Lesson 1.4 Introducing Real Number System

Objective

- Show that irrational numbers are characterized by a nonterminating and nonrepeating representation.

- Introduce the real number system and the real number line.

- **Common Core State Standards** *7.NS.1 & 7.NS.2.d*
- **Mathematical Practices** 2. Reason 4. Model mathematics. 5. Use tools strategically. 6. Attend to precision. 7. Look for and use structures

Lesson 1.4 Introducing Real Number System

Review Yesterday's learning…

*were able to graph rational and irrational numbers on a number line with and without the use a calculator

*found the absolute value of integers

Lesson 1.4 Introducing Real Number System

Scribe and Sage

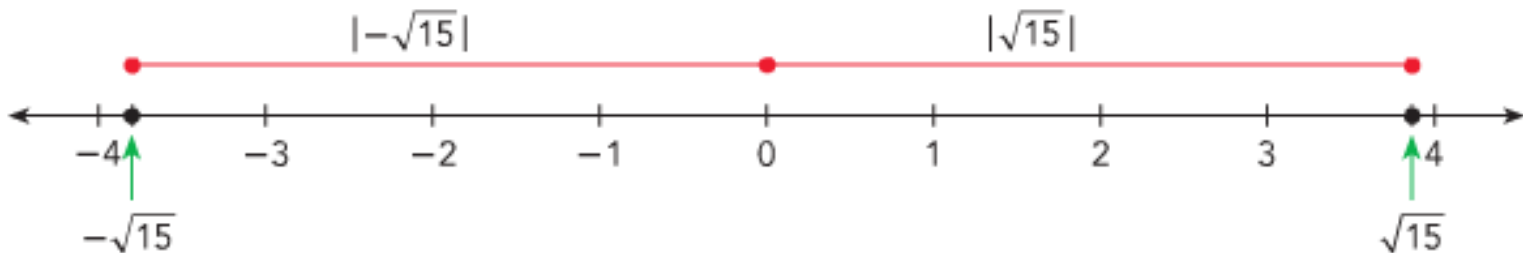Can you find the absolute value of irrational numbers?

Lesson 1.4 Introducing Real Number System

Can you find the absolute value of irrational numbers?

You have seen that irrational numbers can be located on the number line. So you can use their absolute values to indicate their distances from 0.

$$|-\sqrt{15}| = |\sqrt{15}|$$

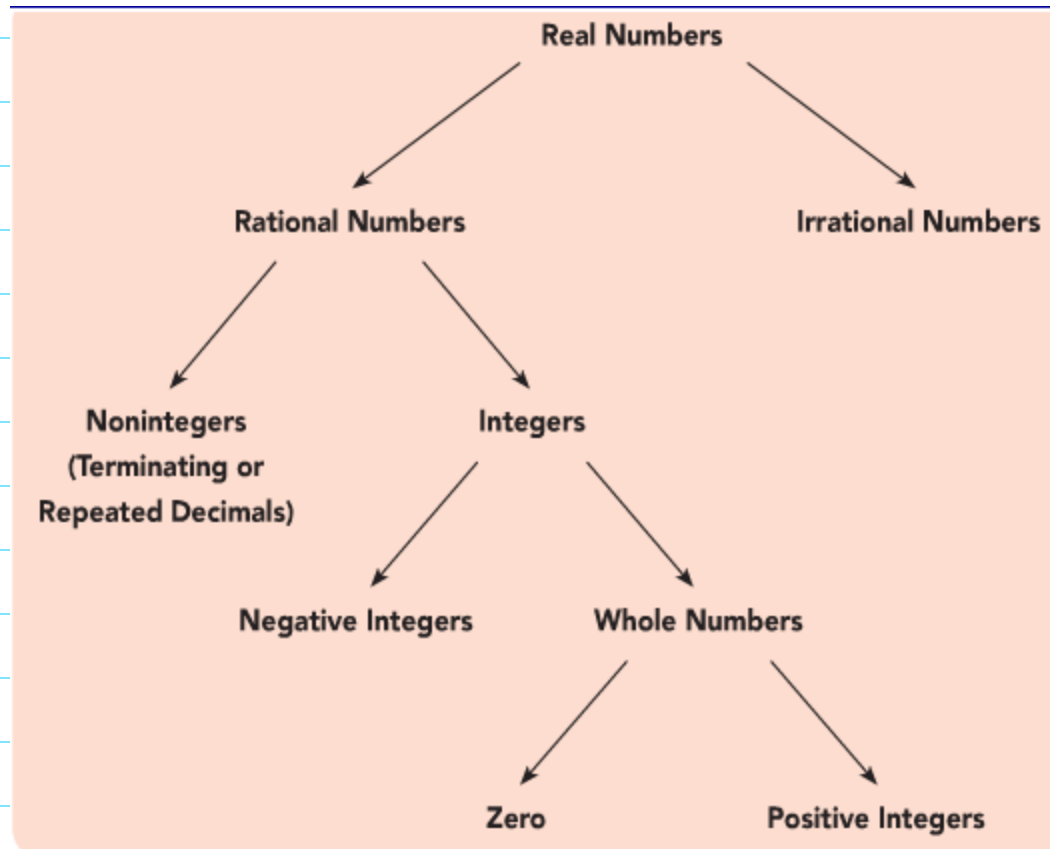This equation is true because $\sqrt{15}$ and $-\sqrt{15}$ are equidistant from 0.

The absolute value of a rational number can be measured exactly. The absolute value of an irrational number cannot. It can only be approximated. In Example 9 on page 31, the value of $\sqrt{15}$ is only approximated by 3.87, a value correct to two decimal places.

Lesson 1.4 Introducing Real Number System

Real Number System

Rational and irrational numbers are collectively known as real numbers. The number line containing all real numbers is called the real number line. The diagram below summarizes the relationship among the types of numbers you have learned. You can see that a real number is either rational or irrational.

Real Numbers

→ **Rational Numbers** → **Irrational Numbers**

Rational Numbers

→ **Nonintegers (Terminating or Repeated Decimals)** → **Integers**

Integers

→ **Negative Integers** → **Whole Numbers**

Whole Numbers

→ **Zero** → **Positive Integers**

Lesson 1.4 Introducing Real Number System

Order real numbers on the real number line.

It's easiest to compare when in decimal form

$$5\frac{11}{13}, \ \sqrt{30}, \ -\frac{84}{25}, \ -8.2\overline{83}, \ \pi^2$$

Order real numbers on the real number line.

$$5\frac{11}{13}, \sqrt{30}, -\frac{84}{25}, -8.2\overline{83}, \pi^2$$

a) Represent each real number in decimal form with 3 decimal places.

b) Order the real numbers from least to greatest using the symbol $<$.

c) Locate each real number approximately on the real number line.

Order real numbers on the real number line.

$$5\frac{11}{13},\ \sqrt{30},\ -\frac{84}{25},\ -8.2\overline{83},\ \pi^2$$

a) Represent each real number in decimal form with 3 decimal places.

Solution

From the calculator,

$$5\frac{11}{13} \approx 5.846,\ \sqrt{30} \approx 5.477,\ -\frac{84}{25} = -3.360$$

$$-8.2\overline{83} \approx -8.284,\ \pi^2 \approx 9.870$$

b) Order the real numbers from least to greatest using the symbol <.

Solution

Ordering the real numbers from least to greatest,

$$-8.2\overline{83} < -\frac{84}{25} < \sqrt{30} < 5\frac{11}{13} < \pi^2$$

c) Locate each real number approximately on the real number line.

Solution

Order real numbers on the real number line.

Your Turn $208\frac{12}{19}$

a) 🖩 Represent each real number in decimal form with 3 decimal places.

b) Order the real numbers from least to greatest using the symbol $<$.

c) Locate each real number approximately on the real number line.

Lesson 1.3 Introducing Irrational Numbers

Independent Practice #1-9

Practice 1.4

Use a calculator. Compare each pair of real numbers using either **<** or **>**.

1 $\sqrt{18}$ and $\sqrt{19}$

2 -2.23 and $-\sqrt{5}$

3 6.1640 and $\sqrt{38}$

4 -87.09812 and $-87.098126\ldots$

✓ Lesson Check *#1 & 7*
(can locate positive & negative irrational numbers on the number line using approximation)

Lesson 1.3 Introducing Irrational Numbers

Finding Irrational Numbers
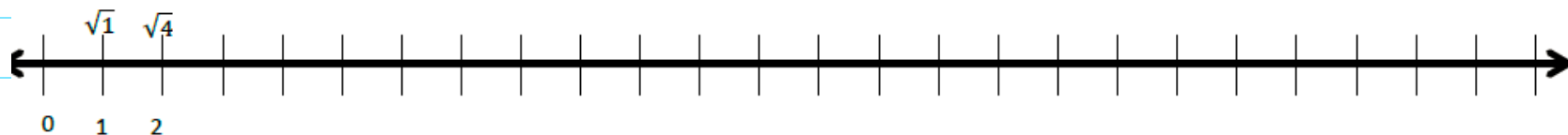### Without a Calculator

Name: _____ Date: _____ Period: _____

Estimating Square Roots

Directions:
---On the bottom of the number line label from 0 – 25.
---On the top of the number line label with square roots.

$\sqrt{1}$ $\sqrt{4}$

0   1   2

Identify which two whole numbers the following square roots fall between. (Example: $\sqrt{2}$ falls between the numbers 1 and 2)

1.) $\sqrt{42}$ _____

2.) $\sqrt{94}$ _____

3.) $\sqrt{10}$ _____

4.) $\sqrt{200}$ _____

5.) $\sqrt{21}$ _____

6.) $\sqrt{132}$ _____

7.) $\sqrt{287}$ _____

8.) $\sqrt{515}$ _____

9.) $\sqrt{5}$ _____

Understanding of Learning

Ticket Out the Door

Explain what an irrational number is and give examples.