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PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

PPT11

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

- PREVIOUS KNOWLEDGE TEST.

  A pair of linear equations in two variables can be represented and solved, by
  Graphical method
  Algebraic method

  Consistent system. A system of linear equations is said to be consistent if it has at least one solution.

  Inconsistent system. A system of linear equations is said to be inconsistent if it has no solution.

  If the two lines **intersect** each other at one particular point then that point will be the only solution of that pair of Linear Equations. It is said to be **a consistent** pair of equations.

  . If the two lines **coincide** with each other, then there will be infinite solutions as all the points on the line will be the solution for the pair of Linear Equations. It is said to be dependent or **consistent** pair of equations.

  If the two lines are **parallel** then there will be no solution as the lines are not intersecting at any point. It is said to be **an inconsistent** pair of equations.

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Learning outcome

- Students will be able to find solution of a pair of linear equations graphically
- *Students will be able to draw the graph of a pair of linear equations in two variables*
- Students will be able to solve a pair of linear equations(by all the three method) and can find solutions
- Students will be able to solve a pair Equations reducible to a pair of linear equations in two variables
- Students will be able to solve real life situations(by forming pair of linear equations & solving it.)

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Revision of the chapter.

https://youtu.be/tVTKTG49eJI(3.5)

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:

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

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

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

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

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

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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

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

Similarly, in second case

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

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

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.

Roohi travels 370 km to her home partly by train and partly by bus. She takes 4 hours if she travels 250 km by train and the remaining by bus. If she travels 130 km by train and the remaining by bus, she takes 18 minutes longer. Find the speed of the train and the bus separately.

Let the speed of the train $= x$ km/h

and the speed of the bus $= y$ km/h

$$\text{As time} = \frac{\text{distance}}{\text{speed}}$$

$$\therefore \text{ Time taken to cover 250 km by train} = \frac{250}{x} \text{ h}$$

$$\text{Time taken to cover 120 km by bus} = \frac{120}{y} \text{ h}$$

Total time taken = 4 h

$$\Rightarrow \quad \frac{250}{x}+\frac{120}{y}=4 \qquad \ldots(1)$$

Time taken to cover 130 km by train $=\frac{130}{x}$ h

Time taken to cover 240 km by bus $=\frac{240}{y}$ h

Total time taken = 4 hours and 18 minutes $=4\frac{18}{60}\text{ h}=\frac{43}{10}\text{ h}$

$$\Rightarrow \quad \frac{130}{x}+\frac{240}{y}=\frac{43}{10} \qquad \ldots(2)$$

Put $\frac{1}{x}=a$ and $\frac{1}{y}=b$. Then equations (1) and (2) become

$$250a+120b=4 \qquad \ldots(3)$$

$$130a+240b=\frac{43}{40} \qquad \ldots(4)$$

Multiplying equation (3) by 2, we get $500a+240b=8$ ...(5)

Subtracting (5) from (4), we get $-370a=-\frac{37}{10} \Rightarrow a=\frac{1}{100}$

Putting $a=\frac{1}{100}$ in (5), we get $5+240b=8 \Rightarrow b=\frac{3}{240}=\frac{1}{80}$

Now $a=\frac{1}{x}=\frac{1}{100} \Rightarrow x=100$ and $b=\frac{1}{y}=\frac{1}{80} \Rightarrow y=80$

Hence, speed of the train = 100 km/h and speed of the bus = 80 km/h.

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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