UDAAN

2025

Pair of linear equation in two variable

Mathematics | Lecture - 03

By – Ritik Sir

Topics *to be covered*

1. Galat answers par chaacha...
2. Substitution Method
3. Elimination Method
4. Questions on Conditions of Solvability


WORK HARD
DREAM BIG
NEVER GIVE UP !!

Topic : Graphical Method of Solving Simultaneous Linear Equation

#Q. Solving the following system of equations graphically [CBSE 2008]

$x + 3y = 16$

$2x - 3y = 12$

and hence find the value of a, if $4x + 3y = a$

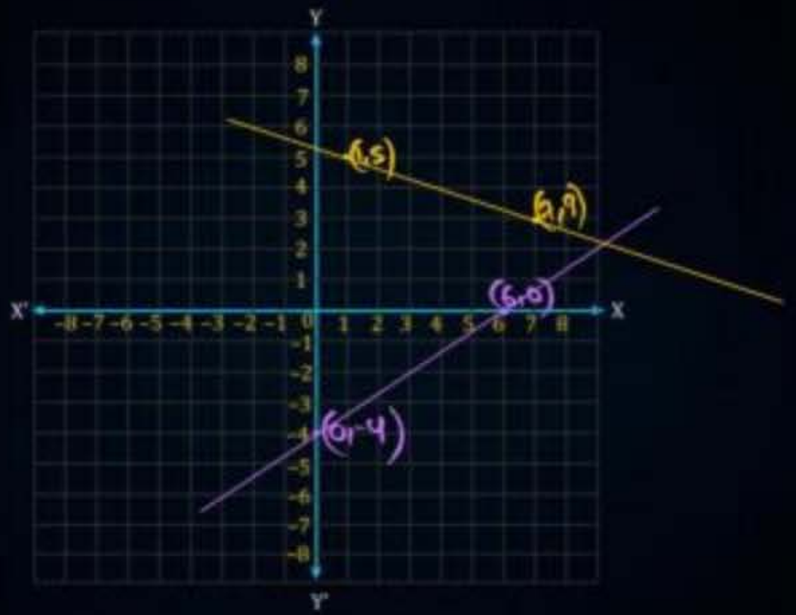
next class

$x+3y=16$

x	1	7
y	5	3

$2x-3y=12$

x	0	6
y	-4	0



$x+3y=16$ -①

$2x-3y=12$ -②

$x=16-3y$ -③

$2x-3y=12$

$2(16-3y)-3y=12$

$32-6y-3y=12$

$-9y=12-32$

$-9y=-20$

$y=\frac{20}{9}$

$x=16-3y$

$x=16-3\left(\frac{20}{9}\right)$

$x=16-\frac{60}{9}$

$x=\frac{144-60}{9}$

$x=\frac{84}{9}$

Topic : Graphical Method of Solving Simultaneous Linear Equations

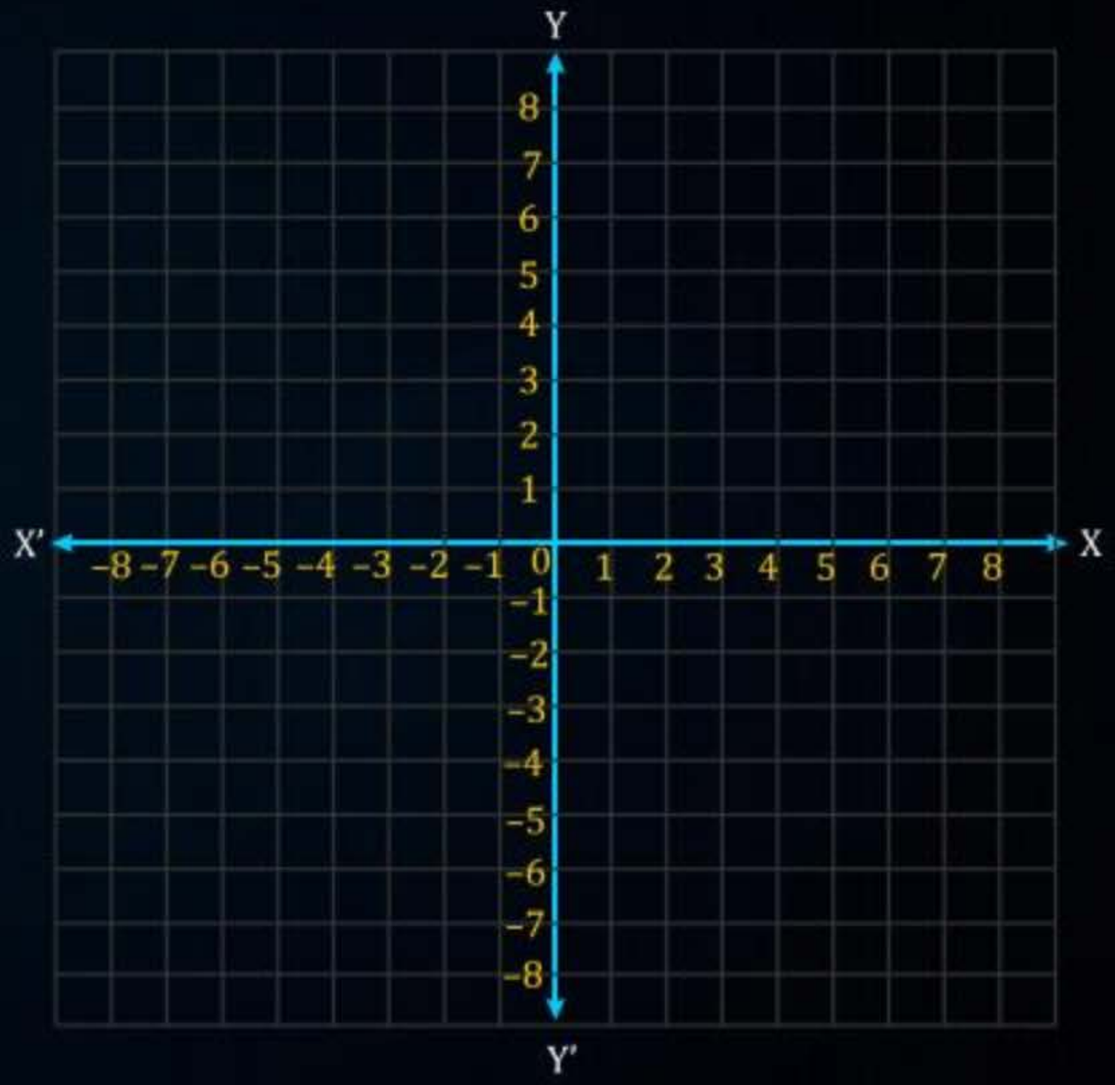
#Q. The area of the triangle formed by the lines y = x, x = 6 and y = 0 is

A 36 sq. units

B 18 sq. units

C 9 sq. units

D 72 sq. units



Topic : Substitution Method

#Q. Solving the following systems of equations by using the method of substitution:

(i) $2x + 3y = 9;\ 3x + 4y = 5$ (1) (2)

$2x+3y=9$

$3y=9-2x$

$y=\frac{9-2x}{3}$ (3)

$y=\frac{9-2(-21)}{3}$

$y=\frac{9+42}{3}=\frac{51}{3}$ {17}

(ii) $\frac{2x}{a}+\frac{y}{b}=2;\ \frac{x}{a}-\frac{y}{b}=4$

$3x+4y=5$

$\frac{3x}{1}+4\left(\frac{9-2x}{3}\right)=5$

$\frac{3x}{1}+\frac{36-8x}{3}=5$

$\frac{9x+36-8x}{3}=5$

$x+36=15$

$x=15-36$

$x=-21$

Topic : Substitution Method

#Q. Solving the following systems of equations by using the method of substitution:

(i) $2x + 3y = 9;\ 3x + 4y = 5$

$\frac{2b-y}{2b} - \frac{y}{b} = 4$

$\frac{2by-2y}{2b} = 4$

$2b - 3y = 8b$

$-3y = 8b - 2b$

$-3y = 6b$

$y = \frac{6b}{-3} = -2b$

$\frac{x}{a} - \frac{y}{b} = 4$

$\frac{a(2b-y)}{2b} - \frac{y}{b} = 4$

$\frac{a(2b-y)}{2ab} - \frac{y}{b} = 4$

(ii) $\frac{2x}{a} + \frac{y}{b} = 2;\ \frac{x}{a} - \frac{y}{b} = 4$

$\frac{2x}{a} + \frac{y}{b} = 2$

$\frac{2x}{a} = 2 - \frac{y}{b}$

$\frac{2x}{a} = \frac{2b-y}{b}$

$a = \frac{a(2b-y)}{2b}$

$x = \frac{a(2b+2b)}{2b}$

$x = \frac{a(4b)}{2b}$

$x = 2a$

Topic : Substitution Method

28 - 14

#Q. Solve by Substitution Method :

$7(y+3) - 2(x+2) = 14$

$4(y-2) + 3(x-3) = 2$

$7y + 21 - 2x - 4 = 14$

$7y - 2x + 17 = 14$

$\boxed{7y - 2x = -3}$ — (1)

$4y - 8 + 3x - 9 = 2$

$\boxed{4y + 3x = 19}$ — (2)

$7y - 2x = -3$

$7y = -3 + 2x$

$\boxed{y = \frac{-3+2x}{7}}$ — (3)

$4y + 3x = 19$

$4\left(\frac{-3+2x}{7}\right) + 3x = 19$

$\frac{-12+8x}{7} + \frac{3x}{1} = 19$

$\frac{-12+8x+21x}{7} = 19$

$-12 + 29x = 133$

$29x = 133 + 12$

$29x = 145$

$x = \frac{145}{29}$

$x = 5$

$\frac{-3+10}{7} = 1$

Topic : Substitution Method

#Q. If $x = a$ and $y = b$ is the solution of the equation $x - y = 2$ and $x + y = 4$, then the value of a and b are respectively.

A 3 and 5

B 5 and 3

C 3 and 1

D -1 and -3

Topic : Substitution Method

#Q. Solve by Substitution Method :

$$\left.\begin{array}{l} 0.4x + 0.3y = 1.7 \\ 0.7x - 0.2y = 0.8 \end{array}\right\} \begin{array}{l} \times 10 \\ \times 10 \end{array}$$

$$4x + 3y = 17 \quad -(1)$$

$$7x - 2y = 8 \quad -(2)$$

$4x = 17 - 3y$

$x = \dfrac{17-3y}{4}$ (1)

$x = \dfrac{17-9}{4} = 2$

$7x - 2y = 8$

$7\left(\dfrac{17-3y}{4}\right) - 2y = 8$

$\dfrac{119 - 21y}{4} - \dfrac{2y}{1} = 8$

$\dfrac{119 - 21y - 8y}{4} = 8$

$119 - 29y = 32$

$-29y = 32 - 119$

$-29y = -87$

$y = \dfrac{-87}{-29}$

$y = 3$

Topic : Substitution Method

#Q. Solve by Substitution Method :

$\frac{x}{3}+\frac{y}{4}=11 \rightarrow \frac{4x+3y}{12}=11 \rightarrow \boxed{4x+3y=132}$

$\frac{5x}{6}-\frac{y}{3}=-7 \rightarrow \frac{5x-2y}{6}=-7 \rightarrow \boxed{5x-2y=-42}$

HW

Topic : Substitution Method

#Q. Solve by Substitution Method :

$x + \frac{y}{2} = 4$ → $\frac{x}{1} + \frac{y}{2} = 4$ → $\frac{2x+y}{2} = 4$ → $2x+y=8$ ①

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

$x+6y=15$ ②

Topic : Substitution Method

#Q. Solve by Substitution Method : [NCERT]

$\sqrt{2}x - \sqrt{3}y = 0$ ①

$\sqrt{3}x - \sqrt{8}y = 0$ ②

$\sqrt{2}x - \sqrt{3}y = 0$

$\sqrt{2}x = \sqrt{3}y$

$x = \frac{\sqrt{3}y}{\sqrt{2}}$ ③

$x = 0$

$\sqrt{3}\left(\frac{\sqrt{3}y}{\sqrt{2}}\right) - \sqrt{8}y = 0$

$\frac{3y}{\sqrt{2}} - \frac{\sqrt{8}y}{1} = 0$

$\frac{3y - 4y}{\sqrt{2}} = 0$

$3y - 4y = 0$

$-y = 0$

$y = 0$

$\sqrt{8} \times \sqrt{2} = \sqrt{16} = 4$ ④

#Q. Solve $5x + 4y = 10$ and $3x - 2y + 16 = 0$ and hence find the value of m for which $y = mx + 3$.

A $x = 2, y = -7, m = -4$

B $x = -2, y = 5, m = -1$

C $x = 1, y = -5, m = -4$

D $x = 5, y = -1, m = -2$

#Q. Solve for x and y : $ax + by = \frac{a+b}{2}$; $3x + 5y = 4$

A $x = \frac{1}{2}, y = 1$

B $x = \frac{1}{2}, y = \frac{1}{2}$

C $x = 1, y = 1$

D $x = 1, y = \frac{1}{2}$

$2ax + 2by = a+b$

$2a\left(\frac{4-5y}{3}\right) + 2by = a+b$

$\frac{8a-10ay}{3} + \frac{2by}{1} = a+b$

$\frac{8a-10ay+6by}{3} = a+b$

$8a-10ay+6by = 3a+3b$

$-10ay+6by = -5a+3b$

$y(-10a+6b) = -5a+3b$

$3x+5y=4$

$3x = 4-5y$

$x = \frac{4-5y}{3}$

$x = \frac{4-5\left(\frac{1}{2}\right)}{3}$

$x = \frac{8-5}{6} = \frac{3}{6}$

$x = \frac{1}{2}$

$$y = \frac{-5a+3b}{-10a+6b}$$

$$y = \frac{-5a+3b}{2[-5a+3b]}$$

$$y = \frac{1}{2}$$

#Q. The pair of equation $3^{x+y} = 81, 81^{x-y} = 3$ has

A No solution

B Infinitely many solution

C The solution $x = 2\frac{1}{8}, y = 1\frac{7}{8}$

D None of these

$3^{x+y} = 81$, $81^{x-y} = 3$

$3^{x+y} = 3^4$, $(3^4)^{x-y} = 3^1$

$3^{x+y} = 3^4$, $3^{4x-4y} = 3^1$

$x+y=4$ ① $4x-4y=1$ ②

On comparison.

$(a^m)^n = a^{mn}$

H.W

$3^{x+y} = 81$

$3^{x+y} = 3^4$

$3^x = 3^y$

On comparison.

$x + y = 4$

On compare...

$x = y$

3	81
3	27
3	9
3	3
	1

Topic : Elimination Method

#Q. Solve :

(i) $\begin{matrix} 3x + 2y = 11 \\ 2x + 3y = 4 \end{matrix}$ $\begin{matrix} \times 2 \\ \times 3 \end{matrix}$

$6x + 4y = 22$

$6x + 9y = 12$

$\ominus \quad \ominus \quad \ominus$

$-5y = 10$

$y = \frac{10}{-5}$

$y = -2$

$3x + 2y = 11$

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

$3x - 4 = 11$

$3x = 15$

$x = 5$

3	3, 2
2	1, 2
	1, 1

LCM(3, 2) = 6

Topic : Elimination Method

#Q. Solve :

(ii) $8x + 5y = 9$ ×3

$3x + 2y = 4$ ×8

$24x + 15y = 27$

$24x + 16y = 32$

(−) (−) (−) (−)

$-y = -5$

$y = 5$

$8x + 5y = 9$

$8x + 25 = 9$

$8x = 9 - 25$

$8x = -16$

$x = -2$

2	8, 3
2	4, 3
2	2, 3
3	1, 3
	1, 1

Topic : Elimination Method

#Q. Solve:

$$\frac{x}{10}+\frac{y}{5}+1=15$$

$$\frac{x}{8}+\frac{y}{6}=15$$

$\frac{x}{10}+\frac{y}{5}=14$ $\quad \frac{x+2y}{10}=14$

$x+2y=140$ ①

$\frac{3x+4y}{24}=15$

$3x+4y=360$ ②

$(x+2y=140)\times 3$

$3x+4y=360$

$3x+6y=420$

$3x+4y=360$

$-\ -\ -$

$2y=60$

$y=30$

$x+2y=140$

$x+2(30)=140$

$x+60=140$

$x=140-60$

$x=80$

Topic : Miscellaneous Problems

#Q. Solve:

$37x + 41y = 70$

$41x + 37y = 86$

Add and Subtract

Add

$37x + 41y = 70$

$41x + 37y = 86$

(+)

$78x + 78y = 156$

$78(x+y) = 156$

$\boxed{x+y = 2}$ — (1)

Subtract :

$37x + 41y = 70$

$41x + 37y = 86$

(−)

$-4x + 4y = -16$

$4(-x+y) = -16$

$\boxed{-x+y = -4}$ — (2)

$(x+y=2) \times (-1)$

$-x+y=-4$

M.I

$-x-y=-2$

$-x+y=-4$

$\ominus \quad \oplus \quad \ominus \quad \oplus$

$-2y=2$

$y=-1$

$x+y=2$

$x-1=2$

$x=3$

M.II

$x+y=2$

$-x+y=-4$

$(+)$

$2y=-2$

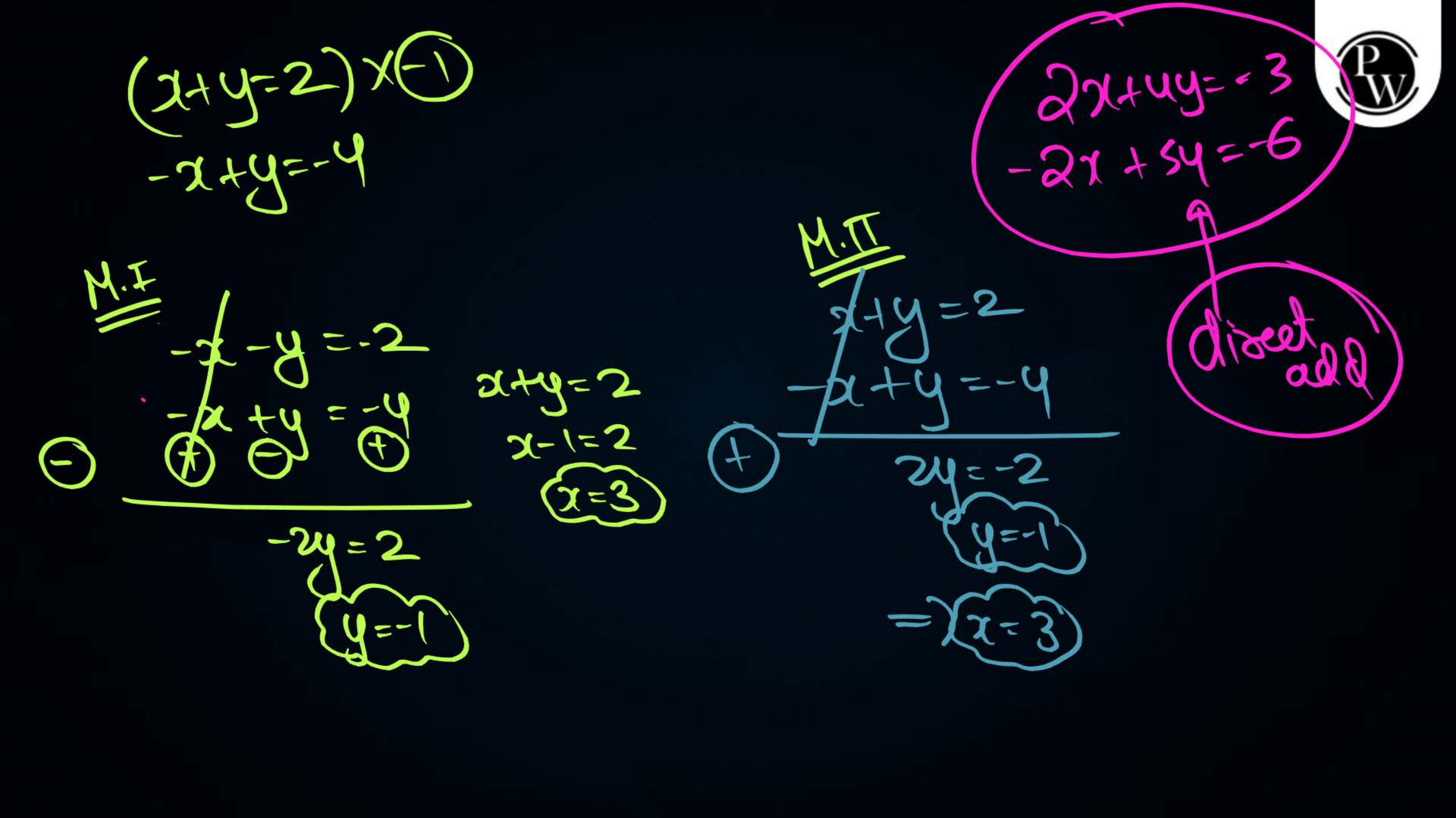
$y=-1$

$\Rightarrow x=3$

$2x+4y=-3$

$-2x+5y=-6$

direct add



Topic : Miscellaneous Problems

#Q. Solve [NCERT]

$152x - 378y = -74$

$-378x + 152y = -604$

– Add

– Subtract

H.W

Homework

DPP + in class H.w.

Determine graphically the coordinates of the vertices of a triangle, the equations of whose sides are given by $2y - x = 8$, $5y - x = 14$ and $y - 2x = 1$. *(Cr)* (CBSE 2020)

Question From My Book.

Write an equation of a line passing through the point representing solution of the pair of linear equations $x + y = 2$ and $2x - y = 1$, How many such lines can we find?

Sochna.....

Will discuss in next class..

THANK YOU