

## Section 4.1 Solving Linear Inequalities

### *Are You in LOVE?*

As the years go by in a relationship,  
three key components of love...

♥ *passion* ♥

♥ *commitment* ♥

♥ *intimacy* ♥

...progress differently over time.

Passion peaks early in a relationship  
and then declines.

By contrast, intimacy and commitment build gradually.

In the applications of this section of the textbook,  
we will use mathematics to explore the relationships  
among these three variables of love.



#### First Steps:

- Take comprehensive notes** from your instructor's lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 4.1 of your textbook which begins on page 254.
- Complete the *Concept and Vocabulary Check* on page 261 of the textbook.

#### Guided Practice:

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

**Objective #1:** Solve linear inequalities.

#### ✓ *Solved Problem #1*

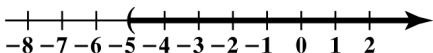
**1a.** Solve and graph the solution set on a number line:  
 $4x - 3 > -23$

$$4x - 3 > -23$$

$$4x > -20$$

$$x > -5$$

The solution set is  $(-5, \infty)$ .



#### ✎ *Pencil Problem #1* ✎

**1a.** Solve and graph the solution set on a number line:  
 $5x + 11 < 26$

**1b.** Solve and graph the solution set on a number line:

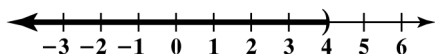
$$3x+1 > 7x-15$$

$$3x+1 > 7x-15$$

$$-4x > -16$$

$$\frac{-4x}{-4} < \frac{-16}{-4}$$

$$x < 4$$

The solution set is  $(-\infty, 4)$ .**1b.** Solve and graph the solution set on a number line:

$$-9x \geq 36$$

**1c.** Solve and graph the solution set on a number line:

$$\frac{x-4}{2} \geq \frac{x-2}{3} + \frac{5}{6}$$

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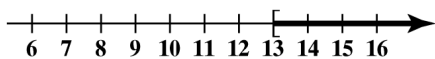
$$6\left(\frac{x-4}{2}\right) \geq 6\left(\frac{x-2}{3} + \frac{5}{6}\right)$$

$$3(x-4) \geq 2(x-2) + 5$$

$$3x-12 \geq 2x-4+5$$

$$3x-12 \geq 2x+1$$

$$x \geq 13$$

The solution set is  $[13, \infty)$ .**1c.** Solve and graph the solution set on a number line:

$$7(x+4)-13 < 12+13(3+x)$$

**Objective #2:** Recognize inequalities with no solution or all real numbers as solutions.

 **Solved Problem #2**

**2a.** Solve the inequality:  $3(x+1) > 3x+2$

$$3(x+1) > 3x+2$$

$$3x+3 > 3x+2$$

$$3 > 2$$

This expression is always true.

The solution set is  $\mathbb{R}$  or  $(-\infty, \infty)$ .

 **Pencil Problem #2** 

**2a.** Solve the inequality:  $8(x+1) \leq 7(x+5) + x$

**2b.** Solve the inequality:  $x+1 \leq x-1$

$$x+1 \leq x-1$$

$$1 \leq -1$$

This expression is always false.

The solution set is  $\emptyset$ .

**2b.** Solve the inequality:  $3x < 3(x-2)$

**Objective #3:** Solve applied problems using linear inequalities.**✓ Solved Problem #3**

3. A car can be rented from Basic Rental for \$260 per week with no extra charge for mileage. Continental charges \$80 per week plus 25 cents for each mile driven to rent the same car. How many miles must be driven in a week to make the rental cost for Basic Rental a better deal than Continental's?

Let  $x$  = number of miles driven in a week.

$$\begin{array}{r} \text{Cost for} \\ \text{Basic Rental} \\ \hline 260 \end{array} < \begin{array}{r} \text{Cost for} \\ \text{Continental} \\ \hline 80 + 0.25x \end{array}$$

$$260 < 80 + 0.25x$$

$$180 < 0.25x$$

$$\frac{180}{0.25} < \frac{0.25x}{0.25}$$

$$720 < x$$

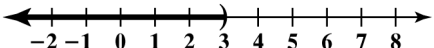
$$x > 720$$

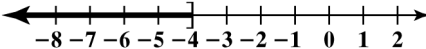
Driving more than 720 miles per week makes Basic Rental a better deal.

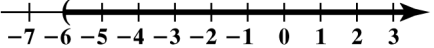
**✎ Pencil Problem #3**

3. An elevator at a construction site has a maximum capacity of 3000 pounds. If the elevator operator weighs 200 pounds and each cement bag weighs 70 pounds, how many bags of cement can be safely lifted on the elevator in one trip?

**Answers for Pencil Problems (Textbook Exercise references in parentheses):**

1a.  $(-\infty, 3)$ ;  (4.1 #1)

1b.  $(-\infty, -4]$ ;  (4.1 #5)

1c.  $(-6, \infty)$ ;  (4.1 #27)

2a.  $\mathbb{R}$  or  $(-\infty, \infty)$  (4.1 #23)    2b.  $\emptyset$  (4.1 #25)

3. At most, 40 bags of cement can be lifted safely on the elevator per trip. (4.1 #65)

**Homework:**

- Review the Section 4.1 summary** on page 305 of the textbook.
- Insert your homework** into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.