NAME _____ DATE _____

Study Guide

Student Edition
Pages 119–125

Square Roots and Real Numbers

The chart below illustrates the various kinds of real numbers.

Counting or Natural Numbers, N	{1, 2, 3, 4, ⋯}
Whole Numbers, W	{0, 1, 2, 3, 4, ⋯}
Integers, Z	{⋯ −3, −2, −1, 0, 1, 2, 3, ⋯}
Rational Numbers, Q	{all numbers that can be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$}
Irrational Numbers, I	{numbers that cannot be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$}
Real Numbers, R	{rational numbers and irrational numbers}

The square roots of perfect squares are classified as rational numbers. A **square root** is one of two equal factors of a number. For example, the square root of 36 is 6 and -6 since $6 \cdot 6$ or 6^2 is 36 and $(-6)(-6)$ or $(-6)^2$ is also 36. A rational number like 36, whose square root is a rational number, is called a **perfect square.**

The symbol $\sqrt{\ }$ is called a **radical sign.** It indicates the nonnegative, or **principal,** square root of the expression under the radical sign.

Example: Find $\pm\sqrt{49}$. The symbol $\pm\sqrt{49}$ represents both square roots. Since $7^2 = 49$, we know that $\pm\sqrt{49} = \pm 7$.

Numbers such as $\sqrt{2}$ and $\sqrt{3}$ are not perfect squares. Notice what happens when you find these square roots with your calculator. The numbers continue indefinitely without any pattern of repeating digits. These numbers are not rational numbers since they are not repeating or terminating decimals and they are classified as **irrational numbers.**

Find each square root. Use a calculator if necessary. Round to the nearest hundredth if the result is not a whole number or simple fraction.

1. $\sqrt{81}$ **2.** $\sqrt{0.00025}$ **3.** $-\sqrt{\frac{25}{16}}$ **4.** $-\sqrt{3600}$ **5.** $\pm\sqrt{\frac{121}{100}}$

Evaluate each expression. Use a calculator if necessary. Round to the nearest hundredth if the result is not a whole number.

6. $\sqrt{a}$, if $a = 39$

7. $\pm\sqrt{s + t}$, if $s = 30$ and $t = 19$

8. $-\sqrt{\frac{a}{b}}$, if $a = 169$ and $b = 4$

9. $\sqrt{cd}$, if $c = 12$ and $d = 15$

Name the set or sets of numbers to which each real number belongs. Use N for natural numbers, W for whole numbers, Z for integers, Q for rational numbers, and I for irrational numbers.

10. 3.145 **11.** $\sqrt{1}$ **12.** $\sqrt{25}$