frac{1}{3}$

$\Rightarrow \frac{1}{3} = \frac{2}{k}$ and $\frac{2}{k} \neq \frac{1}{3}$

$\Rightarrow \quad k = 6$ and $k \neq 6$, which is impossible.

Hence, there is no value of k for which the given system of equations has no solution.

16. Putting $\frac{1}{x}$ = u and $\frac{1}{y}$ = v, the given equations become

$2u + 3v = 13$ .... (i)

$5u - 4v = -2$ ....(ii)

Multiplying (i) by 4 and (ii) by 3 and adding the results, we get

$8u + 15u = 52 - 6$

$\Rightarrow 23u = 46$

$\Rightarrow \quad u = \frac{46}{23} = 2$

Putting u = 2 in (i), we get

$(2 \times 2) + 3v = 13 \Rightarrow 3v = 13 - 4 = 9 \Rightarrow v = 3.$

Now, u = 2 $\Rightarrow \frac{1}{x} = 2 \Rightarrow 2x = 1 \Rightarrow x = \frac{1}{2}$

And, v = 3 $\Rightarrow \frac{1}{y} = 3 \Rightarrow 3y = 1 \Rightarrow y = \frac{1}{3}$

Hence, $x = \frac{1}{2}$ and $y = \frac{1}{3}$

17. The given systems of equations are:

$x + 3y = 6\ and\ 2x - 3y = 12$

Now, $x + 3y = 6$

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

Table for equation $x + 3y = 6$

x	0	3
y	2	1

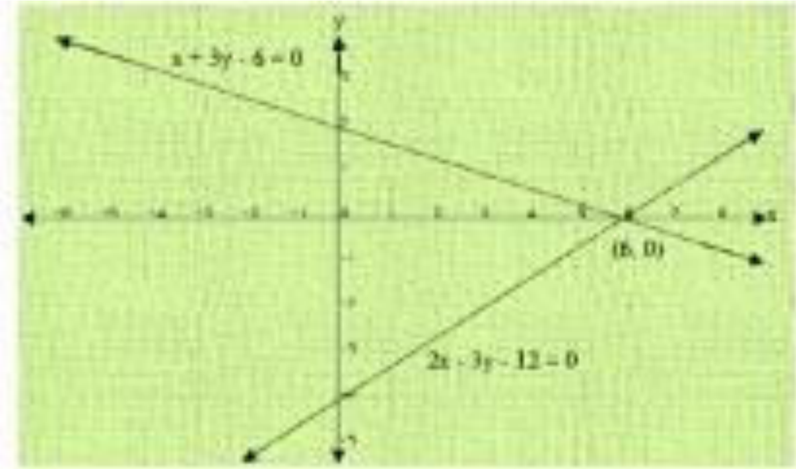
Now, $2x - 3y = 12$

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

Table for equation $2x - 3y = 12$

x	**0**	**6**
y	-4	0

Graph of the given system of equations are :



Clearly the two lines meet y-axis at B(0, 2) and C(0, -4) respectively.

Hence the required coordinates are (0,2) and (0, -4)

18. Let the numerator and the denominator of the fraction be x and y respectively.

Then the fraction is $\frac{x}{y}$.

Given, The sum of the numerator and the denominator of the fraction is 3 less than the twice of the denominator.

Thus, we have

$x + y = 2y - 3$

$\Rightarrow x + y - 2y + 3 = 0$

$\Rightarrow x - y + 3 = 0$..............(1)

Also given, If the numerator and the denominator both are decreased by 1, the numerator becomes half the denominator. Thus, we have

$x - 1 = \frac{1}{2}(y - 1)$

$\Rightarrow 2(x - 1) = (y - 1)$

$\Rightarrow$ 2x - 2 = (y - 1)

$\Rightarrow$ 2x - y - 1 = 0.........................(2)

So, we have formed two linear equations in x & y as following:-

x - y + 3 = 0

2x - y - 1 = 0

Here x and y are unknowns.

We have to solve the above equations for x and y.

By using cross-multiplication method , we have

$$\frac{x}{(-1)\times(-1)-(-1)\times 3} = \frac{-y}{1\times(-1)-2\times 3} = \frac{1}{1\times(-1)-2\times(-1)}$$

$$\Rightarrow \frac{x}{1+3} = \frac{-y}{-1-6} = \frac{1}{-1+2}$$

$$\Rightarrow \frac{x}{4} = \frac{-y}{-7} = \frac{1}{1}$$

$$\Rightarrow \frac{x}{4} = \frac{y}{7} = 1$$

Using Part I & III , we get x = 4

& From part II & III, we get y = 7

$\Rightarrow$ x = 4, y = 7

Hence, The fraction is $\frac{x}{y}$ = $\frac{4}{7}$

19. We have,

$x - y + z = 4$ ...(i)

$x - 2y - 2z = 9$ ...(ii)

$2x + y + 3z = 1$ ...(iii)

From equation (i), we get

$z = 4 - x + y$

$\Rightarrow z = -x + y + 4$

Substituting the value of z in equation (ii),

$\therefore x - 2y - 2(-x + y + 4) = 9$

$\Rightarrow x - 2y + 2x - 2y - 8 = 9$

$\Rightarrow 3x - 4y = 9 + 8$

$\Rightarrow 3x - 4y = 17$ ...(iv)

Substituting the value of z in equation (iii), we get

$2x + y + 3(-x + y + 4) = 1$

$\Rightarrow 2x + y - 3x + 3y + 12 = 1$

$\Rightarrow -x + 4y = 1 - 12$

$\Rightarrow -x + 4y = -11$ ...(v)

Adding equations (iv) and (v), we get

$3x - x - 4y + 4y = 17 - 11$

$\Rightarrow 2x = 6$

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

Putting x = 3 in equation (iv), we get

3 × 3 - 4y = 17

⇒ 9 - 4y = 17

⇒ -4y = 17 - 9

⇒ -4y = 8

$\Rightarrow y = \frac{8}{-4} = -2$

Putting x = 3 and y = -2 in z = -x + y + 4, we get

z = -3 - 2 + 4

⇒ z = -5 + 4

⇒ z = -1

Hence, solution of the giving system of equation is x = 3, y = -2, z = -1.

20. Given equations, $x - 2y = 5 \; and \; 3x - 6y =$
$15 \quad x - \quad =$ Now, $2y \quad 5$

$\Rightarrow x = 2y + 5$

When y = - 1 then, x = 3

When y = 0 then, x = 5

Thus, we have the following table giving points on the line $x - 2y = 5$

x	3	5
y	-1	0

Now, $3x - 6y = 15$

$\Rightarrow x = \frac{15+6y}{3}$

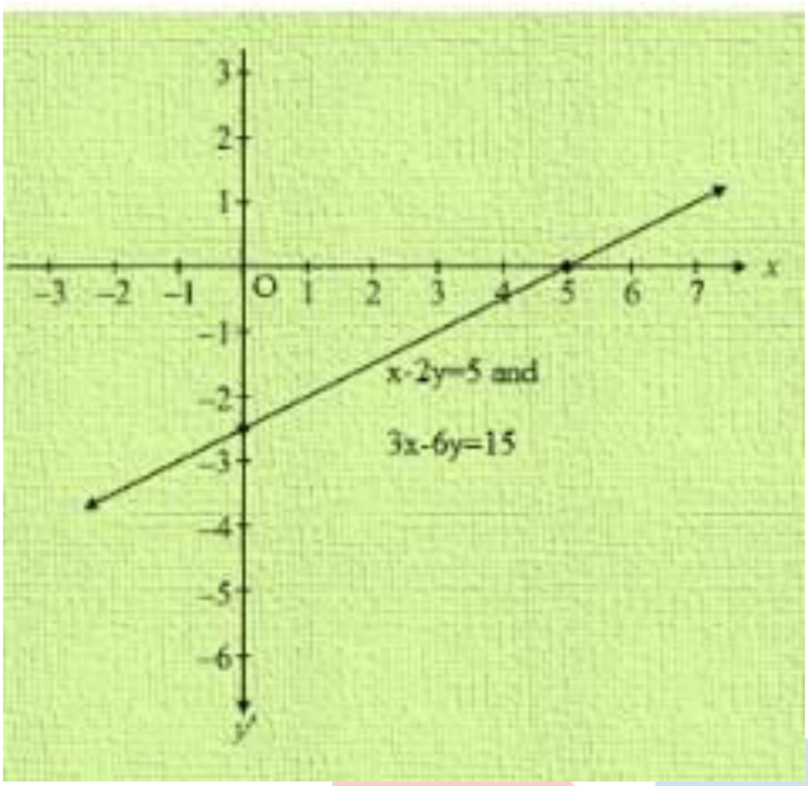
When y = 0, then x = 5

When y = -1, then x = 3

Thus, we have the following table giving points on the line $3x - 6y = 15$

x	5	3
y	0	-1

Graph:



Hence, Given equations have infinitely many solutions.