

**Learning Objectives:**
1. Graphing linear inequalities on a Number Line.
2. Write each inequality using interval notation and set-builder notation.
4. Solve problems involving linear inequalities.

1. **Graphing Inequalities on a Number Line**

**Definitions:**
1. **Linear Inequality**—is an algebraic expression of the form \( ax + b \leq c \) or \( ax + b \geq c \) or \( ax + b < c \) or \( ax + b > c \) where \( a, b \) and \( c \) are real numbers and \( a \neq 0 \).
2. **Solution of a Linear Inequality**—is any replacement for the variable that satisfied the inequality. (Gives true statement results)

3. **Writing Solution Set Using Notations**

<table>
<thead>
<tr>
<th>Interval Notation</th>
<th>Set-builder Notation</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open interval - ((a, b))</td>
<td></td>
<td>–∞→∞</td>
</tr>
<tr>
<td>Closed interval - ([a,b])</td>
<td></td>
<td>–∞→∞</td>
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<tr>
<td>Half open interval - ([a, b))</td>
<td></td>
<td>–∞→∞</td>
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<tr>
<td>Half open interval - ((a, b])</td>
<td></td>
<td>–∞→∞</td>
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<tr>
<td>Interval - ([a, \infty))</td>
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<td>–∞→∞</td>
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<td>Interval - ((a, \infty))</td>
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<td>Interval - ((\infty, a])</td>
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</tr>
</tbody>
</table>

**Example 1.** Graph each inequality on a number line.

1. \( x > -1 \)

2. \( x \leq 4 \)

3. \( -3 < x \leq 5 \)
2. Write each inequality using interval notation

Example 2. Write each inequality using interval notation and set-builder notation.

1. \[ \frac{x}{5} - \frac{x}{2} \leq 3 \]

   Interval notation:__________________

   Set-builder notation:__________________

2. \[ 7 - 2(y - 4) < 5(1 - 2y) \]

   Interval notation:__________________

   Set-builder notation:__________________
3. \[-7 < \frac{3y+1}{2} \leq 8\]

Interval notation: __________________________

Set-builder notation: __________________________

4. **Solving Applications Involving Inequalities**

**Key words:**

- Less than means \(<\)
- Greater than means \(>\)
- Less than or equal to means \(\leq\)
- Greater than or equal to means \(\geq\)
- Exceed means \(>\)
- At most means \(\leq\)
- At least means \(\geq\)
- No less than means \(\geq\)
- Not equal to means \(\neq\)

**Example 3.** Revenue Problem.

Suppose the monthly revenue from selling \(x\) boxes of stationery is given by the equation \(R = 2.5x\). The monthly cost of producing the stationery is given by the equation \(C = 0.75x + 455\). For how many boxes of stationery will revenue exceed costs?