Key points

- **Linear equation in one variable:** An equation which can be written in the form $ax + b = 0$, where a, b are real numbers and $a \neq 0$ is called a linear equation in one variable.
- **Linear equation in two variables:** An equation which can be written in the form $ax + by + c = 0$, where a, b and c are real numbers and $a, b \neq 0$, is called a linear equation in two variables.

  Linear equation in one variable has a unique solution.

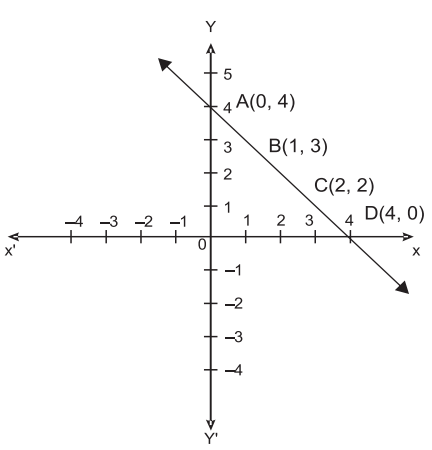
  $ax + b = 0 \Rightarrow x = -\frac{b}{a}$
- Linear equation in two variables has infinitely many solutions.
- The graph of every linear equation in two variables is a straight line.
- Every point on the line satisfies the equation of the line.
- Every solution of the equation is a point on the line. Thus, a linear equation in two variables is represented geometrically by a line whose points make up the collection of solutions of the equation.

Graph

- The pair of values of x and y which satisfies the given equation is called solution of the linear equation in two variables.

  Example: $x + y = 4$

  Solutions of equation $x + y = 4$ are (0, 4) (1, 3) (2, 2) (4, 0) and many more.



Very Short Answer Questions (1 Mark)

1. Which of the following is not a linear equation?

(a) $3x + 3 = 5x + 2$

(b) $x^2 + 5 = 3x - 5$

(c) $\frac{7}{3}x - 5 = 4x - 3$

(d) $(x + 2)^2 = x^2 - 8$

2. Which of the following is not a linear equation in two variables?

(a) $2x + 3y = 5$ (b) $3t + 2s = 6$

(c) $ax^2 + by = c$ (d) $ax + by = c$

3. A linear equation in two variables has maximum

(a) One solution (b) Two solutions

(c) Infinite solutions (d) Four solutions

4. The graph of $ax + by + c = 0$ is

(a) a straight line parallel to x-axis (b) a straight line parallel to y-axis

(c) a general straight line (d) not a straight line

5. If $x = 1, y = 1$ is a solution of equation $8x + 12ay = 63$, then the value of a is :

(a) 3 (b) 0

(c) –3 (d) 4

6. The equation of x-axis is :

(a) $x = k$ (b) $x = 0$

(c) $y = k$ (d) $y = 0$

7. Any point on the line $y = x$ is of the form :

(a) $(a, 0)$ (b) $(0, a)$

(c) (a, a) (d) $(a, -a)$

8. The equation $x = 0$ represents :–

(a) x-axis (b) y-axis

(c) a line parallel to x-axis (d) a line parallel to y-axis

9. Which of the following linear equation has solution $x = 2, y = 3$?

(a) $2x + y = 8$ (b) $x + 2y = 8$

(c) $x + y = 8$ (d) $-x + y = 8$

10. The graph of $2x + 3y = 6$ is a line which meets the y-axis at the point.

(a) (2, 0) (b) (3, 0)

(c) (0, 2) (d) (0, 3)

11. At what point, the graph of $3x + 2y = 9$, cuts the y-axis?

12. Let y varies directly as x. If $y = 15$ when $x = 5$, then write a linear equation.

13. Write the point of intersection of the lines $x = 2$ and $y = -3$

14. What is the distance of the point $(3, -7)$ from x-axis?

15. What is the distance of the point $(-5, -4)$ from y-axis?

16. Express the linear equation $\sqrt{2}x - 4 = 5y$ in the form of $ax + by + c = 0$ and thus indicate the values of a, b and c.

17. Express x in terms of y for the equation $3x + 4y = 7$.

18. Express y in the terms of x.

$y + 35x = 9$

19. On which axis does the point (9,0) lie?

20. Find a solution of $x + y = 5$ which lies on y-axis.

21. Express the equation $5y = 9$ as linear equation in two variables.

22. Write the linear equation which is parallel to x-axis and is at a distance of 2 units from the origin in upward direction.

23. Check whether $(1, -2)$ is a solution of $2x - y = 6$.

24. Check whether $x = 2$ and $y = 2$ is a solution of $2x + y = 6$.

25. How many solutions are there for equation $y = 5x + 2$.

26. Find the value of K, if $x = -1$ and $y = 1$ is a solution of equation $Kx - 2y = 0$

27. If the graphs of equation $2x + Ky = 10K$ intersects x-axis at point $(5, 0)$, find the value of K.

28. The graph of the linear equation $4x = 6$ is parallel to which axis?

29. At which point the graph of $2x - y = 6$, cuts x-axis?

30. The graph of the equation $x + 3=0$ lies on which side of y axis?

31. The graph of the equation $2y-1=0$ lie on which side of the x axis?

Fill in the blanks:

32. (a) The equation of a line parallel to x-axis is _____ $=a$, where a is any non-zero real number.

(b) The equation of a line parallel to y-axis is _____ $=a$, where a is any non-zero real number.

33. The graph of every linear equation in two variables is a _____.

34. An equation of the form $ax + b = 0$, where a, b are real numbers and $a \neq 0$, in the variable x, geometrically represents _____.

35. The coefficient of x in the linear equation $2(x + y) - x = 7$ is _____

36. State whether the following statements are true or false :-

(a) The linear equation $7x + 9y = 8$ has a unique solution

(b) All the points (2, 0), (–3, 0), (4, 2) lie on the x-axis

(c) The line parallel to y-axis at a distance of 5 units to the left of y-axis is given by the equation $x = -5$.

(d) The graph of every linear equation in two variables need not be a line.

(e) The graph of the linear equation $x + 2y = 5$ passes through the point (0, 5)

Short Answer Type-I Questions (2 marks)

37. Find any two solutions of equation

$x + 2y = x + 5$

38. Find the value of P if $x = 2$, $y = 3$ is a solution of equation $5x + 3Py = 4a$

39. If the points $A(3, 5)$ and $B(1, 4)$ lies on the graph of line $ax + by = 7$, find the value of a.

40. Write the coordinates of the point where the graph of the equation $5x - 2y = 10$ intersect both the axes.

41. Write the equations of two lines passing through (3, 10).

42. The cost of coloured paper is 7 more than 1/3 of the cost of white paper. Write this statements in linear equation in two variables.

43. Draw the graph of equation $x + y = 5$.

44. The graph of linear equation $2x - y = 6$ will pass through which quadrants(s).

45. How many solution of the equations $3x - 2 = x - 3$ are there on the

(i) Number line

(ii) Cartesian plane.

46. Find the points where the graph of $x + y = 4$ meets line which is

(i) parallel to x-axis at 3 units from origin in positive direction of y-axis.

(ii) parallel to y-axis at 2 units on left of origin.

Short Answer Type-II Questions (3 marks)

47. The total number of legs in a herd of goats and hens is 40. Represent this situation in the form of a linear equation in two variables.

48. Find the value of a and b, if the line $ax + by = 24$ passes through, (2, 0) and (1, 2)

49. Determine the point on the graph of the linear equation $2x + 5y = 19$ whose ordinate is 1½ times its abscissa.

50. Find the points where the graph of the following equation cuts the x-axis and y-axis $2x = 1 - 5y$.

51. Write the equation of the line parallel to x-axis at a distance of 4 units above the origin.

52. If the points $A(4, 6)$ and $B(1, 3)$ lie on the graph of $ax + by = 8$ then find the value of a and b.

53. Find the value of 'a' if $(1, -1)$ is the solution of the equation $2x + ay = 5$. Find two more solutions of the equation.

54. Find two solutions of the equation $4x + 5y = 28$. Check whether $(-2, 10)$ is solution of the given equation.

55. Write the equation of line passing through $(3, -3)$ and $(6, -6)$.

56. If $x = 3k - 2, y = 2k$ is a solution of equation $4x - 7y + 12 = 0$, then find the value of k.

57. If $(m - 2, 2m + 1)$ lies on equation $2x + 3y - 10 = 0$, find m.

58. Given $F=\left(\frac{9}{5}\right)C+32$, where F is temperature in Fahrenheit and C is temperature in Celsius.

(i) If the temperature is 35°C, what is the temperature in Fahrenheit?

(ii) If the temperature is 30°C, what is the temperature in Fahrenheit?

59. Draw the graph of the linear equation $2x + 3y = 6$. Find out the coordinates of the points where the line intersets x-axis and y-axis.

60. Draw the graph for the linear equation $3x + 4y = 12$. If $x = 8$, find the value of y with the help of graph.

61. Draw the graph of $y = x$ and $2y = -5x$ on the same graph.

62. Give the geometrical representation of $5x + 7 = 0$ as equation:

(i) in one variable

(ii) in two variables

63. Draw the graph of the linear equation $2y - x = 7$. With the help of graph check whether $x = 3$ and $y = 2$ is the solution of the equation:

64. Draw the graph of linear equation $3x - y = 4$. From the graph find the value of p and q if the graph passes through $(p, -4)$ and $(3, q)$

65. Draw the graph of equations $2x + 3y = -5$ and $x + y = -1$ on the same graph. Find the co-ordinate of the point of intersection of two lines.

66. Show that the points $A(1, -1)$, $B(2, 6)$ and $C(0, -8)$ lie on the graph of the linear equation $7x - y = 8$.

Long answer type questions (5 Marks)

67. Write $3y = 8x$ in the form of $ax + by + c = 0$. Write x in terms of y. Find any two solutions of the equation. How many solutions you can find out?

68. Rohan and Ramita of Class IX decided to collect ₹25 for class cleanliness. Write it in linear equation in two variables. Also draw the graph.

69. Sarika distributes chocolates on the occasion of children's Day. She gives 5 chocolates to each child and 20 chocolates to adults. If number of children is represented by 'x' and total distributed chocolates as 'y'.

(i) Write it in the form of linear equation in two variables.

(ii) If she distributed 145 chocolates in total, find number of children?

70. Priyanka and Arti decided to donate ₹1600 for the Army widows. Assuming Priyanka's share as 'x' and Arti's share as 'y':

(a) Form a linear equation in two variables.

(b) If Priyanka donates thrice the amount donated by Arti, then find out the amount donated by both.

71. Riya participates in Diwali Mela with her friends for the charity to centre of handicapped children. They donate ₹3600 to the centre from the amount earned in Mela. If each girl donates ₹150 and each boy donates ₹200, they

(a) Form the linear equation in two variables.

(b) If number of girls are 8, find number of boys.

72. Aftab is driving a car with uniform speed of 60 km/hr. Assuming total distance to be y km and time taken as x hours, form a linear equation. Draw the graph. From the graph read the following:

(i) distance travelled in 90 minutes.

(ii) Time taken to cover a distance of 150 km.

73. The parking charges of a car in a private parking is ₹ 20 for the first hour and ₹10 for subsequent hours. Taking total parking charges to be y and total parking time as x hours form a linear equation. Write it in standard form and indicate the values of a, b and c. Draw the graph also.

74. We know that $C = 2\pi r$, taking $\pi = 22/7$, circumference as y units, radius as x units, form a linear equation. Draw the graph. Check whether the graph passes through (0, 0). From the graph read the circumference when radius is 2.8 units.

CHAPTER-4

LINEAR EQUATIONS IN TWO VARIABLES

Answers

1. (b) $x^2 + 5 = 3x - 5$

2. (c) $ax^2 + by = c$

3. (c) Infinite solutions

4. (c) a general straight line

5. (a) 3

6. (d) $y = 0$

7. (c) (a, a)

8. (b) y-axis

9. (b) $x + 2y = 8$

10. (c) (0, 2)

11. (0, 4.5)

12. $y = 3x$

13. (2, –3)

14. 7 units

15. 5 units

16. $\sqrt{2}x - 5y - 4 = 0$

$a = \sqrt{2}, b = -5, c = -4$

17. $x = \frac{7 - 4y}{3}$

18. $y = \frac{9 - 5x}{3}$

19. x-axis

20 (0, 5)

21. $0x + 5y = 9$

22. $y = 2$

23. No

24. Yes

25. Infinitely many solutions

26. $k = -2$

27. $k = 1$

28. Parallel to y-axis

29. (3, 0)

30. On left side

31. Above x-axis

32. (a) y

(b) x

33. Straight line

34. a point on number line

35. 1

36. (a) F (b) F (c) T (d) F (e) F

37. (1, 4) (0, 5) (or any other possible solutions)

38. $b = \dfrac{4a - 10}{9}$

39. $3a + 5b = 7$; $a + 4b = 7$

$b = 2$, $a = -1$

40. The Graph of $5x - 2y = 10$ will intersect x-axis when $y = 0$ ie $x = 2$ and point is (2,0)

Similarly for y-axis put $x = 0 \Rightarrow$ y = -5

Hence points are (2,0) and (0,-5)

41. $3x - y + 1 = 0$, $x + y = 13$ (or any other possible equation)

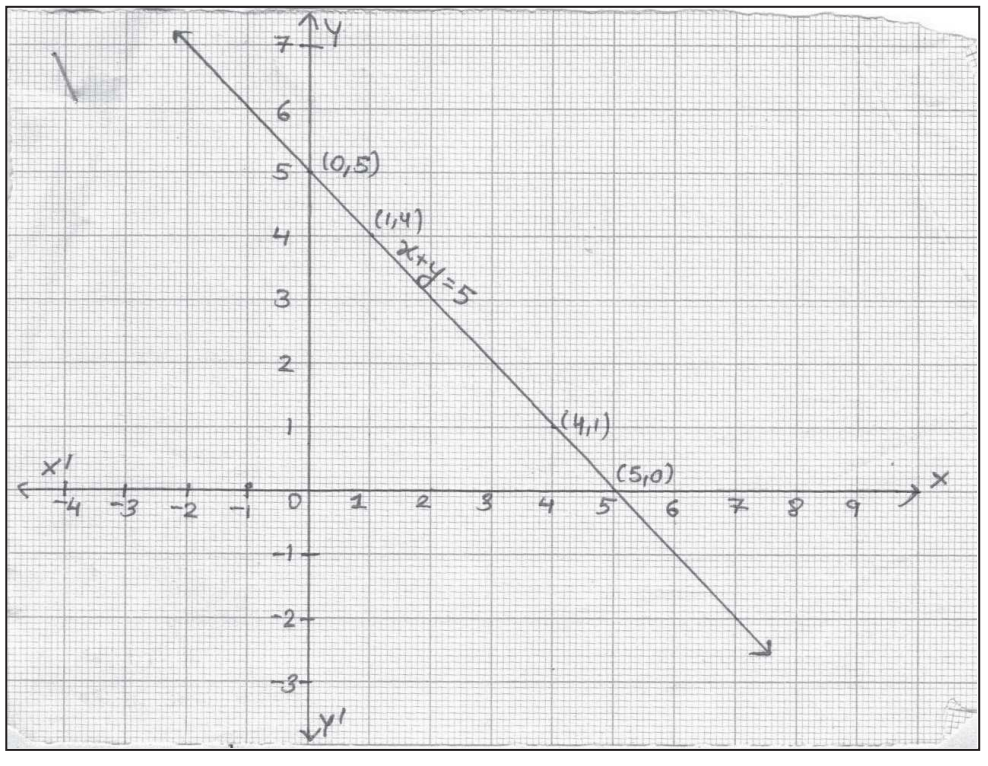
42. Let the cost of coloured paper be ₹ x

Let the cost of white paper be ₹ y, then

$x = 1/3\ y + 7$ or $3y - y = 21$

43. $x + y = 5$

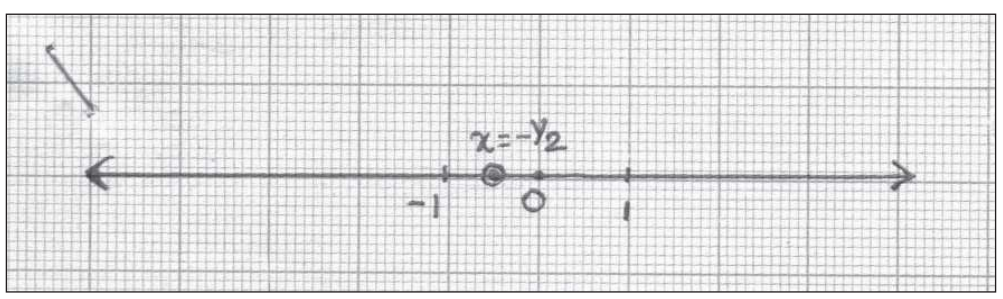
x	0	5	1
y	5	0	4



44. I, IV, III

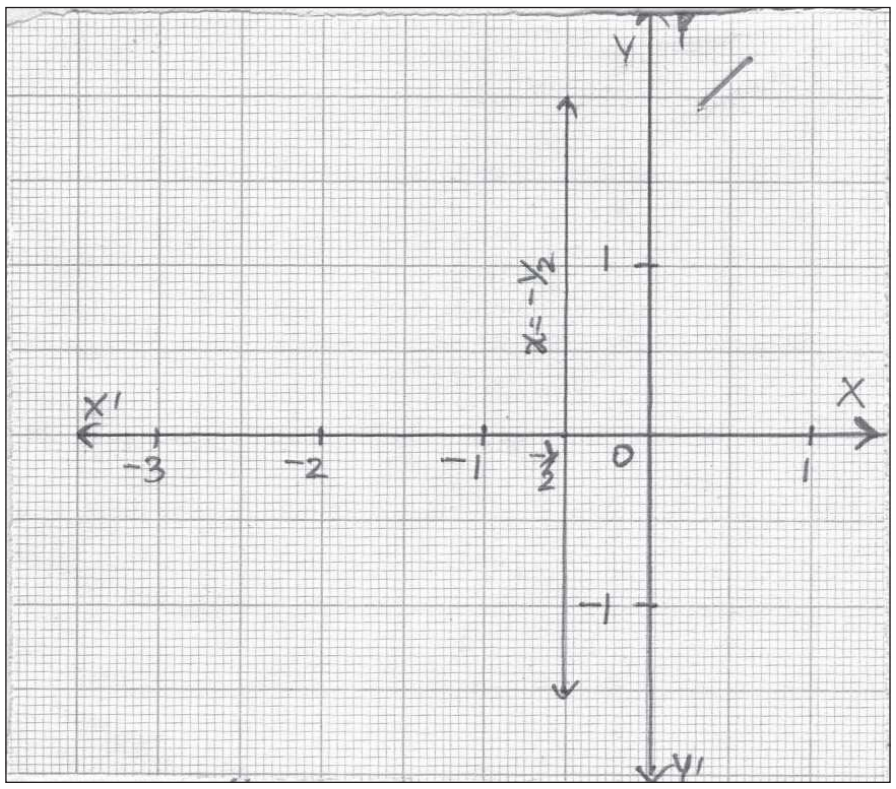
45. (i) $3x - 2 = x - 3 \Rightarrow x = -\frac{1}{2}$

On number line only one solution i.e.,



(ii) On Cartesian plane infinitely many solutions i.e., $1 \cdot x + 0 \cdot y = -\frac{1}{2}$

x	$-\frac{1}{2}$	$-\frac{1}{2}$	$-\frac{1}{2}$
y	–1	0	1



(A line parallel to y-axis)

46. (i) Parallel to x-axis $\Rightarrow$ abscissa is zero

3 units from origin is opposite direction of y-axis

$\Rightarrow$ ordinate in 3

putting $n = 0, y = 3$

is $n + y = 4$

$\Rightarrow n = 1$

Hence point is (1,3)

(ii) Parallel to y-axis $\Rightarrow$ ordinate is zero

2 units on left of origin $\Rightarrow$ abscissa is -2

putting $x = -2, y = 0$

is $x + y = 4$

$\Rightarrow y = 6$

Hence point is (-2,6)

47. Let number of goats = x

Number of hens = y

$$4x + 2y = 40$$

or

$$2x + y = 20$$

48. Putting $x = 2$ and $y = 0$

$= a = 2$

Now putting $x = 1$ and $a = 2$

$= b = 6$

49. Let required pt. be (x', y')

$$A/Q,\ y' = 1\frac{1}{2}x' = \frac{3}{2}x' \qquad \text{------- (1)}$$

(x', y') lies on graph of $2x + 5y = 19$

$x' + 5y' = 19$ 2 ------- (2)

from (1) and (2)

$$2x' + 5\left(\frac{3}{2}x'\right) = 19$$

$x' + 15x' = 38$ 4 $\Rightarrow x' = 2$

$$y' = \frac{3}{2} \times 2 = 3$$

so point will be (x', y') i.e. (2, 3)

50. cuts x-axis at $\left(\frac{1}{2}, 0\right)$, cuts y-axis at $\left(0, \frac{1}{5}\right)$

51. $y = 4$

52. $4a + 6b = 8 \quad \Rightarrow 2a + 3b = 4$

$a + 3b = 8$

After solving $a = -4$ and $b = 4$

53. Putting $x = 1$ and $y = -1$

$\Rightarrow a = -3$

any two correct solution

54. Given equation is $4x + 5y = 28$

LHS $= 4x + 5y$

Putting $x = -2$

LHS = 42

But RHS = 28

Hence LHS ≠ RHS

$\Rightarrow$ (–2, 10) is not a solution of equation $4x + 5y = 28$

55. $x + y = 0$

56. $4[3k - 2] - 7[2k] + 12 = 0$

$\Rightarrow 12k - 8 - 14k + 12 = 0$

$\Rightarrow k = 2$

57. $2[m - 2] + 3[2m + 1] - 10 = 0$

$m - 4 + 6m + 3 - 10 = 0$

$m = \frac{11}{8}$

58. (i) $F = \left(\frac{9}{5}\right) C + 32$

when $C = 35$

$\Rightarrow F = \left(\frac{9}{5}\right)(35) + 32$

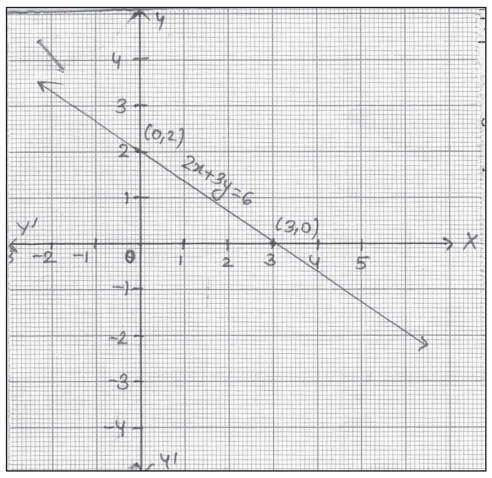
$\Rightarrow F = 95°$ F

(ii) $F = \left(\frac{9}{5}\right)(30) + 32$

$= 9 \times 6 + 32$

$= 86°$ F

59. $2x + 3y = 6$

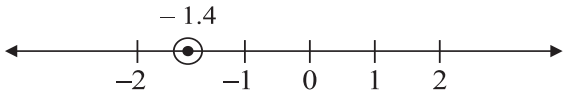


x-axis co-ordinates (3, 0) ; y-axis co-ordinates (0, 2)

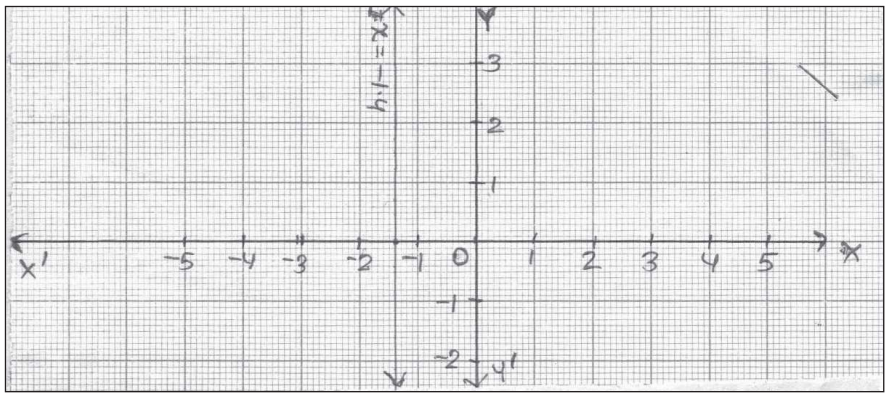
60. $y = -3$

62. $x = \frac{-7}{5}$ or $x = -1.4$

(i)



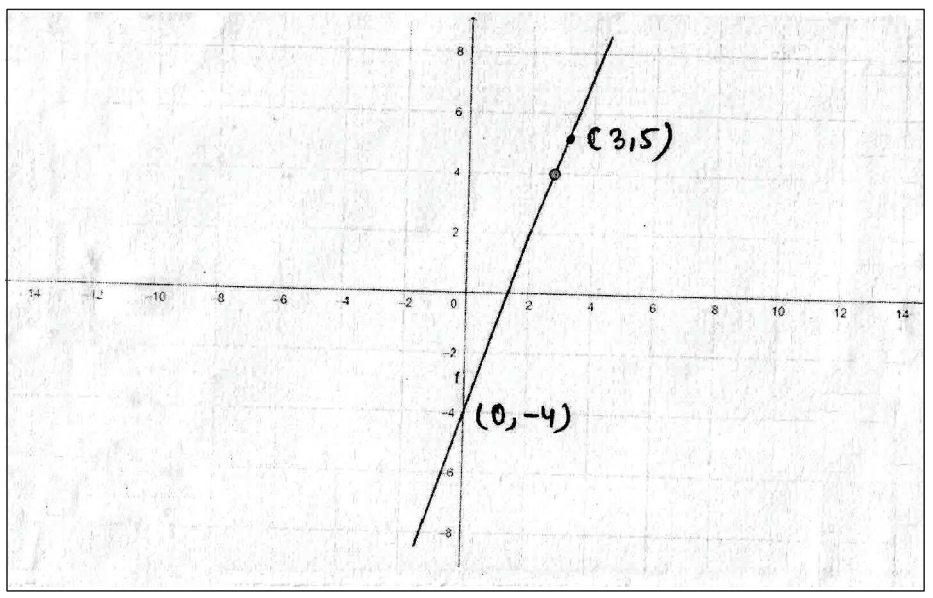
(ii)



63. No

64. Similarly $(3, q)$ lies on this line when $x = 3, y = 5$

$\Rightarrow \quad q = 5$



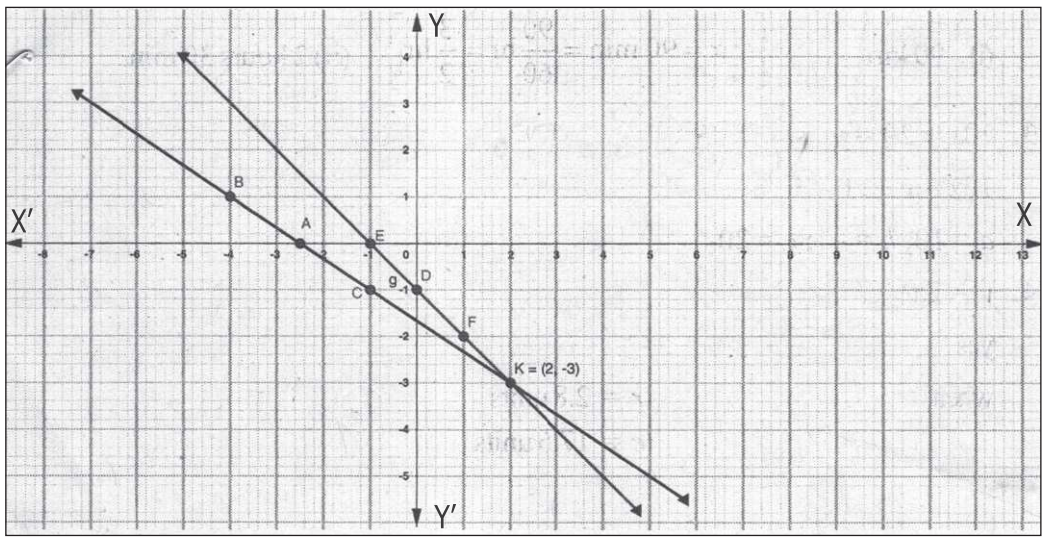
65. $2x + 3y = -5$

$\Rightarrow x = \dfrac{-5 - 3y}{2}$ .... (1)

x	–2.5	–4	–1
y	0	1	–1

$x + y = -1$

x	0	–1	1
y	–1	0	–2



Point of intersection is (2, –3)

67. $8x - 3y + 0 = 0$; $x = \dfrac{3y}{8}$

(0, 0) (3, 8)

Infinitely many solutions.

68. $x + y = 25$ [where x-Rohan's collection and y-Ramita's collection

69. (i) $5x + 20 = y$

(ii) Put $y = 145$ in $5x + 20 = y$

$\Rightarrow x = 25$

70. (a) $x + y = 1600$

(b) Priyanka = ₹1200 [$\because x = 3y$]

Arti = ₹400

71. (a) Let number of girl be x and no. of boys be y

$150x + 200y = 3600$

(b) Number of boys = 12

72. Using speed $= \dfrac{\text{distance}}{\text{time}} \Rightarrow y = 60x$

(i) 90 km $\left[\because x = 90 \text{ min} = \dfrac{90}{60}\text{hr} = \dfrac{3}{2}\text{hr}\right]$

(ii) 2 hours 30 min.

73. $20 + 10(x - 1) = y$

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

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

so $a = 10, b = -1, c = 10$

74. $y = 2 \text{ x } \dfrac{22}{7} \text{ x } x \Rightarrow 7y = 44x$

yes , graph passes through (0,0)

Where $r = 2.8$ units $c = 17.6$ units

Chapter - 4
Linear Equations in Two Variables
Practice Test

Time: 1 hr. **M.M.: 20**

1. The graph of linear equation $2y = 5$ is parallel to which axis? (1)

2. Write the linear equation of the graph which is parallel to y-axis and is at a distance of 3 units on left from the origin (1)

3. Find the value of a and b if the line $5bx - 3ay = 30$ passes through $(-1, 0)$ and $(0, -3)$. (2)

4. Write two linear equation passing through the points $(2, -3)$ (2)

5. Write the linear equation $x + \sqrt{3}y = 4$ in the form of $ax + by + c = 0$ and hence write the values of a, b and c. Write also x in terms of y (3)

6. Find the solutions of linear equation $2x + y = 4$ which represents a point on/ which (3)

(i) on x-axis

(ii) on y-axis

(iii) perpendicular distance of 3 units above x-axis

7. Give the geometrical representation of $2x + 5 = 0$ as a linear equation in (3)

(a) one variable

(b) two variables

8. A taxi charges ₹15 for first kilometer and ₹8 each for every subsequent kilometer. For a distance of x km, an amount of ₹ y is paid. Write the linear equation representing the above information and draw the graph. (5)