

## 1-2 Properties of Real Numbers

Name the sets of numbers to which each number belongs.

18.  $-\frac{4}{3}$

**SOLUTION:**

The number  $-\frac{4}{3}$  is a real number. Since  $-\frac{4}{3}$  can be expressed as a ratio  $\frac{a}{b}$  where  $a$  and  $b$  are integers and  $b$  is not 0 it is also a rational number. It is not a part of the set  $\{\dots-2, -1, 0, 1, 2, \dots\}$  so it is not an integer. Since it is not a part of the set  $\{\dots 0, 1, 2, 3, \dots\}$  it is not a whole number or a natural number.  
Q, R

20.  $\sqrt{25}$

**SOLUTION:**

Since  $\sqrt{25} = 5$ , this is a real number. Since 5 can be expressed as a ratio  $\frac{a}{b}$  where  $a$  and  $b$  are integers and  $b$  is not 0 it is also a rational number. It is part of the set  $\{\dots-2, -1, 0, 1, 2, \dots\}$  so it is an integer. It is part of the set  $\{\dots 0, 1, 2, 3, \dots\}$  so it is a whole number and since it is not 0 it is also a natural number.  
N, W, Z, Q, R

22.  $\frac{9}{3}$

**SOLUTION:**

The number  $\frac{9}{3} = 3$  and is a real number. Since 3 can be expressed as a ratio  $\frac{a}{b}$  where  $a$  and  $b$  are integers and  $b$  is not 0 it is also a rational number. It is part of the set  $\{\dots-2, -1, 0, 1, 2, \dots\}$  so it is an integer. It is part of the set  $\{\dots 0, 1, 2, 3, \dots\}$  so it is a whole number and since it is not 0 it is also a natural number.  
N, W, Z, Q, R

24.  $\frac{21}{7}$

**SOLUTION:**

The number  $\frac{21}{7} = 3$  and is a real number. Since 3 can be expressed as a ratio  $\frac{a}{b}$  where  $a$  and  $b$  are integers and  $b$  is not 0 it is also a rational number. It is part of the set  $\{\dots-2, -1, 0, 1, 2, \dots\}$  so it is an integer. It is part of the set  $\{\dots 0, 1, 2, 3, \dots\}$  so it is a whole number and since it is not 0 it is also a natural number.  
N, W, Z, Q, R

Name the property illustrated by each equation.

26.  $-7y + 7y = 0$

**SOLUTION:**

Additive Inverse Property; the Additive Inverse Property states that a number added to its opposite is zero.

Find the additive inverse and multiplicative inverse for each number.

30.  $-8$

**SOLUTION:**

Since  $-8 + 8 = 0$ , the additive inverse of  $-8$  is 8.

Since  $-8 \left( -\frac{1}{8} \right) = 1$ , the multiplicative inverse of  $-8$  is

$$-\frac{1}{8}.$$

32.  $-0.25$

**SOLUTION:**

Since  $-0.25 + 0.25 = 0$ , the additive inverse of  $-0.25$  is 0.25.

Since  $-0.25 \left( -\frac{1}{0.25} \right) = -0.25(-4) = 1$ , the multiplicative inverse of  $-0.25$  is  $-4$ .

## 1-2 Properties of Real Numbers

34.  $-\frac{3}{8}$

**SOLUTION:**

Since  $-\frac{3}{8} + \frac{3}{8} = 0$ , the additive inverse of  $-\frac{3}{8}$  is  $\frac{3}{8}$ .

Since  $-\frac{3}{8} \left(-\frac{8}{3}\right) = 1$ , the multiplicative inverse of  $-\frac{3}{8}$  is  $-\frac{8}{3}$ .

36. **CONSTRUCTION** Jorge needs two different kinds of concrete: quick drying and slow drying. The quick-drying concrete mix calls for  $2\frac{1}{2}$  pounds of dry cement, and the slow-drying concrete mix calls for  $1\frac{1}{4}$  pounds of dry cement. He needs 5 times more quick-drying concrete and 3 times more slow-drying concrete than the mixes make.

a. How many pounds of dry cement mix will he need?

b. Use the properties of real numbers to show how Jorge could compute this amount mentally. Justify each step.

**SOLUTION:**

a. Write an expression. Jorge needs 5 times the amount of dry cement,  $2\frac{1}{2}$ , for the quick-drying mix plus 3 times the amount of dry cement,  $1\frac{1}{4}$ , for the slow-drying mix.

$$\begin{aligned} 5\left(2\frac{1}{2}\right) + 3\left(1\frac{1}{4}\right) &= 5\left(\frac{5}{2}\right) + 3\left(\frac{5}{4}\right) \\ &= \frac{(5)(5)}{2} + \frac{(3)(5)}{4} \\ &= \frac{25}{2} + \frac{15}{4} \\ &= \frac{25(2) + 15}{4} \\ &= \frac{50 + 15}{4} \\ &= \frac{65}{4} \\ &= 16\frac{1}{4} \end{aligned}$$

He will need  $16\frac{1}{4}$  pounds of dry cement.

b.

$$\begin{aligned} &5\left(2\frac{1}{2}\right) + 3\left(1\frac{1}{4}\right) \\ &= 5\left(2 + \frac{1}{2}\right) + 3\left(1 + \frac{1}{4}\right) && \text{Definition of a mixed number} \\ &= 5(2) + 5\left(\frac{1}{2}\right) + 3(1) + 3\left(\frac{1}{4}\right) && \text{Distributive Property} \\ &= 10 + \frac{5}{2} + 3 + \frac{3}{4} && \text{Multiply.} \\ &= 10 + 3 + \frac{5}{2} + \frac{3}{4} && \text{Commutative Property (+)} \\ &= 13 + \frac{5}{2} + \frac{3}{4} && \text{Add.} \\ &= 13 + \left(\frac{5}{2} + \frac{3}{4}\right) && \text{Associative Property (+)} \\ &= 13 + 3\frac{1}{4} \text{ or } 16\frac{1}{4} && \text{Add.} \end{aligned}$$

**Simplify each expression.**

38.  $-2a + 9d - 5a - 6d$

**SOLUTION:**

$$\begin{aligned} -2a + 9d - 5a - 6d &= -2a - 5a + 9d - 6d \\ &= (-2 - 5)a + (9 - 6)d \\ &= -7a + 3d \end{aligned}$$