CHAPTER 1: Graphs, Functions, and Models

1.1 Introduction to Graphing
1.2 Functions and Graphs
1.3 Linear Functions, Slope, and Applications
1.4 Equations of Lines and Modeling
1.5 Linear Equations, Functions, Zeros and Applications
1.6 Solving Linear Inequalities

Linear Inequalities
The principles for solving inequalities are similar to those for solving equations.

Principles for Solving Inequalities
For any real numbers a, b, and c:

The Addition Principle for Inequalities: If \( a < b \) is true, then \( a + c < b + c \) is true.

The Multiplication Principle for Inequalities: If \( a < b \) and \( c > 0 \) are true, then \( ac > bc \) is true. If \( a < b \) and \( c < 0 \) are true, then \( ac > bc \) is true. Similar statements hold for \( a < b \).

NOTE: When both sides of an inequality are multiplied by a negative number, we must reverse the inequality sign.

Compound Inequalities
When two inequalities are joined by the word and or the word or, a compound inequality is formed. A compound inequality like \(-3 < 2x + 5 \) and \( 2x + 5 \leq 7 \) is called a conjunction, because it uses the word and.

The sentence \(-3 < 2x + 5 \leq 7 \) is an abbreviation for the preceding conjunction.

Solve and graph the solution set.
154/2. \( 8x + 1 \geq 5x - 5 \)

Solve and graph the solution set.
154/10. \( 12 - 8y \geq 10y - 6 \)
Solve and graph the solution set.

154/29. \[ 3x - 6 \quad \text{or} \quad x - 1 > 0 \]

\[
\begin{align*}
3x - 6 & > 0 \\
3x & > 6 \\
x & > 2 \\
& \text{or}
\end{align*}
\]

\[
\begin{align*}
x - 1 & > 0 \\
x & > 1 \\
& \text{or}
\end{align*}
\]

\[ (-\infty, 2] \cup (1,\infty) \]

Solve and graph the solution set.

154/32. \[ 3x - 1 < -5 \quad \text{or} \quad 3x - 1 > 5 \]

\[ 3x - 1 < -5 \]

\[
\begin{align*}
3x & < -4 \\
x & < -\frac{4}{3} \\
& \text{or}
\end{align*}
\]

\[ 3x - 1 > 5 \]

\[
\begin{align*}
3x & > 6 \\
x & > 2 \\
& \text{or}
\end{align*}
\]

No solution.

Digital Hubs. The equation \( y = 5x + 5 \) estimates the number of U.S. households, in millions, expected to install devices that receive and manage broadband TV and Internet content to the home, where \( x \) is the number of years after 2002 (Source: Forrester Research). For what years will there be at least 20 million homes with these devices?

\[
\begin{align*}
y = 5x + 5 & \geq 20 \\
5x + 5 & \geq 20 \\
5x & \geq 15 \\
x & \geq 3 \\
& \text{Since 2002, the years are 2005 or later.}
\end{align*}
\]

Checking-account Plans. Parsons Bank offers two checking-account plans. The No Frills plan charges 35 cents per check whereas the Simple Checking plan costs $5 per month plus 10 cents per check. For what number of checks per month will the Simple Checking plan cost less?

\[
\begin{align*}
x & = \# \text{ of checks per month} \\
5 + 0.10x & < 0.35x \\
-0.25x & < 5 \\
x & > -20 \\
& \text{More than 20 checks per month,} \\
& \text{S.C. is cheaper.}
\end{align*}
\]
Solve and graph the solution set.

155/44. Income Plans. Karen can be paid in one of two ways for selling insurance policies: Plan A: A salary of $750 per month, plus a commission of 10% of sales; Plan B: A salary of $1000 per month, plus a commission of 8% of sales in excess of $2000. For what amount of monthly sales is plan A better than plan B if we can assume that sales are always more than $2000?

\[
\begin{align*}
750 + 0.10x &> 1000 + 0.08(x-2000) \\
750 + 0.10x &> 1000 + 0.08x - 160 \\
0.02x &> 90 \\
x &> 4500
\end{align*}
\]

More than $4500 of sales per month.

SAS Curriculum Pathways at sasinschools.com
Introductory Algebra > Equations & Inequalities > InterActivity 962 Solver: Linear Inequalities