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CLASS 9 MATHS NOTES

LINEAR EQUATIONS
IN TWO VARIABLES

CHAPTER-4

LINEAR EQUATIONS IN TWO VARIABLES

KEY POINTS

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

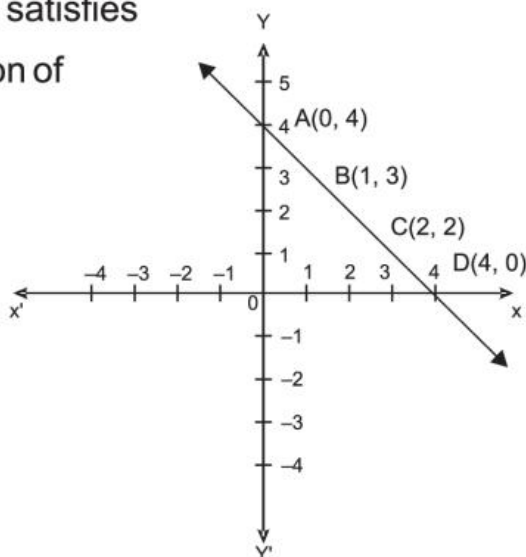
Example : $x + y = 4$

Solutions of equation

$x+y = 4$ are

$(0,4) (1,3) (2,2) (4,0)$

and many more



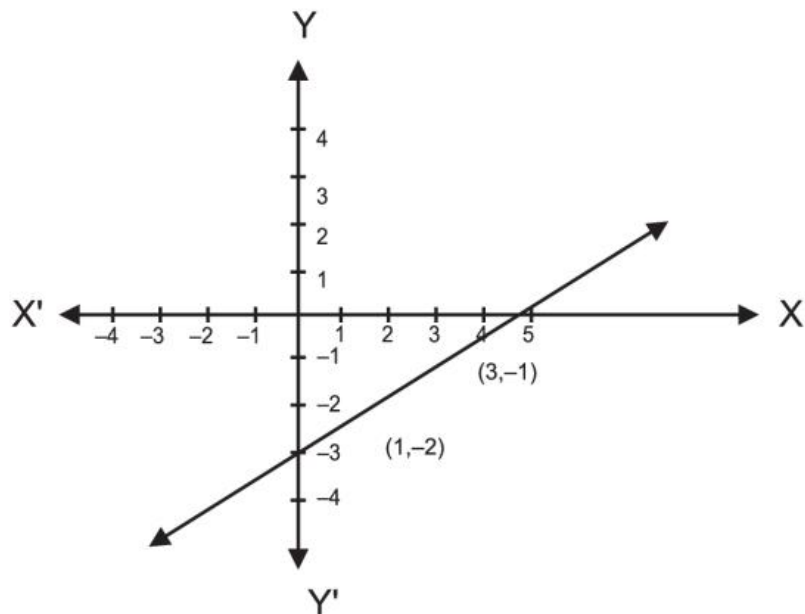
Important Questions with Solutions

Part – A

- 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 .
- Express x in terms of y for the equation $3x + 4y = 7$
- Express y in the terms of x .
 $3y + 5x = 9$
- Point $(9, 0)$ lie on which axis?
- Write the equation of x axis.
- Express the equation $5y = 9$ as linear equation in two variables.
- Write the linear equation which is parallel to x -axis and is at a distance of 2 units from the origin in upward direction.
- Check whether $(1, -2)$ is a solution of $2x - y = 6$.
- Check whether $x = 2$ & $y = -2$ is a solution of $2x - y = 6$.
- How many solutions are there for equation $y = 5x + 2$.
- Find the value of K , if $x = -1$ & $y = 1$ is a solution of equation $Kx - 2y = 0$.
- If the graph of equation $2x + Ky = 10$ intersects x -axis at point $(5, 0)$ find the value of K .
- The graph of the linear equation $4x = 6$ is parallel to which axis?
- At what point the graph of $2x - y = 6$, cuts x -axis?
- Check whether $(0, 0)$ is a point on $y = mx + c$ or $y = mx$.
- On which side of y -axis, $x + 3 = 0$, lies.
- Find any two solutions of equation
 $2x + y = x + 5$.
- Find the value of P if $x = 2$, $y = 3$ is a solution of equation $5x + 3Py = 4a$
- If the points $A(3, 5)$ and $B(1, 4)$ lies on the graph of line $ax + by = 7$, find the value of a .

20. Write the coordinates of the point where the graph of the equation $5x+2y=10$ intersect both the axes.
21. Write the equations of two lines passing through $(3, 10)$.
22. The cost of coloured paper is ₹ 7 more than $\frac{1}{3}$ of the cost of white paper. Write this statement in linear equation in two variables.
23. Draw the graph of equation $x+y=5$.
24. From the choices given below, choose the equation whose graph is given in figure –

- (i) $x+2y = 5$
- (ii) $x-2y = 5$
- (iii) $y+2x = 5$



25. The graph of linear equation $2x - y = 6$ will pass through which quadrant(s).
26. How many solution of the equation $3x - 2 = x - 3$ are there on the
 - (i) Number line
 - (ii) Cartesian plane..
27. 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.
28. 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.
29. Find the value of 'a' if $(1, -1)$ is the solution of the equation $2x + ay = 5$. Find the two more solutions of the equation.

30. Find two solutions of the equation $4x + 5y = 28$. Check whether $(-2, 10)$ is solution of the given equation.
31. Write the equation of line passing through $(3, -3)$ & $(6, -6)$.
32. If $x = 3k - 2$, $Y = 2k$ is a solution of equation $4x - 7y + 12 = 0$, then find the value of K .
33. If $(m - 2, 2m + 1)$ lies on equation $2x + 3y - 10 = 0$, find m .
34. $F = (9/5)C + 32$.
 - (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?
35. Draw the graph of the linear equation $2x + 3y = 6$. Find out the coordinates of the points where the line intersects at x axis and y -axis.
36. Draw the graph for the linear equations
 $3x - 4y = 12$. If $x = 8$, find the value of y with the help of graph.
37. Draw the graph of $y = x$ & $2y = -5x$ on the same graph.
38. Give the geometrical representation of $5x + 7 = 0$ as equation.
 - (i) in one variable
 - (ii) in two variables
39. Draw the graph of the linear equations $2y - x = 7$. With the help of graph check whether $x = 3$ and $y = 2$ is the solution of the equation?

Part – D

40. 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?

41. Rohan and Ramita of Class IX decided to collect ₹ 25 for class cleanliness. Write it in linear equations in two variables. Also draw the graph.
42. Sarika distributes chocolates on the occasion of children's Day. She gives 5 chocolates to each child and 20 chocolates to adults. If no. of children is represented by 'x' and total distributed chocolates as 'y'.
- Write it in the form of linear equation in two variables.
 - If she distributed 145 chocolates in total, find no. of children?
43. Priyanka and Arti decided to donate ₹ 1600 for the Army widows. Priyanka's share as 'x' and Arti share as 'y'.
- Form a linear equation in two variables.
 - If Priyanka donates thrice the amount donated by Arti, then find out the amount donated by both.
44. 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.
- Form the linear equation in two variables.
 - If no. of girls are 8, find no. of boys.
45. Akool is driving a car with uniform speed of 60 km/hr. Assuming total distance to be y km & time taken as x hours, form a linear equation. Draw the graph. From the graph read the following:
- distance travelled in 90 minutes.
 - Time taken to cover a distance of 150 km.
46. 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 & total parking time as x hours form a linear equation. Write it in standard form & hence find, a, b & c. Draw the graph also.

47. 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
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ANSWERS

1. $\sqrt{2}x - 5y - 4 = 0$, Where $a = \sqrt{2}$, $b = -5$, $c = -4$
2. $x = \frac{7 - 4y}{3}$
3. $y = \frac{9 - 5x}{3}$
4. x-axis
5. $y = 0$
6. $0.x + 5.y = 9$
7. $y = 2$
8. No
9. Yes
10. Infinitely many solutions
11. $k = -2$
12. $K = 1$
13. Parallel to y-axis.
14. $(3, 0)$
15. $y = mx$
16. On left side
17. $(1, 4)$ $(0, 5)$ (or any other two possible solutions)
18. $P = \frac{4a - 10}{9}$
19. $a = -1$
20. $(0, 5)$ and $(2, 0)$

21. $3x - y + 1 = 0$ (or any other possible solution)
 $12x + 7y = 106$.
22. $3x - y = 21$ (Let the cost of coloured paper be ₹x cost of white paper by ₹y).
24. $x - 2y = 5$
25. I, II, III
26. (i) One Solution (ii) Infinitely many
27. (i) (3, 1) (ii) (6, -2)
28. $a = -4, b = 4$
29. $a = -3$ (any two solutions)
30. (2, 4), (7, 0), No
32. $k = 2$
33. $m = 11/8$
34. $95^\circ \text{F}, 86^\circ \text{F}$
35. (3, 0), (0, 2)
36. $y = 3$
39. No
40. $8x - 3y + 0 = 0$
 $a = 8, b = -3, c = 0$
 Infinitely many solutions.
41. $x + y = 25$

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

(ii) 25

43. (i) $x + y = 1600$

(ii) Priyanka = ₹1200, Arti = ₹400

44. (i) $150x + 200y = 3600$, (ii) Boys = 12

45. $y = 60$, (i) 90 km (ii) $2\frac{1}{2}$ hours

46. $y = 20 + 10x$

Standard form $10x - y + 20 = 0$

$a = 10, b = -1, C = 20$

PRACTICE TEST

LINEAR EQUATIONS IN TWO VARIABLES

Time : 50 Min.

M.M. 20

1. The graph of linear equation $2y = 5$ is parallel to which axis? (1)
2. Write the linear equation the graph of which is parallel to y-axis and is at a distance 3 units on left from the origin. (1)
3. If the point $(5, 2)$ lies on the graph of the linear equation $kx + 5y = 10$, Find k . (2)
4. Write two linear equations the graph of which passes through $(2, -3)$. the from of (2)
5. Write the linear equation $x + \sqrt{3}y = 4$ in the from of $ax + by + c = 0$ & hence write the values of a, b & c .
Write x in terms of y . (3)
6. Find the solutions of linear equation $2x + y = 4$ which represents a point on (3)
 - (i) x-axis,
 - (ii) y-axis.
 - (iii) parallel to x-axis at a distance 3 units from origin.
7. Give the geometrical representation of $2x + 5 = 0$ as a linear-equation in (4)
 - (a) one variable
 - (b) two variables.
8. In a Residential Society, Rain water is stored in underground water tank. The water is stored at the rate of 30 cubic cm per second. If water stored is y cubic cm in x second, write a linear equation in two variables. Draw its graph. (4)

From the graph read the following:

 - (i) Total water stored in 3 seconds.
 - (ii) In how many seconds water stored is 120 cm^3 ?

