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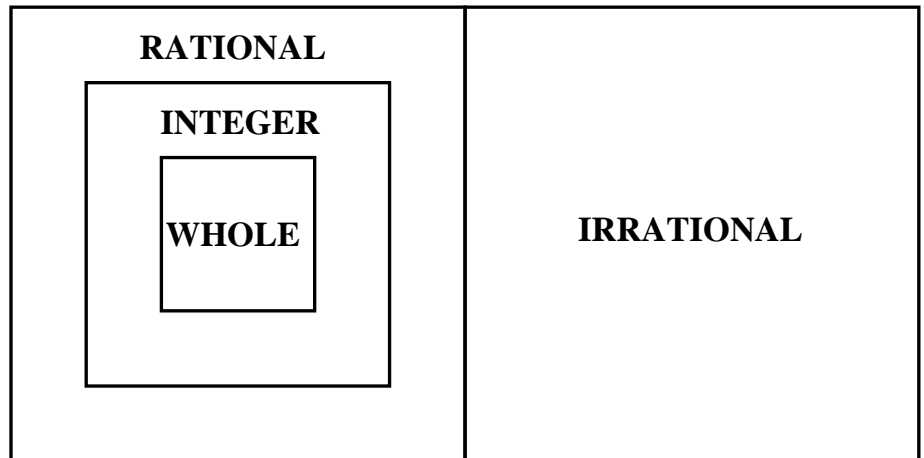
The Real Number System Algebra 1

Algebra is a powerful tool to manipulate standard arithmetic to solve complex problems. At its heart are numbers. To begin our study of algebra, we must first review the **Real Number System**, a system that includes all of the types of numbers that we will work with throughout this course.

The Whole Numbers:

The Integers:

The Rational Numbers:



The Irrational Numbers:

Exercise #1: Which of the following is not an integer?

(1) $\frac{6}{3}$

(2) -17

(3) $\frac{3}{8}$

(4) 42

Exercise #2: Which of the following is an irrational number?

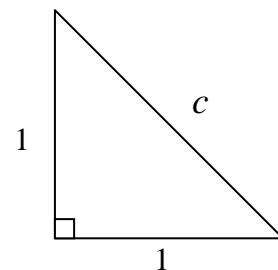
(1) $\sqrt{25}$

(2) $-\frac{1}{2}$

(3) 0

(4) $\sqrt{10}$

Exercise #3: For the following isosceles right triangle, determine the length of its hypotenuse using the Pythagorean Theorem. What type of number is its length?



Oftentimes, it is important to compare rational and irrational numbers. Rational approximations are helpful in this case.

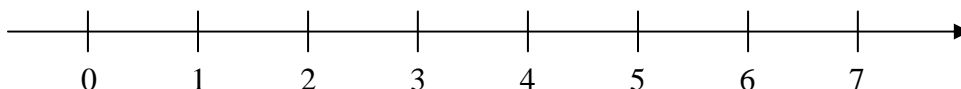
Exercise #4: Determine the value of each of the following variables to the nearest hundredth and then plot the variable on the number line below.

$$w = \frac{\sqrt{79}}{3}$$

$$x = \sqrt{3}$$

$$y = \frac{29}{6}$$

$$z = 2\pi$$



Exercise #5: For each of the following pairs of numbers place a greater than symbol, $>$, or a less than symbol, $<$, to compare the two numbers.

(a) $\frac{133}{8} \square 5\pi$

(b) $-\sqrt{613} \square -\frac{6681}{250}$

(c) $\frac{\sqrt{43}}{7} \square \frac{\pi^2}{10}$

Exercise #6: Rational numbers are ratios of integers (or in other words, division of two integers). We can divide any two integers to get a rational number, except we cannot divide by the integer 0.

(a) Explain why $\frac{6}{3} = 2$ in terms of a multiplication sentence.

(b) Explain why $\frac{28}{4} = 7$ in terms of a multiplication sentence.

(c) Explain why $\frac{10}{0}$ does not exist as any real number considering your answers to (a) and (b).

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The Real Number System Algebra 1 Homework

Skills

1. Which of the following is not an integer?

- (1) -13 (2) $\frac{8}{2}$ (3) $\sqrt{36}$ (4) $\frac{13}{5}$

2. Which of the following is a rational number?

- (1) $\sqrt{5}$ (2) $\frac{\pi}{2}$ (3) $-\frac{3}{2}$ (4) $\sqrt{20}$

3. Which of the following numbers is an integer but not a whole number?

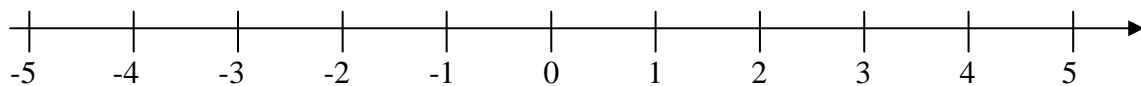
- (1) -5 (2) $\frac{12}{3}$ (3) π (4) 8

4. Which of the following numbers is a rational number but not an integer?

- (1) $\sqrt{12}$ (2) $-\frac{3}{7}$ (3) $\frac{15}{3}$ (4) -6

5. Determine the value of each variable shown below to the nearest *hundredth*. Then, plot the points on the number line.

$$a = \sqrt{14} \qquad b = -\frac{237}{102} \qquad c = \frac{3\pi}{2} \qquad d = \frac{-\sqrt{93}}{3}$$

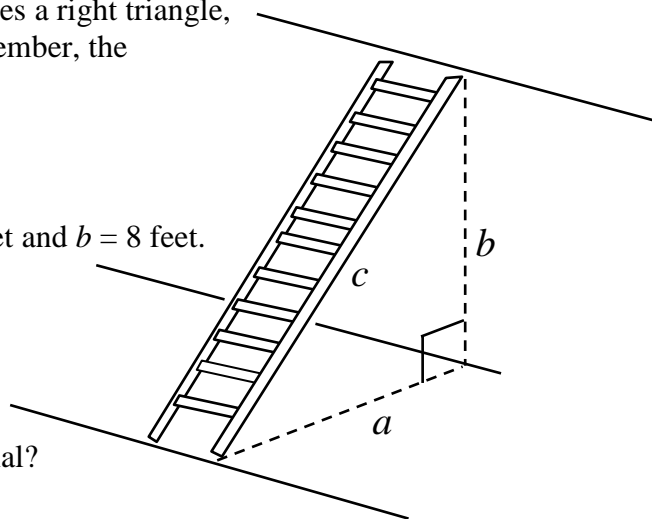


Applications

6. A ladder is leaning against a building such that it creates a right triangle, with the ladder being the triangle's hypotenuse. Remember, the Pythagorean Theorem states:

$$c^2 = a^2 + b^2$$

- (a) Find the length of the length of the ladder if $a = 6$ feet and $b = 8$ feet.



- (b) Is the answer you found in part (a) rational or irrational?
- (c) Suppose $a = 4$ feet and $b = 6$ feet. Is the value of c a rational or irrational number? Explain.

Reasoning

7. Use your calculator to evaluate the right and left hand sides of each equations. Round to the nearest hundredth when necessary. Then, answer the questions asked.

- (a) Which of the following statements is true?

$$\sqrt{2} + \sqrt{8} = \sqrt{10} \quad \text{or} \quad \sqrt{2} \times \sqrt{8} = \sqrt{16}$$

- (b) Which of the following statements is true?

$$\sqrt{4} + \sqrt{9} = \sqrt{13} \quad \text{or} \quad \sqrt{4} \times \sqrt{9} = \sqrt{36}$$

- (c) Generalize by placing either an equals sign, $=$, or a not equals sign, \neq , in the box between each general statement.

$$\sqrt{a} + \sqrt{b} \quad \square \quad \sqrt{a+b}$$

$$\sqrt{a} \times \sqrt{b} \quad \square \quad \sqrt{a \times b}$$