

LINEAR EQUATIONS IN TWO VARIABLES

BASIC CONCEPTS AND FORMULAE:

- general form: $ax + by + c = 0; a \neq 0, b \neq 0$

number of solutions = infinite

each linear equation in two variables represents a straight line.

- consider two linear equations in two variables:

Consider two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$.

The two lines can be intersecting or parallel or coinciding.

A system of two linear equations is said to be consistent if it has at least one solution.

If $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$, the lines have **unique solution** i.e. they are **intersecting**.

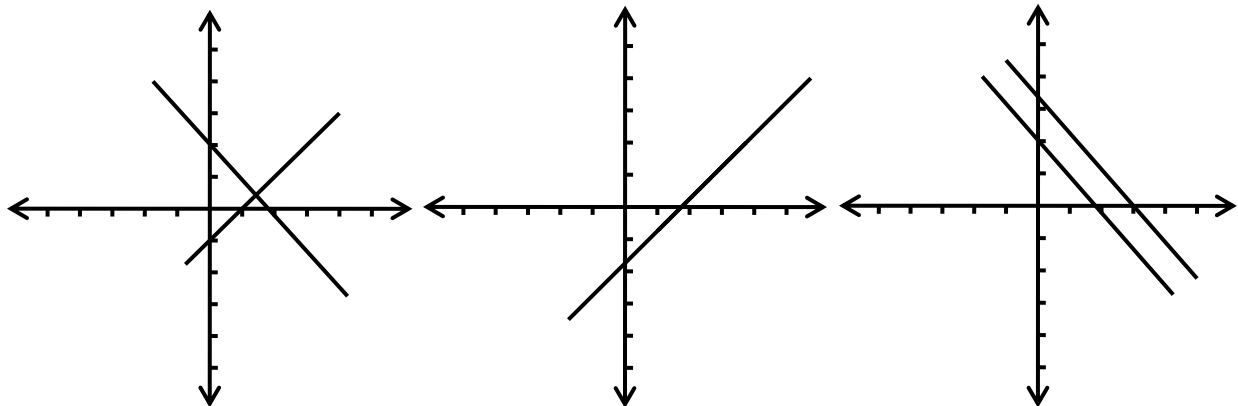
Here system is consistent as they have one solution.

If $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, the lines have **infinite number of solutions** i.e. they are **coincidence**.

Here system is consistent as they have infinite solutions.

If $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$, the lines have **no solution** i.e. they are **parallel**.

In this case the system of given equations is inconsistent.



Unique solution
(Consistent)

infinite solutions
(Consistent)

no solution
(Inconsistent)

- Cross multiplication method:
If system of equations have unique solution, then

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{y}{c_1a_2 - c_2a_1} = \frac{1}{a_1b_2 - a_2b_1}$$

$$\Rightarrow x = \frac{b_1c_2 - b_2c_1}{a_1b_2 - a_2b_1}, y = \frac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b_1}$$

SELECT THE CORRECT OPTION: (ONLY ONE OPTION IS CORRECT)

- For a pair to be consistent and dependent the pair must have
(a) no solution (b) unique solution (c) infinite solution (d) any of these
- What is the equation of x-axis?
(a) $x = 0$ (b) $y = 0$ (c) $x = y$ (d) $x + y = 0$
- Find the condition that the system of equations $ax + by = c$ and $lx + my = n$ has a unique solution.
(a) $al \neq bm$ (b) $am \neq bl$ (c) $al = bm \neq cn$ (d) $ab \neq ml$
- The pair of linear equations is said to be inconsistent if they have
(a) unique solution (b) no solution (c) infinite solutions (d) both (a) and (c)
- Lines $2x - 3y = 5$ and $4x - 6y = 2$ intersect at
(a) $(2, -1)$ (b) no point (c) infinite many points
(d) can't be determined without graph
- Line $y = a$ and $x = b$
(a) intersect each other at (b, a) (b) are perpendicular to each other
(c) are parallel to x and y-axis respectively (d) all are true
- Find 'k' for infinite solutions: $2x - 3y = 7$, $(k + 2)x - (2k + 1)y = 3(2k - 1)$.
(a) 2 (b) 3 (c) 4 (d) 5
- If $ax + by = a - b$ & $bx - ay = a + b$, what is the value of $3x + 5y$?
(a) 1 (b) -1 (c) -2 (d) 8
- Solve for x and y if $217x + 131y = 913$ and $131x + 217y = 827$.
(a) $(3, 2)$ (b) $(2, 3)$ (c) $(1, 1)$ (d) $(-3, -2)$
- Solve for 'x' and 'y' if $2x + 3y - 1 = 5x - 2y + 4 = 0.5x - y/3 + 7/3$.
(a) $(1, 0)$ (b) $(0, 1)$ (c) $(1, 1)$ (d) $(2, 3)$
- If $ax + by = a + b$ and $bx + ay = a + b$ then $x + y$ equals
(a) 1 (b) $a + b$ (c) 2 (d) $a^2 + b^2$

- 12) If $31x + 43y = 117$ and $43x + 31y = 105$, then x equals
 (a) 1 (b) 2 (c) 3 (d) none of these
- 13) Line $2ax - by = 1$ and $a^2x + b^2y = a + b$ surely passes through
 (a) (a, b) (b) $(1/a, 1/b)$ (c) (b, a) (d) $(1/b, 1/a)$
- 14) Which of the following line is parallel to x -axis?
 (a) $3x = 5y$ (b) $4x - y = 0$ (c) $3x - 5 = 0$ (d) $5y = 3$
- 15) What are the values of 'a' and 'b' if lines $(2a - 1)x + 3y = 5$ and $3x + (b - 1)y = 2$ have infinite number of solutions?
 (a) 1, 2 (b) 3, 4/5 (c) 11/5, 17/5 (d) 17/4, 11/5
- 16) Lines $x - 2y = 3$ and $3x + ky = 1$ has a unique solution. Value of k is
 (a) -6 only (b) 6 only (c) all real values except 6
 (d) all real values except -6
- 17) Lines $2x + 3y = 1$ and $(k + 1)x + (k + 2)y = 3k$ have infinite number of solutions. 'k' equals
 (a) 5 (b) 7 (c) 3 (d) 1
- 18) Lines $(k - 1)x - y = 5$ and $(k + 1)x + (1 - k)y = 3k + 1$ have infinite number of solutions. 'k' equals
 (a) 5 (b) 7 (c) 3 (d) 0, 3
- 19) **If an integer of two digits is k times the sum of its digits, the number formed by interchanging the digits is the sum of the digits multiplied by
 (a) $9 - k$ (b) $10 - k$ (c) $11 - k$ (d) $k - 1$
- 20) Sum of reciprocals of two numbers is $1/4$ and difference of these reciprocals is $1/12$. Smaller of these numbers is
 (a) 6 (b) 8 (c) 12 (d) 18
- 21) If $x + 2y = 2x + y$, then value of $(x + 2y)/(2x + y)$ is
 (a) 1 (b) 0 (c) 2 (d) 4
- 22) **A, B, C, D and E have certain pencils. A and B has equal number of pencils, pencils with D is twice the total pencils with C and E together; D has 12 pencils. How many pencils does E have?
 (a) 3 (b) 6 (c) 5 (d) data insufficient
- 23) Lines $2x + (k - 2)y = k$ and $6x + (2k - 1)y = 2k + 5$ have infinite number of solutions. 'k' equals
 (a) 5 (b) 7 (c) 3 (d) none of these
- 24) Lines $5x + 2y = 2k$ and $2(k + 1)x + ky = 3k + 4$ have infinite number of solutions. 'k' equals
 (a) 5 (b) 7 (c) 3 (d) 4
- 25) What are the values of 'a' and 'b' if lines $(a - 1)x + 3y = 2$ and $6x + (1 - 2b)y = 6$ have infinite number of solutions?
 (a) 3, -4 (b) 3, 4 (c) 2, -3 (d) none of these
- 26) If $6x + 3y = 8x + 9y - 5 = 10x + 12y - 8$, then value of $2x - 3y$ is
 (a) 0 (b) 1 (c) -2 (d) -1
- 27) Equations $2x + 5y = 6$, $4x + 10y = -12$ have

- (a) no solution (b) unique solution (c) infinite solutions (d) unique or infinite
- 28) The equations $3x - y = 14$ and $(a + b)x - 2by = 5a + 2b + 1$ has infinite number of solutions. $a =$
 (a) 1 (b) 5 (c) 4 (d) -1
- 29) If $ax + by = a^2 + b^2$ and $bx + ay = 2ab$ then $x - y$ equals
 (a) $a - b$ (b) $a^2 - b^2$ (c) 0 (d) none of these
- 30) **Find the vertices of the triangle formed by $x + 2y = 1$, $x + y = 0$ and $x - y = 0$.
 (a) (0, 0), (1, 1), (-1, -1)
 (b) (0, 0), (-1/3, -1/3), (-1, 1)
 (c) (0, 0), (1, -1), (-1, 1)
 (d) (0, 0), (1/3, 1/3), (-1, 1)
- 31) A rectangular field is half as wide as it is long and is completely enclosed by x yards of fencing. The area in terms of x is
 (a) $x^2/2$ (b) $2x^2$ (c) $2x^2/9$ (d) $x^2/18$
- 32) The sum of a two-digit number and the number obtained by interchanging the digits of the number is 110. The digits of the number differ by 6. The number(s) are
 (a) 28 (b) 82 (c) 28, 82 (d) none of these
- 33) A train, an hour after starting, meets with an accident which detains it a half hour, after which it proceeds at $\frac{3}{4}$ of its former rate and arrives $3\frac{1}{2}$ hours late. Had the accident happened 90 miles farther along the line, it would have arrived only 3 hrs late. The length of the trip in miles was
 (a) 400 (b) 465 (c) 600 (d) 540
- 34) Servant was asked to buy 33 pencils and 44 pens. But he got confused and bought 33 pens and 44 pencils. Now the bill was Rs. 935, which was Rs. 55 less than the original bill. Cost of 1 pen is
 (a) Rs10 (b) Rs15 (c) Rs20 (d) none of these
- 35) A boat covers 32 km upstream and 36 km downstream in 7 hrs. It can cover 40 km upstream and 48 km downstream in 9 hrs. Find the speed of boat (in kmph) in still water.
 (a) 8 (b) 9 (c) 10 (d) 12
- 36) Find the area of the triangle formed by $x + y = 0$, $x - y = 0$, $x = 2$.
 (a) 1 sq. units (b) 2 sq. units (c) 4 sq. units (d) 8 sq. units

SELECT THE CORRECT OPTION(S) (MORE THAN ONE OPTION CAN BE CORRECT)

(not meant for examination point of view)

- 37) If lines $3x + 4y + 12 = 0$ and $(a + b - 1)x + (2a - b)y + 4a + 3b - 2 = 0$ are coinciding lines, then of the following is true?
 (a) $a - b = 3$ (b) $2a + b = 12$ (c) $3a + 4b = 23$ (d) $2a = 5b$
- 38) Line $3x + 4y = 12$ passes through
 (a) (4, 0) (b) (0, 4) (c) (2, 1.5) (d) (-2, 3)

- 39) If $199x + 201y = 599$, $201x + 199y = 601$ then
 (a) $x + y = 3$ (b) $x - y = 1$ (c) $x = 2y$ (d) $2x = y$
- 40) A bought 4 erasers, 5 pens and 6 pencils for Rs.81. B bought 8 erasers, 12 pencils, 9 pens for Rs.151. Which of the following is true?
 (a) cost of 1 pen is Rs.11 (b) cost of pen cannot be determined
 (c) cost of eraser cannot be determined (d) cost of pencil cannot be determined
- 41) Line equation
 L1 $x + y = 0$
 L2 $3x + 2y = 0$
 L3 $3x = 2y$
 L4 $4x + 4y = 5y + 5$
- Statement I: L1 passes through origin
 Statement II: L2 passes through origin
 Statement III: L3 passes through origin
 Statement IV: L4 passes through origin
- Which of the above statement is true?
 (a) I (b) II (c) III (d) IV
- 42) Which of the following is true?
 (a) lines $2x + 4y = 3$ and $2x + 4y + 3 = 0$ are parallel
 (b) line $3x + 5y = 8(x - 3y)$ passes through origin
 (c) line $4x + 3y = 12$ meets x-axis at (3, 0)
 (d) line $3x + 4y = 12$ meets y-axis at (0, 4)
- 43) A lending library has a fixed charge for first three days and an additional charge for each day thereafter. Charges for keeping a book for 5 days is Rs.21 and that for 7 days is Rs.27. Which of the following is true?
 (a) charges for keeping a book for 12 days is Rs.48
 (b) charges for keeping a book for 10 days is Rs.48
 (c) charges for keeping a book for 3 days is Rs.15
 (d) charges for keeping a book for 8 days is Rs.30
- 44) In cyclic quadrilateral ABCD, $\angle A = (2x - 1)^\circ$, $\angle B = (y + 5)^\circ$, $\angle C = (2y + 15)^\circ$, $\angle D = (4x - 7)^\circ$. Which of the following is true?
 (a) $x = 33$ (b) $y = 50^\circ$ (c) $\angle C = 65^\circ$ (d) $\angle D = 125^\circ$
- 45) A boat goes 32 km upstream and 36 km downstream in 7 hours. Also, it covers 40 km upstream and 48 km downstream in 9 hours. Which of the following is true?
 (a) speed of boat in still water is 10 kmph (b) speed of boat with water is 10 kmph

- (c) speed of boat against water is 10 kmph (d) speed of water is 2 kmph
- 46) Father's present age is three times the sum of ages of his two children. After 5 years, his age will be twice the sum of ages of his two children. Which of the following is true?
 (a) present age of father is 45 years (b) sum of present ages of children is 45 years
 (c) present age of father is 55 years (d) sum of present ages of children is 55 years
- 47) Equations $kx + 3y = k - 3$ and $12x + ky - k = 0$ have infinite number of solutions. Value of k is
 (a) 0 (b) 6 (c) -6 (d) 36
- 48) Sum of a two digit number and the number obtained by reversing its digits is 121. Difference of the digits is 3. Number is
 (a) 47 (b) 74 (c) 62 (d) 84
- 49) If $\frac{1}{2(2x + 3y)} + \frac{12}{7(3x - 2y)} = \frac{1}{2}$ and $\frac{7}{(2x + 3y)} + \frac{4}{(3x - 2y)} = 2$, then
 (a) $x = 1$ (b) $y = 1$ (c) $x = 2$ (d) $y = 2$
- 50) If $x + 4y = 3xy$ and $5x + 2y = 6xy$ then
 (a) $x = 0, y = 0$ (b) $x = 2, y = 1$ (c) $x = 1, y = 2$ (d) $x = 1, y = 0.5$
- 51) Equation $kx + y = k^2$ and $x + ky = 1$ has no solution. Value of k is
 (a) 1 (b) -1 (c) 0 (d) 2
- 52) Equation $kx + y = k^2$ and $x + ky = 1$ has infinite number of solutions. Value of k is
 (a) 1 (b) -1 (c) 0 (d) 2
- 53) Which of the following lines passes through origin?
 (a) $3x - 4y = 0$ (b) $3(x + y) - 4 = 0$ (c) $y = 3$ (d) $x = 2$
- 54) A triangle is enclosed between lines $2y - x = 8$, $5y - x = 14$, $y - 2x = 1$. Vertices of the triangle are
 (a) (-4, 2) (b) (1, 3) (c) (6, 4) (d) (2, 5)

SUBJECTIVE PART

Solve for x and y; $x, y \in \mathbb{R}$:

- 55) $\frac{2}{3}x - \frac{3}{4}y = \frac{2}{3}, \frac{3}{2}x - y = \frac{3}{2}$
- 56) $3x - 2y + 1 = 4x - 9y + 6 = \frac{x + 8y}{2}$
- 57) $4x - 3y - 13 = 2x + y + 3 = 6x + 3y + 1$
- 58) $3(2x + y) = 7xy; \quad 6x + 9y = 15xy$

$$59) \quad \frac{xy}{x+y} = \frac{6}{5}, \frac{xy}{y-x} = 6$$

$$60) \quad 4x + 10y = 9xy, 4x - 2y = 3xy; (x, y \neq 0)$$

$$61) \quad 2x + \frac{3}{y} = 7, 3x - 2 = \frac{4}{y}$$

$$62) \quad 2/x - 3/y = 0; 3/x - 2/y = 5/6$$

$$63) \quad \sqrt{2}x - \sqrt{3}y = 0; \sqrt{3}x - 2y = 0$$

$$64) \quad \sqrt{2}x + \sqrt{3}y = 0; \sqrt{3}x - \sqrt{2}y = 0$$

$$65) \quad \sqrt{3}x + \sqrt{2}y = 2\sqrt{3} + \sqrt{2}, x = 1 + y$$

$$66) \quad 2x + 5y = 6, 4x + 10y = -12$$

$$67) \quad 304x + 409y = 1017, 409x + 304y = 1122$$

$$68) \quad (a^2 - b^2)x + (a + b)^2y = 2a(a + b); (a^2 - b^2)(x + y) = (2a + 2b)(a - b)$$

$$69) \quad \frac{1}{4x + 6y} + \frac{12}{21x - 14y} = \frac{1}{2}, \frac{7}{2x + 3y} + \frac{4}{3x - 2y} = 2$$

$$70) \quad \frac{2}{2x + 3y} - \frac{3}{3x + 2y} = 0; \frac{3}{4x + 6y} - \frac{2}{9x + 6y} = \frac{19}{36}$$

$$71) \quad \frac{3}{3x - y} + \frac{4}{x - 3y} = \frac{-17}{5}, \frac{5}{3x - y} + \frac{5}{2x - 6y} = \frac{-3}{2}$$

$$72) \quad \frac{3}{x + y} - \frac{2}{y - x} = 3, \frac{2}{3(x + y)} - \frac{3}{2(x - y)} = \frac{-23}{18}$$

$$73) \quad \frac{x+3}{2} - \frac{y+2}{7} = 1, \frac{x+2}{11} - \frac{y+3}{11} = 1$$

$$74) \quad \frac{m+n}{x+y} + \frac{m-n}{x-y} = 2, \frac{2m}{x+y} + \frac{2n}{x+y} = 2$$

$$75) \quad \frac{a^2}{x} - \frac{b^2}{y} = a - b, \frac{x}{ba^2} = \frac{y}{ab^2}$$

$$76) \quad \frac{a^2x}{b^2} - \frac{b^2y}{a^2} = a - b, ab(x - y) = (b - a)(a^2 + ab + b^2)$$

$$77) \quad 2ax - by = 1, \frac{x}{a} + \frac{y}{b} = \frac{a^2 + b^2}{a^2b^2}$$

$$78) \quad (a + 2b)x + (2a - b)y = 2, a(x + 2y) + b(y - 2x) = 3$$

- 79) $(a + b)x + (a - b)y = a^2 + 2ab - b^2$, $a(x - y) + b(x + y) = a^2 + b^2$
- 80) $(a - b)x + (a + b)y = a^2 + b^2$, $(a + b)(x + y) = (a - b)^2 + 4ab$
- 81) $a^2x + b^2y = a + b$, $x : y = b : a$
- 82) What are the values of 'a' and 'b' if lines $2x + 3y = 7$ and $(a + b + 1)x + (a + 2b + 2)y = 4a + 4b + 1$ have infinite number of solutions?
- 83) What are the values of 'a' and 'b' if lines $2x - 3y = 7$ and $(a + b)x - (a + b - 3)y = 4a + b$ have infinite number of solutions?
- 84) The equations $(x + 2y - 3)a + (2x + 3y + 3)b = 3x + 2y$ and $2x + 5y = 6$ have infinite number of solutions. Find the values of 'a' and 'b'.
- 85) Find m if the following pair of linear equations has no solution:
 $(m + 1)x + 2y = 5$, $3x + y = 6$
- 86) Find 'k' for infinite solutions:
 $2x - 3y = 7$, $(k + 2)x - (2k + 1)y = 3(2k - 1)$.
- 87) Find the value of 'a' for which the following equations has infinitely many solutions.
 $ax + 3y = a - 3$; $12x + ay = a$.
- 88) Without drawing graph find the point where the line $3x - 2y = 3$ meets y - axis.
- 89) Without using graph, find the intersection point of $3x - y = 7$ and $4x + y = 7$.
- 90) Line $2x + 3y - 2a = 3$ meets x-axis at 2. Find 'a'.
- 91) Find value of 'k' if lines $2x + 3y = 1$ and $3x - 2y = k$ have unique solution.

Solve the following equations by cross multiplication method:

- 92) $6x - 5y = 16$, $7x - 13y + 10 = 0$
- 93) $2x - y = 3$, $x - 2y + 3 = 0$
- 94) $2x + y = 7$, $4x - y = 5$
- 95) $\frac{x}{a} + \frac{y}{b} = a + b$, $\frac{x}{a^2} + \frac{y}{b^2} = 2$
- 96) $ax + by = c$, $bx + ay = 1 + c$
- 97) Find the two numbers whose sum is 42 and difference is 18.
- 98) If 2 is added to the numerator of a fraction, it reduces to $\frac{1}{2}$ and if 1 is subtracted from the denominator, it reduces to $\frac{1}{3}$. Find the fraction.
- 99) 10 years ago, father's age was 12 times that of his son and 10 years hence, his age would be twice that of his son. Find their present ages.
- 100) 5 years hence, a man's age will be 3 times that of his son. Five years ago, his age was 7 times that of his son. What are their present ages?

- 101) The age of a father is 3 years more than 3 times the son's age. 3 years hence, his age will be 10 years more than double the age of his son. Find their present ages.
- 102) The sum of a two-digit number and the number formed by reversing the digits is 88. Determine the number if the difference of the digits is 2.
- 103) Sum of the digits of a two-digit number is 9. If the digits are reversed, the number is increased by 9. Find the number.
- 104) 3 bags and 4 pens together cost Rs257 whereas 4 bags and 3 pens together cost Rs324. Find the total cost of 1 bag and 10 pens.
- 105) A woman has only 20 paise coins and 25 paise coins in her purse. If she has 50 coins in all totaling to Rs11.25, how many coins of each does she possess?
- 106) 90% and 97% pure acid solutions are mixed to obtain 21 litres of 95% pure acid solution. Find the amount of each type of acid to be mixed to form the mixture.
- 107) A person invested a certain amount at the rate of 12% simple interest and some other, at the rate of 10% simple interest. He received an yearly interest of Rs.130. He would have received Rs.4 more as interest if he interchanged the amounts invested. How much amount did he invest at different rates?
- 108) The sum of numerator and denominator of a fraction is 12. If 1 is added to both numerator and denominator, the fraction becomes $\frac{3}{4}$. Find the fraction.
- 109) A part of the monthly expenses of a family is constant and the remaining varies with the rate of wheat. When the rate of wheat is Rs.250 a quintal, the total monthly expenses are Rs.1000 and when it is Rs.240 a quintal, it is Rs.980. Find the total monthly expenses of the family when the cost of wheat is Rs.350 a quintal.
- 110) A and B each have certain number of oranges. A says to B, "If you give me 10 of your oranges, I will have twice the number of the oranges as left with you". B replies, "If you give me 10 of your oranges, I will have the same number of oranges as left with you". Find the number of oranges with A and B separately.
- 111) The area of a rectangle gets increased by 350 sq.units if its length as well as breadth is increased by 5 units. The area increases by 175 sq.units, if only breadth is increased by 5 units. Find the dimensions.
- 112) 2 kg apples and 3 kg oranges costs Rs.200 whereas 3 kg apples and 2 kg oranges costs Rs.190. Find cost of 1 kg apples and 1 kg oranges.
- 113) 2 men and 3 women can do a work in 5 days. 3 men and 2 women can do the same work in 6 days. In how many days a man and a woman can do the same work?
- 114) If the sum of two numbers is divided by 3, the quotient is 4 and the remainder is 1. If the difference of these two is divided by 2, the quotient is 2 and remainder is 1. Find the numbers.
- 115) Abhay tells Sabhya, " If you give me Rs.20, I will have thrice the money left with you". Sabhya replies, "If you give me Rs.50, I will have twice the money left with you". Find original amount with each.
- 116) The sum of the digits of a two-digit number is 12. The number obtained by interchanging its digit is 18 less than the original number. Find the number.

- 117) Rental charges for a book consist of fixed charges for first 5 days followed by per day charges. A man pays Rs.35 when he keeps book for 7 days and pays Rs.55 for 11 days for another book. Find rent if a book has to be kept for 12 days.
- 118) There are some students and benches in a class. If 3 students are allowed to sit on each bench, one student remains standing. If 4 students are allowed to sit on each bench, 3 benches are left vacant. Find number of students.
- 119) If a two digit number is divided by the sum of its digits, then we get 4 and 3 as quotient and remainder respectively. If number obtained by reversing the digits of the original number is divided by the sum of digits then we obtain 6 and 8 as quotient and remainder respectively. Find the original number.
- 120) A man travels 600 km to his home partly by train and partly by car. He takes 8 hrs if he travels 120 km by train and rest by car. He takes 20 minutes longer, if he travels 200 km by train and rest by car. Find the speed of train and the car.
- 121) A shopkeeper got an order of 339 pens and 439 pencils but instead he delivered 339 pencils and 439 pens and therefore the bill amount becomes Rs.4529 instead of Rs.4029. Find the cost of 1 pen and 1 pencil.
- 122) A, B and C have certain number of mangoes.
A says to B, "If I give 2 mangoes to C and 4 to you, both of us will be having an equal number of mangoes."
B replies, " If I give you 4 and C 5 then number of mangoes with me will be half of you."
Find the number of mangoes with A and B.
- 123) 2 years ago 'X' was 5 times of the age of 'Y'. Three years later 'X' will be three times of 'Y'. Find their present ages.
- 124) A man lent a part of his money at 10% p.a. and the rest at 15% p.a. His annual income ₹1900. If he had interchanged the rate of interest on the two sums, he would have earned ₹200 more. Find the amount he lent in each case.
- 125) Students of a class are made to stand in rows. If 4 students were extra in a row, there would be 2 rows less. If 4 students were less in a row, there would be 4 more rows. Find the number of students in the class.
- 126) A two digit number when added to a number obtained by reversing the order of its digits gives 55. Also three times of tens digit of the original number is equal to two times of its unit digit. Find the number.
- 127) A number consists of two digits. When it is divided by the sum of the digits, the quotient is 7. If 27 is subtracted from the number, the digits are reversed. Find the number.
- 128) A number consists of two digits. When it is divided by the sum of the digits, the quotient is 6 with no remainder. When the number is diminished by 9, the digits are reversed. Find the number.
- 129) A boat goes 16 km upstream and 24 km downstream in 6 hours. It can go 12 km upstream and 36 km downstream in the same time. Find the speed of the boat in still water and the speed of the stream.
- 130) The taxi charges in a city comprises of a fixed charge together with the charge for the distance covered. A journey of 10 km costs Rs75 and that of 15 km, Rs110. What will a person have to pay for travelling a distance of 25 km?
- 131) A part of monthly hostel charges in a college is fixed and the remaining depends on the number of days one has taken food in the mess. A student X, who takes food for 20 days, pays Rs1000 as hostel charges. However another student Y, taking food for 26 days, pays Rs1180. Find the fixed charges and the cost of food per day.
- 132) 'A' was standing near a bus stand. He saw 'B' standing 400 m away from him. He started running and 'B' started chasing him at a speed of 5 m/s more than that of 'A'. Find their speeds if B caught A after running a distance of 600 m.

- 133) To cover a distance of 40 km, A takes 4 hours more than B. If A doubles his speed, he takes $1\frac{1}{2}$ hours more than B to cover the same distance. Find their speeds.
- 134) The area of a rectangle gets reduced by 80sq.units if its length is decreased by 5 units and breadth is increased by 2 units. The area increases by 50sq.units if its length is increased by 10 units and breadth is decreased by 5 units. Find the dimensions.
- 135) Points A and B are 70 km apart. A car starts from 'A' and another from 'B' at the same time. If they travel in same direction, they meet after 7 hrs. But if they travel towards each other, they meet after 60 minutes. What are their speeds?
- 136) The population of a town is 50000. In a year the number of males increased by 5% and the number of females increased by 3%. The population increased to 52020. Find the number of males and females in the town a year ago.
- 137) A man sold a table and a chair for ₹760, thereby making a profit of 10% on the table and 25% on chair. By selling them together for ₹767.50, he would have made a profit of 25% on the table and 10% on the chair. Find cost price of each.
- 138) A boat goes 18 km upstream and 36 km downstream in 5 hours. It can go 12 km upstream and 28 km downstream in 3 hours 40 minutes. Find the speed of the boat in still water and the speed of the stream.
- 139) A and B are friends. A is elder to B by 2 years. A's father D is twice as old as A and B is twice as old as his sister C. if ages of D and C differ by 40 years, find the age of A.
- 140) Last year, one kilogram of tea and three kilograms of sugar together cost `96. This year rates of tea increased by 15% and that of sugar by 10%. So the same amounts of tea and sugar now cost `108.60. Find per kilogram rates of tea and sugar last year.
- 141) There are some lotus flowers in a lake. If one butterfly sits on each flower, one butterfly is left behind. If two butterflies sit on each flower then one flower is left behind. Find the number of flowers and butterflies.
- 142) Find coordinates of vertices and area of the triangle enclosed between $2x + 3y = 12$, $x - y = 1$ and x-axis.
- 143) Find coordinates of vertices and area of the triangle enclosed between $2x + 3y = 12$, $x - y = 1$ and y-axis.
- 144) Find coordinates of vertices and area of the triangle enclosed between $x = y$, $x + y = 0$ and $x = 3$.

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(not meant for examination point of view)

- 145) Solve for x and y: $\frac{1001}{3x + 5y} + \frac{1144}{3y + 5x} = 179$, $\frac{1001}{3y + 5x} + \frac{1144}{3x + 5y} = 181$
- 146) Solve for x and y: $\frac{m}{n} \cdot x + \frac{n}{m} \cdot y = \left(\frac{1}{n} + \frac{1}{m}\right)(m^2 + n^2)$, $(x + y)(m^2 + n^2) = 2(m^3 + n^3) + mn(x + y)$
- 147) If $ax + by = c$, $bx + ay = d$, then show that $(a^2 - b^2)(x^2 - y^2) = c^2 - d^2$.
- 148) Solve for a and b :
 $2^a + 3^b = 17$, $2^{a+2} - 3^{b+1} = 5$

- 149) A says to B, "I am five times as old as you were, when I was as old as you are.". The sum of their present ages is 64. Find their ages.
- 150) A number of three digits has five in the unit's place and the middle figure is half the sum of the other two. If 108 is added to the number, the hundredth figure will take the unit's place and the unit's the ten's and the ten's the hundredth. Find the number.
- 151) y varies as the sum of two quantities of which one varies directly as x and the other inversely as x . If $y = 6$ when $x = 4$ and $y = 3\frac{1}{3}$ when $x = 3$, then find the relation between x and y .
- 152) If y be the sum of three quantities which vary as x , x^2 , x^3 respectively, and if when x has the values 1, 2, 3, the corresponding values of y be 4, 8, 18, then express y in terms of x .
- 153) I was born 30 years after my father. My sister was born 25 years after my mother. The average age of my family is 26.25 right now. My sister will get married 4 years from now and will leave the family. Then the average age of the family will be $107/3$. Then what is the age of my father right now?
- 154) Find the real values of x and y : $(2x - 3y - 13)^2 + (3x + 4y + 6)^2 = 0$

answers

- 1)c 2)b 3)b 4)b 5)b 6)d 7)c 8)c 9)a 10)b
 11)c 12)a 13)b 14)d 15)d 16)d 17)d 18)c 19)c 20)a
 21)a 22)d 23)a 24)d 25)a 26)d 27)a 28)b 29)a 30)d
 31)d 32)c 33)c 34)b 35)c 36)c
 37)abcd 38)ac 39)abc 40)acd 41)abc 42)abc 43)cd 44)abd
 45)ad 46)a 47)b 48)ab 49)bc 50)ab 51)b 52)a 53)a 54)abd
 55) (1, 0) 56) (2, 1) 57) (2, -3) 58) (3/4, 2), (0, 0)
 59) (2, 3) 60) (2, 1) 61) (2, 1) 62) (2, 3)
 63) (0, 0) 64) (0, 0) 65) (2, 1) 66) no solution
 67) (2, 1) 68) (1, 1) 69) (2, 1) 70) (1, 0)
 71) (2, 1) 72) (2, 1) 73) (1, 5) 74) (m, n)
 75) (a, b) 76) $\left(\frac{b^2}{a}, \frac{a^2}{b}\right)$ 77) $\left(\frac{1}{a}, \frac{1}{b}\right)$ 78) $\left(\frac{-2a+5b}{10ab}, \frac{a+10b}{10ab}\right)$
 79) (a, b) 80) (a, b) 81) $\left(\frac{1}{a}, \frac{1}{b}\right)$ 82) $a = 3, b = 2$
 83) $a = -5, b = -1$ 84) $a = 7, b = 1$ 85) $m = 5$ 86) $k = 4$

- 87) $a = 6$ 88) $\left(0, \frac{-3}{2}\right)$ 89) (2, -1) 90) 0.5
- 91) all real values 92) (6, 4) 93) (3, 3) 94) (2, 3)
- 95) (a^2, b^2) 96) $\left(\frac{ca - cb - b}{a^2 - b^2}, \frac{ca - cb + a}{a^2 - b^2}\right)$ 97) 30, 12
- 98) $\frac{3}{10}$ 99) 34 years, 12 years 100) 40 years, 10 years 101) 33 years, 10 years
- 102) 35, 53 103) 45 104) Rs.155 105) 25, 25
- 106) 6 litres, 15 litres 107) Rs.500, Rs.700 108) 5/7 109) Rs.1200
- 110) 70, 50 111) 35 units, 30 units 112) apples = Rs.34/kg, oranges = Rs.44/kg
- 113) man = 50 days, woman = 18.75 days 114) 9, 4 115) Abhay = Rs. 106, Sabhay = Rs. 62
- 116) 75 117) Rs.60 118) 40 119) 47
- 120) train = 60 kmph, bus = 80 kmph
- 121) pen = Rs. 8, pencil = Rs. 3 122) A = 42, B = 32 123) X = 27 years, Y = 7 years
- 124) 10000, 6000 125) 96 126) 23 127) 63
- 128) 54 129) 8 kmph, 4 kmph 130) Rs.180 131) Rs. 400, Rs. 30
- 132) 2.5 m/s, 7.5 m/s 133) 8 kmph, 40 kmph 134) 40 units, 30 units 135) 40 kmph, 30 kmph
- 136) 26000 males, 24000 females 137) chair = Rs.300, table = Rs.350
- 138) 10.5 kmph, 1.5 kmph 139) 26 years 140) Rs.60, Rs.12 141) flowers = 3, butterfly = 4
- 142) (3, 2), (6, 0), (0, -1); 5 sq.units 143) (3, 2), (0, 4), (0, -1); 7.5 sq.units
- 144) (3, 3), (0, 0), (3, -3); 9 sq.units 145) (2, 1) 146) $(m + n, m + n)$
- 147) (2, -3) 148) $a = 3, b = 2$ 149) 40 yrs, 24 yrs 150) 345
- 151) $y = 2x - \frac{8}{x}$ 152) $y = 6x - 3x^2 + x^3$ 153) 45 yrs 154) (2, -3)