

# □ Class 11 Mathematics – Chapter: Linear Inequalities

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## 1. Introduction

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

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

- Two-variable inequalities:  
Inequalities involving two variables, e.g.,  $2x + 3y \leq 6$
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### 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.
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### 4. Solving Linear Inequalities in One Variable

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Isolate the variable on one side.

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Example:

$$2x + 3 > 7$$
$$2x + 3 - 3 > 7 - 3$$

$$2x > 4$$
$$2x > 4 \div 2$$

$$x > 2$$

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## 5. Graphical Representation of Inequalities in One Variable

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Use a number line.

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Open circle for strict inequalities ( $<$ ,  $>$ ).

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Closed circle for inclusive inequalities ( $\leq$ ,  $\geq$ ).

- Shade the solution region.

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## 6. Linear Inequalities in Two Variables

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

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

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## 7. Solution Sets

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

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