

# Study Guide

## Inequalities C 03/01/2012

### Inequalities - C

An inequality is a number sentence that uses "is greater than," "is greater than or equal to," "is less than," "is less than or equal to," or "is not equal to" symbols. For example,  $6n > 4$  is a number sentence with an inequality symbol, and is read "six times  $n$  is greater than four." Inequalities can be identified in real world situations by expressions such as "is less than," "is more than," "at least," and "at most." Sentences can be translated to number sentences using the following symbols.

<u>Symbol</u>	<u>Meaning</u>	<u>Associated Word Phrases</u>
	is more than	more than

An inequality can be solved for a variable (a letter that represents a number) in the same way that an equation is solved. An example of solving an inequality follows.

**Example 1:** Solve the inequality for  $x$ .

$$2x + 7 > 11$$

$$\begin{array}{r} \text{(1)} \\ 2x + 7 > 11 \\ \underline{-7 \quad -7} \\ 2x > 4 \end{array} \qquad \begin{array}{r} \text{(2)} \\ \frac{2x}{2} > \frac{4}{2} \\ x > 2 \end{array}$$

**Step 1:** Subtract 7 from each side of the inequality symbol to isolate the variable term,  $2x$ , and simplify.

**Step 2:** Divide both sides of the inequality by 2 to completely isolate  $x$ .

**Answer:**  $x > 2$

A compound inequality has more than one condition and can be identified in a number sentence by two inequality symbols, or in a real world application by the words "and" or "or." For example,  $3 < x < 9$  is a compound inequality. To read a compound inequality, start in the center and read left:  $x > 3$ , then go back to the center and read to the right:  $x < 9$ . The compound inequality is a combination of  $x > 3$  AND  $x < 9$ . Solving a compound inequality is very similar to solving a single inequality.

**Example 2:** Solve the compound inequality for  $x$ .

$$4 < 3x + 1 < 7$$

$$\begin{array}{r} \text{(1)} \\ 4 < 3x + 1 < 7 \\ \underline{-1 \quad -1 \quad -1} \\ 3 < 3x < 6 \end{array} \qquad \begin{array}{r} \text{(2)} \\ \frac{3}{3} < \frac{3x}{3} < \frac{6}{3} \\ 1 < x < 2 \end{array}$$

**Step 1:** Subtract 1 from the left, center, and right side of the number sentence to isolate the variable term,  $3x$ .

**Step 2:** Divide the left, center, and right side of the number sentence by 3 to isolate  $x$ .

**Answer:**  $1 < x < 2$ . This answer can be interpreted to mean that  $x$  is greater than 1 and  $x$  is less than 2.

Although the above examples do not include negative numbers, students must remember to switch the inequality sign when multiplying or dividing by a negative number. Once the student is familiar with solving compound inequalities, he or she should be ready to solve them in real world situations.

**Example 3:** The telephone company charges \$21.95 per month for basic service plus \$0.17 per local call. What is the maximum number of calls that can be made in a month if a family can spend at least \$27.50 and at most \$32.75 per month for telephone service? Round your answer to the nearest whole number of calls that satisfies the inequality.

$$(1) \quad \$27.50 < \$21.95 + \$0.17c < \$32.75$$



Step 1: Translate the information in the problem to a compound inequality. Let  $c$  represent the number of calls. The family gets charged  $\$21.95 + \$0.17c$  each month (the service charge plus local calls). Since the charges are **at least** \$27.50 and **at most** \$32.75, place the minimum amount of \$27.50 to the left of the expression that represents the charges and the maximum amount of \$32.75 to the right of the expression. Refer to the chart above to see which inequality symbol to use. Since the question uses the words *at least* and *at most*, the  $\leq$  needs to be used. Place the  $\leq$  on either side of the charges expression.

Step 2: