CHAPTER 6 : LINEAR INEQUALITY

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MATHEMATICS DEPARTMENT

BBPS PITAMPURA

CLASS- 11$^{\text{TH}}$

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LINEAR INEQUALITIES

- Two algebraic expressions or real numbers related by the symbol ≤, ≥, < and >form an inequality. For example 2a-3b>0 or 5p-7q<0

- From inequality equal numbers can be subtracted or added from both the sides of an equation.

- In an inequality both sides can be divided or multiplied by same number(non -zero)

Note: when we multiply , divide with negative number or take reciprocal on the both sides the inequality sign changes. For ex: 3>2 but -3< -2

SOLVING LINEAR INEQUALITY

Children in this chapter we will learn to solve linear inequalities of different forms.

TYPE I : $x + a > b$ or $x + a < b$ or $x + a \geq b$, $x + a \leq b$

Ex:

1)

$$4x + 3 \leq 6x + 7$$

$$4x - 6x \leq 7 - 3$$

$$-2x \leq 4$$

$x \geq -2$ [as we are dividing with -2 therefore inequality sign change]

$$x \in [-2, \infty]$$

Note: In linear inequality, we represent solution in interval form

2)

$$\frac{5-2x}{3} \leq \frac{x}{6} - 5$$

$$\frac{5-2x}{3} \leq \frac{x-30}{6}$$

10-4x ≤ x-30

-5x ≤ -40

x ≥ 8

x ∈ [8, ∞]

3)

$$\frac{1}{2}\left(\frac{3x}{5} + 4\right) > \frac{1}{3}(x - 6)$$

$$\frac{3x + 20}{10} > \frac{x - 6}{3}$$

$$9x + 60 > 10x - 60$$

$$120 > x$$

$$x \in (-\infty, 120)$$

TASK

Solve the inequalities in Exercises 5 to 16 for real x.

5. $4x + 3 < 5x + 7$

6. $3x - 7 > 5x - 1$

7. $3(x - 1) \leq 2(x - 3)$

8. $3(2 - x) \geq 2(1 - x)$

9. $x + \dfrac{x}{2} + \dfrac{x}{3} < 11$

10. $\dfrac{x}{3} > \dfrac{x}{2} + 1$

11. $\dfrac{3(x - 2)}{5} \leq \dfrac{5(2 - x)}{3}$

12. $\dfrac{1}{2}\left(\dfrac{3x}{5} + 4\right) \geq \dfrac{1}{3}(x - 6)$

13. $2(2x + 3) - 10 < 6(x - 2)$

14. $37 - (3x + 5) \geq 9x - 8(x - 3)$

15. $\dfrac{x}{4} < \dfrac{(5x - 2)}{3} - \dfrac{(7x - 3)}{5}$

16. $\dfrac{(2x - 1)}{3} \geq \dfrac{(3x - 2)}{4} - \dfrac{(2 - x)}{5}$

Solve the inequalities in Exercises 17 to 20 and show the graph of the solution in each case on number line

17. $3x - 2 < 2x + 1$

18. $5x - 3 \geq 3x - 5$

19. $3(1 - x) < 2(x + 4)$

20. $\dfrac{x}{2} \geq \dfrac{(5x - 2)}{3} - \dfrac{(7x - 3)}{5}$

TYPE II :

$$\frac{x \pm a}{x \pm b} > 0 \quad or \quad \frac{x \pm a}{x \pm b} < 0,$$

Ex:

1)

$$\frac{x - 3}{x - 5} > 0$$

$$\frac{(x - 3)(x - 5)}{(x - 5)^2} > 0$$

$$(x-3)(x-5) > 0$$

$$x \in (-\infty, 3) \cup (5, \infty)$$

2)

$$\frac{2x + 4}{x - 1} \geq 5$$

$$\frac{2x + 4}{x - 1} - 5 \geq 0$$

$$\frac{2x + 4 - 5x + 5}{x - 1} \geq 0$$

$$\frac{-3x + 9}{x - 1} \geq 0$$

$$\frac{x - 3}{x - 1} \leq 0$$

$$\frac{(x - 3)(x - 1)}{(x - 1)^2} \leq 0$$

$(x-3)(x-1) \leq 0$

$x \in (1, 3]$

TASK

1) $\dfrac{X+3}{X-2} \leq 2$

2) $\dfrac{4X+3}{2X-5} < 6$

3) $\dfrac{X}{X-5} > \dfrac{1}{2}$

4) $\dfrac{5X-6}{X+6} < 1$

5) $\dfrac{6X}{4X-1} - \dfrac{1}{2} \leq 0$