MATHEMATICS

General instructions for Students: Whatever be the notes provided, everything must be copied in the Maths copy and then do the HOMEWORK in the same copy.

5. SIMULTANEOUS LINEAR EQUATIONS

System of simultaneous linear equations

Let the system of simultaneous linear equations be

$$a_1x + b_1y + c_1 = 0$$

 $a_2x + b_2y + c_2 = 0$

To solve this system of linear equation by cross-multiplication method:

Write the coefficients of the pair of linear equations $a_1x + b_1y + c_1 = 0$

$$a_2x+b_2y+c_2=0$$

As



The solution is given by

$$x = rac{b_1 c_2 - b_2 c_1}{a_1 b_2 - a_2 b_1}$$
, $y = rac{c_1 a_2 - c_2 a_1}{a_1 b_2 - a_2 b_1}$

CROSS-MULTIPLICATION METHOD

EXERCISE – 5.3

Solve the following systems of simultaneous linear equations by cross- multiplication method.

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

1. (i) 3x + 2y = 4, 8x + 5y = 9

Solution: 3x + 2y - 4 = 0, 8x + 5y - 9 = 0

$$a_1=3 \qquad b_1=2 \qquad c_1=-4$$

$$a_2 = 8$$
 $b_2 = 5$ $c_2 = -9$

$$x = \frac{b_1 c_2 - b_2 c_1}{a_1 b_2 - a_2 b_1} = \frac{(2)(-9) - (5)(-4)}{(3)(5) - (8)(2)} = \frac{-18 + 20}{15 - 16} = \frac{2}{-1} = -2$$
$$y = \frac{c_1 a_2 - c_2 a_1}{a_1 b_2 - a_2 b_1} = \frac{(-4)(8) - (-9)(3)}{(3)(5) - (8)(2)} = \frac{-32 + 27}{15 - 16} = \frac{-5}{-1} = 5$$

Hence, the solution is x = -2, y = 5 Ans.

HOMEWORK

EXERCISE -5.3 QUESTION NUMBER: 1(ii)

EQUATIONS REDUCIBLE TO PAIR OF LINEAR EQUATIONS

EXERCISE-5.4

Solve the following pairs of linear equations.

1. (ii) $\frac{3}{2x} + \frac{2}{3y} = 5$, $\frac{5}{x} - \frac{3}{y} = 1$

Solution: Let $\frac{1}{x} = a$ and $\frac{1}{y} = b$ $\frac{3}{2}a + \frac{2}{3}b = 5 \Rightarrow 9a + 4b = 30$ (i)] × 3 5a - 3b = 1(ii)] × 4 27a + 12b = 90 20a - 12b = 4 Adding (i) and (ii) 47a = 94 $\Rightarrow a = 2$ (ii) $\Rightarrow 5a - 3b = 1 \Rightarrow 5(2) - 3b = 1 \Rightarrow 3b = 9 \Rightarrow b = 3$ $\frac{1}{x} = a \Rightarrow \frac{1}{x} = 2 \Rightarrow x = \frac{1}{2}$ and $\frac{1}{y} = b \Rightarrow \frac{1}{y} = 3 \Rightarrow y = \frac{1}{3}$ Hence, the solution is $x = \frac{1}{2}$, $y = \frac{1}{3}$ Ans. 4.(ii) $\frac{3}{x+y} + \frac{2}{x-y} = 3$, $\frac{2}{x+y} + \frac{3}{x-y} = \frac{11}{3}$ Solution: Let $\frac{1}{x+y} = a$, $\frac{1}{x-y} = b$ 3a + 2b = 3(i)] × 1

6a+4b=6
6a + 9b = 11
(-) (-) (-) On subtracting
-5b = -5
$\Rightarrow b = 1$
(i) $\Rightarrow 3a + 2(1) = 3 \Rightarrow 3a = 3 - 2 \Rightarrow 3a = 1 \Rightarrow a = \frac{1}{3}$
$\frac{1}{x+y} = \frac{1}{3} \qquad \implies x+y = 3 $ (iii)
$\frac{1}{x-y} = 1 \qquad \Longrightarrow x-y = 1$ (iv)
x + y = 3
x - y = 1 On adding
$2x = 4 \implies x = 2$
(iii) $\Rightarrow x + y = 3 \Rightarrow 2 + y = 3 \Rightarrow y = 3 - 2 \Rightarrow y = 1$
Hence, the solution is $x = 2$, $y = 1$ Ans.
HOMEWORK
EXERCISE -5.4
QUESTION NUMBERS: 1 (i), 2 (i), 3 (ii) and 5 (i)
CHAPTER TEST: 2(ii), 5 and 6