

LESSON
4.6

Study Guide

For use with pages 225–230



GOAL

Work with irrational numbers

VOCABULARY

An **irrational number** is a number that cannot be written as a quotient of two integers.

Together, rational numbers and irrational numbers make up the set of **real numbers**.

Lesson 4.6

EXAMPLE 1

Classifying Real Numbers

Tell whether the number is *rational* or *irrational*.

a. 0.8888...

b. $\frac{2}{5}$

c. $\sqrt{10}$

Solution

a. Because 0.8888... is a repeating decimal, it is rational.

b. Because $\frac{2}{5}$ is a quotient of two integers (2 and 5), it is rational.

c. Because 10 is a positive integer and is not a perfect square, $\sqrt{10}$ is irrational.

Exercises for Example 1

Tell whether the number is *rational* or *irrational*. Explain your reasoning.

1. $\frac{3}{7}$

2. $\sqrt{16}$

3. $-\frac{2}{11}$

4. $\sqrt{6}$

EXAMPLE 2

Comparing Real Numbers

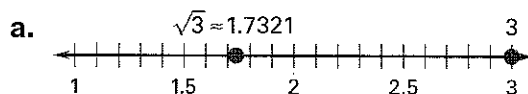
Graph the pair of numbers on a number line. Then complete the statement with $<$, $>$, or $=$.

a. 3 $\underline{\quad ? \quad}$ $\sqrt{3}$

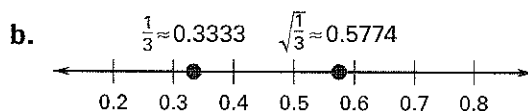
b. $\frac{1}{3}$ $\underline{\quad ? \quad}$ $\sqrt{\frac{1}{3}}$

Solution

Use a calculator to approximate each square root and write any fractions as decimals. Then graph the numbers on a number line and compare.



So, $3 > \sqrt{3}$.



So, $\frac{1}{3} < \sqrt{\frac{1}{3}}$.

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LESSON
4.6**Study Guide** *continued*
For use with pages 225–230**Exercises for Example 2**

Graph the pair of numbers on a number line. Then complete the statement with $<$, $>$, or $=$.

5. 3 ? $\sqrt{7}$

6. 4 ? $\sqrt{16}$

7. $\sqrt{\frac{1}{8}}$? $\frac{1}{8}$

EXAMPLE 3 **Ordering Real Numbers**

Order the numbers $-0.\overline{26}$, $-0.\overline{262}$, $-0.\overline{26}$ and -0.262 from least to greatest.

Solution

Write each decimal out to six decimal places.

$$-0.\overline{26} = -0.266666\dots \quad -0.\overline{262} = -0.262262\dots$$

$$-0.\overline{26} = -0.262626\dots \quad -0.262 = -0.262000$$

Answer: From least to greatest, the order is $-0.\overline{26}$, $-0.\overline{262}$, $-0.\overline{26}$, and -0.262 .

Exercises for Example 3

Order the numbers from least to greatest.

8. $\sqrt{0.124}$, $0.\overline{34}$, $0.\overline{34}$, $0.\overline{342}$

9. $-\overline{0.89}$, -0.889 , $-\overline{0.898}$, $-\overline{0.8}$

EXAMPLE 4 **Using an Irrational Number**

A solid cylinder rolls down a ramp from a resting position. When the height of the cylinder from the ground has decreased by d meters, its speed s (in meters per second) is given by the equation $s = \sqrt{\frac{4}{3}(9.8)d}$. What is the speed of the cylinder when it has dropped 1.2 meters in height?

Solution

$$s = \sqrt{\frac{4}{3}(9.8)d} \quad \text{Write original equation.}$$

$$= \sqrt{\frac{4}{3}(9.8)(1.2)} \quad \text{Substitute 1.2 for } d.$$

$$= \sqrt{15.68} \quad \text{Multiply.}$$

$$\approx 3.96 \quad \text{Approximate square root.}$$

Answer: When the cylinder has rolled to a point that is 1.2 meters lower, its speed is about 3.96 meters per second.

Exercise for Example 4

10. In Example 4, find the speed of the cylinder when its height from the ground has dropped by 3.4 meters.