


Unit 3: Inequality phrases
Lesson 02 Solving linear inequalities

The phrases

“at least”,
 “no more than”,
 “don’t exceed”,
 “in excess of”,
 or their equivalents

in a statement all lead to **inequality** statements.

Example 1: Write the inequality expressed by the statement, “This year’s profit is **at least** last year’s profit.”

$$typ \geq lyp$$

Example 2: Write the inequality expressed by the statement, “Make sure the expenses are **no more than** \$100.”

$$e \leq 100$$

Example 3: Write the inequality expressed by the statement, “My speed did not exceed 70 mph.”

$$s \leq 70$$

Example 4: Write the inequality expressed by the statement, “My speed was in excess of 50 mph.”

$$s > 50$$

Solving an inequality involves exactly the same steps as when solving an equation with the following **exception**:

If both sides of the inequality are multiplied (or divided) by a **negative number**, the **inequality symbol must be reversed**.

Example 5: Determine the inequality solution to $x - 4 > 2$. Express the answer both symbolically and as a graph on a number line.

$$\begin{aligned}x - 4 &> 2 \\x - \cancel{4} + \cancel{4} &> 2 + 4 \\x &> 6\end{aligned}$$



Example 6: Determine the inequality solution to $-3x + 2 \leq -7$. Express the answer both symbolically and as a graph on a number line.

$$\begin{aligned}-3x + 2 &\leq -7 \\-3x + \cancel{2} - \cancel{2} &\leq -7 - 2 \\-3x &\leq -9 \quad \text{---} \quad \begin{array}{c} 0 \\ \bullet \\ \longrightarrow \\ x \end{array} \\ \frac{-3x}{-3} &\geq \frac{-9}{-3} \quad \text{reversed} \\x &\geq 3\end{aligned}$$

Example 7: Determine the inequality solution to $3x - 5 > x + 6$. Express the answer both symbolically and as a graph on a number line.

$$\begin{aligned}3x - 5 &> x + 6 \\3x - \cancel{5} &> x + \cancel{6} + 5 \\3x &> x + 11 \\3\cancel{x} - \cancel{x} &> x + 11 - x \\2x &> 11 \quad \text{---} \quad \begin{array}{c} 0 \\ \bullet \\ \longrightarrow \\ x \end{array} \\ \frac{2x}{2} &> \frac{11}{2} \\x &> \frac{11}{2}\end{aligned}$$

Example 8: Determine the inequality solution to $3(x + 2) > 7x - 10$. Express the answer both symbolically and as a graph on a number line.

$$\begin{aligned}
 & 3(\cancel{x+2}) > 7x - 10 \\
 & 3x + 6 > 7x - 10 \\
 & 3x + \cancel{6} > 7x - \cancel{10} - \cancel{6} \\
 & 3x > 7x - 16 \\
 & \underline{3x - 7x} > \cancel{7x} - 16 - \cancel{7x} \\
 & -4x > -16 \\
 & \frac{-4x}{-4} < \frac{-16}{-4} \quad \text{reversed} \\
 & x < 4
 \end{aligned}$$

Assignment:

<p>1. Write the inequality expressed by the statement, “Unfortunately, Richard’s grade did not exceed 70.”</p>	<p>2. Write the inequality expressed by the statement, “The government says the work-day should be no more than 8 hours.”</p>
<p>3. Write the inequality expressed by the statement, “When I graduate, I want to make at least \$50,000 per year.”</p>	<p>4. Write the inequality expressed by the statement, “The number of calories in that meal was definitely in excess of 2000.”</p>
<p>5. Write the inequality expressed by the statement, “The probability of me passing Algebra is not less than 80%.”</p>	<p>6. Write the inequality expressed by the statement, “The score made by the Eagles will likely not exceed 10 more than the Bobcat’s score.”</p>

Determine the inequality solution to the following problems. Express the answer both symbolically and as a graph on a number line.

7. $x + 17 \leq 4$

8. $4 - x < 11$

9. $7x + 2 > x - 9$

10. $-3 \leq x + 7 + 4x$

11. $4(x + 12) + 1 < x + 8$

12. $4x - 6 > 7x$

13. $4(2 + x) - 5x < x + 12$

*14. $6x - 2 + x \geq 7x - 13$