

CHAPTER 3

PAIR OF LINEAR EQUATION IN TWO VARIABLE

KEY POINTS

1. The most general form of a pair of linear equations is :

$$a_1x + b_1y + c_1 = 0$$

$$a_2x + b_2y + c_2 = 0$$

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

2. The graph of a pair of linear equations in two variables is represented by two lines;

- (i) If the lines intersect at a point, the pair of equations is consistent. The point of intersection gives the unique solution of the equation.
- (ii) If the lines coincide, then there are infinitely many solutions. The pair of equations is consistent. Each point on the line will be a solution.
- (iii) If the lines are parallel, the pair of the linear equations has no solution. The pair of linear equations is inconsistent.

3. If a pair of linear equations is given by $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$

- (i) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow$ the pair of linear equations is consistent. (Unique solution).

- (ii) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow$ the pair of linear equations is inconsistent (No solution).

- (iii) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow$ the pair of linear equations is dependent and consistent (infinitely many solutions).

MULTIPLE CHOICE QUESTIONS

- Every linear equation in two variables has ____ solution(s).
 (a) no (b) one
 (c) two (d) infinitely many
- $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ is the condition for
 (a) intersecting lines (b) parallel lines
 (c) coincident lines (d) none
- For a pair to be consistent and dependent the pair must have
 (a) no solution (b) unique solution
 (c) infinitely many solutions (d) none of these
- Graph of every linear equation in two variables represent a ____
 (a) point (b) straight line
 (c) curve (d) triangle
- Each point on the graph of pair of two lines is a common solution of the lines in case of ____
 (a) Infinitely many solutions (b) only one solution
 (c) no solution (d) none of these
- The pair of linear equations $x = y$ and $x + y = 0$ has
 (a) no common solution (b) infinitely many solutions
 (c) unique solution (d) none

7. One of the common solution of $ax + by = c$ and y -axis is _____

(a) $\left(0, \frac{c}{b}\right)$

(b) $\left(0, \frac{b}{c}\right)$

(c) $\left(\frac{c}{b}, 0\right)$

(d) $\left(0, -\frac{c}{b}\right)$

8. For $x = 2$ in $2x - 8y = 12$ the value of y will be

(a) -1

(b) $+1$

(c) 0

(d) 2

9. The pair of linear equations is said to be inconsistent if they have

(a) only one solution

(b) no solution

(c) infinitely many solutions.

(d) both a and c

10. On representing $x = a$ and $y = b$ graphically we get _____

(a) parallel lines

(b) coincident lines

(c) intersecting lines at (a, b)

(d) intersecting lines at (b, a)

11. In a $\triangle ABC$, $\angle C = 3 \angle B$, $\angle C = 2 (\angle A + \angle B)$ then $\angle A$, $\angle B$ and $\angle C$ are—

(a) $30^\circ, 60^\circ, 90^\circ$

(b) $20^\circ, 40^\circ, 120^\circ$

(c) $45^\circ, 45^\circ, 90^\circ$

(d) $110^\circ, 40^\circ, 50^\circ$

12. For $2x + 3y = 4$, y can be written in terms of x as—

(a) $y = \frac{4 + 2x}{3}$

(b) $y = \frac{4 - 3x}{2}$

(c) $x = \frac{4 - 3y}{2}$

(d) $y = \frac{4 - 2x}{3}$

13. The pair of linear equations $x = 2$ and $x = 5$ has

(a) no common solution

(b) infinitely many solutions

(c) unique solution

(d) none

14. The coordinates of the point where x-axis and the line represented by $\frac{x}{2} + \frac{y}{3} = 1$ intersect, are
- (a) (0, 3) (b) (3, 0)
(c) (2, 0) (d) (0, 2)
15. Graphically $x - 2 = 0$ represents a line
- (a) parallel to x-axis at a distance 2 units from x-axis.
(b) parallel to y-axis at a distance 2 units from it.
(c) parallel to x-axis at a distance 2 units from y-axis.
(d) parallel to y-axis at a distance 2 units from x-axis.
16. If $ax + by = c$ and $lx + my = n$ has unique solution then the relation between the coefficients will be ____
- (a) $am \neq lb$ (b) $am = lb$
(c) $ab = lm$ (d) $ab \neq lm$

SHORT ANSWER TYPE QUESTIONS

17. Form a pair of linear equations for : If twice the son's age is added to father's age, the sum is 70. If twice the father's age is added to the son's age the sum is 95.
18. Amar gives ₹ 9000 to some athletes of a school as scholarship every month. Had there been 20 more athletes each would have got ₹ 160 less. Form a pair of linear equations for this.
19. Give linear equations which is coincident with $2x + 3y - 4 = 0$
20. What is the value of a for which (3, a) lies on $2x - 3y = 5$
21. The sum of two natural nos. is 25 and their difference is 7. Find the nos.
22. Dinesh is walking along the line joining (1, 4) and (0, 6), Naresh is walking along the line joining (3, 4,) and (1,0). Represent on graph and find the point where both of them cross each other.

23. Solve the pair of linear equations

$$x - y = 2 \text{ and } x + y = 2. \text{ Also find } p \text{ if } p = 2x + 3$$

24. Check graphically whether the pair of linear equations $3x + 5y = 15$, $x - y = 5$ is consistent. Also check whether the pair is dependent.

25. For what value of p the pair of linear equations

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

$$2x - 3y = 7$$

has unique solution.

26. Find the value of K so that the pair of linear equations :

$$(3K + 1)x + 3y - 2 = 0$$

$$(K^2 + 1)x + (k-2)y - 5 = 0 \text{ is inconsistent.}$$

27. Given the linear equation $x + 3y = 4$, write another linear equation in two variables such that the geometrical representation of the pair so formed is (i) intersecting lines (ii) parallel lines (iii) coincident lines.

28. Solve $x - y = 4$, $x + y = 10$ and hence find the value of p when $y = 3x - p$

29. Determine the value of K for which the given system of linear equations has infinitely many solutions:

$$Kx + 3y = K - 3$$

$$12x + Ky = K$$

30. Find the values of α and β for which and following system of linear equations has infinite no of solutions :

$$2x + 3y = 7$$

$$2\alpha x + (\alpha + \beta)y = 28.$$

31. Solve for x and y :

$$\frac{(x + 1)}{2} + \frac{(y - 1)}{3} = 8; \quad \frac{(x - 1)}{3} + \frac{(y + 1)}{2} = 9$$

32. Solve for x and y :

$$2^x + 3^y = 17$$

$$2^{x+2} - 3^{y+1} = 5.$$

33. Solve for x and y

$$139x + 56y = 641$$

$$56x + 139y = 724$$

34. Solve for x and y

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

$$\frac{15}{x+y} - \frac{5}{x-y} = -2$$

35. Solve the system of linear equations graphically :

$$3x - 5y = 19, 3y - 7x + 1 = 0.$$

Does the point $(4, 9)$ lie on any of the lines? Write equations.

36. Check graphically whether the pair of lines $3x + 2y - 4 = 0$ and $2x - y - 2 = 0$ is consistent. Also find the coordinates of the points where the graphs of the lines of equations meet the y -axis.

LONG ANSWER TYPE QUESTIONS

37. Solve for x and y

$$\frac{1}{2(2x+3y)} + \frac{12}{7(3x-2y)} = \frac{1}{2}$$

$$\frac{7}{(2x+3y)} + \frac{4}{(3x-2y)} = 2 \text{ for } 2x+3y \neq 0 \text{ and } 3x-2y \neq 0$$

38. Solve for p and q

$$\frac{p+q}{pq} = 2, \frac{p-q}{pq} = 6, p \neq 0, q \neq 0.$$

$$39. \frac{6}{x+y} = \frac{7}{x-y} + 3, \frac{1}{2(x+y)} = \frac{1}{3(x-y)}, x+y \neq 0, x-y \neq 0$$

$$40. \frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2, \frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1; x \neq 0, y \neq 0$$

41. If from twice the greater of two numbers, 20 is subtracted, the result is the other number. If from twice the smaller number, 5 is subtracted, the result is the greater number. Find the numbers.
42. In a deer park the number of heads and the number of legs of deer and visitors were counted and it was found that there were 39 heads and 132 legs. Find the number of deers and visitors in the park, using graphical method.
43. A two digit number is obtained by either multiplying the sum of the digits by 8 and adding 1; or by multiplying the difference of the digits by 13 and adding 2. Find the number. How many such nos. are there.
44. In an examination one mark is awarded for every correct answer and $\frac{1}{4}$ mark is deducted for every wrong answer. A student answered 120 question and got 90 marks. How many questions did he answer correctly?
45. A boatman rows his boat 35 km upstream and 55 km down stream in 12 hours. He can row 30 km. upstream and 44 km downstream in 10 hours. Find the speed of he stream and that of the boat in still water. Hence find the total time taken by the boat man to row 50 cm upstream and 77 km downstream.
46. In a function if 10 guests are sent from room A to B , the no. of guests in room A and B are same. If 20 guests are sent from B to A , the no. of guests in A is double the no. of guests in B . Find no. of guests in both the rooms in the beginning.
47. In a function Madhu wished to give Rs. 21 to each person present and found that she fell short of Rs. 4 so she distributed Rs. 20 to each and found that Rs. 1 were left over. How much money did she gave and how many persons were there.

48. A mobile company charges a fixed amount as monthly rental which includes 100 minutes free per month and charges a fixed amount there after for every additional minute. Abhishek paid Rs. 433 for 370 minutes and Ashish paid Rs. 398 for 300 minutes. Find the bill amount under the same plan, if Usha use for 400 minutes.

ANSWERS

- | | |
|--|-------------------------------------|
| 1. d | 2. c |
| 3. c | 4. b |
| 5. a | 6. c |
| 7. a | 8. a |
| 9. b | 10. c |
| 11. b | 12. d |
| 13. a | 14. c |
| 15. b | 16. a |
| 17. Father's age x years, Son's age = y years
$x + 2y = 70$, $2x + y = 95$ | |
| 18. No. of athletes = x , No. of athletes increased = y | |
| 19. $4x + 6y - 8 = 0$ | 20. $\frac{1}{3}$ |
| 21. 16, 9 | 22. (2, 2) |
| 23. (2, 0) $P = 7$ | 24. No |
| 25. $p \neq 4$ | |
| 26. $k = -1$, $k \neq \frac{19}{2}$ | 27. $-$ |
| 28. (7, 3), 18 | 29. $k = 6$ |
| 30. (4, 8) | 31. (7, 13) |
| 32. (3, 2) | 33. (3, 4) |
| 34. (3, 2) | 35. (-2, -5) yes, $3y - 7x + 1 = 0$ |
| 36. Yes | 37. (2, 1) |

38. $\left(-\frac{1}{2}, \frac{1}{4}\right)$

39. (1, 1)

40. (4, 9)

41. 15, 10

42. 27, 12

43. 41 or 14(2)

44. 96

45. 34 km/hr, 5km/hr.

46. 100, 80

47. Rs. 101, 5

48. $\left[\text{Rs. } 298, \text{Rs. } \frac{1}{2}\right] \text{Rs. } 448$