
NAME ______________________________

**Module 1** Getting Ready for Algebra
**Lesson 1** Defining Sets and Real Numbers

**Identify all the sets of numbers to which each of the following belong.**

**1.** $-7$ integers, rationals, reals

**2.** 0 whole numbers, integers, rationals, reals

**3.** $3\frac{2}{5}$ rationals, reals

**4.** $\frac{\pi}{3}$ irrationals, reals

**If possible, give an example of a number that is . . .** possible answers given

**5.** an integer but not a natural number. $-7$

**6.** both a natural number and an irrational number. not possible

**7.** both an irrational number and a real number. $\pi$

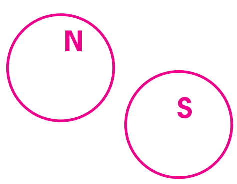
**8.** both an integer and an irrational number. not possible

**9.** an integer but not a rational number. not possible

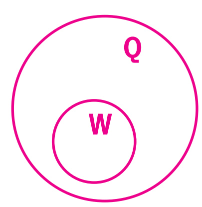
**10.** a rational number but not a whole number. $3\frac{2}{5}$

**Draw a Venn diagram to show the relationship between the following sets of numbers:**

**11.** Irrational numbers and natural numbers

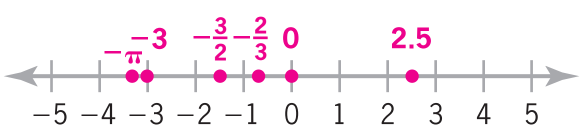



**12.** Rational numbers and whole numbers

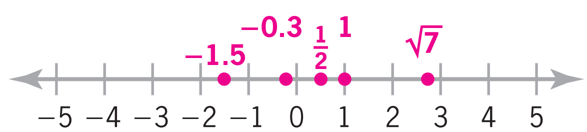



**Graph the numbers on the number line provided.**

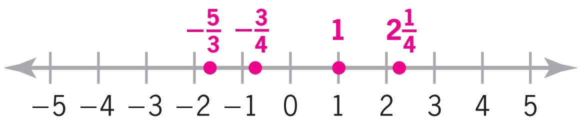
**13.** $0, 2.5, -3, -\frac{2}{3}, -\frac{3}{2},$ and $-\pi$



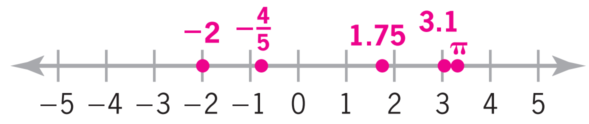

**14.** $\frac{1}{2}, 1, -0.3, \sqrt{7},$ and $-1.5$



**15.** $-\frac{3}{4}$, 1, $-\frac{5}{3}$, and $2\frac{1}{4}$




**16.** −2, 1.75, $-\frac{4}{5}$, 3.1, and $\pi$




**Determine whether each statement is *true* or *false*. If a statement is false, provide an example showing it is false.**

**17.** The quotient of two non-zero integers is also an integer. **False, $2 \div 5 = \frac{2}{5}$**

**18.** The product of two rational numbers is also a rational number. **True**

**19.** The sum of two rational numbers is also a rational number. **True**

**20.** The sum of two irrational numbers is also an irrational number. **False, $-\sqrt{7} + \sqrt{7} = 0$**

**To describe each of the following examples, identify the most reasonable set of numbers from which to choose.**

**21.** Fahrenheit temperatures: **integers**

**22.** The number of siblings someone has: **whole numbers**

**23.** Number of children in a family: **natural numbers**

**24.** Celsius temperatures: **integers**

**25.** Number of yards gained on a football play: **whole numbers**

**26.** U.S. highway speed limits in mph: **natural numbers**

**27.** Average number of yards gained per carry: **rationals**

**28.** Height of a plant in millimeters: **natural numbers**

**29.** A family's checking account balance: **rationals**

**30.** Length of your foot in centimeters: **rationals**

## Journal

1. In 25 words or less, explain how the set of whole numbers and the set of integers are similar and how they are different.
2. Give an example of a situation in which you would rather use decimal numbers for computation. Give an example of a situation in which you would rather use fractions for computation.
3. Explain what is meant by saying the set of rational numbers and the set of irrational numbers are *disjoint* sets.
4. Explain what you would say to your parent to show that the set of integers is a subset of the set of rational numbers.
5. Your parent says that natural numbers best describe weight, but a grocer says that rational numbers are best to describe weight. Explain why both answers can be correct.

## Calculator Problems

The set of real numbers contains the set of rational numbers and the set of irrational numbers. A square root can be either rational or irrational.

A square root is **rational** if its radicand is a perfect square. For example:

$\sqrt{9}$ is rational because 9 is a perfect square. $\sqrt{9} = \sqrt{3 \cdot 3} = \sqrt{3^2} = 3$.

$\sqrt{\frac{9}{16}}$ is rational because $\frac{9}{16}$ is a perfect square. $\sqrt{\frac{9}{16}} = \sqrt{\frac{3 \cdot 3}{4 \cdot 4}} = \sqrt{\frac{3^2}{4^2}} = \frac{3}{4}$.

A square root is **irrational** if its radicand is not a perfect square. For example:

$\sqrt{7}$ is irrational because 7 is not a perfect square (there is no rational number that can be squared to get 7).

$\sqrt{\frac{11}{16}}$ is irrational because $\frac{11}{16}$ is not a perfect square (there is no rational number that can be squared to get $\frac{11}{16}$).

Use a calculator to find whole number or decimal representations for square roots. For example:

Rational square roots:

$\sqrt{9} = 3$ (exact)

$\sqrt{\frac{9}{16}} = \frac{3}{4} = 0.75$ (exact)

$\sqrt{\frac{16}{81}} = \frac{4}{9} \approx 0.4444$ (an approximation for a repeating decimal, rounded to the nearest ten thousandth)

$\sqrt{\frac{16}{121}} = \frac{4}{11} \approx 0.3636$ (an approximation for a repeating decimal, rounded to the nearest ten thousandth)

Irrational square roots:

$\sqrt{7} \approx 2.6458$ (an approximation for a nonrepeating, nonterminating decimal, rounded to the nearest ten thousandth)

$\sqrt{\frac{11}{16}} \approx 0.8292$ (an approximation for a nonrepeating, nonterminating decimal, rounded to the nearest ten thousandth)

**Use a calculator to find a decimal representation for each of the following rational numbers. Round to the nearest ten thousandth if rounding is necessary.**

**1.** $\sqrt{100}$ 10

**2.** $\sqrt{\frac{1}{16}}$ 0.25

**3.** $\sqrt{\frac{49}{121}}$ 0.6364

**4.** $\sqrt{169}$ 13

**5.** $\sqrt{\frac{7}{7}}$ 1

**Use a calculator to find a decimal representation for each of the following irrational numbers. Round to the nearest ten thousandth if rounding is necessary.**

**1.** $\sqrt{8}$ 2.8284

**2.** $\sqrt{\frac{9}{11}}$ 0.9045

**3.** $\sqrt{\frac{22}{21}}$ 1.0235

**4.** $\sqrt{51}$ 7.1414

**5.** $\sqrt{23.29}$ 4.8260

## Cumulative Review

**Simplify.**

1. $23.3 + 5.79$ **29.09**
2. $17.41 - 2.93$ **14.48**
3. $10.1 - 3.28$ **6.82**
4. $2.5 \cdot 0.36$ **0.9**
5. $1.2 \div 0.03$ **40**
6. $3\frac{4}{5} - 2\frac{1}{5}$ $1\frac{3}{5}$
7. $2\frac{1}{8} + 3\frac{3}{4}$ $5\frac{7}{8}$
8. $3\frac{1}{5} - 1\frac{3}{5}$ $1\frac{3}{5}$
9. $1\frac{3}{4} \div 3\frac{1}{2}$ $\frac{1}{2}$
10. $1\frac{3}{4} \cdot 1\frac{1}{3}$ $\frac{7}{3}$ **or** $2\frac{1}{3}$

**Possible Journal Responses**

1. **Both whole numbers and integers contain the numbers 0, 1, 2, ... Integers, however, contain the opposites of the whole numbers, such as –1, –2, –3, ..., which the whole numbers do not contain.**
2. **If I needed to find the average of a set of numbers, I would prefer to use decimal numbers in order to avoid addition of fractions. For example, the average of 3.3, 25.36, 21.22, and 0.24 is**

$$\frac{3.3 + 25.36 + 21.22 + 0.24}{4} = \frac{50.12}{4} = 12.53.$$

**If I needed to perform multiplication, I would prefer to have the numbers in fraction form in order not to lose accuracy in calculation. For example:**

$$\frac{33}{2} \cdot 6 = 99 \text{ or } \frac{18}{49} \cdot \frac{21}{6} = \frac{9}{7}$$

3. **There is no number that is both rational and irrational. Therefore, the set of rational numbers and the set of irrational numbers have no common elements.**
4. **Any integer $a$ can be written in the form $\frac{a}{1}$. Therefore, every integer is a rational number.**
5. **If your parent uses a typical household scale, then the reading is in natural numbers. The grocer, however, would like to sell items of any size, not just in natural number denominations. So, the grocer will use rational numbers to weigh the items.**