CBSE Class 10 Mathematics_ Important Board Question Bank

Chapter 3: Pair of Linear Equations in Two Variables Only (2021-2025)

Dedicated Chapter 3 Question Bank (2021-2026)
Bifurcated by Standard (041) & Basic (241) Curriculums

Section 1: Standard Mathematics (041) — 10 Linear Equations Questions

Question 1 [2025 Exam] (1 Mark - MCQ)

The pair of linear equations 2x - 3y = 1 and 3x - 2y = 4 has:
(A) a unique solution (B) exactly two solutions (C) infinitely many solutions (D) no solution

[Marking Scheme] *Ratio comparison setup a1/a2 != b1/b2: 1 Mark.*

Answer:

Comparing equation, 2x - 3y = 1 and 3x - 2y = 4 with

$a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$

we have

$\frac{a1}{a2} = \frac{2}{3}$, $\frac{b1}{b2} = \frac{3}{2}$; we can see that, $\frac{2}{3} \neq \frac{3}{2}$

Since they are not equal, the lines are intersecting and have a unique solution.

Correct Option: (A)

Question 2 [2024 Exam] (3 Marks - Short Answer)

Solve the following pair of linear equations algebraically:
2x + 3y = 11
2x - 4y = -24

[Marking Scheme] *Finding y value: 1.5 Marks | Finding x value: 1.5 Marks.*

Answer: **Given,**

$2x + 3y = 11$____________ **(A)**

$2x - 4y = -24$ __________ **(B)**

Step 1: Eliminate x by subtracting Equation 2 from Equation 1

Since both equations have the identical term $2x$, subtracting one equation from the other will eliminate the variable x entirely.

$$2x + 3y = 11$$

$$\_2x \mp 4y = \mp 24$$

7y = 35

Divide both sides by 7:

$$y = \frac{35}{7}$$

$$\mathbf{y = 5}$$

Step 3: Substitute $y = 5$ back into Equation 1 to find x

Take the value of y and plug it into the first original equation:

$$2x + 3(5) = 11$$

$$2x + 15 = 11$$

Subtract 15 from both sides:

$$2x = 11 - 15$$

$$2x = -4$$

$$x = \frac{-4}{2} \quad \text{(Divide by 2)}$$

$$\mathbf{x = -2}$$

Final Answer:

$$x = -2, \quad y = 5$$

Question 3 [2023 Exam] (3 Marks - Solvability)

Find the value of k for which the system of linear equations x + 2y = 3 and 5x + ky + 7 = 0 has no solution.

> **[Marking Scheme]** *Setting parallel criteria a1/a2 = b1/b2 != c1/c2: 1.5 Marks | Solving for k: 1.5 Marks.*

Answer:

Comparing x + 2y = 3 and 5x + ky + 7 = 0 with

$a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$

we know, the given equation has no solution,

$\frac{a1}{a2} = \frac{b1}{b2} \neq \frac{c1}{c2}$

now we will take $\frac{a1}{a2} = \frac{b1}{b2}$

$\frac{1}{5} = \frac{2}{k}$

k = 10.

Question 4 [2022 Exam] (5 Marks - Long Word Problem)

A fraction becomes 1/3 when 1 is subtracted from the numerator and it becomes 1/4 when 8 is added to its denominator. Find the fraction.

> **[Marking Scheme]** *Equation setup: 2 Marks | Algebraic reduction: 2.5 Marks | Final format fraction: 0.5 Mark.*

Answer: Let the required fraction be $\frac{x}{y}$, where:

- x is the **numerator**
- y is the **denominator**

Condition 1: The fraction becomes $\frac{1}{3}$ when 1 is subtracted from the numerator.

$$\frac{x-1}{y} = \frac{1}{3}$$

Cross-multiply to simplify:

$$3(x-1) = 1 \times y$$

$$3x - 3 = y$$

i.e $3x - y = 3$ ------------(A)

Condition 2: The fraction becomes $\frac{1}{4}$ when 8 is added to its denominator.

$$\frac{x}{y+8} = \frac{1}{4}$$

Cross-multiply to simplify:

$$4 \times x = 1(y+8)$$

$$4x = y + 8$$

i.e $4x - y = 8$ ----------(B)

Solving equation (A) and (B) by elimination method,

$$3x - y = 3$$

$$\_4x \mp y = \_8$$

$$-x = -5$$

i.e x = 5

Substitute $x = 5$ into Equation (A)

$$3(5) - y = 3$$

$$15 - y = 3$$

$$15 - 3 = y$$

$$y = 12$$

Since $x = 5$ and $y = 12$, the fraction is $\frac{5}{12}$

Question 5 [2025 Exam] (1 Mark - MCQ)

If a pair of linear equations is consistent, then the lines representing them will be:
(A) always parallel (B) always coincident (C) intersecting or coincident (D) always intersecting

[Marking Scheme] *Conceptual definitions of consistency parameters: 1 Mark.*

Answer: Consistent systems have 1 or infinite solutions. Correct Option: (C)

Question 6 [2024 Exam] (2 Marks - Short Answer)

Find the values of a and b for which the following pair of linear equations has infinite number of solutions:
2x + 3y = 7
(a-b) x + (a+b) y = 21

[Marking Scheme] *Setting full ratio strings: 1 Mark | Solving system: 1 Mark.*

Answer:

Comparing equation, 2x + 3y = 7 and (a-b) x + (a+b) y = 21 with

$a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$

we have

$$\frac{a1}{a2} = \frac{b1}{b2} = \frac{c1}{c2}$$

$$\frac{2}{(a-b)} = \frac{3}{(a+b)} = \frac{7}{21}$$

$$\frac{2}{(a-b)} = \frac{3}{(a+b)} = \frac{1}{3} \quad \text{---------(divide by 7)}$$

Solving, $\frac{2}{(a-b)} = \frac{1}{3}$

a-b = 6 --------- (A)

and $\frac{3}{(a+b)} = \frac{1}{3}$

here, a+b = 9 --------(B)

solving equations, A and B,

$$a - b = 6$$

$$a + b = 9$$

$$2a = 15$$

$$a = \frac{15}{2}$$

put value of a in equation A,

$$a - b = 6$$

$$\frac{15}{2} - b = 6$$

$$\frac{15}{2} - 6 = b$$

$$\frac{15 - 12}{2} = b$$

$$\frac{3}{2} = b$$

Final Answer: $a = \frac{15}{2}$ and $b = \frac{3}{2}$

Question 7 [2023 Exam] (3 Marks - Speed Problem)

Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour. What are the speeds of the two cars?

> **[Marking Scheme]** *Formulating relative motion conditions: 2 Marks | Speed calculations: 1 Mark.*

Answer: Let

- The speed of the car starting from place A = x km/h
- The speed of the car starting from place B = y km/h
- Assume the car from A is faster than the car from B ($x > y$) so that it can catch up when moving in the same direction.

The distance between A and B is 100 km.

- When two objects move in the same direction, their **relative speed** is the difference between their individual speeds: $(x - y)$ km/h.
- They meet in 5 hours.

Using the formula:

$$\text{Distance} = \text{Speed} \times \text{Time}$$

$$100 = (x - y) \times 5$$

Divide both sides by 5:

$$x - y = \frac{100}{5}$$

$$\mathbf{x - y = 20} \quad \text{---------(A)}$$

- When two objects move toward each other, their **relative speed** is the sum of their individual speeds: $(x + y)$ km/h.
- They meet in 1 hour.

Using the formula:

$$\text{Distance} = \text{Speed} \times \text{Time}$$

$$100 = (x + y) \times 1$$

$$\mathbf{x + y = 100} \quad \text{----------(B)}$$

Solving equation, A and B:

$$x - y = 20$$

$$x + y = 100$$

2x = 120

$$x = \frac{120}{2}$$

Add Equation 1 and Equation 2 together to eliminate y:

$$(x - y) + (x + y) = 20 + 100$$

$$2x = 120$$

$$x = \frac{120}{2}$$

$$\mathbf{x = 60}$$

Step 4: Find the value of y

Substitute $x = 60$ into Equation Bs:

$$60 + y = 100$$

$$y = 100 - 60$$

$$\mathbf{y = 40}$$

Final Answer:

- The speed of the car starting from place A is 60 km/h.
- The speed of the car starting from place B is 40 km/h.

Question 8 [2021 Exam] (5 Marks - Age Problem)

Five years ago, Nuri was thrice as old as Sonu. Ten years later, Nuri will be twice as old as Sonu. How old are Nuri and Sonu currently?

> **[Marking Scheme]** *Setting up correct age shifts: 2 Marks | Variable solvers: 3 Marks.*

Answer:

Let the current age of Nuri be x years.

Let the current age of Sonu be y years.

Form the first equation (Five years ago)

Five years ago, their ages were:

- Nuri's age: $x - 5$
- Sonu's age: $y - 5$

The problem states that five years ago, Nuri was thrice (three times) as old as Sonu:

$$x - 5 = 3(y - 5)$$

Now, let's simplify this equation:

$$x - 5 = 3y - 15$$

$$x - 3y = -15 + 5$$

$$x - 3y = -10 \quad \text{-----------(A)}$$

(Ten years later)

Ten years from now, their ages will be:

- Nuri's age: $x + 10$
- Sonu's age: $y + 10$

The problem states that ten years later, Nuri will be twice as old as Sonu:

$$x + 10 = 2(y + 10)$$

Now, let's simplify this equation:

$$x + 10 = 2y + 20$$

$$x - 2y = 20 - 10$$

$$x - 2y = 10 \quad \text{--- (B)}$$

Solve the equations A and B

$$x - 3y = -10$$

$$-x \mp 2y = -10$$

$$-y = -20$$

i.e y = 20

So, Sonu's current age is 20 years.

Find Nuri's age

Substitute the value of $y = 20$ into **Equation B**

$$x - 2(20) = 10$$

$$x - 40 = 10$$

$$x = 10 + 40$$

$$x = 50$$

Final Answer:

- **Nuri's current age:** 50 years old
- **Sonu's current age:** 20 years old

Question 9 [2025 Exam] (3 Marks - Digit Word Problem)

The sum of a two-digit number and the number obtained by reversing the digits is 66. If the digits of the number differ by 2, find the number. How many such numbers are there?

> **[Marking Scheme]** *Setting standard numbering expansion equations: 1.5 Marks | Cases separation: 1.5 Marks.*

Answer:

Let the tens digit of the number be x and the units (ones) digit be y.

- The value of the original two-digit number can be written as:

$$\text{Original Number} = 10x + y$$

- If we reverse the digits, the tens digit becomes y and the units digit becomes x. The value of the reversed number is:

$$\text{Reversed Number} = 10y + x$$

Condition 1:

The problem states that the sum of the original number and the reversed number is 66:

$$(10x + y) + (10y + x) = 66$$

Combine the like terms:

$$11x + 11y = 66$$

Divide the entire equation by 11 to simplify it:

$$x + y = 6 \quad \text{--------(A)}$$

Condition 2:

The problem states that the digits differ by 2. Because we don't know whether the tens digit (x) or the units digit (y) is larger, this gives us two possible cases:

- **Case A:** $x - y = 2$ (Tens digit is larger)
- **Case B:** $y - x = 2$ (Units digit is larger)

Solve for both cases

Solving Case A ($x - y = 2$)

We have a system of two equations:

$$x + y = 6$$

$$x - y = 2$$

$$2x = 8$$

$$x = 4$$

Substitute $x = 4$ back into Equation A,

$$4 + y = 6$$

$$y = 2$$

Using these digits ($x = 4, y = 2$), the **original number is 42**.

Solving Case B ($y - x = 2$)

We have a system of two equations:

$$x + y = 6$$

$$y - x = 2 \Longrightarrow -x + y = 2$$

Solving equations,

$$x + y = 6$$

$$-x + y = 2$$

$$2y = 8$$

$$y = 4$$

Substitute $y = 4$ back into Equation A:

$$x + 4 = 6$$

$$x = 2$$

Using these digits ($x = 2, y = 4$), the **original number is 24**.

Conclusion

- **The numbers are: 42** and **24**
- **How many such numbers are there?** There are **2** such numbers.

Question 10 [2022 Exam] (3 Marks - Graphical Solutions)

Solve graphically the pair of linear equations: x - y + 1 = 0 and 3x + 2y - 12 = 0.

> **[Marking Scheme]** *Table plot coordinate mappings: 1.5 Marks | Stating intersection point: 1.5 Marks.*

Answer:

To find the coordinates for each line, we can rearrange the original equations into the **slope-intercept form** ($y = mx + b$).

For the first equation: Original: $x - y + 1 = 0$
Simplified: $y = x + 1$

The distinct coordinates plotted on the **blue** line Equation $y = x + 1$

- $(-1,0)$, $(0,1)$, $(2,3)$

x	-1	0	2
y	0	1	3
(x,y)	$(-1,0)$	$(0,1)$	$(2,3)$

2. For the second equation: Original: $3x + 2y - 12 = 0$

Simplified: $2y = -3x + 12$

$$\Rightarrow y = -\frac{3}{2}x + 6 \Rightarrow y = -1.5\,x + 6$$

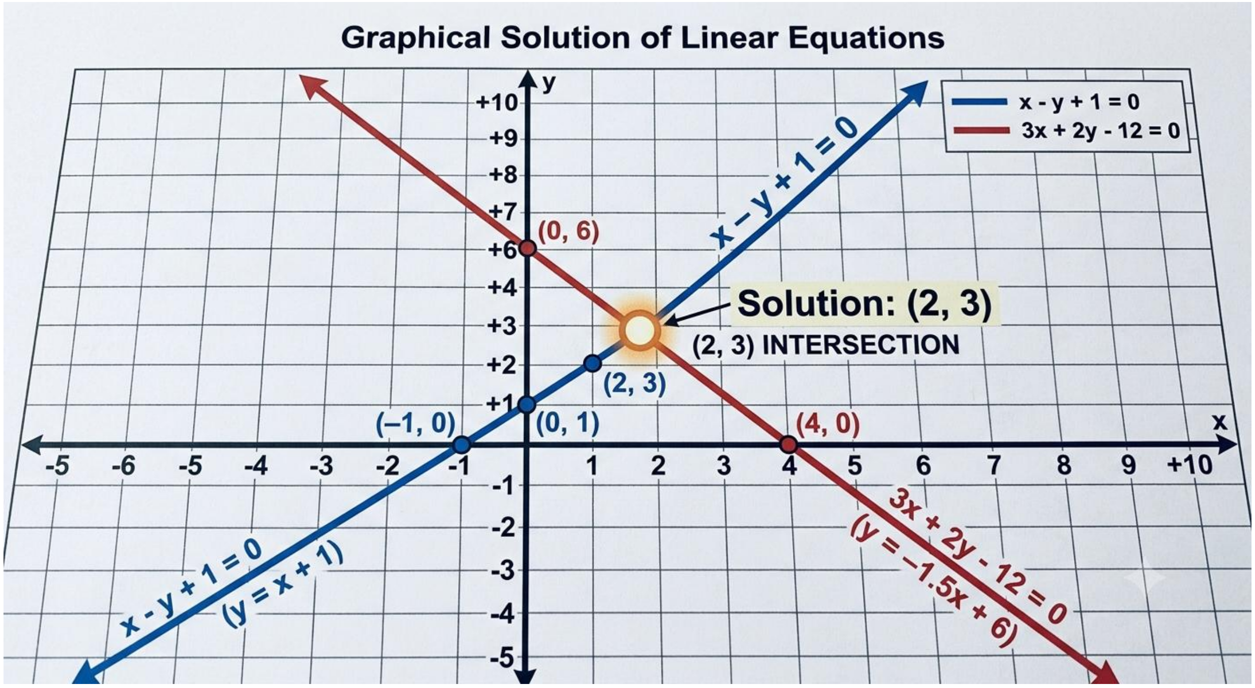
The distinct coordinates plotted on the **red** line equation $y = -1.5\,x + 6$

- $(0,6)$, $(2,3)$, $(4,0)$

x	0	2	4
y	6	3	0
(x,y)	$(0,6)$	$(2,3)$	$(4,0)$

Solution

Looking at both the coordinates listed above and the graph, the only point common to both equations is $(2,3)$. This point is highlighted on the graph as the **Intersection Point**.



Solution: The coordinate of intersecting line (2,3)

Section 2: Basic Mathematics (241) — 10 Linear Equations Questions

Question 11 [2025 Exam] (1 Mark - MCQ)

If the lines given by 3x + 2ky = 2 and 2x + 5y + 1 = 0 are parallel, then the value of k is:

(A) $-\frac{5}{4}$ (B) $\frac{2}{5}$ (C) $\frac{15}{4}$ (D) $\frac{3}{2}$

[Marking Scheme] *Parallel slope ratio cross-multiplication: 1 Mark.*

Answer: Comparing equation, 3x + 2ky = 2 and 2x + 5y + 1 = 0 with

$a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$

we know , if equations are parallel then the ratio are equal,

$\frac{a1}{a2} = \frac{b1}{b2}$

$\frac{3}{2} = \frac{2k}{5}$

=> k = $\frac{15}{4}$. Correct Option: (C)

Question 12 [2024 Exam] (2 Marks - Consistency Check)

Check whether the pair of lines x - 2y = 0 and 3x + 4y - 20 = 0 is consistent or inconsistent.

[Marking Scheme] *Finding and matching simple ratios: 2 Marks.*

Answer:

Comparing equation, x - 2y = 0 and 3x + 4y - 20 = 0 with

$a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$

$\frac{a1}{a2} = \frac{1}{3}$, and $\frac{b1}{b2} = \frac{-1}{2}$.

Since they are unequal, lines intersect uniquely and are Consistent.

Question 13 [2023 Exam] (2 Marks - Substitution)

Solve for x and y using the substitution method:
x + y = 14
x - y = 4

[Marking Scheme] *Isolating one letter and substituting: 2 Marks.*

Answer:

1. $x + y = 14$ -------- (A)
2. $x - y = 4$ ----------(B)

We can choose either equation. Let's take **Equation B** and express x in terms of y:

$$x - y = 4$$

$$x = y + 4 \quad \text{---------(C)}$$

Now, substitute the expression for x from Equation C into **Equation A:**

$$(y + 4) + y = 14$$

Combine the like terms and simplify:

$$2y + 4 = 14$$

$$2y = 14 - 4$$

$$2y = 10$$

$$y = \frac{10}{2}$$

$$y = 5$$

Substitute the value of $y = 5$ back into **Equation C**:

$$x = 5 + 4$$

$$x = 9$$

Conclusion

The solution for the given system of equations is:

- $x = 9$
- $y = 5$

Question 14 [2021 Exam] (3 Marks - Cost Problem)

The coach of a cricket team buys 3 bats and 6 balls for INR 3900. Later, she buys another bat and 3 more balls of the same kind for INR 1300. Represent this situation algebraically and find the cost of a bat.

> **[Marking Scheme]** *Item pricing equations matrix: 1.5 Marks | Elimination step: 1.5 Marks.*

Answer:

Let the cost of one bat be INR x.

Let the cost of one ball be INR y.

Step 2: Represent the situation algebraically

- **Condition 1:** The coach buys 3 bats and 6 balls for INR 3900.

$$3x + 6y = 3900 \quad \text{-------A}$$

Condition 2 : She buys another bat (1 bat) and 3 more balls for INR 1300.

$$1x + 3y = 1300 \quad \text{-------B}$$

Notice that all terms in **Equation A** can be divided by 3 to make it simpler:

$$\frac{3x}{3} + \frac{6y}{3} = \frac{3900}{3}$$

$$x + 2y = 1300 \quad \text{--------(C)}$$

Now look at **Equation B** and **Equation C**:

$$x + 3y = 1300$$

$$x + 2y = 1300$$

$$y = 0$$

This tells us that the cost of a ball (y) is **INR 0**.

Find the cost of a bat (x)

Substitute $y = 0$ back into **Equation B**:

$$x + 3(0) = 1300$$

$$x = 1300$$

Conclusion

- **Algebraic Representation:** $3x + 6y = 3900$ and $x + 3y = 1300$
- **Cost of a bat: INR 1300**

Question 15 [2024 Exam] (1 Mark - MCQ)

The value of c for which the pair of equations cx - y = 2 and 6x - 2y = 3 will have infinitely many solutions is:
(A) 3 (B) -3 (C) 4 (D) Does not exist

Answer: Comparing cx - y = 2 and 6x - 2y = 3 with

$a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$

we know, the given equation has no solution,
$\frac{a1}{a2} = \frac{b1}{b2} = \frac{c1}{c2}$

For infinite solutions,

$\frac{C}{6} = \frac{-1}{-2} = \frac{2}{3}$

=> $\frac{1}{2} \neq \frac{2}{3}$ (impossible mismatch).

Correct Option: (D)

Question 16 [2022 Exam] (2 Marks - Axis Intercept)

Find the coordinates of the point where the line x - y = 2 intersects the y-axis.

Answer: Intersecting y-axis implies x = 0.

Substituting gives 0 - y = 2

=> y = -2.

The point is (0, -2).

Question 17 [2023 Exam] (3 Marks - Perimeter Geometry)

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

Answer:

Let the width of the rectangular garden be x meters.

Let the length of the rectangular garden be y meters.

Condition 1: The length is 4 m more than its width.

$$y = x + 4 \quad \text{---------(A)}$$

Condition 2: The perimeter of the rectangular garden is 36 m.

The formula for the perimeter of a rectangle is $2(\text{length} + \text{width})$.

$$2(y + x) = 36$$

Divide both sides by 2 to simplify it:

$$y + x = 18 \quad \text{---------(B)}$$

Solve the equations using Substitution

Put the value of y from **Equation A** into **Equation B**:

$$(x + 4) + x = 18$$

$$2x + 4 = 18$$

$$2x = 18 - 4$$

$$2x = 14$$

$$x = \frac{14}{2}$$

$$x = 7$$

So, the width of the garden is 7 m.

Substitute the value of $x = 7$ back into **Equation 1**:

$$y = 7 + 4$$

$$y = 11$$

So, the length of the garden is 11 m.

Conclusion

- **Width of the garden:** 7 m
- **Length of the garden:** 11 m

Question 18 [2024 Exam] (1 Mark - MCQ)

The solution of the equations x + y = 7 and 5x + 12y = 7 has what kind of solution nature?
(A) Unique solution | (B) No solution | (C) Infinitely many solutions

Answer:

Comparing x + y = 7 and 5x + 12y = 7 with

$a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$

we know, the given equation has no solution,
$\frac{a1}{a2} = \frac{1}{5}$; $\frac{b1}{b2} = \frac{1}{12}$

Since $\frac{1}{5} \neq \frac{1}{12}$, the system has a unique solution. Correct Option: (A)

Question 19 [2022 Exam] (3 Marks - Elimination Short Answer)

Solve for x and y: 21x + 47y = 110 and 47x + 21y = 162.

Answer:

$$21x + 47y = 110 \quad \text{---------(A)}$$

$$47x + 21y = 162 \text{---------(B)}$$

Add Equation A and Equation B

$$21x + 47y = 110$$

$$47x + 21y = 162$$

$$68x + 68y = 272$$

Divide the entire equation by 68 to simplify it:

$$x + y = \frac{272}{68}$$

$$x + y = 4 \quad \text{--------- (C)}$$

Step 2: Subtract Equation A from Equation B

$$47x + 21y = 162$$

$$-21x \pm 47y = -110$$

$$26x - 26y = 52$$

Divide the entire equation by 26 to simplify it:

$$x - y = \frac{52}{26}$$

$$x - y = 2 \quad \text{--------(D)}$$

Solving equation C and D by elimination method,

$$x + y = 4$$

$$x - y = 2$$

$$2x = 6$$

$$x = \frac{6}{2}$$

$$x = 3$$

Find the value of y

Substitute the value of $x = 3$ back into **Equation C**:

$$3 + y = 4$$

$$y = 4 - 3$$

$$y = 1$$

Conclusion

The final solution is:

- $x = 3$
- $y = 1$

Question 20 [2024 Exam] (3 Marks - Income and Savings Matrix)

The monthly incomes of two persons are in the ratio 9:7 and their expenditures are in the ratio 4:3. If each of them manages to save INR 2000 per month, find their monthly incomes.

Answer:

To find the monthly incomes of the two persons, we can use the fundamental relationship between income, expenditure, and savings:

$$\text{Income} - \text{Expenditure} = \text{Savings}$$

- The monthly incomes of the two persons are in the ratio $9:7$. Let their incomes be $9x$ and $7x$.
- Their monthly expenditures are in the ratio $4:3$. Let their expenditures be $4y$ and $3y$.

Form the linear equations

Since each person saves INR 2000 per month, we can set up two equations:

- **For the first person:**

$$9x - 4y = 2000 \quad \text{--------(A)}$$

- **For the second person:**

$$7x - 3y = 2000 \quad \text{------(B)}$$

Use the elimination method

To eliminate the variable y, let's make the coefficients of y equal in both equations.

Multiply **Equation A** by 3 and **Equation B** by 4:

- **New Equation 1:** $3 \times (9x - 4y = 2000) \Longrightarrow 27x - 12y = 6000 \quad \text{-------(C)}$
- **New Equation 2:** $4 \times (7x - 3y = 2000) \Longrightarrow 28x - 12y = 8000 \quad \text{-------(D)}$

Now, subtract **Equation C** from **Equation D**:

$$27x - 12y = 6000$$

$$-28x \mp 12y = -8000$$

$$x = 2000$$

Calculate their monthly incomes

Now that we have the value of the common ratio factor $x = 2000$, we can substitute it back to find their specific incomes:

- **Income of the first person:**

$$9x = 9 \times 2000 = \text{INR } 18{,}000$$

- **Income of the second person:**

$$7x = 7 \times 2000 = \text{INR } 14{,}000$$

Conclusion

The monthly incomes of the two persons are **INR 18,000** and **INR 14,000** respectively.