

Question Bank 2

Class: X

Subject: Maths

Topic: Linear Equations in two variables

➤ **Questions related to graphical method of solving simultaneous linear equations:**

- Solve the following systems of equation graphically:
 - $x + y = 6, x - y = 2.$
 - $x + y = 3, 3x - 2y = 4$
- Show graphically that each one of the following system of equations has infinitely many solutions:
 - $x + y = 6, 4x + 4y = 24$
 - $x - 2y = 5, 2x - 4y = 10$
- Determine by drawing graphs, whether the following system of linear equations has a unique solution or not
 - $x + 2y = -1, 2x - 3y = 12$
 - $2y = 11 - 2x, 2x = 4 - 3y$
- Draw the graphs of the following equations on the same graph paper:
 $2x - y = 2, 4x + 3y = 24, y + 4 = 0$
Find the coordinates of the vertices of the triangle so formed. Also, determine the area.

➤ **Questions related to conditions for solvability (or consistency)**

The pair of linear equations represented by these lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$

- If $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ then the pair of linear equations has exactly one solution or unique solution.
- If $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ then the pair of linear equations has infinitely many solutions.
- If $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$, then the pair of linear equations has no solution.

- For which value of k , following pair of linear equations have no solution.
 $x + 2y = 3$
 $5x + ky = -7$
- Find value of k for which equations $2x + 3y - 5 = 0$ and $4x + ky - 10 = 0$, will have infinitely many solutions.
- For what value of K the following system of equation are parallel. $2x + Ky = 10, 3x + (k + 3)y = 12$
- For what value of p the pair of linear equations $px - y = 2, 6x - 2y = 3$ has a unique solution.
- Find the value of k so that the equations $2x + 4y = -14, 4x + 2ky + 28 = 0$ will represent coincident lines.

10. Find the value of k if the pair of linear equations $3x + 5y = 0$ and $kx + 10y = 0$ has a non zero solution.
11. Find the value of p for which the following system of equation have exactly one solution:

$$\begin{aligned} px + 2y &= 5 \\ 3x + y &= 1 \end{aligned}$$

➤ **Questions related to method of substitution:**

a) Substitution method: Following are the steps to solve the pair of linear equations by substitution method:

$$a_1x + b_1y + c_1 = 0 \dots (i) \text{ and}$$

$$a_2x + b_2y + c_2 = 0 \dots (ii)$$

Step 1: We pick either of the equations and write one variable in terms of the other

$$y = -a_1 / b_1 x - c_1 / b_1 \dots (iii)$$

Step 2: Substitute the value of x in equation (i) from equation (iii) obtained in step 1.

Step 3: Substituting this value of y in equation (ii) obtained in step 1, we get the values of x and y .

12. Solve $2x - y = 4$, $x + y = 10$ and hence find the value of p when $y = 3x + 2p$.
13. Solve $x - 5y = 1$, $x - y = -1$
14. Solve $2x + 4y = -2$, $2x - 3y = 14$
15. Solve $6x + 3y = 9$, $3x + 4y = 5$.

➤ **Questions related to method of elimination by equating the coefficients:**

(b) Elimination method: Following are the steps to solve the pair of linear equations by elimination method:

Step 1: First multiply both the equations by some suitable non-zero constants to make the coefficients of one variable (either x or y) numerically equal.

Step 2: Then add or subtract one equation from the other so that one variable gets eliminated.

(i) If you get an equation in one variable, go to Step 3.

(ii) If in Step 2, we obtain a true statement involving no variable, then the original pair of equations has infinitely many solutions.

(iii) If in Step 2, we obtain a false statement involving no variable, then the original pair of equations has no solution, i.e., it is inconsistent.

Step 3: Solve the equation in one variable (x or y) so obtained to get its value.

Step 4: Substitute this value of x (or y) in either of the original equations to get the value of the other variable.

16. Solve by method of elimination:

i) $x + 2y = 11$, $2x + 3y = 4$

ii) $8x - 5y = 9$, $3x + 2y = 4$

iii) $-x + 2y = 5$, $2x + 3y = -4$

iv) $4x - 7y + 10 = 0$, $y - 2x - 3 = 0$

➤ **Questions related to method of cross multiplication:**

(c) Cross multiplication method: By cross multiplication method, the value of x and y is as follows:

$$x = \frac{b_1c_2 - b_2c_1}{a_1b_2 - a_2b_1} \quad \text{and} \quad y = \frac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b_1} \quad \text{when } a_1b_2 - a_2b_1 \neq 0$$

17. Solve by method of cross multiplication:

i) $x - 4y = -14$, $3x + 2y = 14$

ii) $ax + by = a - b$, $bx - ay = a + b$

18. Solve for x and y (by cross multiplication method):

$5mx + 6ny = 28$, $3mx + 4ny = 18$.

➤ **Applications to word problems:**

Step 1: Read the problem carefully and identify the unknown quantities. Give these quantities a variable name like x,y,z etc.

Step 2: Identify the variables to be determined.

Step 3 : Read the problem carefully and formulate the equations in terms of the variables to be determined.

Step 4 : Solve the equations obtained in **Step 3** using any of the above methods.

19. Three chairs and two tables cost Rs 1850. Five chairs and three tables cost Rs 2850. Find the cost of two chairs and two tables.
20. The sum of two digit number and the number obtained by reversing the order of its digit is 99. If the digits differ by 3, find the number.
21. A person can row downstream 20 km in 2 hours and upstream 4 km in 2 hours. Find man's speed of rowing is still water and the speed of the current.
22. The sum of the munerator and denominator of a fraction is 3 less than twice the denominator. If the numerator and denominator are decreased by 1, the numerator becomes half the denominator. Determine the fraction.
23. Two places A and B are 120 km apart from each other on a highway. A car starts from A B and another from B at the same time. If they move in the same direction, they meet in 6 hours and if they move in opposite directions, they meet in 1 hour and 12 minutes. Find the speeds of the cars.
24. Aftab tells his daughter, "Seven years ago, I was seven times as old as you were then . Also, three years from now, I shall be three times as old as you will be." Represent this situation algebraically and graphically.
25. If we buy 2 tickets from station A to station B, and 3 tickets from station A to station C, we have to pay Rs 795. but 3 ticket from station A to B and 5 ticket from station A to C cost a total of Rs 1300. What is the fare from station A to B and that from station A to C.
26. A person starts his job with a certain monthly salary and earns a find increment every year. If his salary was Rs. 4500 after 4 years of service and Rs. 5400 after. 10 years of service, find his initial salary and the annual increment.
27. The total expenditure per month of a house hold consists of a fixed rent of the house and the mess charge depending upon the number of people sharing the house. The total monthly expenditure is Rs. 3,900 for 2 people and Rs. 7,500 for 5 people. Find the rent of the house and the mess charges per head per month.
28. A taxi charges consists of fixed charges and the remaining depending upon the distance traveled 70 km, he pay s Rs. 500 and for traveling 100 km, he pays Rs 680 express the above statements with the help of simultaneous equations and hence find the fixed charges and the rate per km?

29. Ram is three times as old as Rahim. Five years later, Ram will be two-and-a-half times as old as Rahim. How old are Ram and Rahim now.

➤ **Special Equations:**

30. Solve the following system of equation for x and y

$$\frac{x}{a} + \frac{y}{b} - 2 = 0 \text{-----(1)}$$

$$ax - by + b^2 - a^2 = 0 \text{-----(2)}$$

31. Solve the following system of equation:

$$\frac{11}{v} - \frac{7}{u} = 1 \text{-----(1)}$$

$$\frac{9}{v} - \frac{4}{u} = 6 \text{-----(2)}$$

32. Find the solution of following system of equation such that $u \neq 0, v \neq 0$:

$$2u + v = \frac{7}{3}uv$$

$$u + 3v = \frac{11}{3}uv$$

33. Solve for x and y:

$$\frac{44}{x+y} + \frac{30}{x-y} = 10$$

$$\frac{55}{x+y} + \frac{40}{x-y} = 13 \quad [2002C, OD]$$

34. Determine the value of k so that the following linear equations have no solution:

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

$$(k^2+1)x + (k-2)y - 5 = 0$$

35. Solve the following system of equation:

$$4x + \frac{6}{y} = 15 \text{ and } 6x - \frac{8}{y} = 14 \quad [1994, OD]$$