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PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

PPT10

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 03
CHAPTER NAME : PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

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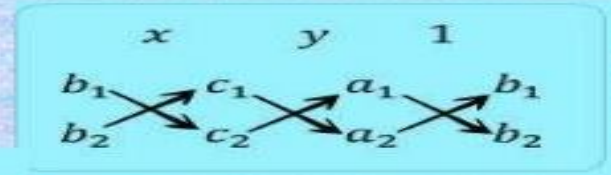
PREVIOUS KNOWLEDGE TEST

CROSS- MULTIPLICATION METHOD

$a_1x + b_1y + c_1 = 0$ $\qquad$ $a_2x + b_2y + c_2 = 0$

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



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

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

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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

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

1/2x +1/3y =2

1/3x + 1/2y =13/6.

Given, pair of equations is

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

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

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

and $$2u+3v=13 \quad \ldots(ii)$$

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

$$3(3u+2v)-2(2u+3v)=3\times12-2\times13$$

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

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

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

$$3\times2+2v=12 \Rightarrow 2v=12-6$$

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

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

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

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

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

$2x + 4y = 5xy$

$$6x + 3y = 6xy$$

$$\Rightarrow \quad \frac{6}{y} + \frac{3}{x} = 6$$

(dividing by xy both sides) ... (i)

Also, $\quad 2x + 4y = 5xy$

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

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

$$6u + 3v = 6 \qquad \ldots (iii)$$

and $\quad 2u + 4v = 5 \qquad \ldots (iv)$

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

By cross multiplication method:

$$\begin{array}{ccccc} u & & v & & -1 \\ 3 & & 6 & & 6 & & 3 \\ & \searrow\swarrow & & \searrow\swarrow & & \searrow\swarrow & \\ 4 & & 5 & & 2 & & 4 \end{array}$$

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

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

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

$$\Rightarrow \quad \boxed{y = 2} \text{ and } \boxed{x = 1}$$

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 is 4 days

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

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

Similarly, in second case

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

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

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

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

[on multiplying both sides by 4]

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

[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

$$9(8u + 20v) - 8(9u + 18v) = 9 - 8$$

$$\Rightarrow \quad 180v - 144v = 1$$

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

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

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

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

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

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

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

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?.

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