

## Section 1.3 The Real Numbers

### The Golden Rectangle

Which of the following rectangles do you feel is most visually pleasing?



Did you know that the ancient Greeks believed that the most visually pleasing rectangles needed to have the ratio of the width to the height be exactly  $\sqrt{5} + 1$  to 2?

In this section of your textbook, you will explore numbers such as  $\sqrt{5}$ .  
And by the way, rectangle #2 above has the dimensions of the golden rectangle.

#### 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 1.3 of your textbook which begins on page 32.
- Complete the *Concept and Vocabulary Check* on page 41 of the textbook.

#### Guided Practice:

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

**Objective #1:** Define the sets that make up the real numbers.

#### ✓ *Solved Problem #1*

- 1a.** Write a positive or negative integer that describes the following situation.

A debt of \$500

–500

- 1b.** Write a positive or negative integer that describes the following situation.

282 feet below sea level.

–282

#### ✎ *Pencil Problem #1* ✎

- 1a.** Write a positive or negative integer that describes the following situation.

A gain of 8 pounds

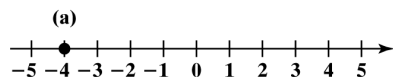
- 1b.** Write a positive or negative integer that describes the following situation.

A bank withdrawal of \$3000

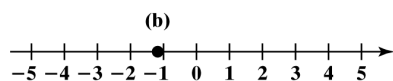
**Objective #2:** Graph numbers on a number line.

 **Solved Problem #2**

2a. Graph:  $-4$



2b. Graph:  $-1.2$



 **Pencil Problem #2** 

2a. Graph: 2

2b. Graph:  $-\frac{16}{5}$

**Objective #3:** Express rational numbers as decimals.

 **Solved Problem #3**

3a. Express the rational number as a decimal:  $\frac{3}{8}$

$$\begin{array}{r} 0.375 \\ 8 \overline{)3.000} \\ \underline{24} \phantom{00} \\ 60 \phantom{0} \\ \underline{56} \phantom{0} \\ 40 \phantom{0} \\ \underline{40} \\ 0 \end{array}$$

$\frac{3}{8} = 0.375$

3b. Express the rational number as a decimal:  $\frac{5}{11}$

$$\begin{array}{r} 0.454... \\ 11 \overline{)5.000...} \\ \underline{44} \phantom{00} \\ 60 \phantom{0} \\ \underline{55} \phantom{0} \\ 50 \phantom{0} \\ \underline{44} \phantom{0} \\ 60 \phantom{0} \end{array}$$

$\frac{5}{11} = 0.\overline{45}$

 **Pencil Problem #3** 

3a. Express the rational number as a decimal:  $\frac{7}{8}$

3b. Express the rational number as a decimal:  $\frac{9}{11}$

**Objective #4:** Classify numbers as belonging to one or more sets of the real numbers.

 **Solved Problem #4**

4. List all numbers from the given set that are:  
**a.** natural numbers, **b.** whole numbers, **c.** integers,  
**d.** rational numbers, **e.** irrational numbers,  
**f.** real numbers.

$$\{-9, -1.3, 0, 0.\bar{3}, \frac{\pi}{2}, \sqrt{9}, \sqrt{10}\}$$

- a.**  $\sqrt{9}$   
**b.**  $0, \sqrt{9}$   
**c.**  $-9, 0, \sqrt{9}$   
**d.**  $-9, -1.3, 0, 0.\bar{3}, \sqrt{9}$   
**e.**  $\frac{\pi}{2}, \sqrt{10}$   
**f.**  $-9, -1.3, 0, 0.\bar{3}, \frac{\pi}{2}, \sqrt{9}, \sqrt{10}$

 **Pencil Problem #4**

4. List all numbers from the given set that are:  
**a.** natural numbers, **b.** whole numbers, **c.** integers,  
**d.** rational numbers, **e.** irrational numbers,  
**f.** real numbers.

$$\{-11, -\frac{5}{6}, 0, 0.75, \sqrt{5}, \pi, \sqrt{64}\}$$

**Objective #5:** Understand and use inequality symbols.

 **Solved Problem #5**

- 5a. Insert either  $<$  or  $>$  to make the statement true.  
 $-19 \quad -6$

Since  $-19$  is to the left of  $-6$  on the number line,  
then  $-19 < -6$ .

- 5b. Determine if the inequality is true or false.  
 $-2 \geq -2$

Because  $-2 = -2$  is true,  
then  $-2 \geq -2$  is true.

- 5c. Determine if the inequality is true or false.  
 $-4 \geq 1$

Because neither  $-4 > 1$  nor  $-4 = 1$  is true,  
then  $-4 \geq 1$  is false.

 **Pencil Problem #5**

- 5a. Insert either  $<$  or  $>$  to make the statement true.  
 $-\pi \quad -3.5$

- 5b. Determine if the inequality is true or false.  
 $0 \geq -6$

- 5c. Determine if the inequality is true or false.  
 $-17 \geq 6$

**Objective #6:** Find the absolute value of a real number.

 **Solved Problem #6**

**6a.** Find the absolute value:  $|-4|$

$-4$  is 4 units from 0.  
Thus  $|-4| = 4$ .

 **Pencil Problem #6** 

**6a.** Find the absolute value:  $|-7|$

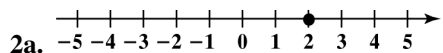
**6b.** Find the absolute value:  $|\sqrt{-2}|$

$-\sqrt{2}$  is  $\sqrt{2}$  units from 0.  
Thus  $|\sqrt{-2}| = \sqrt{2}$ .

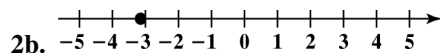
**6b.** Find the absolute value:  $\left|\frac{5}{6}\right|$

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

**1a.** 8 (1.3 #3)    **1b.**  $-3000$  (1.3 #5)



**2a.**  $-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5$  (1.3 #9)



**2b.**  $-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5$  (1.3 #19)

**3a.** 0.875 (1.3 #25)    **3b.**  $0.\overline{81}$  (1.3 #27)

**4a.**  $\sqrt{64}$  (1.3 #35)    **4b.** 0,  $\sqrt{64}$  (1.3 #35)    **4c.**  $-11, 0, \sqrt{64}$  (1.3 #35)

**4d.**  $-11, -\frac{5}{6}, 0, 0.75, \sqrt{64}$  (1.3 #35)    **4e.**  $\sqrt{5}, \pi$  (1.3 #35)    **4f.**  $-11, -\frac{5}{6}, 0, 0.75, \sqrt{5}, \pi, \sqrt{64}$  (1.3 #35)

**5a.**  $-\pi > -3.5$  (1.3 #61)    **5b.** true (1.3 #67)    **5c.** false (1.3 #69)

**6a.** 7 (1.3 #73)    **6b.**  $\frac{5}{6}$  (1.3 #75)

**Homework:**

- Review the Section 1.3 summary** on page 104 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.