

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

PPT10

SUBJECT : MATHEMATICS

CHAPTER NUMBER: 03

CHAPTER NAME : PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

CHANGING YOUR TOMORROW

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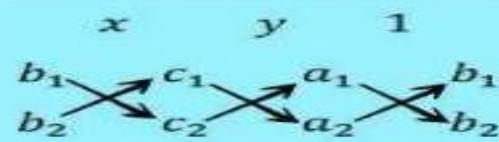
PREVIOUS KNOWLEDGE TEST

CROSS- MULTIPLICATION METHOD

$$a_1x + b_1y + c_1 = 0$$

$$a_2x + b_2y + c_2 = 0$$

To solve this pair of equations for x and y using cross-multiplication, we'll arrange the variables and their coefficients a_1, a_2 and b_1, b_2 and the constants c_1 and c_2



$$\Rightarrow x = \frac{b_1c_2 - b_2c_1}{a_1b_2 - a_2b_1}$$

$$\Rightarrow y = \frac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b_1}$$

Learning outcome

- Students will be able to find solution of a pair of linear equations reducible to a pair of linear equations in two variables.
- . Students will be able to apply it to solve real life situations.
- . Students will be able to express given situation in two variables and hence find solution
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Solve the following pairs of equations by reducing them to a pair of linear equations

$$\frac{1}{2}x + \frac{1}{3}y = 2$$

$$\frac{1}{3}x + \frac{1}{2}y = \frac{13}{6}$$

<https://youtu.be/XNq-CLyEaeM>

Solve the following pairs of equations by reducing them to a pair of linear equations

$$\frac{1}{2}x + \frac{1}{3}y = 2$$

$$\frac{1}{3}x + \frac{1}{2}y = \frac{13}{6}.$$

Given, pair of equations is

$$\frac{1}{2}x + \frac{1}{3}y = 2 \text{ and } \frac{1}{3}x + \frac{1}{2}y = \frac{13}{6}$$

On putting $\frac{1}{x} = u$ and $\frac{1}{y} = v$, in given equations, we get

$$\frac{1}{2}u + \frac{1}{3}v = 2 \text{ and } \frac{1}{3}u + \frac{1}{2}v = \frac{13}{6}$$

On multiplying both sides by 6, we get

$$3u + 2v = 12 \quad \dots(i)$$

$$\text{and } 2u + 3v = 13 \quad \dots(ii)$$

On multiplying Eq. (i) by 3 and Eq. (ii) by 2 and then subtracting Eq. (ii) from Eq. (i), we get

$$3(3u + 2v) - 2(2u + 3v) = 3 \times 12 - 2 \times 13$$

$$\Rightarrow 9u - 4u = 36 - 26$$

$$\Rightarrow 5u = 10 \Rightarrow u = 2$$

On putting $u = 2$ in Eq. (i), we get

$$3 \times 2 + 2v = 12 \Rightarrow 2v = 12 - 6$$

$$\Rightarrow 2v = 6 \Rightarrow v = 3$$

If $u = 2$, then by $u = \frac{1}{x}$, we get $x = \frac{1}{2}$

If $v = 3$, then by $v = \frac{1}{y}$, we get $y = \frac{1}{3}$

$$\therefore x = \frac{1}{2} \text{ and } y = \frac{1}{3}$$

Solve the following pairs of equations by reducing them to a pair of linear equations

$$(vi) 6x + 3y = 6xy$$

$$2x + 4y = 5xy$$

$$\begin{aligned} & 6x + 3y = 6xy \\ \Rightarrow & \frac{6}{y} + \frac{3}{x} = 6 \\ & \text{(dividing by } xy \text{ both sides) ... (i)} \end{aligned}$$

$$\text{Also, } 2x + 4y = 5xy$$

$$\Rightarrow \frac{2}{y} + \frac{4}{x} = 5 \quad \dots (ii)$$

Putting $\frac{1}{y} = u$ and $\frac{1}{x} = v$ in eqs. (i) and (ii), we get

$$6u + 3v = 6 \quad \dots (iii)$$

$$\text{and } 2u + 4v = 5 \quad \dots (iv)$$

Solving (iii) and (iv) for u and v

By cross multiplication method:

$$\begin{array}{ccc} u & v & -1 \end{array}$$

$$\begin{array}{ccc} 3 & 6 & 6 \\ 4 & 5 & 2 \\ \cancel{3} & \cancel{6} & \cancel{6} \\ \cancel{4} & \cancel{5} & \cancel{2} \end{array}$$

$$\frac{u}{15-24} = \frac{v}{12-30} = \frac{-1}{24-6}$$

$$\Rightarrow \frac{u}{-9} = \frac{v}{-18} = \frac{-1}{18}$$

$$\Rightarrow u = \frac{1}{2} \text{ and } v = 1$$

$$\Rightarrow [y = 2] \text{ and } [x = 1]$$

Formulate the following problems as a pair of equations, and hence find their solutions:

ii) 2 women and 5 men can together finish an embroidery work in 4 days, while 3 women and 6 men can finish it in 3 days. Find the time taken by 1 woman alone to finish the work, and also that taken by 1 man alone.

Let one woman finish the work in x days and one man finish the work in y days.

Work of one woman in one day = $1/x$

Work of one man in one day = $1/y$

Since, 2 women and 5 men finish work in 4 days

\therefore One day's work of 2 women and 5 men = $\frac{1}{4}$ part of work

work

$$\Rightarrow \frac{2}{x} + \frac{5}{y} = \frac{1}{4} \quad \dots \text{(i)}$$

Similarly, in second case

One day's work of 3 women and 6 men = $\frac{1}{3}$ part of work

$$\Rightarrow \frac{3}{x} + \frac{6}{y} = \frac{1}{3} \quad \dots \text{(ii)}$$

On putting $\frac{1}{x} = u$ and $\frac{1}{y} = v$ in Eq. (i) and Eq. (ii), we get

$$2u + 5v = \frac{1}{4} \Rightarrow 8u + 20v = 1 \quad \dots \text{(iii)}$$

[on multiplying both sides by 4]

and $3u + 6v = \frac{1}{3} \Rightarrow 9u + 18v = 1 \quad \dots \text{(iv)}$

[on multiplying both sides by 3]

On multiplying Eq. (iii) by 9 and Eq. (iv) by 8 and then subtracting Eq. (iv) from Eq. (iii), we get

$$9(8u + 20v) - 8(9u + 18v) = 9 - 8$$
$$\Rightarrow 180v - 144v = 1$$

$$\Rightarrow 36v = 1 \Rightarrow v = \frac{1}{36}$$

On substituting $v = \frac{1}{36}$ in Eq. (iv), we get

$$18 \times \frac{1}{36} + 9u = 1$$
$$\Rightarrow \frac{1}{2} + 9u = 1 \Rightarrow u = \frac{1}{18}$$

Thus, we get $u = \frac{1}{18}$ and $v = \frac{1}{36}$

$$\Rightarrow \frac{1}{x} = \frac{1}{18} \text{ and } \frac{1}{y} = \frac{1}{36}$$

$$\Rightarrow x = 18 \text{ and } y = 36$$

Hence, a single woman can finish the work in 18 days and a single man can finish the work in 36 days.

Home assignment

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- **Ex. 3.6 Q. 1 to 2 & AHA**

1.. A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours, it can go 40 km upstream and 55 km down-stream. Determine the speed of the stream and that of the boat in still water

2. 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?.

THANKING YOU

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