

Question Bank - I

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:
 - $x + y = 3$, $2x + 5y = 12$.
 - $x + y = 4$, $2x - 3y = 3$
- Show graphically that each one of the following system of equations has infinitely many solutions:
 - $2x + 3y = 6$, $4x + 6y = 12$
 - $x - 2y = 5$, $3x - 6y = 15$
- Determine by drawing graphs, whether the following system of linear equations has a unique solution or not
 - $2x - 3y = 6$, $x = y = 1$
 - $2y = 4x - 6$, $2x = y + 3$
- Draw the graphs of the following equations on the same graph paper:
 $2x + 3y = 12$, $x - y = 1$,
Find the coordinates of the vertices of the triangle formed by the two straight lines and the y - axis.

➤ **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 a , following pair of linear equations have no solution.
 $ax + 16y = a$
 $4x + ay = a - 4$
 - Find value of k for which equations $kx - 3y - 3 = 0$ and $3x + y + 1 = 0$, 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 $(p + 2)x - (2p + 1)y = 3(2p - 1)$, $2x - 3y = 7$ has a unique solution.

9. Find the value of k so that the equations $x + 2y = -7$, $2x + ky + 14 = 0$ will represent coincident lines.
10. Find the value of k if the pair of linear equations $kx + 2y = 5$ and $3x + y = 1$ has a unique solution.
11. If $x = a$, $y = b$ is the solution of the equations $x - y = 2$ and $x + y = 4$, then find the values of a and b .
12. If $ax + by = c$ and $lx + my = n$ has a unique solution then find the relation between the coefficients.
13. For which values of a and b , will the following pair of linear equations have infinitely many solutions? $x + 2y = 1$, $(a - b)x + (a + b)y = a + b - 2$.
14. For which value(s) of λ , do the pair of linear equations $\lambda x + y = \lambda 2$ and $x + \lambda y = 1$ have
 - (i) no solution?
 - (ii) infinitely many solutions?
 - (iii) a unique solution?

➤ **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 (iii) obtained in step 1, we get the values of x and y .

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

➤ **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.

19. Solve by method of elimination:
 - i) $3x + 2y = 11$, $2x + 3y = 4$
 - ii) $8x + 5y = 9$, $3x + 2y = 4$
 - iii) $x + 2y = 5$, $2x + 3y = -4$
 - iv) $3x - 7y + 10 = 0$, $y - 2x - 3 = 0$

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

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

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

20. Solve by method of cross multiplication:

- i) $x + y = 7$, $5x + 12y = 4$
- ii) $2x + 3y = 17$, $3x - 2y = 6$
- iii) $2x - y - 3 = 0$, $4x + y - 3 = 0$
- iv) $2x + y - 35 = 0$, $3x + 4y - 65 = 0$

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

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

➤ **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.

- 22. The sum of a two digit number and the number obtained by reversing the order of its digits is 99. If the digits differ by 3, find the number.
- 23. Two years ago a father was five times as old as his son. Two years later, his age will be 8 years more than three times the age of the son. Find the present ages of father and son.
- 24. The monthly incomes of A and B are in the ratio of 9:7 and their monthly expenditures are in the ratio of 4:3. If each saves Rs 1600 per month, find the monthly incomes of each.
- 25. A number consisting of two digits is equal to 7 times the sum of its digits. When 27 is subtracted from the number, the digits interchange their places. Find the number.
- 26. The present age of a father is equal to the sum of the ages of his 5 children. 12 years hence the sum of the ages of his children will be twice the ages of their father. Find the present age of the father.
- 27. A man travels 600 km partly by train and partly by car. If he covers 400 km by train and the rest by car, it takes 6 hours and 30 minutes. But if he travels 200 km by train and rest by car, he takes half an hour longer. Find the speed of the train and that of car.
- 28. Two places A and B are 80 km apart from each other on a highway. A car starts from A and another from B at the same time. If they move in the same direction, they meet in 8 hours and if they move in opposite directions they meet in 1 hour and 20 minutes. Find the speed of the cars.
- 29. A train covered a certain distance at a uniform speed. If the train would have 6 km/hr. faster it would have taken 8 hrs. less than the scheduled time. And if the train were slower

by 6 km/hr. it would have taken 12 hours more than the scheduled time. Find the length of the journey.

30. A motorboat, whose speed is 9 km / hr in still water, goes 12 km downstream and comes back in a total time of 3 hrs. Find the speed of the stream.
31. A certain number of students planned a picnic. The budget for food was Rs 3600. But 15 of these students failed to go and thus the cost of food for each student increased by Rs 8. How many students attended the picnic?
32. An express train takes 4 hours less for a journey of 1200 km if its speed is increased by 15 km/hr from its usual speed. Find its usual speed.

➤ **Special Equations:**

- **Equations of the form $ax + by = c$ and $bx + ay = d$**

Step 1: Add and subtract the two equations, we get, $x + y = c+d / a = b \dots\dots\dots(i)$ and $x - y = c -d / a - b \dots\dots\dots(ii)$

Step 2 : Add and subtract equations (i) and (ii) to get the values of x and y.

33. Solve $217x + 131y = 913$, $131x + 217y = 827$
34. Solve $21x + 47y = 110$, $47x + 21y = 162$.
35. Solve for x and y : $139x + 56y = 641$, $56x + 139y = 724$