

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) $s - t = 3$;

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

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

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

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

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

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) $2x + y = 5$

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

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

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

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) $\frac{1}{2x} + \frac{1}{3y} = 2;$

$$\frac{1}{3x} + \frac{1}{2y} = \frac{13}{6}$$

(iii) $\frac{4}{x} + 3y = 14;$

$$\frac{3}{x} - 4y = 23$$

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

$$\frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1$$

(iv) $\frac{5}{(x-1)} + \frac{1}{(y-2)} = 2;$

$$\frac{6}{(x-1)} - \frac{1}{(y-2)} = 1$$

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).

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

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

Q.76. Solve the following system of equations

$$\frac{x}{7} + \frac{y}{3} = 5 \text{ and } \frac{x}{2} - \frac{y}{9} = 6.$$

Q.77. A and B each have a certain number of mangoes. A says to B, if you give 30 of your mangoes, I will have twice as many as left with you. B replies, if you give me 10, I will have thrice as many as left with you. How many mangoes does each have ?

Q.78. The sum of digits of a two-digit number is 15. The number obtained by reversing the order of digits of the given number exceeds the given number by 9. Find the given number.

Q.79. Check graphically whether the pair of equations

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

is consistent. Also, find the coordinates of the points, where the graphs of the equations meet the Y-axis.

Q.80. Draw the graph of the pair of equations $2x + y = 4$ and $2x - y = 4$. Write the vertices of the triangle formed by these lines and the Y-axis. Find the area of this triangle.

Q.81. Find the value of m for which the pair of linear equations $2x + 3y - 7 = 0$ and $(m - 1)x + (m + 1)y = (3m - 1)$ has infinitely many solutions.

Q.82. A sailor goes 8 km downstream in 40 min and comes back in 1 h. find the speed of sailor in still water and the speed of current.

Q.83. Sonia invests a certain sum at the rate of 10% per annum of interest and another sum at the rate of 8% per annum get an yield of ₹ 1640 in one year's time. Next year, she interchanges the rates and gets a yield of ₹ 40 less than the previous year. How much did she invest in each type in the first year ?

Q.84. A vessel contains a mixture of 24 L milk and 6 L water and second vessel contains a mixture of 15 L milk and 10 L water. How much mixture of milk and water should be taken from the first and the

second vessel separately and kept in a third vessel so that the third vessel may contain a mixture of 25 L milk and 10 L water.

Q.85. X takes 3 h more than Y to walk 30 km. But, if X doubles his place, he is ahead of Y by $1\frac{1}{2}$ an hour. Find their speed of walking.

Q.86. Graphically, solve the following pair of equations

$$2x + y = 6 \text{ and } 2x - y = 0.$$

Find the ratio of the areas of the two triangles formed by the lines representing these equations with the X-axis and the lines with Y-axis.

Q.87. Anil is sitting on a boat which goes 30 km upstream and 44 km downstream in 10 h. In 13 h, he can go 40 km upstream and 55 km downstream.

(i) Form the linear equations.

(ii) Determine the speed of the stream and that of the boat in still water.

(iii) which mathematical concept is used in above problem ?

Q.88. Shyam went to a stationary shop and purchased 2 pens and 3 pencils for ₹ 9. His friend Rahim saw the new variety of pens and pencils with shyam and he also bought 4 pens and 6 pencils of the same kind for ₹ 18.

(i) Form the equations in variables x and y.

(ii) Represent this situation graphically.

(iii) Which person have been more beneficial ?

Q.89. 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 numbers are there ?

Q.90. The sum of the digits of a two-digit number is 15. The number obtained by interchanging the digits exceeds the given number by 9. Find the number.

Q.91. For what value of k, the pair of equations

$$Kx + 2y = 5, 3x - 4y = 10 \text{ has no solution ?}$$

Q.92. Show that the following system of equations has an unique solution.

$$3x + 5y = 12, 5x + 3y = 4$$

Also, find the solution of the given system of equations.

Q.93. Five years ago, I was thrice as old as my daughter and ten years later, I shall be twice as old as my daughter. How old are we now ?

Q.94. Half of the sum of two numbers is equal to 42. One-third of their difference is equal to 4. Find the two numbers.

Q.95. A part of monthly charges in a college is fixed and the remaining depend on the number of days one has taken food in the mess. When a student X takes food for 25 days, he has to pay ₹ 1750 as hotel charges, whereas a student Y who takes food for 28 days, pays ₹ 1900 as hotel charges. Find the fixed charge and the cost of food per day.

Q.96. Point P and Q are 70 km apart on a highway. A car starts from P and another car starts from Q at the same time. If they travel in the same direction, they meet in 7 h but if they travel towards each other they meet in 1 h. What are their respective speeds?

Q.97. 2 men and 5 women can together finish an embroidery work in 4 days, while 3 men and 6 women can finish it in 3 days. Find the time taken by 1 man alone to finish the work and also that taken by 1 woman alone (solve by cross-multiplication method).

Q.98. A and B are two points 150 km apart on a highway. Two cars start with different speeds, from A and B at the same time. If they move in the same direction, they meet in 15 h, but if they move in the opposite directions, they meet in 1 h. Find their speeds.

Q.99. A man, when asked how many hens and buffaloes he has, told that his animals have 120 eyes and 180 legs. How many hens and buffaloes has he?

Q.100. A computer store sold 4 hard drives and 10 pen drives for ₹ 200 and 6 hard drives and 14 pen drives for ₹ 290. Find the cost of a hard drive and the cost of a pen drive.

Q.101. A large sports stadium has 21000 seats. The seats are organised into blocks of either 400 or 450 seats. There are three times as many blocks of 450 seats as there are blocks of 400 seats. How many blocks are there?

Q.102. Magazines cost ₹ m each and newspaper cost ₹ n each. One magazine cost ₹ 2.55 more than one newspaper. The cost of two magazines is the same as the cost of five newspapers.

(i) Write down two equations in m and n to show this information.

(ii) Find the values of m and n .

Q.103. 7 canes of a fizzy drink and 5 packets of apple juice cost ₹ 6.80, while 5 canes of the fizzy drink and 11 packets of apple juice cost ₹ 8.20. Calculate the cost of one cane of fizzy drink and one packet of apple juice.

Q.104. The ratio of incomes of two friends Anjali and Abdul is 9:7 and the ratio of their expenditures is 4:3. If each of them saves ₹ 4000 per month, then find their monthly incomes. Also, if each of them

donates 9% of her/his income to a charity working for old age destitute, then find the resulting savings of each. What value is indicated from this action ?

Q.105. Solve the following system of linear equation graphically

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

Calculate the area bounded by these lines and the X-axis.

Q.106. Five years ago, I was thrice as old as my daughter and ten years later, I shall be twice as old as my daughter. How old are we now ?

Q.107. Solve the pair of linear equations.

$$(i) \quad \frac{x}{a} + \frac{y}{b} = a + b$$

$$\frac{x}{a^2} + \frac{y}{b^2} = 2, a, b \neq 0$$

$$(ii) \quad ax + by = 1;$$

$$bx + ay = \frac{2ab}{a^2 + b^2}$$

Q.108. Solve the pair of equations by eliminating method.

$$(i) \quad 3x - 4y = 11;$$

$$(ii) \quad 2x + 3y - 5 = 0;$$

$$7x - 5y = 4$$

$$3x - 2y - 14 = 0$$

$$(iii) \quad 3x + 2y = 7;$$

$$(iv) \quad 11x + 15y + 23 = 0$$

$$2x - 5y + 8 = 0$$

$$7x - 2y - 20 = 0$$

Q.109. Solve the equation $\frac{m-3}{4} + \frac{m+4}{3} = -7$.

Q.110. The sum of two numbers is 120 and the one of the numbers is 3 times the other. Find the value of the numbers.

Q.111. The combined ages of two people is 34. If one person is 6 yr younger than the other, then find their ages.

Q.112. Solve the pair of linear equations by cross – multiplication method.

$$(i) \quad 2x - 3y = -8;$$

$$(ii) \quad x + y = 6;$$

$$5x + 3y = 1$$

$$x - y = 4$$