

DAY 3

Elimination method (Equating the co-efficients):-

In last section we have discussed about Elimination method by Substitution method. In this section we shall discuss one more algebraic method Elimination method by equating the coefficients. As its name tells, in this method we shall equate the coefficients of one variable then solve.

Procedure :-

In this method we eliminate one of its variables by making equal coefficients.

- Multiply the given equations by suitable numbers (if necessary) so as to make the coefficients of one variable same.
- Add them if coefficients are of opposite sign otherwise subtract them if they have same sign.
- Solve the equation and find the value of second variable.
- Replace this value of variable in one of given equations to find another.

Lets discuss some examples:

1. Solve the pair of equations $4x + 3y = 5$ and $5x - y = 11$

Sol: – Given equations are $4x + 3y = 5$ i)

$$5x - y = 11 \text{ ii)}$$

To equate the coefficient of x , Multiply Equation i) by 5 and ii) by 4, we get

$$\text{i)} \Rightarrow \{4x + 3y = 5\} \times 5 \Rightarrow 20x + 15y = 25$$

$$\text{ii)} \Rightarrow \{5x - y = 11\} \times 4 \Rightarrow 20x - 4y = 44$$

Subtract both equations, we get

$$(20x + 15y) - (20x - 4y) = 25 - 44$$

$$\Rightarrow 20x + 15y - 20x + 4y = -19$$

$$\Rightarrow 19y = -19 \Rightarrow y = \frac{-19}{19} = -1$$

Replace the value of y in equation i)

$$\text{i)} \Rightarrow 4x + 3y = 5 \Rightarrow 4x + 3(-1) = 5 \Rightarrow 4x - 3 = 5$$

$$\Rightarrow 4x = 5 + 3 = 8 \Rightarrow x = \frac{8}{4} = 2$$

$\therefore x = 2, y = -1$ is the required solution.

NOTE:- Students can solve by equating the coefficients of y also by multiplying ii) by 3 and add both equations.

2. Solve the pair of equations $6x - y = 3$ and $7x + 4y = 9$

Sol: – Given equations are $6x - y = 3$ i)

$$7x + 4y = 9 \text{ ii)}$$

To equate the coefficient of x , Multiply Equation i) by 7 and ii) by 6, we get

$$\text{i)} \Rightarrow \{6x - y = 3\} \times 7 \Rightarrow 42x - 7y = 21$$

$$\text{ii)} \Rightarrow \{7x + 4y = 9\} \times 6 \Rightarrow 42x + 24y = 54$$

Subtract both equations, we get

$$(42x - 7y) - (42x + 24y) = 21 - 54$$

$$\Rightarrow 42x - 7y - 42x - 24y = -33$$

$$\Rightarrow -31y = -33 \Rightarrow y = \frac{-33}{-31} = \frac{33}{31}$$

Replace the value of y in equation i)

$$i) \Rightarrow 6x - y = 3 \Rightarrow 6x - \left(\frac{33}{31}\right) = 3$$

$$\Rightarrow 6x \times 31 - \left(\frac{33}{31}\right) \times 31 = 3 \times 31$$

{Multiply complete equation by 31 instead of taking LCM}

$$\Rightarrow 186x - 33 = 93 \Rightarrow 186x = 93 + 33 = 126 \Rightarrow x = \frac{126}{186} = \frac{21}{31}$$

$$\therefore x = \frac{21}{31}, y = \frac{33}{31} \text{ is the required solution.}$$

NOTE:- Students can solve by equating the coefficients of y also by multiplying i) by 4 and add both equations.

3. Solve the pair of equations $5x - 4y + 8 = 0$ and $7x + 6y - 9 = 0$

Sol:- Given equations are $5x - 4y + 8 = 0$ i)

$$7x + 6y - 9 = 0 \text{ ii)}$$

To equate the coefficient of x, Multiply Equation i) by 7 and ii) by 5, we get

$$i) \Rightarrow \{5x - 4y + 8 = 0\} \times 7 \Rightarrow 35x - 28y + 56 = 0$$

$$ii) \Rightarrow \{7x + 6y - 9 = 0\} \times 5 \Rightarrow 35x + 30y - 45 = 0 \text{ (subtract both equations)}$$

$$\Rightarrow -58y + 101 = 0 \Rightarrow y = \frac{-101}{-58} = \frac{101}{58}$$

Replace the value of y in equation i)

$$i) \Rightarrow 5x - 4y + 8 = 0 \Rightarrow 5x - 4\left(\frac{101}{58}\right) + 8 = 0$$

$$\Rightarrow 5x \times 58 - 4\left(\frac{101}{58}\right) \times 58 + 8 \times 58 = 0$$

{Multiply complete equation by 58 instead of taking LCM}

$$\Rightarrow 290x - 104 + 464 = 0 \Rightarrow 290x = -60 \Rightarrow x = \frac{-60}{290} = \frac{-6}{29}$$

$$\therefore x = \frac{-6}{29}, y = \frac{101}{58} \text{ is the required solution.}$$

EXERCISE

Solve the following pair of equations:

1. $3x - y = 3$ and $7x + 2y = 20$

2. $3x + 2y = 14$ and $-x + 4y = 7$

3. $2x + y = 17$ and $17x - 11y = 8$

4. $3x + 4y = 7$ and $2x + y = -2$

5. $5x + 8y = 9$ and $2x + 3y = 4$