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PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

PPT2

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

PREVIOUS KNOWLEDGE TEST

An **equation** in the form ax + by + c = 0, where a, b and c are real **numbers**, and a≠ 0 and b ≠ 0, is called a **linear equation in two variables** x and y. For Example: 2x + 3y + 7 = 0, where a = **2**, b = 3, c =5 are real **numbers**. So, given **equation** is a **linear equation in two variables.**

- The general form of a pair of linear equations is: $a_1x + b_1y + c_1 = 0$; $a_2x + b_2y + c_2 = 0$ where a_1, a_2, b_1, b_2, c_1 and c_2 are real numbers, such that $a_1^2 + b_1^2 \neq 0$, $a_2^2 + b_2^2 \neq 0$.
- A pair of values of variables 'x' and 'y' which satisfy both the equations in the given system of equations is said to be a solution of the simultaneous pair of linear 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 know the conditions for consistency

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Find the solution of a pair Linear Equations in two Variables

https://youtu.be/vt99nBFTF8o{10.08}

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Form the pair of linear equations in the following problem, and find the solution graphically.

10 students of Class X took part in a Mathematics quiz. If the number of girls is 4 more than the number of boys, find the number of boys and girls who took part in the quiz

1. (*i*) Let the number of girls be x and number of boys be y.

A.T.Q.

Ist Condition:

$x + y = 10$ ... (*i*)

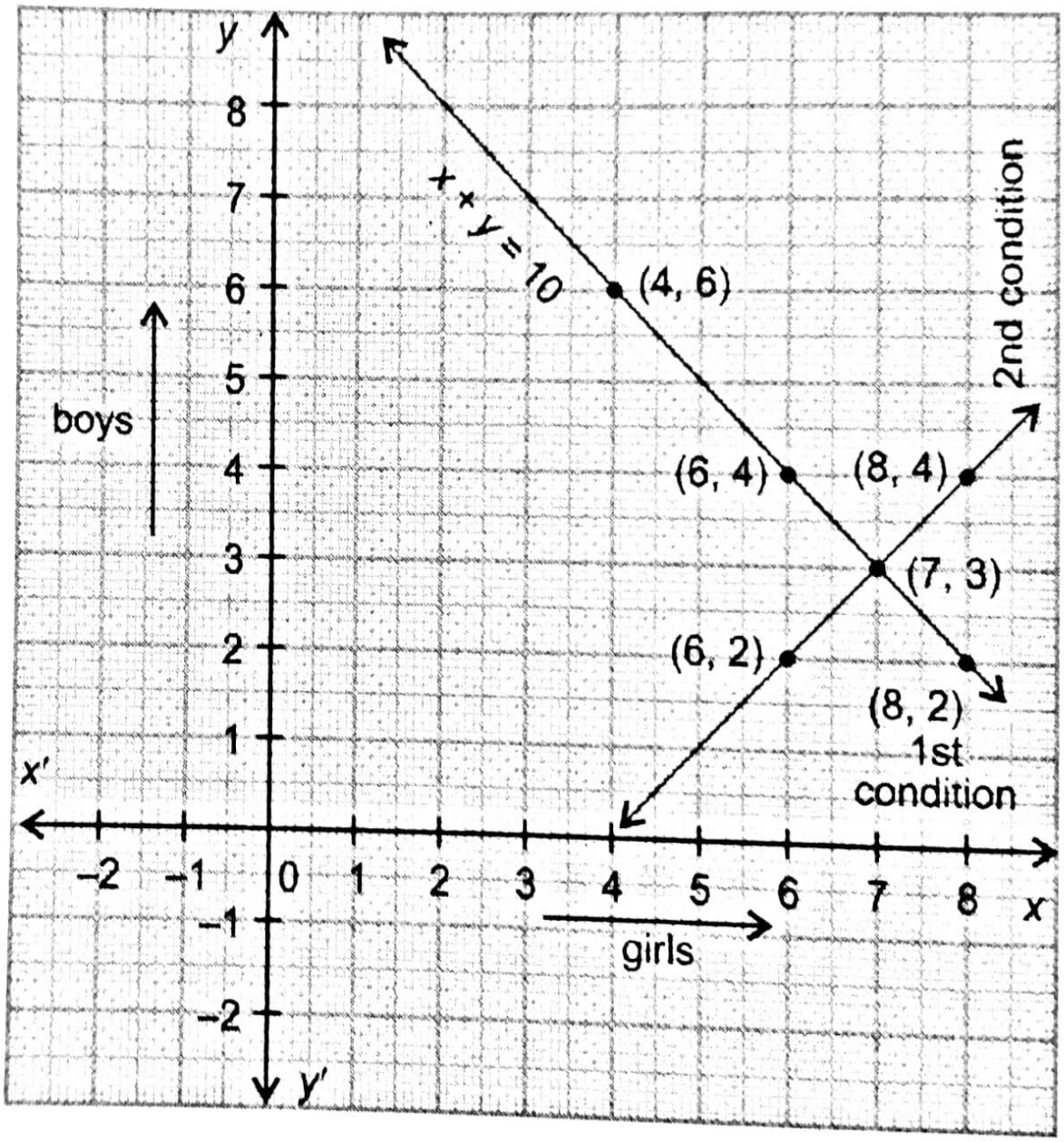
x	4	6	7	8
y	6	4	3	2

2nd Condition:

$x = y + 4 \Rightarrow x - y = 4$ ... (*ii*)

x	8	6	7
y	4	2	3

Solving (*i*) and (*ii*) graphically



Solution is $x = 7$, $y = 3$ *i.e.* (7, 3)

Hence, no. of girls, $x = 7$

and no. of boys, $y = 3$

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Conditions for consistency or inconsistency

https://youtu.be/PZwwjR06kWQ.

•**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.

CONDITIONS FOR CONSISTENCY

Let the two equations be:

$a_1x + b_1y + c_1 = 0$

$a_2x + b_2y + c_2 = 0$

Then,

Relationship between coeff. or the pair of equations	Graph	Number of Solutions	Consistency of System
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting lines	Unique solution	Consistent
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Parallel lines	No solution	Inconsistent
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Co-incident lines	Infinite solutions	Consistent

2. On comparing the ratios $\frac{a_1}{a_2}, \frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$, find out whether the lines representing the following pairs of linear equations intersect at a point, are parallel or coincident:

(i) $5x - 4y + 8 = 0,\ 7x + 6y - 9 = 0$

(ii) $9x + 3y + 12 = 0,\ 18x + 6y + 24 = 0$

(iii) $6x - 3y + 10 = 0,\ 2x - y + 9 = 0$

Sol. (i) Equations are $5x - 4y + 8 = 0,\ 7x + 6y - 9 = 0$

Here $\frac{a_1}{a_2} = \frac{5}{7}$; $\frac{b_1}{b_2} = \frac{-4}{6}$; $\frac{c_1}{c_2} = \frac{8}{-9}$

$\Rightarrow \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ as $\frac{5}{7} \neq \frac{-4}{6}$.

$\therefore$ Pair of lines represented by given equations are intersecting lines and they have exactly one solution.

(ii) $9x + 3y + 12 = 0,\ 18x + 6y + 24 = 0$

Here

$\frac{a_1}{a_2} = \frac{9}{18} = \frac{1}{2}$; $\frac{b_1}{b_2} = \frac{3}{6} = \frac{1}{2}$; $\frac{c_1}{c_2} = \frac{12}{24} = \frac{1}{2}$

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\because$ Pair of equations represents coincident lines and having infinitely many solutions.

(iii) $6x - 3y + 10 = 0,\ 2x - y + 9 = 0$

Here $\frac{a_1}{a_2} = \frac{6}{2} = 3$; $\frac{b_1}{b_2} = \frac{-3}{-1} = 3$; $\frac{c_1}{c_2} = \frac{10}{9}$

$\therefore \quad \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\therefore$ It represents parallel lines and having no solution.

3. On comparing the ratios $\frac{a_1}{a_2}, \frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$, find out whether the following pair of linear equations are consistent, or inconsistent.

(*i*) $3x + 2y = 5;\ 2x - 3y = 7$

(*ii*) $2x - 3y = 8;\ 4x - 6y = 9$

(*iii*) $\frac{3}{2}x + \frac{5}{3}y = 7;\ 9x - 10y = 14$

(*iv*) $5x - 3y = 11;\ -10x + 6y = -22$

(*v*) $\frac{4}{3}x + 2y = 8;\ 2x + 3y = 12$

Sol. (*i*) $3x + 2y = 5,\ 2x - 3y = 7$

Here $\frac{a_1}{a_2} = \frac{3}{2},\ \frac{b_1}{b_2} = \frac{2}{-3},\ \frac{c_1}{c_2} = \frac{-5}{-7} = \frac{5}{7}$

$\because\ \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ as $\frac{3}{2} \neq \frac{-2}{3}$

$\therefore$ Pair of equations is consistent.

(*ii*) $2x - 3y = 8,\ 4x - 6y = 9$

Here $\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$, $\frac{b_1}{b_2} = \frac{-3}{-6} = \frac{1}{2}$, $\frac{c_1}{c_2} = \frac{8}{9}$

$\because \quad \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\therefore$ Pair of equations is inconsistent.

(*iii*) $\frac{3}{2}x + \frac{5}{3}y = 7,\ 9x - 10y = 14$

$\frac{a_1}{a_2} = \frac{3}{2 \times 9} = \frac{1}{6}$, $\frac{b_1}{b_2} = -\frac{5}{3 \times 10} = \frac{-1}{6}$,

$\frac{c_1}{c_2} = \frac{-7}{-14} = \frac{1}{2}$

$\because \quad \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

$\therefore$ Pair of equations is consistent.

Home assignment

- Ex. 3.2 Q. No 1 to 3. AHA
- 1.For what value of k, the pair of equations 4x – 3y = 9, 2x + Ky = 11 has no solution?
- 2. Calculate the area bounded by the line x + y = 10 and both the co-ordinate axes
- 3. Check graphically whether the pair of equations 3x – 2y + 2 = 0 and 32x – y + 3 = 0, is consistent. Also find the coordinates of the points where the graphs of the equations meet the Y-axis.
- 4.Find the condition for which the system of Equations $\frac{x}{a} + {}^{y}/_{b} = 1 \; and \; bx + ay = 4ab$ is inconsistent.

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THANKING YOU

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