

## Section P.3 Properties of Real Numbers

1.  $3 + (-5) = -5 + 3$   
Commutative Property of Addition
3.  $25 - 25 = 0$   
Additive Inverse Property
5.  $6(-10) = -10(6)$   
Commutative Property of Multiplication
7.  $7 \cdot 1 = 7$   
Multiplicative Identity Property
9.  $25 + 35 = 35 + 25$   
Commutative Property of Addition
11.  $3 + (12 - 9) = (3 + 12) - 9$   
Associative Property of Addition
13.  $(8 - 5)(10) = 8 \cdot 10 - 5 \cdot 10$   
Distributive Property
15.  $(10 + 8) + 3 = 10 + (8 + 3)$   
Associative Property of Addition
17.  $5(2a) = (5 \cdot 2)a$   
Associative Property of Multiplication
19.  $1 \cdot (5t) = 5t$   
Multiplicative Identity Property
21.  $3x + 0 = 3x$   
Additive Identity Property
23.  $4 + (3 - x) = (4 + 3) - x$   
Associative Property of Addition
25.  $3(6 + b) = 3 \cdot 6 + 3 \cdot b$   
Distributive Property
27.  $6(x + 3) = 6 \cdot x + 6 \cdot 3$   
Distributive Property
29.  $3(6y) = (3 \cdot 6)y$
31.  $15(-3) = (-3)15$
33.  $5(6 + z) = 5 \cdot 6 + 5 \cdot z$
35.  $25 + (-x) = (-x) + 25$
37.  $(x + 8) \cdot 1 = (x + 8)$
39. (a) Additive Inverse:  $-10$   
(b) Multiplicative Inverse:  $\frac{1}{10}$
41. (a) Additive Inverse:  $16$   
(b) Multiplicative Inverse:  $-\frac{1}{16}$
43. (a) Additive Inverse:  $-6z$   
(b) Multiplicative Inverse:  $\frac{1}{6z}$
45. (a) Additive Inverse:  $-(x + 1)$  or  $-x - 1$   
(b) Multiplicative Inverse:  $\frac{1}{x + 1}$
47.  $(x + 5) - 3 = x + (5 - 3)$
49.  $32 + (4 + y) = (32 + 4) + y$
51.  $3(4 \cdot 5) = (3 \cdot 4)5$
53.  $6(2y) = (6 \cdot 2) \cdot y = 12y$
55.  $20(2 + 5) = 20 \cdot 2 + 20 \cdot 5$
57.  $5(3x - 4) = 5 \cdot 3x - 5 \cdot 4$  or  $5 \cdot 3x + 5 \cdot -4$
59.  $(x + 6)(-2) = x \cdot (-2) + 6 \cdot (-2)$
61.  $-6(2y - 5) = -6(2y) + (-6)(-5)$
63.  $3(x + 5) = 3x + 15$
65.  $-2(x + 8) = -2x - 16$
67.  $ac = bc, c \neq 0$  Original equation  
 $\frac{1}{c}(ac) = \frac{1}{c}(bc)$  Multiplication Property of Equality  
 $\frac{1}{c}(ca) = \frac{1}{c}(cb)$  Commutative Property of Multiplication  
 $\left(\frac{1}{c} \cdot c\right)a = \left(\frac{1}{c} \cdot c\right)b$  Associative Property of Multiplication  
 $1 \cdot a = 1 \cdot b$  Multiplicative Inverse Property  
 $a = b$  Multiplicative Identity Property

69.  $x + 5 = 3$  Original Equation  
 $(x + 5) + (-5) = 3 + (-5)$  Addition Property of Equality  
 $x + (5 + (-5)) = 3 - 5$  Associative Property of Addition  
 $x + 0 = -2$  Additive Inverse Property  
 $x = -2$  Additive Identity Property
71.  $2x - 5 = 6$  Original equation  
 $(2x - 5) + 5 = 6 + 5$  Addition Property of Equality  
 $2x + (-5 + 5) = 11$  Associative Property of Addition  
 $2x + 0 = 11$  Additive Inverse Property  
 $2x = 11$  Additive Identity Property  
 $\frac{1}{2}(2x) = \frac{1}{2}(11)$  Multiplication Property of Equality  
 $(\frac{1}{2} \cdot 2)x = \frac{11}{2}$  Associative Property of Multiplication  
 $1 \cdot x = \frac{11}{2}$  Multiplicative Inverse Property  
 $x = \frac{11}{2}$  Multiplicative Identity Property
73.  $16(1.75) = 16(2 - \frac{1}{4}) = 16(2) - 16(\frac{1}{4})$   
 $= 32 - 4$   
 $= 28$
75.  $7(62) = 7(60 + 2)$   
 $= 7(60) + 7(2)$   
 $= 420 + 14$   
 $= 434$
77.  $9(6.98) = 9(7 - 0.02)$   
 $= 9(7) - 9(0.02)$   
 $= 63 - 0.18$   
 $= 62.82$
79.  $a(b + c) = ab + ac$ , Distributive Property
81. Use the graph to approximate the dividend paid in 1995.  
 According to the graph, the dividend paid in 1995 was approximately \$0.60.
83. Dividend per share =  $0.08t + 0.21$   
 2000 dividend per share =  $0.08(10) + 0.21 = \$1.01$
85. Given two real numbers  $a$  and  $b$ , the sum  $a$  plus  $b$  is the same as the sum  $b$  plus  $a$ .
87. The multiplicative inverse of a real number  $a(a \neq 0)$  is the number  $\frac{1}{a}$ . The product of a number and its multiplicative inverse is the multiplicative identity 1. For example,  $8 \cdot \frac{1}{8} = 1$ .
89.  $0 \cdot a = 0$  is the Multiplicative Property of zero.

91. let  $a = 1$  &  $b = 2$ 

$$a \odot b \neq b \odot a$$

$$1 \odot 2 \neq 2 \odot 1$$

$$2 \cdot 1 + 2 \neq 2 \cdot 2 + 1$$

$$4 \neq 5$$

So, the Commutative Property is not true.

let  $a = 1, b = 2, c = 3$ 

$$a \odot (b \odot c) \neq (a \odot b) \odot c$$

$$1 \odot (2 \odot 3) \neq (1 \odot 2) \odot 3$$

$$2 \cdot 1 + (2 \cdot 2 + 3) \neq (2 \cdot 1 + 2) \odot 3$$

$$2 + 7 \neq 4 \odot 3$$

$$9 \neq 2 \cdot 4 + 3$$

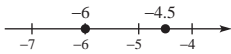
$$9 \neq 8 + 3$$

$$9 \neq 11$$

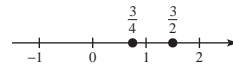
So, the Associative Property is not true.

## Mid-Chapter Quiz for Chapter P

1.  $-4.5 > -6$



2.  $\frac{3}{4} < \frac{3}{2}$



3.  $|-3.2| = 3.2$

4.  $-|5.75| = -5.75$

5.  $|-15 - 7| = |-22| = 22$

6.  $|(-10.5) - (-6.75)| = |-10.5 + 6.75|$   
 $= |-3.75| = 3.75$

7.  $32 + (-18) = 14$

8.  $-10 - 12 = (-10) + (-12) = -(10 + 12) = -22$

9.  $\frac{3}{4} + \frac{7}{4} = \frac{3+7}{4} = \frac{10}{4} = \frac{5}{2}$

10.  $2\frac{2}{3} - \frac{1}{6} = \frac{4}{6} - \frac{1}{6}$   
 $= \frac{4-1}{6} = \frac{3}{6} = \frac{1}{2}$

11.  $(-12)(-4) = 48$

12.  $\left(-\frac{4}{5}\right)\left(\frac{15}{32}\right) = \frac{(-4)(15)}{(5)(32)}$   
 $= \frac{(-4)(15)}{(5)(32)} = -\frac{3}{8}$

13.  $\frac{7}{12} \div \frac{5}{6} = \frac{7}{12} \cdot \frac{6}{5}$   
 $= \frac{(7)(6)}{(12)(5)} = \frac{(7)(\overset{1}{\cancel{6}})}{(\cancel{12})(5)} = \frac{7}{10}$

14.  $\left(-\frac{3}{2}\right)^3 = \left(-\frac{3}{2}\right)\left(-\frac{3}{2}\right)\left(-\frac{3}{2}\right)$   
 $= \frac{(-3)(-3)(-3)}{(2)(2)(2)} = -\frac{27}{8}$

15.  $3 - 2^2 + 25 \div 5 = 3 - 4 + 25 \div 5$   
 $= 3 - 4 + 5$   
 $= -1 + 5$   
 $= 4$

16.  $\frac{18 - 2(3 + 4)}{6^2 - (12 \cdot 2 + 10)} = \frac{18 - 2(7)}{36 - (24 + 10)}$   
 $= \frac{18 - 14}{36 - (34)}$   
 $= \frac{4}{2}$   
 $= 2$

17. (a)  $8(u - 5) = 8 \cdot u - 8 \cdot 5$  Distributive Property

(b)  $10x - 10x = 0$  Additive Inverse Property