

Class 11 Mathematics – Chapter: Linear Inequalities

1. Introduction

- A linear inequality is similar to a linear equation but uses inequality signs ($<$, $>$, \leq , \geq) instead of equality.
- Example: $2x+3 > 7$
 $2x + 3 > 7$

2. Types of Linear Inequalities

- One-variable inequalities:
Inequalities involving a single variable, e.g., $3x-5 \geq 10$
 $3x - 5 \geq 10$

- Two-variable inequalities:
Inequalities involving two variables, e.g., $2x+3y \leq 6$ $2x + 3y \leq 6$

3. Properties of Inequalities

- Adding or subtracting the same number on both sides keeps the inequality true.
- Multiplying or dividing both sides by a positive number keeps the inequality direction.
- Multiplying or dividing both sides by a negative number reverses the inequality direction.

4. Solving Linear Inequalities in One Variable

- Isolate the variable on one side.

- Example:

$$2x+3 > 7 \quad 2x + 3 > 7$$

$$2x > 4 \quad 2x > 4$$

$$x > 2 \quad x > 2$$

5. Graphical Representation of Inequalities in One Variable

- Use a number line.
- Open circle for strict inequalities ($<$, $>$).
- Closed circle for inclusive inequalities (\leq , \geq).

- Shade the solution region.

6. Linear Inequalities in Two Variables

- Form: $ax+by \leq c$ or $ax+by > c$, where a, b, c are constants.
- Represents a region on the coordinate plane.
- Boundary line: $ax+by=c$
- To graph:
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Plot the boundary line (solid for \leq or \geq , dashed for $<$ or $>$).

- Choose a test point not on the line.
- Shade the half-plane that satisfies the inequality.

7. Solution Sets

- Infinite points forming a half-plane.
- Intersections of multiple inequalities form feasible regions.

8. Applications

- Optimization problems.
- Feasibility regions in Linear Programming.
- Real-world constraints in economics and business.

9. Important Tips

- Always reverse inequality sign when multiplying/dividing by a negative.
- Check solutions with test points.

- Know difference between strict and inclusive inequalities.
- Practice graphing to understand regions visually.