

EDUCATION SOLUTION

MATHEMATICS OF CLASS X

PAIR OF LINEAR EQUATION IN TWO VARIABLES

Q.1. Verify that $x = 2$ is a solution of the linear equation $2x + 7 = 13 - x$.

Q.2. Show that $x = 2$ and $y = -2$ is a solution of the linear equation $5x + 3y = 4$. Also, show that $x = 7$, $y = 2$ is not a solution of the equation $3x + 2y = 17$.

Q.3. Show graphically that system of equation $x + 2y = 5$; $3x + 6y = 15$ has infinitely many solutions.

Q.4. For what value of k , will the following system of equations have infinite solution?

Q.5. On comparing the ratios $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$ and without drawing them, find out whether the lines representing the following pairs of linear equations intersect at a point or parallel or coincide.

$$3x - 5y + 8 = 0$$

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

Q.6. For what value of k , will the following system of linear equations has no solution?

Q.7. Aftab tells his daughter, 7 yr ago, I was seven times as old as you were then. Also, 3 yr from now, I shall be three times as old as you will be. (Isn't this interesting) Represent this situation algebraically and graphically.

Q.8. The coach of a cricket team buys 3 bats and 6 balls for ₹ 3900. Later, she buys another bat and 2 more balls of the same kind for ₹ 1300. Represent this situation algebraically and geometrically.

Q.9. The cost of 2 kg of apples and 1 kg of grapes on a day was found to be ₹ 160. After a month, the cost of 4 kg of apples and 2 kg of grapes is ₹ 300. Represent the situations algebraically and geometrically.

Q.10. From the pair of linear equations in the following problems and find their solutions graphically.

(i) 10 students of class X took part in a Mathematics quiz. If the number of girls is 4 more than the number of boys, then find the number of boys and girls who took part in the quiz.

(ii) 5 pencils and 7 pens together cost ₹ 50 whereas 7 pencils and 5 pens together cost ₹ 46. Find the cost of one pencil and that of one pen.

Q.11. On comparing the ratios $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$, find out whether the lines representing the following pair

Of linear equations intersect at a point are parallel or coincident.

(i) $5x - 4y + 8 = 0$; $7x + 6y - 9 = 0$

(ii) $9x + 3y + 12 = 0$; $18x + 6y + 24 = 0$

(iii) $6x - 3y + 10 = 0$; $2x - y + 9 = 0$

Q.12. On comparing the ratios $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$, find out whether the following pairs of linear equations are consistent or inconsistent.

(i) $3x + 2y = 5$; $2x - 3y = 7$

(ii) $2x - 3y = 8$; $4x - 6y = 9$

Q.13. Which of the following pairs of linear equations are consistent/inconsistent? If consistent, obtain the solution graphically.

(i) $x + y = 5$; $2x + 2y = 10$

(ii) $x - y = 8$; $3x - 3y = 16$

(iii) $2x + y - 6 = 0$; $4x - 2y - 4 = 0$

Q.14. Half the perimeter of a rectangular garden whose length is 4 m more than its width, is 36 m. Find the dimensions of the garden.

Q.15. Given, the linear equation $2x + 3y - 8 = 0$, 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.

Q.16. Draw the graphs of the equation $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Determine the coordinates of the vertices of the triangle formed by these lines and the X - axis and shade the triangular region.

Q.17. Check the points (3,2) and (2,3) are lie on the line $3x - 2y = 5$ or not.

Q.18. Is the system of linear equations $2x + 3y - 9 = 0$ and $4x + 6y - 18 = 0$ consistent? justify your answer.

Q.19. Find the values of a and b for which the following system of linear equations has infinite number of solutions, $(a + b)x - 2by = 5a + 2b + 1$, $3x - y = 14$.

Q.20. Draw the graphs of the equations $x = 3$, $x = 5$ and $2x - y - 4 = 0$. Also, find the area of the quadrilateral formed by the lines and the X-axis.

Q.21. Check graphically whether the pair of linear equations $4x - y - 8 = 0$ and $2x - 3y + 6 = 0$ is consistent. Also, find the vertices of the triangle formed by these lines with the X-axis.

Q.22. Solve the following system of equations graphically and find the vertices of the triangle formed by these lines and y-axis

$$X - Y + 1 = 0, 3x + 2y - 12 = 0$$

Q.23. Solve the following pairs of linear equation by the substitution method.

(i) $x + y = 14$; (ii) $s - t = 3$;

$$X - y = 4 \quad \frac{s}{3} + \frac{t}{2} = 6$$

(iii) $3x - y = 3$ (iv) $0.2x + 0.3y = 1.3$;

$$9x - 3y = 9 \quad 0.4x + 0.5y = 2.3$$

(iv) $\sqrt{2x} + \sqrt{3y} = 0$ (vi) $\frac{3x}{2} - \frac{5y}{3} = -2$

$$\sqrt{3x} + \sqrt{8y} = 0 \quad \frac{x}{3} + \frac{y}{2} = \frac{13}{6}$$

Q.24. Solve $2x + 3y = 11$ and $2x - 4y = -24$ and hence find the value of m for which $y = mx + 3$.

Q.25. Solve the following pairs of linear equations by elimination method and the substitution Method.

(i) $x + y = 5$ and $2x - 3y = 4$

(ii) $3x + 4y = 10$ and $2x - 2y = 2$

(iii) $3x - 5y - 4 = 0$ and $9x = 2y + 7$

Q.26. Which of the following pairs of linear equations has unique solution, no solution or infinitely many solution? In case there is a unique solution, find it by using cross – multiplication method.

(i) $x - 3y - 3 = 0$ (ii) $2x + y = 5$

$$3x - 9y - 2 = 0 \quad 3x + 2y = 8$$

(iii) $3x - 5y = 20$ (iv) $x - 3y - 7 = 0$

$$6x - 10y = 40 \quad 3x - 3y - 15 = 0$$

Q.27. (i) For which value of a and b does the following pair of linear equations have an infinite number of solutions ?

$$2x + 3y = 7$$

$$(a-b)x + (a+b)y = 3a + b - 2$$

(ii) For which value of k, will the following pair of linear equations have no solution ?

$$3x + y = 1$$

$$(2k - 1)x + (k - 1)y = 2k + 1$$

Q.28. Solve the following pair of linear equations by the substitution and cross-multiplication methods

$$8x + 5y = 9$$

$$3x + 2y = 4$$

Q.29. Solve the pair of linear equations by eliminating method and by substitution method.

$$(i) \frac{3x-4y}{2} = 10, \frac{3x+2y}{4} = 2 \quad (ii) 3x + 7y = 37, 5x + 6y = 39$$

$$(iii) y = \frac{2}{3}x + 6, 2y - 4x = 20$$

Q.30. Solve the pair of equations by cross-multiplication method.

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

$$(a - 2b)x + (2a + b)y = 3$$

Q.31. Solve the pair of equations

$$41x + 53y = 135$$

$$53x + 41y = 147$$

Q.32. Find the values of p and q for which the system of equations represent coincident lines.

$$2x + 3y = 7$$

$$(p + q + 1)x + (p + 2q + 2)y = 4(p + q) + 1.$$

Q.33. The cost of 4 pens and 4 pencil boxes in ₹ 100. Three times the cost of a pen in ₹ 15 more than the cost of a pencil box. From the pair of linear equations for the above situations, find the cost of a pen and a pencil box.

Q.34. Solve the following system of linear equations by cross-multiplication method

$$2(ax - by) + (a + 4b) = 0$$

$$2(bx + ay) + (b - 4a) = 0$$

Q.35. Solve the pair of equations

$$(i) \frac{2}{x} + \frac{3}{y} = 13 \quad (ii) \frac{5}{x} - \frac{4}{y} = -2$$

Q.36. A boat goes 30 km upstream and 44 km downstream in 10 h. In 13 h, it can go 40 km upstream and 55 km downstream. Determine the speed of the stream and that of the boat in still water.

Q.37. A fraction becomes $\frac{4}{5}$, if 1 is added to both numerator and denominator, if however, 5 is subtracted from both numerator and denominator, the fraction becomes $\frac{1}{2}$. What is the fraction ?

Q.38. Solve the following pairs of equations by reducing them to a pair of linear equations

$$(i) \frac{1}{2x} + \frac{1}{3y} = 2; \quad (ii) \frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2;$$

$$\frac{1}{3x} + \frac{1}{2y} = \frac{13}{6} \quad \frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1$$

$$\begin{aligned} \text{(iii)} \quad \frac{4}{x} + 3y &= 14; & \text{(iv)} \quad \frac{5}{(x-1)} + \frac{1}{(y-2)} &= 2; \\ \frac{3}{x} - 4y &= 23 & \frac{6}{(x-1)} - \frac{1}{(y-2)} &= 1 \end{aligned}$$

Q.39. Father's age is 3 times the sum of ages of his two children. After 5 yr, his age will be twice the sum of ages of the two children. Find the age of father.

Q.40. The sum of a two-digit number and number obtained by reversing the order of digits is 99. If the digits of the number differ by 3. Then, find the numbers.

Q.41. Harish wants to invest certain amount of money in two schemes A and B, which offer interest at the rate of 8% per annum and 9% per annum respectively, so as to earn an annual interest of ₹ 3720. His friend Hamida advised him to interchange the amount of investments in the two schemes to get ₹ 40 more as annual interest. How much money did Harish plan to invest in each scheme in the beginning? What value is indicated from this action ?

Q.42. The age of two friends Ani and Biju differ by 3 yr. Ani's father Dharam is twice as old as Ani and Biju is twice as old as his sister Cathy. The ages of Cathy and Dharam differ by 30 yr. Find the ages of Ani and Biju.

Q.43. One says, "Give me a hundred, friend! I shall then become twice as rich as you." The other replies, "If you give me ten, I shall be six times as rich as you." Tell me what is the amount of their (respective) capital. [from the Bijaganita of Bhaskara II]

[Hint $x + 100 = 2(y - 100)$, $y + 10 = 6(x - 10)$]

Q.44. The students of a class are made to stand in rows. If 3 students are extra in a row, there would be 1 row less. If 3 students are less in a row, there would be 2 rows more. Then, find the number of students in the class.

Q.45. Draw the graphs of the equations $5x - y = 5$ and $3x - y = 3$. Determine the coordinates of the vertices of the triangle formed by these lines and Y-axis.

Q.46. Find the solution of pair of linear equations $x + 2y + 5 = 0$ and $3x + 6y - 1 = 0$.

Q.47. If the lines given by $2x + ky = 1$ and $3x - 5y = 7$ are intersecting, then find the value of k.

Q.48. Find the solution for the system of equations $x + 2y = -1$ and $2x - 3y = 12$.

Q.49. Find the solution of pair of equations $y = 0$ and $y = -6$.

Q.50. Find the value of k, for which system of equation $x + 3y = 2$, $2x + ky = 8$ has no solution.

Q.51. The father's age is six times his son's age. Four years hence, the age of the father will be four times his son's age. Find the present ages (in years) of the son and the father.

Q.52. Determine the value of α , for which the following system of linear equations has an infinite number of solutions $\alpha x + 3y = \alpha - 3$ and $12x + \alpha y = \alpha$.

Q.53. Determine the values of a and b, for which the following system of linear equations has infinitely many solutions.

Q.54. 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 find the number of ₹ 1 and ₹ 2 coins.

Q.55. Without drawing the graph, find out whether the lines representing the following pair of linear equations intersect at a point, are parallel or coincident.

Q.56. Find the value of k, for which the following system of equations has a unique solution.

$$4x - 5y = k$$

$$2x - 3y = 12$$

Q.57. For what value of k, will the equations

$$x + 2y + 7 = 0$$

and $2x + ky + 14 = 0$

represent coincident lines ?

Q.58. Check whether the following pair of equations is consistent or not.

$$x + y = 14, x - y = 4$$

Q.59. Obtain the condition for the following system of linear equations to have a unique solution.

$$ax + by = c$$

and $lx + my = n$

Q.60. Find the number of solutions of the following pair of linear equations.

$$x + 2y - 8 = 0 \text{ and } 2x + 4y - 16 = 0$$

Q.61. Find the value of k, so that the following system of equations has no solution.

$$3x - y - 5 = 0, 6x - 2y - k = 0$$

Q.62. If $(a + b)x + (2a - b)y = 21$ and $2x + 3y = 7$ have infinitely many solutions, then what are the values of a and b ?

Q.63. Find a, if the line $3x + ay = 8$ passes through the intersection of lines represented by equations $3x - 2y = 10$ and $5x + y = 8$.

Q.64. Two straight paths are represented by the lines

$$7x - 5y = 3 \text{ and } 14x - 10y = 5$$

Check whether the paths cross each other.

Q.65. There are some students in the two examination halls A and B. To make the number of students equal in each hall, 10 students are sent from A to B. But if 20 students are sent from B to A, the number of students in A becomes double the number of students in B. Find the number of students in the two halls.

Q.66. Represent the following system of linear equations graphically and form the graph. Find the points, where the lines intersect Y-axis.

$$3x + y - 5 = 0; 2x - y - 5 = 0$$

Q.67. Find the cost of 2 T-shirt and 3 pants, if the cost of 2 T-shirts and one pant is ₹ 625 and 3 T-shirts and 2 pants together costs ₹ 1125.

Q.68. Find the point of intersecting of lines

$$2ax - by = 2a^2 - b^2$$

And $ax + 2by = a^2 + 2b^2$

By eliminating the variables. Show that the system of equations is concurrent with the line represented by equation

$$(a - b)x + (a + b)y = a^2 + b^2.$$

Q.69. The length of the sides of a triangle is given as

$$2x + \frac{y}{2}, \frac{5x}{3} + y + \frac{1}{2}, \frac{2}{3}x + 2y + \frac{5}{2}.$$

Given that the triangle is equilateral, find its area.

Q.70. Solve the following equations for x and y.

$$7^x + 5^y = 74, 7^{x+1} - 5^{y+1} = 218$$

Q.71. Shashi has decided on a fixed distance to walk on a tread mill. First day, she walks at a certain speed. Next day, she increases the speed of the tread mill by 1 km/h, she takes 6 min less and if she reduces the speed by 1 km/h, then she takes 9 min more. What is the distance that she has decided to walk everyday?

Q.72. Solve the following equations for x and y.

$$7^x + 5^y = 74, 7^{x+1} - 5^{y+1} = 218$$

Q.73. Solve the system of equations

$$\frac{27}{x+y} - \frac{15}{x-y} = -2 \text{ and } \frac{30}{x+y} - \frac{1}{x-y} = 3.$$

Q.74. The cost of 2 kg of apples and 1 kg of grapes on a day was found to be ₹ 160. After a month, the cost of 4 kg of apples and 2 kg of grapes is ₹ 300. Represent the situation algebraically and geometrically.

Q.75. Show graphically that each one of the following systems of equations is inconsistent (i.e., has no solution).

$$3x - 4y - 1 = 0,$$

$$2x - \frac{8}{3}y + 5 = 0$$

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