Pair of Linear Equations in Two Variables

Quick Revision

Two linear equations in the same two variables, say x and y, are called pair of linear equations (or system of pair equations) in two variables.

The general form of pair of linear equations in two variables x and y is

$$a_1 x + b_1 y + c_1 = 0$$

and $$a_2 x + b_2 y + c_2 = 0,$$

where a_1, b_1, c_1 and a_2, b_2, c_2 are all real numbers and $a_1^2 + b_1^2 \neq 0,\ a_2^2 + b_2^2 \neq 0.$

Solution of a Pair of Linear Equations in Two Variables

Any pair of values of x and y which satisfies both the equations, $a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$, is called a solution of a given pair of linear equations.

Solution of a Pair of Linear Equations by Graphical Method

Let us consider a pair of linear equations in two variables, $a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$.

To find the solution graphically, there are three cases arise

***Case* I** When the graph of system of linear equations will represent two intersecting lines, then coordinates of point of intersection say (a, b) is the solution of the pair of linear equations. This is called **consistent** pair of linear equations.

***Case* II** When the graph of system of linear equations will represent two parallel lines, then there is no point of intersection and consequently there is no pair of values of x and y which satisfy both equations. Thus, given system of equations have **no solution.** This is called **inconsistent** pair of linear equations.

***Case* III** When the graph of system of linear equations will represent coincident or overlapping lines, there are infinitely many common points. Thus, the given system of equations have **infinitely many solutions**.

Such pair of linear equations is called **dependent pair** of linear equations and it is always **consistent**.

Nature of Lines and Consistency

The nature of lines and consistency corresponding to linear equations $a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$, is shown in the table given below

Compare the ratios	Graphical representation	Algebraic interpretation	Consistency
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting lines	Exactly one solution (unique)	System is consistent
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Coincident lines	Infinitely many solutions	System is consistent (dependent)
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Parallel lines	No solution	System is inconsistent

Algebraic Methods for Solving a Pair of Linear Equations

There are three methods for solving a pair of linear equations

1. Substitution Method

In this method, value of one variable can be found out in terms of other variable from one of the given equation and this value is substituted in other equation, then we get an equation in one variable, which can be solved easily.

2. Elimination Method

In this method, one variable out of the two variables is eliminated by making the coefficients of that variable equal in both the equations.

After eliminating that variable, the left equation is an equation in another variable, which can be solved easily.

Value of one variable obtained in this way can be substituted in any one of the two equations to find the value of other variable.

Equations Reducible to a Pair of Linear Equations

Sometimes, equations are not linear but they can be reduced to a pair of linear equations by making some suitable substitutions.

(i) If the given equations involve $\frac{1}{x}$ and $\frac{1}{y}$, then put $\frac{1}{x} = p$ and $\frac{1}{y} = q$ to convert into linear form.

(ii) If the given equations involve $\frac{1}{x \pm a}$ and $\frac{1}{y \pm b}$, then put $\frac{1}{x \pm a} = p$ and $\frac{1}{y \pm b} = q$ to convert into linear form.

(iii) If the given equations involve $\frac{1}{x+y}$ and $\frac{1}{x-y}$, then put $\frac{1}{x+y} = p$ and $\frac{1}{x-y} = q$ to convert into linear form.

Some Important Points

(i) Suppose present age of one person as x years and of the other as y years. Then, 'a' years ago, age of 1st person was $(x-a)$ years and 2nd person was $(y-a)$ years. After 'b' years, age of 1st person will be $(x+b)$ years and 2nd person will be $(y+b)$ years.

(ii) Suppose the fare of a full ticket may be taken as ₹ x and the reservation charges may be taken as ₹ y, so that 1 full fare = ₹ $(x+y)$ and 1 half fare = ₹ $\left(\frac{x}{2} + y\right)$.

(iii) Two digit number $= 10x + y$, where x and y are respectively the ten and unit digit. On interchanging the position of digits, new number becomes $10y + x$.

(iv) Let the numerator of the fraction be x and denominator be y. Then, the fraction is x/y.

(v) $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

(vi) Let the speed of boat in still water be x km/h and speed of stream be y km/h. Then, the speed of boat downstream $= (x+y)$ km/h and speed of boat upstream $= (x-y)$ km/h.

(vii) If a person can do a piece of work in n days, then he will do $1/n$ of the work in one day and *vice-versa*.

(viii) (a) Sum of angles of a triangle is 180°.

(b) Opposite angles of a parallelogram are equal.

(c) In parallelogram, sum of adjacent angles is 180°.

(d) In cyclic quadrilateral, sum of opposite angles is 180°.

(e) Area of rectangle = Length × Breadth, Perimeter of rectangle = 2 (Length + Breadth)

Objective Questions

Multiple Choice Questions

1. The pair of equations $y = 0$ and $y = -7$ has *[NCERT Exemplar]*
(a) one solution
(b) two solutions
(c) infinitely many solutions
(d) no solution

2. The pair of equations $x = a$ and $y = b$ graphically represents lines which are *[NCERT Exemplar]*
(a) parallel
(b) intersecting at (b, a)
(c) coincident
(d) intersecting at (a, b)

3. Akhila went to a fair in her village. She wanted to enjoy rides on the giant wheel and play hoopla. If each ride costs ₹ 3 and a game of hoopla costs ₹ 4, then she spent ₹ 20. The linear equation to represent this condition is
(a) $3x+4y=27$ (b) $4x+3y=5$
(c) $3x+4y=20$ (d) None of these

4. A fraction becomes $\frac{4}{5}$, if 2 is added to both numerator and denominator, if however 4 is subtracted from both numerator and denominator, then the fraction becomes $\frac{1}{2}$. The algebraical representation of situation is
(a) $5x-4y+2=0, x-y=0$
(b) $5x-4y+2=0, 2x-y-4=0$
(c) $x+4y=0, y+2x=0$
(d) None of the above

5. Romila went to a stationary stall and purchased 2 pencils and 3 erasers for ₹9. Her friend Sonali saw the new variety of pencils and erasers with Romila, and she also bought 4 pencils and 6 erasers of the same kind for ₹18. The algebraic representation of situation is
(a) $2x+3y=9, 3x+5y=18$
(b) $2x+4y=8, 4x+6y=18$
(c) $2x+3y=9, 4x+6y=18$
(d) None of the above

6. $3x - y = 3, 9x - 3y = 9$ has infinite solution.
(a) True
(b) False
(c) Cannot say
(d) Partially true/false

7. The number of common solutions for the system of linear equations $5x + 4y + 6 = 0$ and $10x + 8y = 12$ is ....
(a) 0 (b) 1
(c) 2 (d) None of these

8. On comparing the ratios $a_1/a_2, b_1/b_2$ and c_1/c_2 and without drawing them, the pair of linear equation is
$3x - 5y + 8 = 0, 7x + 6y - 9 = 0$
(a) parallel
(b) intersecting
(c) coincident
(d) None of the above

9. If a pair of linear equations is consistent, then the lines will be *[NCERT Exemplar]*
(a) parallel
(b) always coincident
(c) intersecting or coincident
(d) always intersecting

10. If a pair of linear equations is given by $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ and $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$. In this case, the pair of linear equations is consistent.
(a) True
(b) False
(c) Cannot say
(d) Partially true/false

11. If the lines intersect at a point, then that point gives the unique solution of the two equations. In this case, the pair of equations is ....

(a) Consistent (b) Cannot say
(c) Inconsistent (d) None of these

12. If the lines are parallel, then the pair of equations has no solution. In this case, the pair of equations is ....

(a) Consistent (b) Inconsistent
(c) Cannot say (d) None of these

13. Which of the following pair of equations are inconsistent?

(a) $3x-y=9,\ x-\frac{y}{3}=3$
(b) $4x+3y=24,\ -2x+3y=6$
(c) $5x-y=10,\ 10x-2y=20$
(d) $-2x+y=3,\ -4x+2y=10$

14. The pair of linear equations are $4x-5y-12=0,\ 10y+20=8x$

(a) consistent (b) inconsistent
(c) can't say (d) None of these

15. A pair of linear equations which has a unique solution $x=2$ and $y=-3$ is *[NCERT Exemplar]*

(a) $x+y=1$ and $2x-3y=-5$
(b) $2x+5y=-11$ and $4x+10y=-22$
(c) $2x-y=1$ and $3x+2y=0$
(d) $x-4y-14=0$ and $5x-y-13=0$

16. The pair of equations $x+2y+5=0$ and $-3x-6y+1=0$ has

(a) a unique solution
(b) exactly two solutions
(c) infinitely many solutions
(d) no solution

17. One equation of a pair of dependent linear equations is $-5x+7y-2=0$. The second equation can be *[NCERT Exemplar]*

(a) $10x+14y+4=0$ (b) $-10x-14y+4=0$
(c) $-10x+14y+4=0$ (d) $10x-14y+4=0$

18. If the lines given by $2x+ky=1$ and $3x-5y=7$ has unique solution, then the value of k is

(a) $-10/3$
(b) $-5/3$
(c) $2/3$
(d) for all real value except $\frac{-10}{3}$

19. The value of k for which the system of linear equations $x+2y=3$, $5x+ky+7=0$ is inconsistent is *[CBSE 2020]*

(a) $-\frac{14}{3}$ (b) $\frac{2}{5}$
(c) 5 (d) 10

20. The value of 'k' for which the system of equations $kx-5y=2;\ 6x+2y=7$ has no solution is

(a) -15
(b) $\frac{-5}{2}$
(c) $\frac{2}{7}$
(d) None of the above

21. For what value of k, will the following pair of linear equations have infinitely many solutions?

$$2x+3y=4 \text{ and } (k+2)x+6y=3k+2$$

(a) 1 (b) 2
(c) 3 (d) 4

22. If the lines given by $3x+2ky=2$ and $2x+5y=1$ are parallel, then the value of k is *[NCERT Exemplar]*

(a) $-\frac{5}{4}$ (b) $\frac{2}{5}$
(c) $\frac{15}{4}$ (d) $\frac{3}{2}$

23. For what value of p, will the following system of linear equations represent parallel lines?

$$-x+py=1 \text{ and } px-y=1$$

(a) 2 (b) 3
(c) 1 (d) None of these

24. The value of a for which the lines $x=1$, $y=2$ and $a^2x+2y-20=0$ are concurrent, is

(a) 1 (b) 8

(c) -4 (d) -2

25. The value of x and y for the following system of equations $x+8y=19$ and $2x+11y=28$, (by substitution method) is

(a) 3, 2 (b) 2, 3

(c) 6, 3 (d) 3, 4

26. Solve the following system of linear equations

$$ax+by-a+b=0$$

and $$bx-ay-a-b=0.$$

The value of x and y are

(a) 1, -1 (b) -1, 1

(c) 1, 0 (d) 0, 2

27. The difference between two numbers is 26 and one number is three times the other number. The numbers are

(a) 39 and 26 (b) 39 and 41

(c) 39 and 13 (d) None of these

28. Two numbers are in the ratio 5 : 6. If 8 is subtracted from each of the numbers, the ratio becomes 4 : 5, then the numbers are .... and ....

(a) 48, 20 (b) 40, 28

(c) 40, 48 (d) 20, 24

29. Using elimination method, all the possible solutions of the following pair of linear equations is

$2x+3y=8$ and $4x+6y=7$

(a) Consistent (b) $x=2, y=3$

(c) No solution (d) All real values

30. Find the values of x and y in the following equations.

$$x-3y=8 \text{ and } 5x+3y=10$$

(a) $x=3, y=-\frac{5}{3}$ (b) $x=-3, y=\frac{5}{3}$

(c) $x=-3, y=\frac{-5}{3}$ (d) None of these

31. The values of x and y for the following pair of linear

$41x+53y=135$ and $53x+41y=147$.

(a) $x=2, y=3$ (b) $x=1, y=2$

(c) $x=3, y=2$ (d) $x=2, y=1$

32. If $2x+3y=5$ and $3x+2y=10$, then $x-y=$ ....

(a) 3 (b) 4

(c) 5 (d) 6

33. If $x=a$ and $y=b$ is the solution of the equations $x-y=2$ and $x+y=4$, then the values of a and b are 3 and 2, respectively

(a) True (b) False

(c) Cannot say (d) Partially true/false

34. The pair of equations

$3^{x+y}=81$, $81^{x-y}=3$ has

(a) no solution

(b) unique solution

(c) infinitely many solutions

(d) $x=2\frac{1}{8}, y=1\frac{7}{8}$

35. If the angles of a triangle are x, y and $40°$ and the difference between the two angles x and y is $30°$. Then, the value of x and y is $85°$ and $55°$ respectively.

(a) True (b) False

(c) Can't say (d) Partially true/false

36. The sum of a two-digit number and the number formed by interchanging its digits is 110. If 10 is subtracted from the first number, the new number is 4 more than 5 times the sum of the digits in the first number. Then, the first number is 64.

(a) True (b) False

(c) Cannot say (d) Partially true/false

37. The area of a rectangle increases by 76 sq units, if the length and breadth is increased by 2 units. However, if the length is increased by

3 units and breadth is decreased by 3 units, the area of sets reduced by 21 sq units. Find the breadth of the rectangle.

(a) 9 units (b) 16 units
(c) 18 units (d) 21 units

38. A fraction becomes 4/5 when 1 is added to each of the numerator and denominator. However, if we subtract 5 from each of them, it becomes 1/2. Then, numerator of the fraction is

(a) 6 (b) 7
(c) 8 (d) 9

39. Six years hence, a man's age will be three times the age of his son and three years ago he was nine times as old as his son. The present age of the man is

(a) 28 (b) 30
(c) 32 (d) 34

40. Aruna has only ₹ 1 and ₹ 2 coins with her. If the total number of coins that she has is 50 and the amount of money with her is ₹ 75, then the number of ₹ 1 and ₹ 2 coins is

(a) 24, 24 (b) 25, 25
(c) 26, 26 (d) None of these

41. From a bus stand in Delhi, if we buy 2 tickets to Pitampura and 3 tickets to Dilshad Garden, the total cost is ₹ 46 but if we buy 3 tickets to Pitampura and 5 tickets to Dilshad Garden, the total cost is ₹ 74. Then, the fares from the bus stand to Pitampura and to Dilshad Garden is

(a) ₹ 8; ₹ 100 (b) ₹ 10, ₹ 8
(c) ₹ 8; ₹ 10 (d) ₹ 20, ₹ 5

42. The value of x and y of the following pair of equation is

$$\frac{2}{x}+\frac{3}{y}=13\,;\;\frac{5}{x}-\frac{4}{y}=-2$$

(a) $x=2, y=3$ (b) $x=\frac{1}{3}, y=\frac{1}{2}$
(c) $x=\frac{1}{2}, y=\frac{1}{3}$ (d) $x=3, y=2$

43. The value of x and y of the following pairs of equations by reducing them to a pair of linear equations is

$$\frac{2}{\sqrt{x}}+\frac{3}{\sqrt{y}}=2;\;\frac{4}{\sqrt{x}}-\frac{9}{\sqrt{y}}=-1$$

(a) $x=4, y=9$
(b) $x=2, y=3$
(c) $x=8, y=18$
(d) None of the above

44. The values of x and y in the pair of equation $x+4y=27xy$, $x+2y-21xy$ is

(a) $x=3, y=15$ (b) $x=15, y=3$
(c) $x=\frac{1}{15}, y=\frac{1}{3}$ (d) $x=\frac{1}{3}, y=\frac{1}{15}$

45. The value of x and y in $\frac{5}{x+1}-\frac{2}{y-1}=\frac{1}{2};\;\frac{10}{x+1}+\frac{2}{y-1}=\frac{5}{2}$, where $x\neq-1$ and $y\neq1$, is

(a) $x=4, y=5$ (b) $x=5, y=4$
(c) $x=\frac{1}{4}, y=\frac{1}{5}$ (d) None of these

46. A train covered a certain distance at a uniform speed. If the train would have been 10 km/h faster, it would have taken 2 h less than the scheduled time and if the train was slower by 10 km/h, it would have taken 3 h more than the scheduled time. Then, the distance covered by the train is

(a) 50 km (b) 300 km
(c) 600 km (d) 12 km

47. The ratio of incomes of two persons is 9 : 7 and the ratio of their expenditures is 4 : 3. If each of them manages to save ₹ 2000 per month, then find their monthly incomes. Form a pair of linear equations from the above data and by elimination method, the value of monthly incomes are

(a) 18000, 14000
(b) 20000, 12000
(c) 22000, 10000
(d) None of the above

48. A boatman rows his boat 35 km upstream and 55 km downstream in 12 h. He can row 30 km upstream and 44 km downstream in 10 h, then the speed of the boat in still water is

(a) 8 km/h (b) 3 km/h
(c) 5 km/h (d) 11 km/h

49. Match the Column

	Column I		Column II
A.	$2x+3y=40$ $6x+5y=10$	1.	Coincident lines
B.	$2x+3y=40$ $6x+9y=50$	2.	Intersecting lines
C.	$2x+3y=10$ $4x+6y=20$	3.	Parallel lines

Codes

	A	B	C		A	B	C
(a)	1	2	3	(b)	3	2	1
(c)	2	3	1	(d)	1	3	2

50. Column-II give value of x and y for pair of equation given in Column-II.

	Column I		Column II
A.	$2x+y=8$, $x+6y=15$	(p)	(3, 4)
B.	$5x+3y=35$, $2x+4y=28$	(q)	(4, 5)
C.	$15x+4y=61$ $4x+15y=72$	(r)	(3, 2)

Codes

	A	B	C		A	B	C
(a)	r	p	q	(b)	p	r	q
(c)	r	q	p	(d)	None of these		

Assertion-Reasoning MCQs

Directions (Q. Nos. 46-54) Each of these questions contains two statements : Assertion (A) and Reason (R). Each of these questions also has four alternative choices, any one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

(a) A is true, R is true; R is a correct explanation for A.
(b) A is true, R is true; R is not a correct explanation for A.
(c) A is true; R is False.
(d) A is false; R is true.

51. **Assertion** (A) $4x+3y=18$ is a line which is parallel to X-axis.

Reason (R) The graph of linear equation $ax=b$, where $a \neq 0$ is parallel to Y-axis.

52. **Assertion** (A) The value of $q=\pm 2$, if $x=3$, $y=1$ is the solution of the line $2x+y-q^2-3=0$.

Reason (R) The solution of the line will satisfy the equation of the line.

53. **Assertion** (A) The graphical representation of $x+2y-4=0$ and $2x+4y-12=0$ will be a pair of parallel lines.

Reason (R) Let $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ be two linear equations and if $\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$, then the pair of equations represent parallel lines and they have no solution.

54. **Assertion** (A) The graphical representation of $2x+y=6$ and $2x-y+2=0$ will be a pair of parallel lines.

Reason (R) When $k=-1$, then linear equations $5x+ky=4$ and $15x+3y=12$ have infinitely many solutions.

55. **Assertion** (A) The value of k for which the system of equations $kx-y=2$, $6x-2y=3$ has a unique solution is 3.

Reason (R) The system of linear equations $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ has a unique solutions, if $\frac{a_1}{a_2}\neq\frac{b_1}{b_2}$.

56. **Assertion (A)** Pair of linear equations : $9x+3y+12=0, 18x+6y+24=0$ have infinitely many solutions.

Reason (R) Pair of linear equations $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ have infinitely many solutions, if $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$.

57. **Assertion (A)** If the system of equations $2x+3y=7$ and $2ax+(a+b)y=28$ has infinitely many solutions, then $2a-b=0$.

Reason (R) The system of equations $3x-5y=9$ and $6x-10y=8$ has a unique solution.

58. **Assertion (A)** When $k=-4$, then linear equations $x+(k+1)=5$, $(k+1)x+9y=8k-1$ have infinitely many solutions.

Reason (R) $a_1x+b_1y=c_1$ and $a_2x+b_2y=c_2$ have infinitely many solutions, if $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$.

59. **Assertion (A)** $x+y-4=0$ and $2x+ky-3=0$ has no solution if $k=2$.

Reason (R) $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ are consistent, if $\frac{a_1}{a_2}\neq\frac{k_1}{k_2}$.

60. **Assertion (A)** A two-digit number is obtained by either multiplying sum of the digits by 8 and adding 1 or by multiplying the difference of digits by 13 and adding 2. The number is 41.

Reason (R) The linear equations used are $7x-2y+1=0$ and $12x-23y+2=0$.

Case Based MCQs

61. From Rajiv Chowk Metro Station, if Charu buys 4 tickets to Karol Bagh and 6 tickets to Hauz Khas, then total cost is ₹ 92, but if she buys 6 tickets to Karol Bagh and 10 tickets to Hauz Khas, then total cost is ₹ 148.

Consider the fares from Rajiv Chowk to Karol bagh and that to hauz Khas as ₹ x and ₹ y respectively and answer the following questions.

(i) Ist situation can be represented algebraically as

(a) $3x-5y=74$
(b) $2x+5y=74$
(c) $2x-3y=46$
(d) $2x+3y=46$

(ii) 2nd situation can be represented algebraically as

(a) $5x+3y=74$ (b) $5x-3y=74$
(c) $3x+5y=74$ (d) $3x-5y=74$

(iii) Fare from Rajiv Chowk to Karol Bagh is

(a) ₹ 6 (b) ₹ 8
(c) ₹ 10 (d) ₹ 2

(iv) Fare from Rajiv Chowk to Hauz Khas

(a) ₹ 10 (b) ₹ 12
(c) ₹ 14 (d) ₹ 16

(v) The system of linear equations represented by both situation has
(a) infinitely many solutions
(b) no solution
(c) unique solution
(d) None of the above

62. A test consists of 'True' or 'False' questions. One mark is awarded for every correct answer while $\frac{1}{4}$ mark is deducted for every wrong answer.
A student knew answers to some of the questions. Rest of the questions he attempted by guessing. He answered 120 questions and got 90 marks.

Type of question	Marks given for correct answer	Marks deducted for wrong answer
True/False	1	0.25

[CBSE Question Bank]

(i) If answer to all questions he attempted by guessing were wrong then how many questions did he answer correctly?
(a) 96 (b) 92
(c) 90 (d) None of these

(ii) How many questions did he guess?
(a) 20 (b) 22
(c) 24 (d) 26

(iii) If answer to all questions he attempted by guessing were wrong and answered 80 correctly, then how many marks he got?
(a) 40 (b) 80
(c) 75 (d) 70

(iv) If answer to all questions he attempted by guessing were wrong, then how many questions answered correctly to score 95 marks?
(a) 95 (b) 100
(c) 120 (d) 80

(v) If answer to all questions he attempted by giving were wrong and answered 90 correctly, then how many marks he got?
(a) 90 (b) 100
(c) 95 (d) 80

63. Mr Jayant sahu arranged dinner party for some of his friends. The expenses of the dinner are partly constant and partly proportional to the number of guests. The expenses amount to ₹ 450 for 5 guest and ₹ 850 for 10 guests.

Denote the constant expense by ₹ x and proportional expense per person by ₹ y and answer the following questions.

(i) Represent both the situations algebraically
(a) $x+5y=850$, $x+10y=450$
(b) $x-5y=850$, $x-10y=450$
(c) $x+5y=450$, $x+10y=850$
(d) None of the above

(ii) Proportional expense for each person is
(a) ₹ 50 (b) ₹ 80
(c) ₹ 90 (d) ₹ 100

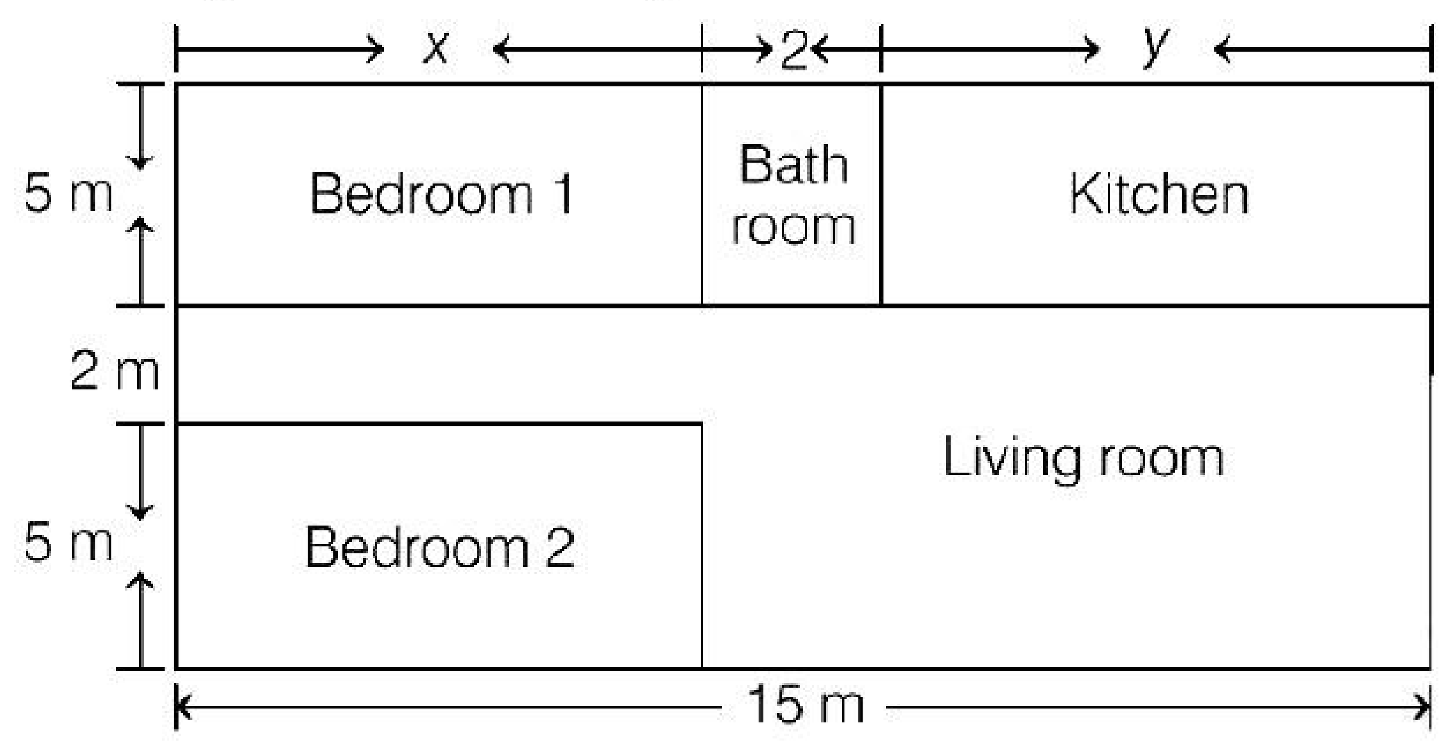
(iii) The fixed (or constant) expense for the party is
(a) ₹ 50 (b) ₹ 80
(c) ₹ 90 (d) ₹ 100

(iv) If there would be 12 guests at the dinner party, then what amount Mr Jayant has to pay?
(a) ₹ 1500 (b) ₹ 1300
(c) ₹ 1200 (d) ₹ 1010

(v) The system of linear equations representing both the situations will have

(a) unique solution
(b) no solution
(c) infinitely many solutions
(d) None of the above

64. Amit is planning to buy a house and the layout is given below. The design and the measurement has been made such that areas of two bedrooms and kitchen together is 95 sq m.



[CBSE Question Bank]

Based on the above information, answer the following questions:

(i) Form the pair of linear equations in two variables from this situation.

(a) $2x + y = 19$, $x - y = 13$
(b) $2x + y = 19$, $x + y = 13$
(c) $2x - y = 13$, $x + y = 19$
(d) $2x - y = 19$, $x + y = 13$

(ii) Find the length of the outer boundary of the layout.

(a) 27 m
(b) 30 m
(c) 54 m
(d) None of these

(iii) Find the area of each bedroom and kitchen in the layout.

(a) 35 m^2, 15 m^2
(b) 27 m^2, 30 m^2
(c) 40 m^2, 30 m^2
(d) 30 m^2, 35 m^2

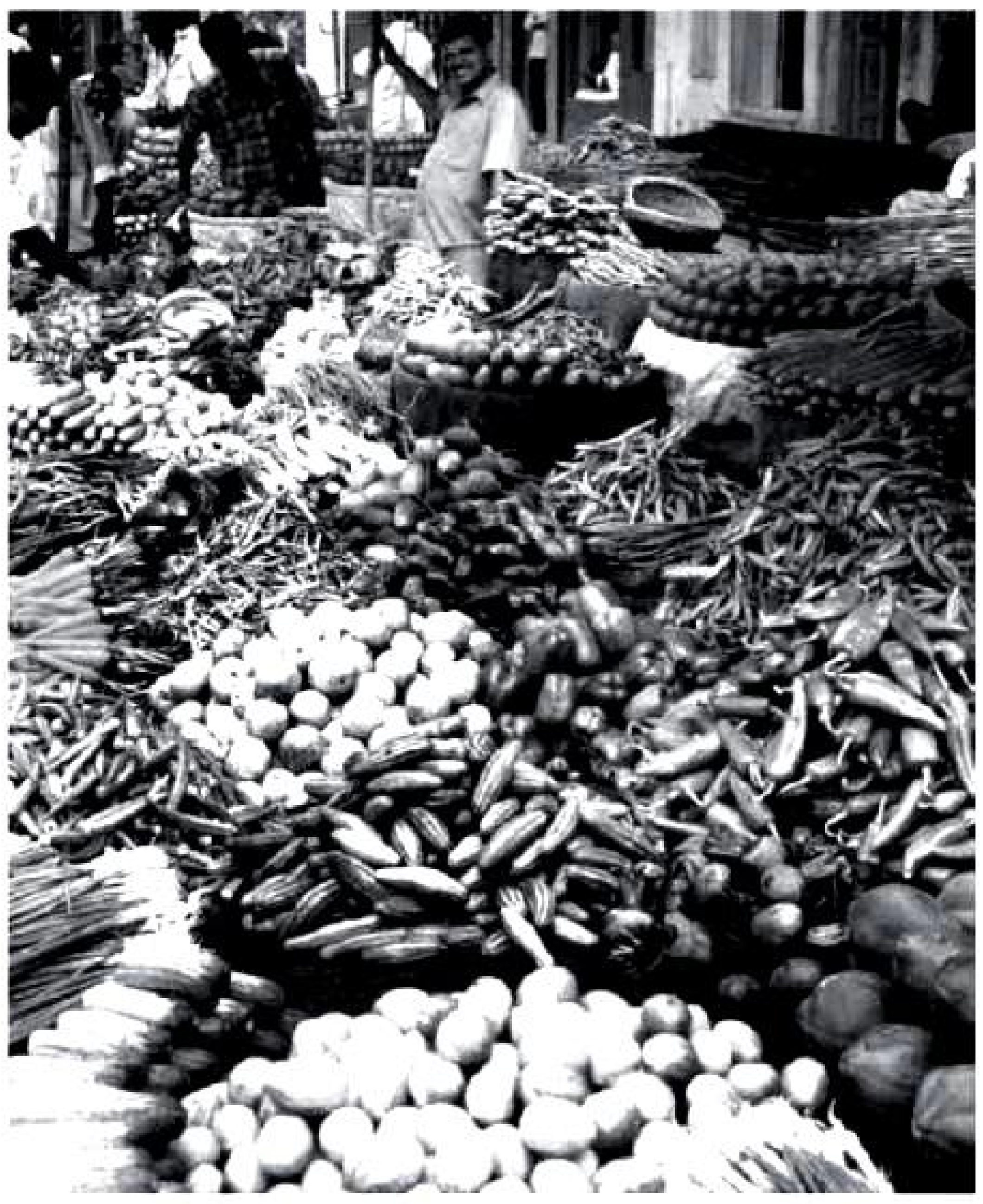
(iv) Find the area of living room in the layout.

(a) 75 m^2
(b) 65 m^2
(c) 72 m^2
(d) None of these

(v) Find the cost of laying tiles in kitchen at the rate of ₹ 50 per sq m.

(a) 1600
(b) 1525
(c) 1750
(d) 1250

65. Shivam usually go to a Vegetable shop with his mother. He observes the following two situations.



On 1st day : The cost of 4 kg of onion and 2 kg of tomato was ₹ 3200.

On 2nd day : The cost of 8 kg of onion and 4 kg of tomato was ₹ 6000.

Denoting the cost of 1 kg onion by ₹ x and cost of 1 kg tomato by ₹ y and answer the following questions.

(i) Represent algebraically the situation of day-I.

(a) $x + 2y = 1500$
(b) $2x + y = 1600$
(c) $x - 2y = 1500$
(d) None of these

(ii) Represent algebraically the situation of day-II.

(a) $2x + y = 1500$
(b) $2x - y = 1500$
(c) $x + 2y = 1500$
(d) $2x + y = 750$

(iii) The linear equation represented by day-I, intersect the X-axis at

(a) $(0, 800)$
(b) $(0, -800)$
(c) $(800, 0)$
(d) $(-800, 0)$

(iv) The linear equation represented by day-II, intersect the Y-axis at

(a) (1500, 0) (b) (0, −1500)
(c) (−1500, 0) (d) (0, 1500)

(v) Linear equations represented by day-I and day-II situations, are

(a) non-parallel
(b) parallel
(c) intersect at one point
(d) overlapping each other

66. It is common that Governments revise travel fares from time to time based on various factors such as inflation (a general increase in prices and fall in the purchasing value of money) on different types of vehicles like auto, Rickshaws, taxis, Radio cab etc. The auto charges in a city comprise of a fixed charge together with the charge for the distance covered. Study the following situations.

Name of the city	Distance travelled (km)	Amount paid (in ₹)
City A	10	75
	15	110
City B	8	91
	14	145

Situation 1 In city A, for a journey of 10 km, the charge paid is ₹ 75 and for a journey of 15 km, the charge paid is ₹ 110.

Situation 2 In a city B, for a journey of 8 km, the charge paid is ₹ 91 and for a journey of 14 km, the charge paid is ₹ 145. ***[CBSE Question Bank]***

Refer situation 1

(i) If the fixed charges of auto rickshaw be ₹ x and the running charges be ₹ y km/h, the pair of linear equations representing the situation is

(a) $x+10y=110,\ x+15y=75$
(b) $x+10y=75,\ x+15y=110$
(c) $10x+y=110,\ 15x+y=75$
(d) $10x+y=75,\ 15x+y=110$

(ii) A person travels a distance of 50 km. The amount he has to pay is

(a) ₹ 155 (b) ₹ 255
(c) ₹ 355 (d) ₹ 455

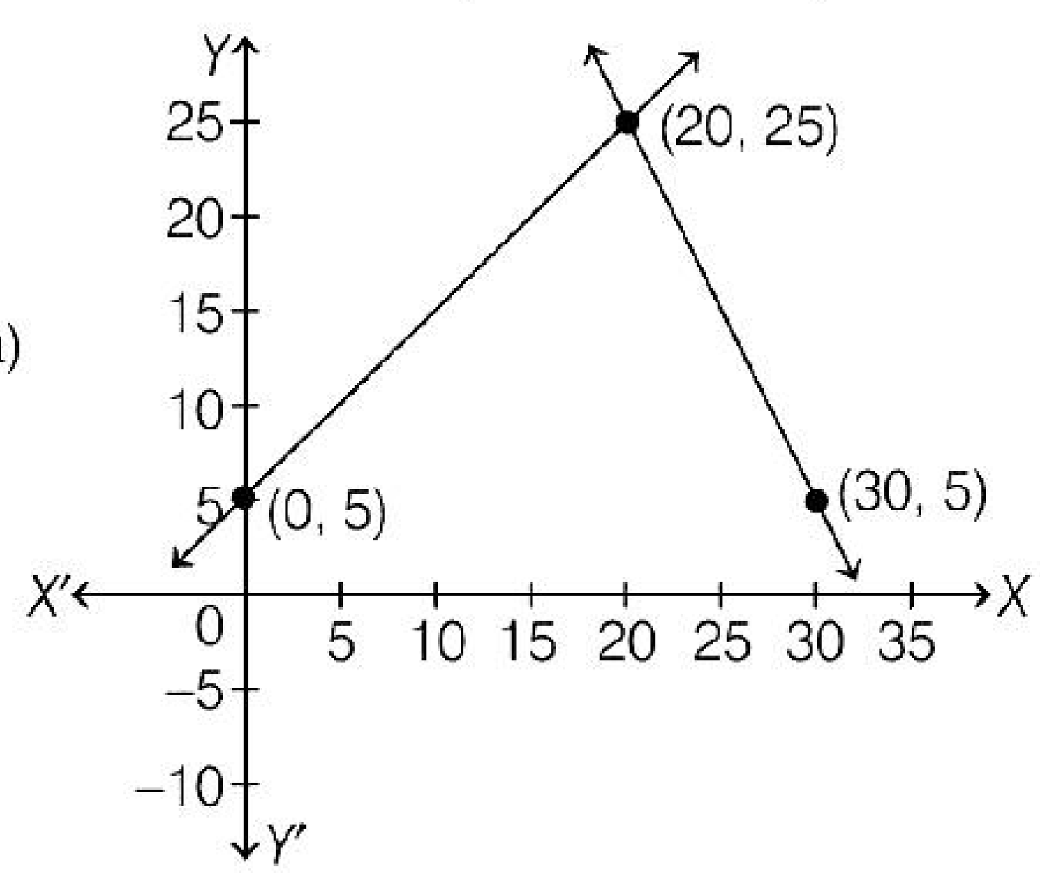
Refer situation 2

(iii) What will a person have to pay for travelling a distance of 30 km ?

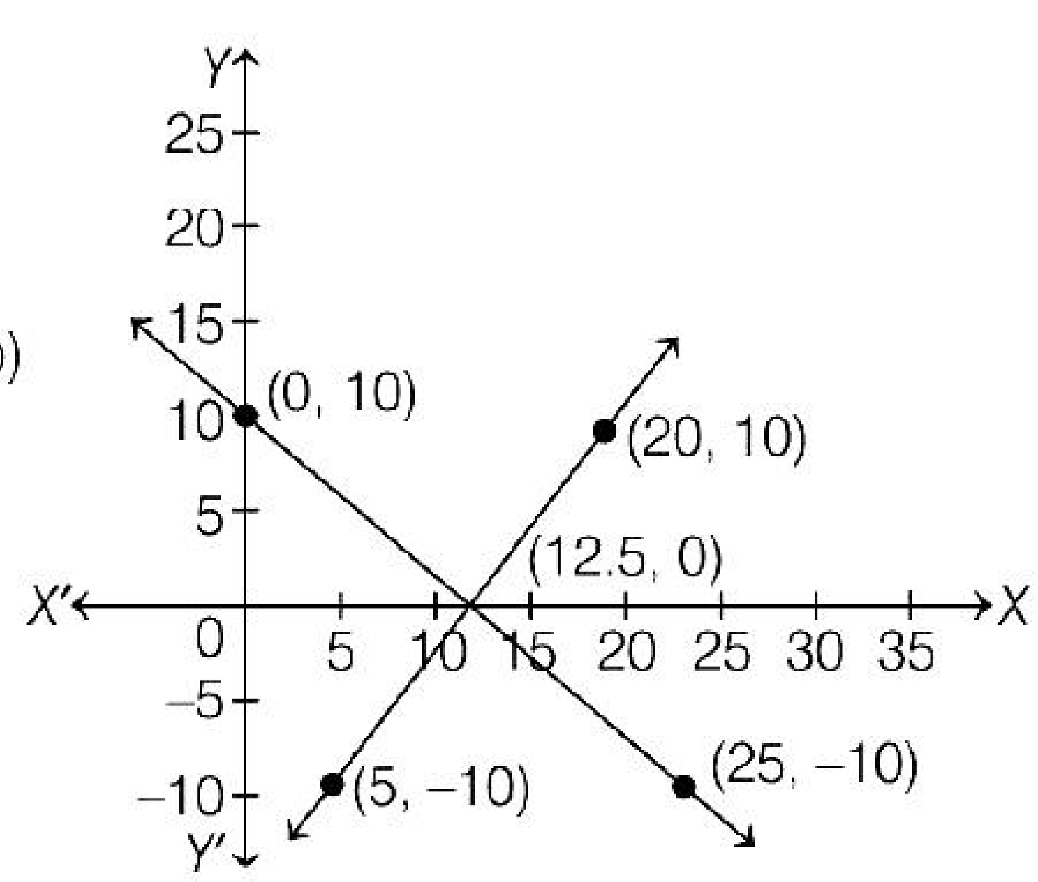
(a) ₹ 185 (b) ₹ 289
(c) ₹ 275 (d) ₹ 305

(iv) The graph of lines representing the conditions are: (situation 2)

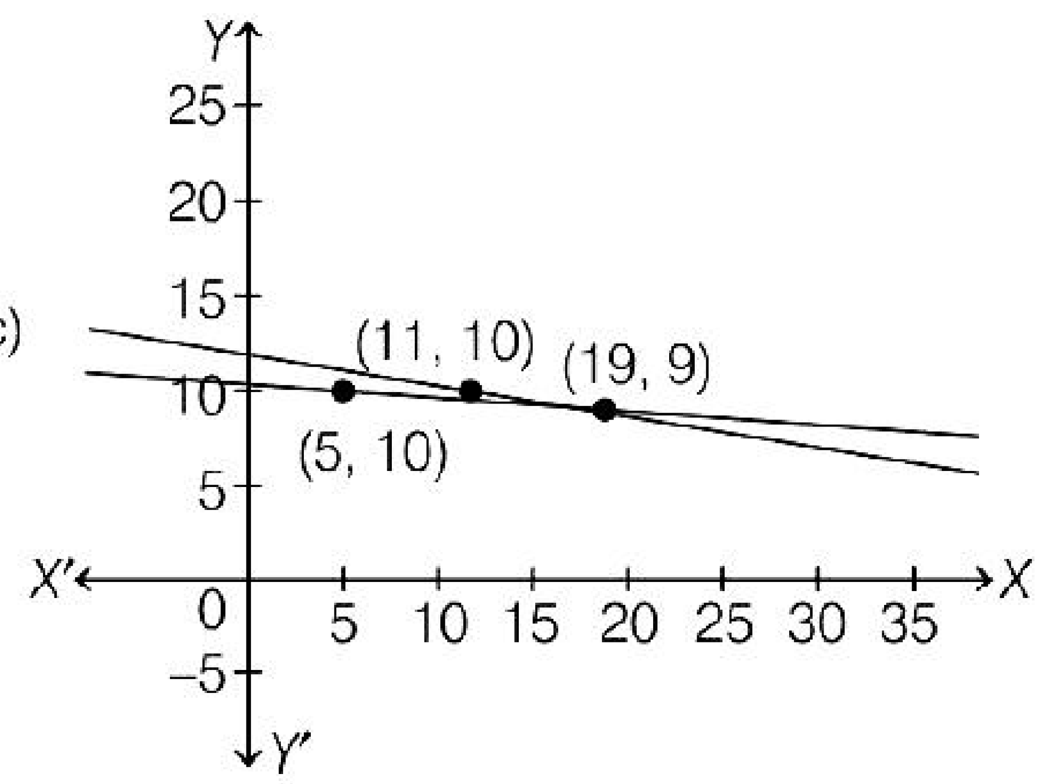
(a)



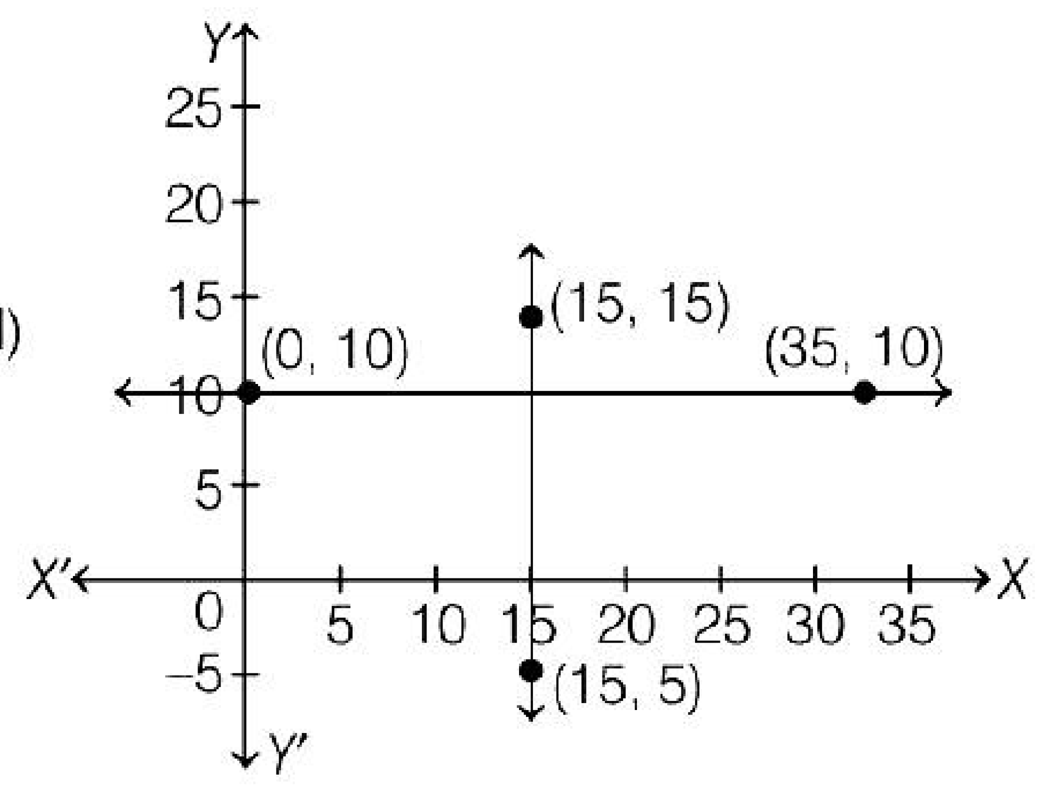
(b)



(c)



(d)



(v) The lines representing the conditions situation 2 are

(a) Parallel lines

(b) Intersecting lines

(c) Coincident lines

(d) None of the above

ANSWERS

Multiple Choice Questions

1. (d)	2. (d)	3. (c)	4. (b)	5. (c)	6. (a)	7. (a)	8. (b)	9. (c)	10. (b)
11. (a)	12. (b)	13. (d)	14. (b)	15. (b)	16. (d)	17. (d)	18. (d)	19. (d)	20. (a)
21. (b)	22. (c)	23. (c)	24. (c)	25. (a)	26. (a)	27. (c)	28. (c)	29. (c)	30. (a)
31. (d)	32. (c)	33. (b)	34. (d)	35. (a)	36. (a)	37. (b)	38. (b)	39. (b)	40. (b)
41. (c)	42. (c)	43. (a)	44. (d)	45. (a)	46. (c)	47. (a)	48. (a)	49. (c)	50. (c)

Assertion-Reasoning MCQs

51. (d)	52. (a)	53. (a)	54. (d)	55. (d)	56. (a)	57. (c)	58. (d)	59. (b)	60. (c)

Case Based MCQs

61. (i) (d) (ii) (c) (iii) (b) (iv) (a) (v) (c)

62. (i) (a) (ii) (c) (iii) (d) (iv) (b) (v) (c)

63. (i) (c) (ii) (b) (iii) (a) (iv) (d) (v) (a)

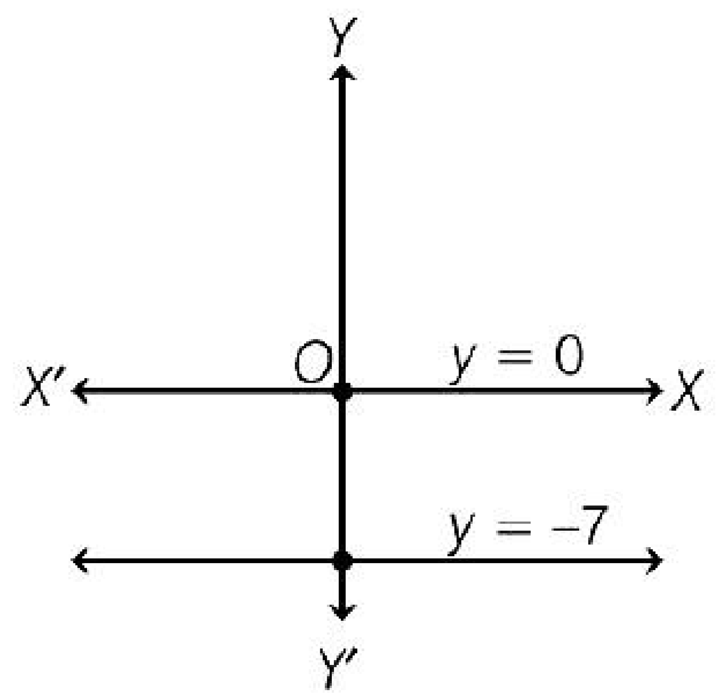
64. (i) (b) (ii) (c) (iii) (d) (iv) (a) (v) (c)

65. (i) (b) (ii) (a) (iii) (c) (iv) (d) (v) (b)

66. (i) (b) (ii) (c) (iii) (b) (iv) (c) (v) (b)

SOLUTIONS

1. The given pair of equations are $y = 0$ and $y = -7$.

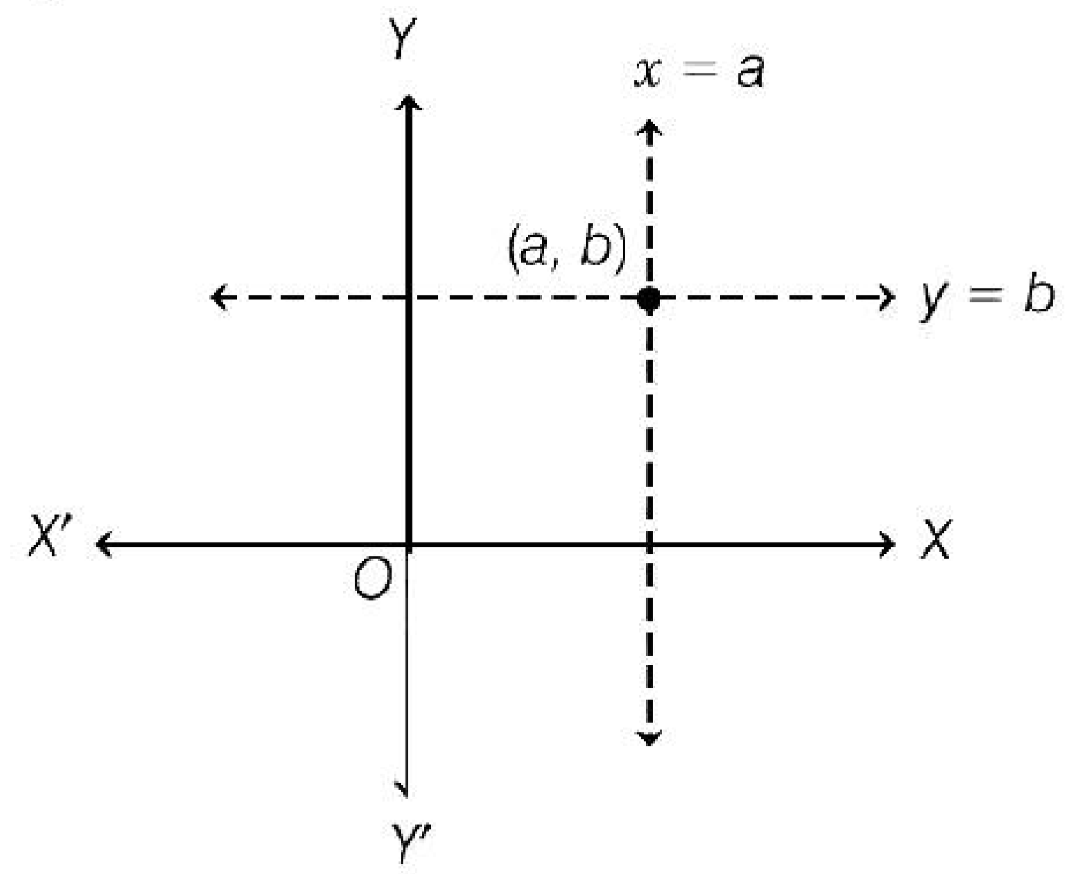


By graphically, both lines are parallel and having no solution.

2. By graphically in every condition, if $a, b > 0$; $a, b < 0, a > 0, b < 0$; $a < 0, b > 0$ but $a = b \neq 0$.

The pair of equations $x = a$ and $y = b$ graphically represents lines which are intersecting at (a, b).

If $a,\ b > 0$



Similarly, in all cases two lines intersect at (a, b).

3. First, identify the variable quantities and let these be x and y.

Let number of rides $= x$

and number of hoopla games played by her $= y$

Cost of 'x' rides $=$ ₹ $3x$

Cost of 'y' hoopla games $=$ ₹ $4y$

Total money spent $=$ ₹ 20

Then, we write the given condition in terms of x and y.

Let the equation be $ax + by + c = 0$.

$\therefore$ Equation is $3x + 4y = 20$

4. Let the numerator of the fraction be x and denominator be y.

Then, the fraction is $\frac{x}{y}$. Now, according to condition I, we have

$$\frac{x+2}{y+2} = \frac{4}{5}$$

$\Rightarrow \quad 5x + 10 = 4y + 8$

[cross-multiply both sides]

$\Rightarrow \quad 5x - 4y + 2 = 0 \quad \ldots(i)$

and according to condition II, we have

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

[cross-multiply both sides]

$\Rightarrow \quad 2x - 8 = y - 4$

$\Rightarrow \quad 2x - y - 4 = 0 \quad \ldots(ii)$

Thus, the algebraic representation of given problem is

$5x - 4y + 2 = 0$

and $\quad 2x - y - 4 = 0$

5. Let the cost of 1 pencil be ₹ x and that of one eraser be ₹y.

It is given that Romila purchased 2 pencils and 3 erasers for ₹ 9.

$\therefore \ 2x + 3y = 9$

It is also given that Sonali purchased 4 pencils and 6 erasers for ₹18

$\therefore \ 4x + 6y = 18$

Algebraic Representation The algebraic representation of the given situation is

$2x + 3y = 9 \quad \ldots(i)$

$4x + 6y = 18 \quad \ldots(ii)$

6. Given, $3x - y = 3$

$9x - 3y = 9$

On comparison with the standard equation

$a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$

$a_1 = 3, b_1 = -1, c_1 = -3$

$a_2 = 9, b_2 = -3, c_2 = -9$

Here, $\frac{a_1}{a_2} = \frac{3}{9} = \frac{b_1}{b_2} = \frac{-1}{-3} = \frac{c_1}{c_2} = \frac{-3}{-9}$

So, the lines are coincident lines and hence infinite solution.

7. Given, $5x + 4y + 6 = 0$ and $10x + 8y - 12 = 0$

On comparison with standard equation

$a_1 = 5, b_1 = 4, c_1 = 6$

$a_2 = 10, b_2 = 8, c_2 = -12$

Here, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow \frac{5}{10} = \frac{4}{8} \neq \frac{6}{-12}$

These represents parallel lines so there is no any common solution

8. The given pair of linear equations is

$3x - 5y + 8 = 0$

and $7x + 6y - 9 = 0$

On comparing the given equations with standard form of pair of linear equations i.e.

$a_1x + b_1y + c_1 = 0$

and $a_2x + b_2y + c_2 = 0$, we get

$a_1 = 3, \quad b_1 = -5, \quad c_1 = 8$

and $a_2 = 7, \quad b_2 = 6, \quad c_2 = -9$

Here, $\frac{a_1}{a_2} = \frac{3}{7}$ and $\frac{b_1}{b_2} = \frac{-5}{6}$

$\because \quad \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

$\therefore$ The lines representing the given pair of linear equations will intersect at a point.

9. Condition for a consistent pair of linear equations

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

[intersecting lines having unique solution]

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

[coincident or dependent]

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

This represents parallel lines and hence no solution (Inconsistent)

11. If lines are intersecting i.e. there is some solution and hence system of equations becomes consistent.

12. If lines are parallel i.e. no solution hence system becomes inconsistent.

13. On comparing the above equations with standard form of pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we get

(a) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ as $\frac{3}{1} = \frac{3}{1} = \frac{-9}{-3}$, consistent

(b) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ as $\frac{4}{-2} \neq -1$, consistent

(c) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ as $\frac{5}{10} = \frac{1}{2} = \frac{10}{20}$, consistent

(d) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ as $\frac{-2}{-4} = \frac{1}{2} \neq \frac{3}{10}$, inconsistent

14. The given pair of linear equations is

$4x - 5y - 12 = 0$ and $-8x + 10y + 20 = 0$

On comparing with standard form of pair of linear equations, we get

$a_1 = 4, b_1 = -5, c_1 = -12$

and $a_2 = -8, b_2 = 10, c_2 = 20$

Here, $\frac{a_1}{a_2} = \frac{4}{-8} = -\frac{1}{2}, \frac{b_1}{b_2} = \frac{-5}{10} = -\frac{1}{2}$

and $\frac{c_1}{c_2} = -\frac{12}{20} = -\frac{3}{5}$

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

$\therefore$ Given pair of linear equations is inconsistent.

15. If $x - 2, y - -3$ is a unique solution of any pair of equation, then these values must satisfy that pair of equations.

From option (b),

$\text{LHS} = 2x + 5y = 2(2) + 5(-3)$

$= 4 - 15 = -11 = \text{RHS}$

and $\text{LHS} = 4x + 10y = 4(2) + 10(-3)$

$= 8 - 30 = -22 = \text{RHS}$

16. Given, equations are $x + 2y + 5 = 0$

and $-3x - 6y + 1 = 0$

Here, $a_1 = 1, b_1 = 2, c_1 = 5$

and $a_2 = -3, b_2 = -6, c_2 = 1$

$\therefore \quad \frac{a_1}{a_2} = -\frac{1}{3}, \frac{b_1}{b_2} = -\frac{2}{6} = -\frac{1}{3}, \frac{c_1}{c_2} = \frac{5}{1}$

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

Hence, the pair of equations has no solution.

17. Condition for dependent linear equations

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} = \frac{1}{k} \quad \ldots(i)$$

Given equation of line is, $-5x + 7y - 2 = 0$

Here, $a_1 = -5, b_1 = 7, c_1 = -2$

From Eq. (i), $-\frac{5}{a_2} = \frac{7}{b_2} = -\frac{2}{c_2} = \frac{1}{k}$ [say]

$\Rightarrow \quad a_2 = -5k, b_2 = 7k, c_2 = -2k$

where, k is any arbitrary constant.

Putting $k = 2$, then $a_2 = -10, b_2 = 14$

and $c_2 = -4$

$\therefore$ The required equation of line becomes

$$a_2x + b_2y + c_2 = 0$$

$\Rightarrow \quad -10x + 14y - 4 = 0$

$\Rightarrow \quad 10x - 14y + 4 = 0$

18. The given equations can be rewritten as $2x + ky - 1 = 0$ and $3x - 5y - 7 = 0$.

On comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we get

$a_1 = 2, b_1 = k, c_1 = -1$ and

$a_2 = 3, b_2 = -5, c_2 = -7$

For unique solution,

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow \frac{2}{3} \neq \frac{k}{-5} \Rightarrow k \neq \frac{-10}{3}$$

Thus, given lines have a unique solution for all real values of k, except $\frac{-10}{3}$.

19. The condition that system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is inconsistent, if

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \quad \ldots(i)$$

Given system of linear equations are

$x + 2y = 3$ or $x + 2y - 3 = 0$

and $5x + ky + 7 = 0$

Here, $a_1 = 1, \; b_1 = 2, \; c_1 = -3$

and $a_2 = 5, b_2 = k, c_2 = 7$

From Eq. (i), we get

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

Taking Ist and IInd terms

$$\frac{1}{5} = \frac{2}{k} \Rightarrow k = 10$$

20. Given, pair of linear equations is

$kx - 5y - 2 = 0$ and $6x + 2y - 7 = 0$

Here, $a_1 = k, b_1 = -5, c_1 = -2$

and $a_2 = 6, b_2 = 2, c_2 = -7$

On comparing with standard form of pair of linear equations we get,

For no solution,

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow \frac{k}{6} = \frac{-5}{2} \neq \frac{-2}{-7}$$

$\Rightarrow \quad \frac{k}{6} = -\frac{5}{2} \Rightarrow k = -15$

21. Given, pair of equations is $2x + 3y - 4 = 0$

and $(k+2)x + 6y - (3k+2) = 0$

On comparing the given equations with standard form i.e.

$a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we get

$a_1 = 2, \quad b_1 = 3, \quad c_1 = -4$

and $a_2 = k + 2, b_2 = 6,$

$c_2 = -(3k + 2)$

For infinitely many solutions,

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

$$\therefore \quad \underset{\text{I}}{\frac{2}{k+2}} = \underset{\text{II}}{\frac{3}{6}} = \underset{\text{III}}{\frac{-4}{-(3k+2)}} \quad \ldots(i)$$

On taking I and II terms, we get

$$\frac{2}{k+2}=\frac{3}{6} \Rightarrow \frac{2}{k+2}=\frac{1}{2}$$

$\Rightarrow \quad k+2=4 \Rightarrow k=2$

which also satisfies the last two terms of Eq. (i).

Hence, the required value of k is 2.

22. Condition for parallel lines is

$$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2} \quad \text{...(i)}$$

Given lines, $3x+2ky-2=0$

and $2x+5y-1=0$

Here, $a_1=3, b_1=2k, c_1=-2$

and $a_2=2, b_2=5, c_2=-1$

From Eq. (i), $\frac{3}{2}=\frac{2k}{5}$

$\therefore \quad k=\frac{15}{4}$

23. Given, pair of equations is

$-x+py-1=0 \quad \text{...(i)}$

and $px-y-1=0 \quad \text{...(ii)}$

On comparing the given equations with standard form i.e. $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$, we get

$a_1=-1, b_1=p, \quad c_1=-1$

and $a_2=p, \; b_2=-1, c_2=-1$

For parallel lines,

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

$$\Rightarrow \underset{\text{I}}{\frac{-1}{p}}=\underset{\text{II}}{\frac{p}{-1}}\neq\underset{\text{III}}{\frac{-1}{-1}} \quad \text{...(iii)}$$

On taking I and II terms, we get

$$\frac{-1}{p}=\frac{p}{-1}$$

$\Rightarrow \quad p^2=1 \Rightarrow p=\pm1$

Since, $p=-1$ does not satisfy the last two terms of Eq. (iii).

$\therefore$ $p=1$ is the required value.

Hence, for $p=1$, the given system of equations will represent parallel lines.

24. Given lines are $x=1$, $y=2$ and $a^2x+2y-20=0$.

Since, $x=1$, $y=2$ and $a^2x+2y-20=0$ are concurrent, i.e $x=1$, $y=2$ and $a^2x+2y-20=0$ having a common solution.

So, $x=1$, $y=2$ is a solution of given equation

$$a^2\cdot1+2\cdot2-20=0 \Rightarrow a^2-16=0$$

$\Rightarrow \quad a^2=16 \Rightarrow a=-4, 4$

25. Given equations are

$x+8y=19 \quad \text{...(i)}$

and $2x+11y=28 \quad \text{...(ii)}$

From Eq. (i), $x=19-8y \quad \text{...(iii)}$

On substituting $x=19-8y$ in Eq. (ii), we get

$2(19-8y)+11y=28$

$\Rightarrow \quad 38-16y+11y=28$

$\Rightarrow \quad 5y=38-28=10$

$\Rightarrow \quad y=\frac{10}{5}=2$

Now, on putting $y=2$ in Eq. (iii), we get

$x=19-8\times2$

$\Rightarrow \quad x=19-16=3$

Thus, $x=3$ and $y=2$ is the required solution.

26. The given system can be rewritten as

$ax+by=a-b \quad \text{...(i)}$

and $bx-ay=a+b \quad \text{...(ii)}$

From Eq. (i), we get

$by=a-b-ax$

$\Rightarrow \quad y=\frac{a-b-ax}{b} \quad \text{...(iii)}$

On substituting the value of y in Eq. (ii), we get

$$bx-a\left[\frac{a-b-ax}{b}\right]=a+b$$

$\Rightarrow \quad b^2x-a(a-b-ax)=b(a+b)$

[multiplying both sides by b]

$\Rightarrow \quad b^2x-a^2+ab+a^2x=ab+b^2$

$\Rightarrow (b^2 + a^2)x = ab + b^2 + a^2 - ab$

$\Rightarrow \quad x = \frac{a^2 + b^2}{a^2 + b^2} = 1$

On substituting $x = 1$ in Eq. (iii), we get

$$y = \frac{a - b - a}{b} \Rightarrow y = \frac{-b}{b} = -1$$

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

27. Let the two numbers be x and y $(x > y)$.

According to the question,

$x - y = 26$ ...(i)

and $x = 3y$ ...(ii)

On substituting the value of x from Eq. (ii) in Eq. (i), we get

$3y - y = 26$

$\Rightarrow \quad 2y = 26$

$\Rightarrow \quad y = 13$

On substituting $y = 13$ in Eq. (ii), we get

$x = 3 \times 13$

$\Rightarrow \quad x = 39$

Hence, the two numbers are 39 and 13

28. Let the two numbers be x and y.

Then, by first condition, ratio of these two numbers = 5 : 6

$x : y = 5 : 6$

$\Rightarrow \quad \frac{x}{y} = \frac{5}{6} \Rightarrow y = \frac{6x}{5}$ ...(i)

and by second condition, then, 8 is subtracted from each of the numbers, then ratio becomes 4 : 5.

$$\frac{x - 8}{y - 8} = \frac{4}{5}$$

$\Rightarrow \quad 5x - 40 = 4y - 32$

$\Rightarrow \quad 5x - 4y = 8$ ...(ii)

Now, put the value of y in Eq. (ii), we get

$$5x - 4\left(\frac{6x}{5}\right) = 8$$

$\Rightarrow \quad 25x - 24x = 40$

$\Rightarrow \quad x = 40$

Put the value of x in Eq. (i), we get

$$y = \frac{6}{5} \times 40$$

$= 6 \times 8 = 48$

Hence, the required numbers are 40 and 48.

29. Given, pair of linear equations is

$2x + 3y = 8$ ...(i)

and $4x + 6y = 7$ ...(ii)

On multiplying Eq. (i) by 2, to make the coefficients of x equal, we get the equation as

$4x + 6y = 16$ ...(iii)

On subtracting Eq. (ii) from Eq. (iii), we get

$(4x - 4x) + (6y - 6y) = 16 - 7$

$\Rightarrow \quad 0 = 9$

which is a false equation involving no variable.

So, the given pair of linear equations has no solution, i.e. this pair of linear equations is inconsistent.

30. Given equations are

$x - 3y = 8$ ...(i)

and $5x + 3y = 10$ ...(ii)

On adding Eqs. (i) and (ii), we get

$$6x = 18 \Rightarrow x = \frac{18}{6} = 3$$

On putting $x = 3$ in Eq. (i), we get

$$3 - 3y = 8 \Rightarrow 3y = 3 - 8 \Rightarrow y = \frac{-5}{3}$$

Hence, $x = 3$ and $y = \frac{-5}{3}$.

31. Given pair of linear equations is

$41x + 53y = 135$ ...(i)

and $53x + 41y = 147$ ...(ii)

On adding Eqs. (i) and (ii), we get

$94x + 94y = 282$

$\Rightarrow \quad x + y = 3$

[dividing both sides by 94] ...(iii)

On subtracting Eqs. (i) from (ii), we get

$12x - 12y = 12$

$\Rightarrow \quad x - y = 1$

[dividing both sides by 12] ...(iv)

Now, adding Eqs. (iii) and (iv), we get

$2x = 4 \Rightarrow x = 2$

On substituting $x = 2$ in Eq. (iii), we get

$y = 3 - 2 = 1$

Hence, $x = 2$ and $y = 1$ is the required solution.

32. Given, $2x + 3y = 5$ ... (i)

$3x + 2y = 10$ ... (ii)

Multiply Eq. (i) by 3 and Eq. (ii) by 2, we get

$6x + 9y = 15$

$6x + 4y = 20$

$\underline{- \quad - \quad -}$

$9y = -5$

$y = -1$

Substitute $y = -1$ in Eq. (i), we get

$2x + 3(-1) = 5$

$2x = 5 + 3$

$2x = 8$

$x = 4$

$\therefore \; x - y = 4 - (-1) = 5$

33. Since, $x = a$ and $y = b$ is the solution of the equations $x - y = 2$ and $x + y = 4$, then these values will satisfy that equations

$a - b = 2$ ...(i)

and $a + b = 4$ ...(ii)

On adding Eqs. (i) and (ii), we get

$2a = 6$

$\therefore \quad a = 3$ and $b = 1$

34. Given,

$3^{x+y} = 81 \Rightarrow 3^{x+y} = 3^4 \Rightarrow x + y = 4$ ...(i)

and $81^{x-y} = 3 \Rightarrow 3^{4(x-y)} = 3^1 \Rightarrow 4(x - y) = 1$

$\Rightarrow \quad x - y = \frac{1}{4}$ ...(ii)

On adding Eqs. (i) and (ii), we get

$2x = 4 + \frac{1}{4} = \frac{17}{4}$

$\Rightarrow \quad x = \frac{17}{8} = 2\frac{1}{8}$

From Eq. (i), we get

$y = \frac{15}{8} = 1\frac{7}{8}$

35. Given that, x, y and $40°$ are the angles of a triangle.

$\therefore \quad x + y + 40° = 180°$

[since, the sum of all the angles of a triangle is 180°]

$\Rightarrow \quad x + y = 140°$ ...(i)

Also, $x - y = 30°$ ...(ii)

On adding Eqs. (i) and (ii), we get

$2x = 170°$

$\Rightarrow \quad x = 85°$

On putting $x = 85°$ in Eq. (i), we get

$85° + y = 140°$

$\Rightarrow \quad y = 55°$

Hence, the required values of x and y are 85° and 55°, respectively.

36. Let the digit at units and tens place in the given number be x and y respectively.

Then,

Number $= 10y + x$ ... (i)

Number formed by interchanging the digits

$= 10x + y$

According to the given conditions, we have

$(10y + x) + (10x + y) = 110$

and, $(10y + x) - 10 = 5(x + y) + 4$

$\Rightarrow \quad 11x + 11y = 110$

and, $4x - 5y + 14 = 0$

$\Rightarrow \quad x + y - 10 = 0$ ...(i)

and, $4x - 5y + 14 = 0$ ...(ii)

On multiplying Eq. (i) by 5, we get

$5x + 5y - 50 = 0$ ...(iii)

On adding Eqs. (ii) and (iii), we get

$9x - 36 = 0$

$\Rightarrow \quad 9x = 36$

$\Rightarrow \quad x = 4$

From Eq. (i),

$$4 + y - 10 = 0$$

$\Rightarrow \quad y - 6 = 0$

$\Rightarrow \quad y = 6$

Putting the value of x and y in Eq. (i), we get

Number $= 10 \times 6 + 4 = 64$

37. Let the length of the rectangle be x units and the breadth y units.

Then, $(x + 2)(y + 2) = xy + 76$

$\Rightarrow \quad 2x + 2y + 4 = 76$

$\Rightarrow \quad x + y = 36 \quad \ldots(i)$

In the second case

$$(x + 3)(y - 3) = xy - 21$$

$\Rightarrow \quad 3y - 3x - 9 = -21$

$\Rightarrow \quad 3x - 3y = 21 - 9 = 12$

$\Rightarrow \quad x - y = 4 \quad \ldots(ii)$

From Eq. (i),

$$y = 36 - x$$

Substituting the value of y in Eq. (ii), we get

$$x - (36 - x) = 4$$

$\Rightarrow \quad x - 36 + x = 4$

$\Rightarrow \quad 2x = 40$

$\therefore \quad x = 20$ units

and $y = 36 - 20 = 16$ units

Hence, length $= 20$ units

and breadth $= 16$ units

38. Let the fraction be $\frac{x}{y}$.

Then, according to the question

$$\frac{x+1}{y+1} = \frac{4}{5}$$

$\Rightarrow \quad 5x + 5 - 4y + 4$

$\Rightarrow \quad 5x - 4y = -1 \quad \ldots(i)$

and $\quad \frac{x-5}{y-5} = \frac{1}{2}$

$\Rightarrow \quad 2x - 10 = y - 5$

$\Rightarrow \quad 2x - y = 5 \quad \ldots(ii)$

On multiplying Eq. (i) by 2 and Eq. (ii) by 5 and then subtracting Eq. (ii) from Eq. (i), we get

$$10x - 8y = -2$$
$$10x - 5y = 25$$
$$- \quad + \quad -$$
$$-3y = -27$$

$\Rightarrow \quad y = 9$

On substituting the value of y in Eq. (i), we get

$$5x - 4 \times 9 = -1$$

$\Rightarrow \quad 5x = -1 + 36$

$\Rightarrow \quad x = 7$

$\therefore$ Fraction $= \frac{7}{9}$

Therefore, numerator of this fraction is 7.

39. Let present age of man $= x$ yr

and present age of son $= y$ yr

Six years hence, men's age $= (x + 6)$ yr,

son's age $= (y + 6)$ yr

According to question,

$$(x + 6) = 3(y + 6) \Rightarrow x + 6 = 3y + 18$$

$\Rightarrow \quad x - 3y = 12 \quad \ldots(i)$

and three years ago Men's age $= (x - 3)$ yr,

son's age $= (y - 3)$ yr

According to the question,

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

$\Rightarrow \quad x - 3 = 9y - 27$

$\Rightarrow \quad x - 9y = -24 \quad \ldots(ii)$

On subtracting Eq. (ii) from Eq. (i), we get

$$6y = 36 \Rightarrow y = 6$$

On substituting the value of y in Eq. (i), we get

$$x - 18 = 12 \Rightarrow x = 30 \text{ yr}$$

40. Let the number of ₹ 1 coins $= x$

and the number of ₹ 2 coins $= y$

Then, by given condition,

$$x + y = 50 \quad \ldots(i)$$

and $\quad x \times 1 + y \times 2 = 75$

$\Rightarrow \quad x + 2y = 75 \quad \ldots(ii)$

On subtracting Eq. (i) from Eq. (ii), we get

$$(x + 2y) - (x + y) = 75 - 50 \Rightarrow y = 25$$

On substituting $y = 25$ in Eq. (i), we get

$$x + 25 = 50 \Rightarrow x = 25$$

Hence, she has 25 coins of ₹ 1 and 25 coins of ₹ 2.

41. Let fare from bus stand to Pitampura be ₹ x and to Dilshad Garden be ₹ y. According to the question, we have

Cost of 2 tickets to Pitampura + 3 tickets to Dilshad Garden = ₹ 46 and cost of 3 tickets to Pitampura + 5 tickets to Dilshad Garden = ₹ 74

∴ We get

$$2x + 3y = 46 \quad \ldots(i)$$

and $$3x + 5y = 74 \quad \ldots(ii)$$

Multiplying Eq. (i) by 3 and Eq. (ii) by 2, we get

$$6x + 9y = 138 \quad \ldots(iii)$$

and $$6x + 10y = 148 \quad \ldots(iv)$$

Subtracting Eq. (iii) from Eq. (iv), we get

$$y = 10$$

From Eq. (i),

$$2x + 3(10) = 46$$

$$\Rightarrow 2x + 30 = 46$$

$$\Rightarrow 2x = 16$$

$$\Rightarrow x = 8$$

Hence, the fare from the bus stand in Delhi to Pitampura is ₹ 8 and the fare to Dilshad Garden is ₹ 10.

42. Given, pair of equations is not linear.

∴ Put $\frac{1}{x} = p$ and $\frac{1}{y} = q$, we get

$$2p + 3q = 13 \quad \ldots(i)$$

and $$5p - 4q = -2 \quad \ldots(ii)$$

which is a pair of linear equations.

Now, on multiplying Eq. (i) by 4 and Eq. (ii) by 3 and
then adding both of them, we get

$$(8p + 12q) + (15p - 12q) = 52 - 6$$

$$\Rightarrow 8p + 15p = 52 - 6 \Rightarrow 23p = 46$$

$$\Rightarrow p = \frac{46}{23} = 2$$

On putting $p = 2$ in Eq. (i), we get

$$2(2) + 3q = 13$$

$$\Rightarrow 3q = 13 - 4 = 9 \Rightarrow q = \frac{9}{3} = 3$$

Since, $p = \frac{1}{x}$ and $q = \frac{1}{y}$

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

$\Rightarrow x = \frac{1}{2}$ and $y = \frac{1}{3}$, which is the required solution.

43. Given pair of equations is

$$\frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2 \text{ and } \frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1$$

On putting $\frac{1}{\sqrt{x}} = u$ and $\frac{1}{\sqrt{y}} = v$ in the given equations, we get

$$2u + 3v = 2 \quad \ldots(i)$$

and $$4u - 9v = -1 \quad \ldots(ii)$$

On multiplying Eq. (i) by 3 and then adding both of them, we get

$$3(2u + 3v) + 4u - 9v = 2 \times 3 - 1$$

$$\Rightarrow 6u + 4u = 5 \Rightarrow 10u = 5 \Rightarrow u = \frac{1}{2}$$

On putting $u = \frac{1}{2}$ in Eq. (i), we get

$$2 \times \frac{1}{2} + 3v = 2 \Rightarrow 3v = 2 - 1 \Rightarrow v = \frac{1}{3}$$

If $u = \frac{1}{2}$, then by $u = \frac{1}{\sqrt{x}}$, we get

$$\sqrt{x} = \frac{1}{u}$$

$$\Rightarrow \sqrt{x} = 2$$

$$\Rightarrow x = 4 \quad \text{[squaring both sides]}$$

If $v = \frac{1}{3}$, then by $v = \frac{1}{\sqrt{y}}$, we get

$$\sqrt{y} = \frac{1}{v} \Rightarrow \sqrt{y} = 3 \Rightarrow y = 9$$

[squaring both sides]

∴ $x = 4$ and $y = 9$ is the required solution.

44. Given equations are

$x+4y=27xy$ and $x+2y=21xy$

On dividing both sides of the above equations by xy, we get

$$\frac{1}{y}+\frac{4}{x}=27 \text{ and } \frac{1}{y}+\frac{2}{x}=21$$

On putting $\frac{1}{y}=u$ and $\frac{1}{x}=v$, we get

$$u+4v=27 \quad \text{...(i)}$$

and $$u+2v=21 \quad \text{...(ii)}$$

On subtracting Eq. (ii) from Eq. (i), we get

$$2v=6 \Rightarrow v=3$$

On putting the value of v in Eq. (i), we get

$$u+12=27 \Rightarrow u=15$$

Now, $v=3 \Rightarrow \frac{1}{x}=3 \Rightarrow x=\frac{1}{3}$

and $u=15 \Rightarrow \frac{1}{y}=15 \Rightarrow y=\frac{1}{15}$

Hence, $x=\frac{1}{3}$ and $y=\frac{1}{15}$ is the required solution.

45. Let $\frac{1}{x+1}=u$ and $\frac{1}{y-1}=v$, then the given pair of linear equations becomes

$$5u-2v=\frac{1}{2} \quad \text{... (i)}$$

and $$10u+2v=\frac{5}{2} \quad \text{...(ii)}$$

On adding Eqs. (i) and (ii), we get

$$15u=\frac{1}{2}+\frac{5}{2} \Rightarrow 15u=\frac{6}{2} \Rightarrow u=\frac{1}{5}$$

On putting $u=\frac{1}{5}$ in Eq. (i), we get

$$5\times\frac{1}{5}-2v=\frac{1}{2} \Rightarrow v=\frac{1}{4}$$

Now, $u=\frac{1}{5} \Rightarrow \frac{1}{x+1}=\frac{1}{5}$

$\Rightarrow x+1=5 \Rightarrow x=4$

and $v=\frac{1}{4} \Rightarrow \frac{1}{y-1}=\frac{1}{4} \Rightarrow y-1=4 \Rightarrow y=5$

Hence, $x=4$ and $y=5$, which is the required unique solution.

46. Let the actual speed of the train be x km/h and actual time taken be y h.

We know that,

Distance = Speed × Time

$\therefore$ Distance = xy km

According to the question,

$$xy=(x+10)(y-2)$$

$\Rightarrow xy=xy-2x+10y-20$

$\Rightarrow 2x-10y+20=0$

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

[dividing both sides by 2] ...(i)

and $xy=(x-10)(y+3)$

$\Rightarrow xy=xy+3x-10y-30$

$\Rightarrow 3x-10y-30=0 \quad$ ...(ii)

On multiplying Eq. (i) by 3 and then subtracting Eq. (ii) from it, we get

$$3\times(x-5y+10)-(3x-10y-30)=0$$

$\Rightarrow -5y=-60$

$\therefore y=12$

On putting $y=12$ in Eq. (i), we get

$$x-5\times12+10=0$$

$\Rightarrow x-60+10=0$

$\Rightarrow x=50$

Hence, the distance covered by train $xy=50\times12=600$ km

47. Given, ratio of incomes $=9:7$

and ratio of their expenditures $=4:3$

Saving of each person = ₹ 2000

Let incomes of two persons be $9x$, $7x$ and their expenditures be $4y$, $3y$.

Then, linear equations so formed are

$$9x-4y=2000 \quad \text{...(i)}$$

and $$7x-3y=2000 \quad \text{...(ii)}$$

We make the coefficients of x numerically equal in both equations. On multiplying Eq.(i) by 7 and Eq. (ii) by 9, we get

$$63x-28y=14000 \quad \text{...(iii)}$$

and $$63x-27y=18000 \quad \text{...(iv)}$$

On subtracting Eq. (iv) from Eq. (iii), we get

$$-28y + 27y = 14000 - 18000$$

$\Rightarrow \quad -y = -4000 \Rightarrow y = 4000$

On putting $y = 4000$ in Eq. (i), we get

$$9x - 4 \times 4000 = 2000$$

$\Rightarrow \quad 9x = 2000 + 16000$

$\Rightarrow \quad x = \frac{18000}{9} = 2000$

Thus, monthly income of both persons are 9(2000) and 7(2000), i.e. ₹ 18000 and ₹ 14000, respectively.

48. Let the speed of the boat in still water $= x$ km/h

and the speed of the stream $= y$ km/h

∴ The speed of the boat upstream $= (x - y)$ km/h

and the speed of the boat downstream $= (x + y)$ km/h

Time taken to go 35 km upstream $= \frac{35}{x - y}$ h

Time taken to go 55 km downstream $= \frac{55}{x + y}$ h

According to the question

$$\frac{35}{x - y} + \frac{55}{x + y} = 12 \quad \ldots\text{(i)}$$

and $$\frac{30}{x - y} + \frac{44}{x + y} = 10 \quad \ldots\text{(ii)}$$

Substituting $(x - y) = a$ and $(x + y) = b$, we get

$$\frac{35}{a} + \frac{55}{b} = 12 \quad \ldots\text{(iii)}$$

and $$\frac{30}{a} + \frac{44}{b} = 10 \quad \ldots\text{(iv)}$$

Multiplying Eq. (iii) by 6 and Eq. (iv) by 7, we get

$$\frac{210}{a} + \frac{330}{b} = 72 \quad \ldots\text{(v)}$$

and $$\frac{210}{a} + \frac{308}{b} = 70 \quad \ldots\text{(vi)}$$

Subtracting Eq. (vi) from Eq. (v), we get

$$\frac{22}{b} = 2$$

$\Rightarrow \quad 2b = 22$

$\Rightarrow \quad b = 11$

From Eq. (iii),

$$\frac{35}{a} + \frac{55}{11} = 12$$

$\Rightarrow \quad \frac{35}{a} + 5 = 12$

$\Rightarrow \quad \frac{35}{a} = 7$

$\Rightarrow \quad 7a = 35$

$\Rightarrow \quad a = 5$

Hence, $a = x - y = 5 \quad \ldots\text{(vii)}$

and $b = x + y = 11 \quad \ldots\text{(viii)}$

Solving Eqs. (vii) and (viii), we get

$$x = 8, y = 3$$

∴ The speed of the boat in still water $= 8$ km/h

49. (A) $a_1 = 2,\ b_1 = 3,\ c_1 = 40$

$a_2 = 6,\ b_2 = 5,\ c_2 = 10$

$$\frac{a_1}{a_2} = \frac{2}{6} = \frac{1}{3}, \frac{b_1}{b_2} = \frac{3}{5}, \frac{c_1}{c_2} = \frac{40}{10} = \frac{4}{1}$$

Here, $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$, so intersecting line

(B) $a_1 = 2, b_1 = 3,\ c_1 = 40$

$a_2 = 6,\ b_2 = 9,\ c_2 = 50$

$$\frac{a_1}{a_2} = \frac{2}{6} = \frac{1}{3}, \frac{b_1}{b_2} = \frac{3}{9} = \frac{1}{3}, \frac{c_1}{c_2} = \frac{40}{50} = \frac{4}{5}$$

Here, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ so parallel lines

(C) $a_1 = 2, b_1 = 3, c_1 = 10$

$a_2 = 4, b_2 = 6, c_2 = 20$

$$\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{3}{6} = \frac{1}{2},$$

$$\frac{c_1}{c_2} = \frac{10}{20} = \frac{1}{2}$$

Here, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ so coincident line.

50. (A) Given, $2x + y = 8$ (i)

and $x + 6y = 15$ ...(ii)

Multiplying Eq. (ii) by 2, we get

$$2x + 12y = 30 \quad ...(iii)$$

Subtracting Eq. (i) from Eq. (iii), we get

$$11y = 22$$

$$\Rightarrow \quad y = 2$$

From Eq. (i), we get

$$2x + 2 = 8$$

$$\Rightarrow \quad 2x = 6$$

$$\Rightarrow \quad x = 3$$

So, $(x, y) = (3, 2)$

(B) Given, $5x + 3y = 35$ ...(i)

and $2x + 4y = 28$ ...(ii)

On dividing Eq. (ii) by 2, we get

$$x + 2y = 14 \quad ...(iii)$$

On multiplying Eq. (iii) by 5, we get

$$5x + 10y = 70 \quad ...(iv)$$

On subtracting Eq. (i) from Eq. (iv), we get

$$7y = 35$$

$$\Rightarrow \quad y = 5$$

From Eq. (iii), we get

$$x + 2(5) = 14$$

$$\Rightarrow \quad x + 10 = 14$$

$$\Rightarrow \quad x = 4$$

So, $(x, y) = (4, 5)$

(C) Given, $15x + 4y = 61$ ...(i)

and $4x + 15y = 72$ ...(ii)

On multiplying Eq. (i) by 4 and Eq. (ii) by 15, we get

$$60x + 16y = 244 \quad ...(iii)$$

and $60x + 225y = 1080$ ...(iv)

On subtracting Eq. (iii) from Eq. (iv), we get

$$209y = 836$$

$$\Rightarrow \quad y = 4$$

From Eq. (i), we get

$$15x + 4(4) = 61$$

$$\Rightarrow \quad 15x + 16 = 61$$

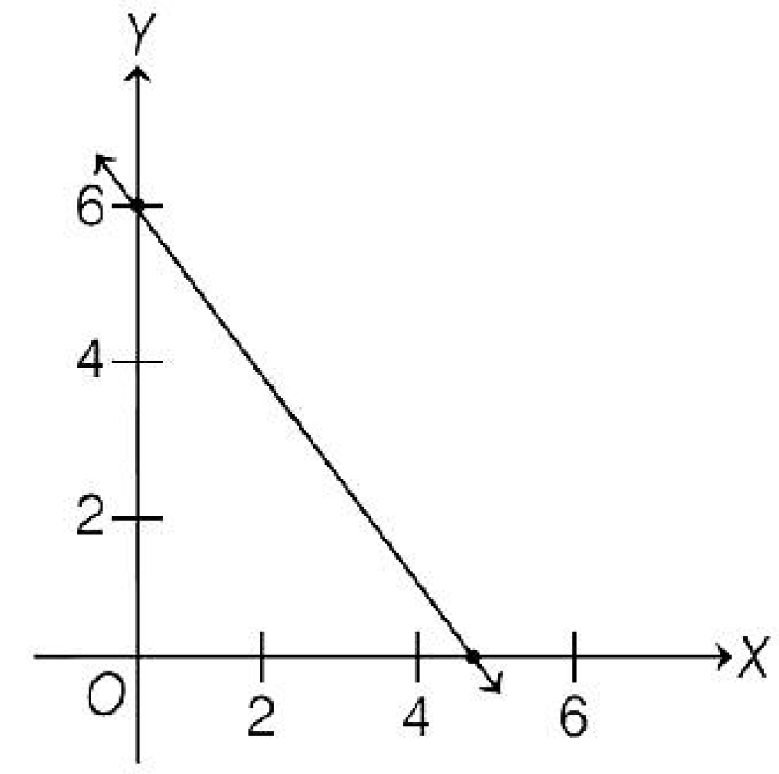
$$\Rightarrow \quad 15x = 45$$

$$\Rightarrow \quad x = 3$$

So, $(x, y) = (3, 4)$

51. $4x + 3y = 18$

x	9/2	0
y	0	6



Assertion : False; **Reason :** True

52. As, $x = 3$, $y = 1$ is the solution of

$$\Rightarrow \quad 2x + y - q^2 - 3 = 0$$

$$\Rightarrow \quad 2 \times 3 + 1 - q^2 - 3 = 0 \Rightarrow 4 - q^2 = 0$$

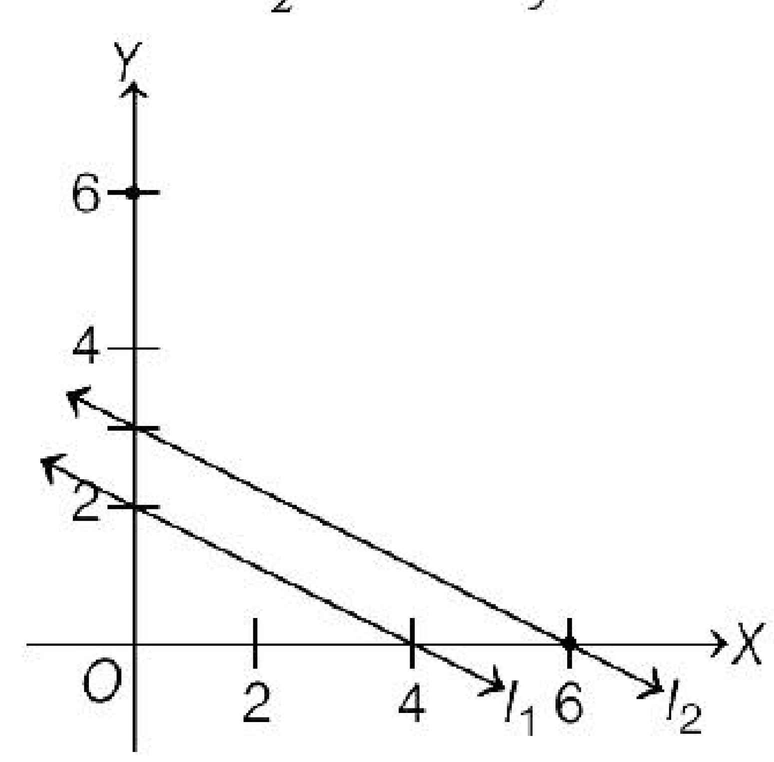
$$\Rightarrow \quad q^2 - 4 = 0 \Rightarrow q = \pm 2$$

Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

53. $l_1 : x + 2y - 4 = 0$ and $l_2 : 2x + 4y - 12 = 0$

x	4	0
y	0	2

x	6	0
y	0	3



so, the lines l_1 and l_2 are parallel to each other.

Assertion : True; **Reason :** True and is the correct explanation of assertion.

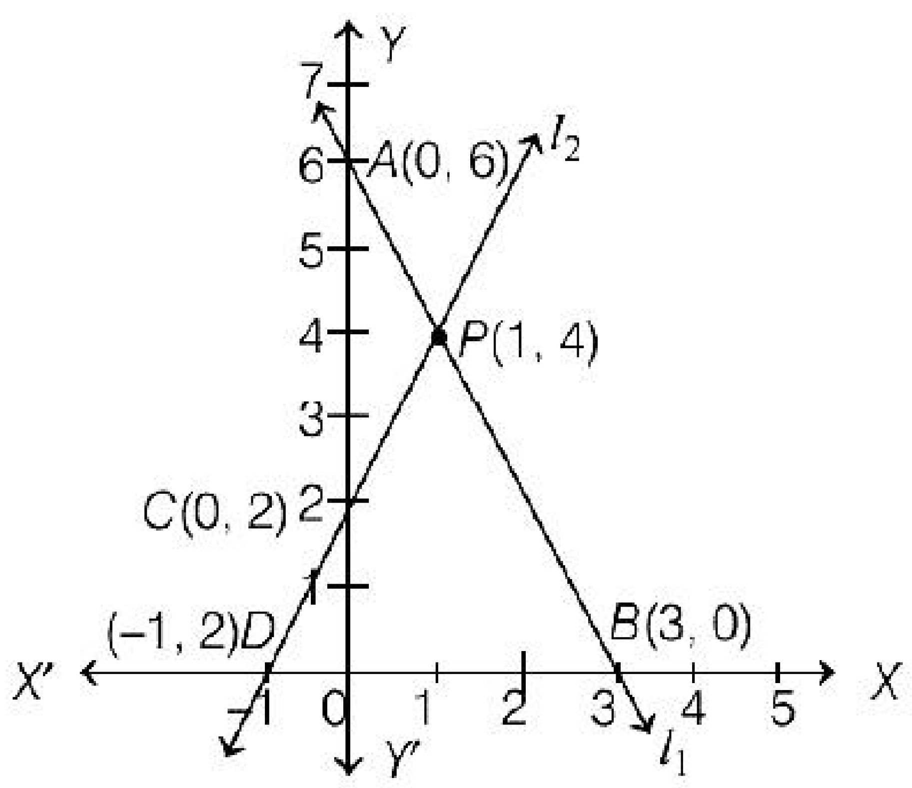
54. **Assertrion** We have,

$l_1 : 2x + y - 6 = 0$; $l_2 : 2x - y + 2 = 0$

$l_1 : y = 6 - 2x$; $l_2 : y = 2x + 2$

x	0	3
y	6	0

x	0	−1
y	2	0



From graph, it is clear that the given lines are not parallel lines.

Reason The linear equations $5x + ky - 4 = 0$ and $15x + 3y - 12 = 0$ have infinitely many solutions.

$\therefore \frac{5}{15} = \frac{k}{3} = \frac{-4}{-12} \Rightarrow \frac{1}{3} = \frac{k}{3} = \frac{1}{3} \Rightarrow k = 1$

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

55. Given system of linear equations has a unique solution, if

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

So, Assertion is false and Reason is true.

56. From the given equations, we have

$$\frac{9}{18} = \frac{3}{6} = \frac{12}{24}$$
$$\frac{1}{2} = \frac{1}{2} = \frac{1}{2} \text{ i.e., } \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

57. Assertion : Given system of equations has infinitely many solutions if,

$$\frac{2}{2a} = \frac{3}{a+b} = \frac{-7}{-28}$$
$$\frac{1}{a} = \frac{3}{a+b} = \frac{1}{4}$$
$$3a = a + b \Rightarrow 2a - b = 0$$

Also, clearly $a = 4$, and $a + b = 12$

$$b = 8$$
$$2a - b = 8 - 8 = 0$$

For unique solution

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \text{ or } \frac{3}{6} = \frac{-5}{-10} \; [3(-10) = (-5)(6) = -30]$$

Assertion is true But reason is false.

58. The given system of equations will have infinitely many solutions, if

$$\frac{1}{k+1} = \frac{k+1}{9} = \frac{5}{8k-1}$$
$$\Rightarrow \frac{1}{k+1} = \frac{k+1}{9} \text{ and } \frac{k+1}{9} = \frac{5}{8k-1}$$

$\Rightarrow (k+1)^2 = 9$ and $(k+1)(8k-1) = 45$

Now, $(k+1)^2 = 9$

$\Rightarrow k + 1 = \pm 3 \Rightarrow k = 2, -4$

We observe that $k = 2$ satisfies the equation $(k+1)(8k-1) = 45$ but $k = -4$ does not satisfy.

Hence, the given system of equations will have infinitely many solutions, if $k = 2$.

Assertion : False; **Reason :** True

59. For assertion, given equation has no solution if

$$\frac{1}{2} = \frac{1}{k} \neq \frac{-4}{-3} \text{ i.e. } \frac{4}{3}$$
$$k = 2 \left[\frac{1}{2} \neq \frac{4}{3} \text{ holds}\right]$$

Assertion is true.

Both Assertion (A) and Reason (R) are true but reason (R) is not the correct explanation of assertion (A).

60. Let the digit at units place be x and the digit at ten's place be y. Then, number $= 10y + x$

According to the given condition, we have

$10y + x = 8(x + y) + 1 \Rightarrow 7x - 2y + 1 = 0$ ...(i)

and, $10y + x = 13(y - x) + 2$

$\Rightarrow \quad 14x - 3y - 2 = 0$ ...(ii)

On multiplying Eq. (i) by 2, we get

$14x - 4y + 2 = 0$ ...(iii)

On subtracting Eq. (iii) from Eq. (ii), we get

$$y - 4 = 0 \Rightarrow y = 4$$

From Eq. (i)

$$7x - 2(4) + 1 = 0$$
$$\Rightarrow 7x - 8 + 1 = 0$$
$$\Rightarrow 7x - 7 = 0$$
$$\Rightarrow 7x = 7$$
$$\Rightarrow x = 1$$

Hence, the number $= 10y + x$

$$= 10 \times 4 + 1 = 41$$

Assertion : True; **Reason :** False

61. (i) Cost of 4 tickets to Karol Bagh $= 4x$

Cost of 6 tickets to Hauz Khas $= 6y$

Total cost $= 92$

Then, the situation can be represented algebraically as

$$4x + 6y = 92$$
$$2x + 3y = 46$$

(ii) Cost of 6 tickets to Karol Bagh $= 6x$

Cost of 10 tickets to Hauz Khas $= 10y$

Total cost $= 148$

Then, the situation can be represented algebraically as

$$6x + 10y = 148$$
$$3x + 5y = 74$$

(iii) We have, pair of linear equations as

$$2x + 3y = 46 \quad \ldots(i)$$
$$3x + 5y = 74 \quad \ldots(ii)$$

Multiply the first equation by 5 and second equation by 3.

$$10x + 15y = 230 \quad \ldots(iii)$$
$$9x + 15y = 222 \quad \ldots(iv)$$

Subtract the Eqs. (iv) for (iii)

$$x = 8$$

(iv) Put $x = 8$ into the Eq. (i)

$$2(8) + 3y = 46$$
$$3y = 46 - 16$$
$$3y = 30$$
$$y = 10$$

(v) Here, $a_1 = 2$, $b_1 = 3$, $c_1 = -46$

and $a_2 = 3$, $b_2 = 5$, $c_2 = -74$

$$\frac{a_1}{a_2} = \frac{2}{3}, \frac{b_1}{b_2} = \frac{3}{5}, \frac{c_1}{c_2} = \frac{-46}{-74} = \frac{23}{37}$$

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

Hence, the above pair of equation has unique solution.

62. Let the number of questions whose answer is known to the student be x and questions attempted by guessing be y.

Then, $\quad x + y = 120 \quad \ldots(i)$

and $\quad x - \frac{1}{4}y - 90$

$$\Rightarrow 4x - y = 360 \quad \ldots(ii)$$

On adding Eqs. (i) and (ii), we get

$$5x = 480$$
$$\Rightarrow x = \frac{480}{5} = 96$$

Put $x = 96$ in Eq. (i), we get

$$96 + y = 120 \Rightarrow y = 120 - 96 = 24$$

(i) He answered 96 questions correctly.

(ii) He guesses only 24 questions.

(iii) In out of 120 questions attempted 80 answered are correct and 40 guessing answered are wrong.

Then, he got the marks

$$= 80 - \frac{1}{4} \text{ of } 40 = 80 - \frac{1}{4} \times 40$$
$$= 80 - 10 = 70$$

(iv) According to the given condition,

$$x - \frac{1}{4} \text{ of } (120 - x) = 95$$
$$\Rightarrow x - \frac{1}{4} \times (120 - x) = 95$$
$$\Rightarrow 4x - 120 + x = 380$$
$$\Rightarrow 5x = 500$$
$$\Rightarrow x = 100$$

Hence, he answered correctly 100 questions to score 95 marks.

(v) 100 answered are correct and 20 giving answered are wrong.

Then, he got the marks $= 100 - \frac{1}{4} \times 20$

$= 100 - 5 = 95$

63. (i) For the first case,

Cost (proportional) for 5 guests $= 5y$

Total cost $= 450$

Then, the situation is $x + 5y = 450$

For the second case,

Cost (proportional) for 10 guests $= 10y$

Total cost $= 850$

Then, the situation is $x + 10y = 850$

(ii) Given, $x + 5y = 450$ ...(i)

$x + 10y = 850$ ...(ii)

Subtract Eq. (i) from Eq. (ii)

$5y = 400$

$y = 80$

(iii) Put $y = 80$ in Eq. (i)

$x + 5(80) = 450$

$x = 450 - 400$

$x = 50$

(iv) Cost (proportional) for 12 guests

$= 12 \times 80 = 960$

Total cost $= 960 + 50 = 1010$

(v) Here, $a_1 = 1, b_1 = 5, c_1 = 450$

and $a_2 = 1, b_2 = 10, c_2 = 850$

$\frac{a_1}{a_2} = 1, \frac{b_1}{b_2} = \frac{5}{10} = \frac{1}{2}, \frac{c_1}{c_2} = \frac{450}{850} = \frac{9}{17}$

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

Hence, unique solutions.

64. (i) From the given figure we see that area of two bedrooms $= 2(5x) = 10x$ m^2

Area of kitchen $= 5 \times y = 5y$ m^2

According to the question,

Area of the two bedrooms and area of kitchen $= 95$

$\therefore \quad 10x + 5y = 95$

$\Rightarrow \quad 2x + y = 19$

[divide both sides by 5] ... (i)

Also, length of the home = 15 cm

$\therefore \quad x + 2 + y = 15 \Rightarrow x + y = 13$ ...(ii)

Hence, pair of linear equations is

$2x + y = 19$ and $x + y = 13$

(ii) The length of the outer boundary of the layout $= 2(l + b)$

$= 2(15 + 12)$

$= 2(27)$

$= 54$ m

(iii) On solving Eqs. (i) and (ii), we get

$x = 6$ and $y = 7$

$\therefore$ Area of each bedroom

$= 5 \times x = 5 \times 6 = 30$ m^2

and area of kitchen

$= 5 \times y = 5 \times 7 = 35$ m^2

(iv) Area of living room

$= 15 \times (5 + 2)$

$-$ Area of bedroom 2

$= 15 \times 7 - 5 \times 6$

$= 105 - 30 = 75$ m^2

(v) Since, area of kitchen $= 5 \times y$

$= 5 \times 7 = 35$ m^2

But, it is also given, the cost of laying tiles in kitchen at the rate of ₹50 per m^2.

$\therefore$ Total cost of laying tiles in the kitchen

$= 35 \times 50 =$ ₹ 1750

65. (i) Cost of 4kg of onion $= 4x$

Cost of 2 kg of tomato $= 2y$

Total cost $= 3200$

Then, $4x + 2y = 3200$

$2x + y = 1600$

(ii) Cost of 8 kg of onion $= 8x$

Cost of 4 kg of tomato $= 4y$

Total cost $= 6000$

Then, $8x + 4y = 6000$

$\Rightarrow \quad 2x + y = 1500$

(iii) When a line intersect the X-axis, its Y coordinate is zero, i.e., $y = 0$

Put $y = 0$ into $2x + y = 1600$

$\Rightarrow \quad 2x + 0 = 1600$

$\Rightarrow \quad x = 800$

(iv) When a line intersect the Y-axis, its X coordinate is zero, i.e., $x = 0$

Put $x = 0$ into $2x + y = 1500$

$\Rightarrow \quad 2(0) + y = 1500$

$y = 1500$

(v) Here $a_1 = 2, b_1 = 1, c_1 = 1600$

and $a_2 = 2, b_2 = 1, c_2 = 1500$

$$\frac{a_1}{a_2} = \frac{2}{2} = 1, \frac{b_1}{b_2} = 1, \frac{c_1}{c_2} = \frac{1600}{1500} = \frac{16}{15}$$

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

Hence, the system have no solution {parallel lines}.

66. (i) As per the situation 1, the pair of linear equation representing the situation is

$x + 10y = 75$ and $x + 15y = 110$

(ii) On solving the above equations, we get

$$\begin{array}{r} x + 10y = 75 \\ x + 15y = 110 \\ - \quad - \quad - \\ \hline -5y = -35 \end{array}$$

$\Rightarrow \quad y = 7$

$\therefore \quad x + 10 \times 7 = 75$

$\Rightarrow \quad x = 75 - 70 = 5$

To travel a distance of 50 km, a person has to pay amount

$= x + 50y = 5 + 50 \times 7$

$= 5 + 350 = ₹\ 355$

(iii) As per the situation 2, the pair of linear is

$x + 8y = 91 \quad \ldots(i)$

and $x + 14y = 145 \quad \ldots(ii)$

On solving Eqs. (i) 4and (ii), we get

$$\begin{array}{r} x + 8y = 91 \\ x + 14y = 145 \\ - \quad - \quad - \\ \hline -6y = -54 \end{array}$$

$\Rightarrow \quad y = 9$

Put $y = 9$ in Eq. (i), we get

$x + 8 \times 9 = 91$

$\Rightarrow \quad x = 91 - 72 = 19$

To travel a distance of 30 km, a person has to pay amount

$= x + 30 \times y$

$= 19 + 30 \times 9$

$= 19 + 270$

$= ₹\ 289$

(iv) In situation 2, the intersection point of two lines is (19, 9), which is shown in figure (c).

(v) From the graph, it is clear that both the lines are intersecting each other.