Chapter 8 – Solving Linear Equations and Inequalities to Make Predictions

Section 5 – Solving Linear Inequalities to Make Predictions

Objectives

1. Describe the addition property of inequalities.
2. Describe the multiplication property of inequalities.
3. Describe the meaning of satisfy, solution, and solution set for a linear inequality in one variable.
4. Solve a linear inequality in one variable, and graph the solution set.
5. Substitute values for variables in a compound inequality.
6. Solve a compound inequality in one variable, and graph the solution set.
7. Use linear inequalities to make predictions about authentic situations.

Lesson/Activity

OBJECTIVE 1 – Describe the addition property of inequalities.

Show what happens when we add a number to both sides of $5 < 7$.

Addition Property of Inequalities

If $a < b$, then $a + c < b + c$.

Similar properties hold for $\leq$, $>$, and $\geq$.

Illustrate the addition property of inequalities by using a number line.

OBJECTIVE 2 – Describe the multiplication property of inequalities.

Show what happens when we multiply both sides of the inequality $5 < 7$ by a number.

Multiplication Property of Inequalities

For a positive number c, if $a < b$, then $ac < bc$.

For a negative number c, if $a < b$, then $ac > bc$.

Similar properties hold for $\leq$, $>$, and $\geq$.

Illustrate that if $a < b$, then $-a > -b$ by using a number line.

OBJECTIVE 3 – Describe the meaning of satisfy, solution, and solution set for a linear inequality in one variable.

Definition: Linear inequality in one variable

A **linear inequality** in one variable is an inequality that can be put into one of the forms $mx + b < 0$; $mx + b \leq 0$; $mx + b > 0$; $mx + b \geq 0$ where m and b are constants and $m \neq 0$.

We say a number **satisfies** an inequality in one variable if the inequality becomes a true statement after we have substituted the number for the variable.

1. Does the number 2 satisfy the inequality $4x - 3 < 8$?

2. Does the number 5 satisfy the inequality $4x - 3 < 8$?

Definition: Solution, solution set, and solve for an inequality in one variable
We say a number is a **solution** of an inequality in one variable if it satisfies the inequality.
The **solution set** of an inequality is the set of all solutions of the inequality.
We **solve** an inequality by finding its solution set.

OBJECTIVE 4 – Solve a linear inequality in one variable, and graph the solution set.

Solve the inequality. Describe the solution set as an inequality, in interval notation, and as a graph.

3. $3x - 5 \le 7$
4. $-4x < -12$
5. $4x < -12$
6. $-3x + 1 < -11$
7. $3k + 3 \ge 8k - 4$
8. $-2.9x + 3.2 < -8.98$
9. $4m + 3 > 2(3m - 4)$
10. $\frac{2}{9} - \frac{5}{3}x \le \frac{7}{3}$
11. $\frac{(2p-1)}{3} - \frac{(7p+3}{4} \ge \frac{5}{6}$

OBJECTIVE 5 – Substitute values for variables in a compound inequality.

12. Substitute 35.2 for $\bar{x}$, 1.761 for **t**, 4.7 for **s**, and 14 for **n** in the compound inequality

$$\bar{x} - t \cdot \frac{s}{\sqrt{n}} < \mu < \bar{x} + t \cdot \frac{s}{\sqrt{n}}$$

to find a compound inequality that describes the variable μ. Also describe the solution set in interval notation and as a graph. Round to the first decimal place.

OBJECTIVE 6 – Solve a compound inequality in one variable, and graph the solution set.

Solve the inequality. Describe the solution set as an inequality, in interval notation, and in a graph.

13. $-1 \le 3x - 7 \le 5$
14. $2 < 8 - 2w < 10$
15. $\frac{1}{2} < 3 - \frac{5}{4}x \le \frac{7}{2}$

OBJECTIVE 7 – Use linear inequalities to make predictions about authentic situations.

16. Let **B** be the total annual box office grosses (in billions of dollars) in the United States and Canada at **t** years since 1980 (see the following table).

Year	Total Box Office Grosses in the United States and Canada (billions of dollars)
1987	4.25
1990	5.02
1995	5.27
2000	7.51
2005	8.82
2010	10.58

Sources: AC Nielsen EDI, Rentrak Corporation

A reasonable model is $B = 0.28t + 1.98$.
In which years was the annual box office gross greater than $9.5 billion?

Homework/Assessment
1, 3, 7, 17, 37, 47, 55, 59, 61, 65, 73, 77, 81, 85, 89