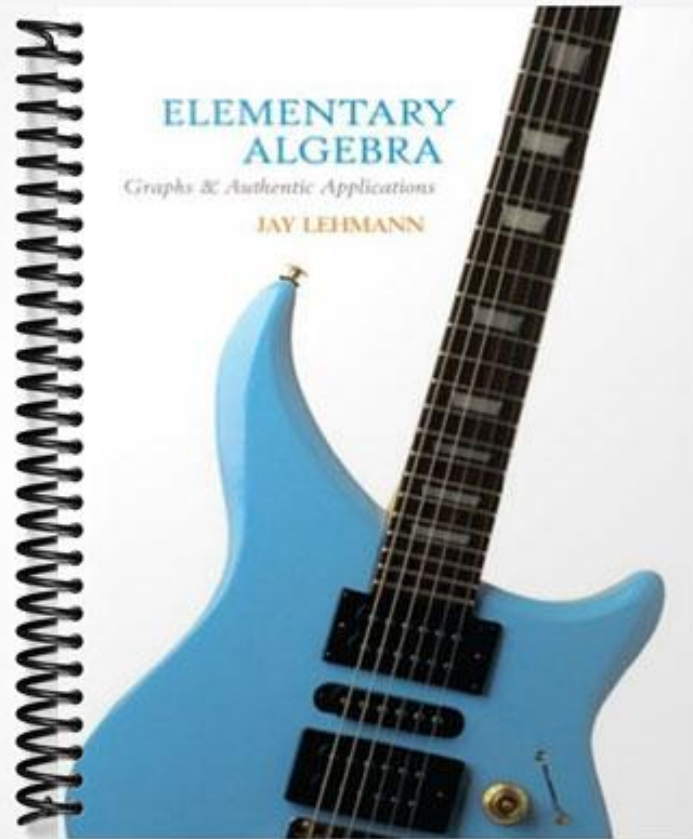


SOLUTIONS MANUAL



Chapter 2

Operations and Expressions

Homework 2.1

2. Substitute 6 for x in $5 + x$:
 $5 + (6) = 11$

4. Substitute 6 for x in $x - 4$:
 $(6) - 4 = 2$

6. Substitute 6 for x in $x(9)$:
 $(6)(9) = 54$

8. Substitute 6 for x in $30 \div x$:
 $30 \div 6 = 5$

10. Substitute 6 for x in $x - x$:
 $(6) - (6) = 0$

12. Substitute 6 for x in $x \div x$:
 $(6) \div (6) = 1$

14. Substitute 160 for w in $w - 7$:
 $(160) - 7 = 153$
 So, the new weight is 153 pounds.

16. Substitute 1791 for c in $c + 695$:
 $1791 + 695 = 2486$
 There were approximately 2486 four-year colleges and universities in 2002.

18. a.

Number of Pairs	Total Cost (dollars)
1	$3 \cdot 1$
2	$3 \cdot 2$
3	$3 \cdot 3$
4	$3 \cdot 4$
<u>n</u>	<u>$3n$</u>

The expression $3n$ represents the total cost of the n pairs of socks.

b. Substitute 9 for n in $3n$:
 $3(9) = 27$

So, the total cost of 9 pairs of socks is \$27.

20. a.

Speed Limit (miles per hour)	Driving Speed (miles per hour)
35	$35 + 5$
40	$40 + 5$
45	$45 + 5$
50	$50 + 5$
<u>s</u>	<u>$s + 5$</u>

The expression $s + 5$ represents the driving speed if the speed limit is s miles per hour.

b. Substitute 65 for s in $s + 5$:
 $65 + 5 = 70$
 So, if the speed limit is 65 miles per hour, the person will be driving 70 miles per hour.

22. a.

Width (feet)	Area (square feet)
1	$20 \cdot 1$
2	$20 \cdot 2$
3	$20 \cdot 3$
4	$20 \cdot 4$
<u>w</u>	<u>$20w$</u>

The expression $20w$ represents the area of the garden (in square feet) if the width is w feet.

b. Substitute 10 for w in $20w$:
 $20(10) = 200$
 So, the area of the garden will be 200 square feet if the width is 10 feet.

24. $8 - x$
 Substitute 8 for x in $8 - x$:
 $8 - (8) = 0$

26. $6 + x$
 Substitute 8 for x in $6 + x$:
 $6 + (8) = 14$

28. $x + 15$
 Substitute 8 for x in $x + 15$:
 $(8) + 15 = 23$

Homework 2.1: Expressions

30. $x - 7$
Substitute 8 for x in $x - 7$:
 $(8) - 7 = 1$
32. $5x$
Substitute 8 for x in $5x$:
 $5(8) = 40$
34. The quotient of 6 and the number.
36. Two less than the number.
38. 4 more than the number.
40. The product of the number and 5.
42. The sum of the number and 3.
44. The quotient of the number and 5.
46. Substitute 6 for x and 3 for y in the expression $y + x$:
 $(3) + (6) = 9$
48. Substitute 6 for x and 3 for y in the expression xy :
 $(6)(3) = 18$
50. Substitute 6 for x and 3 for y in the expression $x \div y$:
 $6 \div 3 = 2$
52. $x + y$
Substitute 9 for x and 3 for y in the expression $x + y$:
 $(9) + (3) = 12$
54. $x \div y$
Substitute 9 for x and 3 for y in the expression $x \div y$:
 $(9) \div (3) = 3$
56. Substitute 3758 for b and 994 for d in the expression $b - d$:
 $(3758) - (994) = 2764$
So, the new balance is \$2764 after a check is written for \$994.
58. Substitute 9000 for T and 20 for n in the expression $T \div n$:
 $9000 \div 20 = 450$
So, if 20 students go on a ski trip that costs \$9000, the cost per student is \$450.
60. Substitute 505 for E and 7 for t (1999 is 7 years after 1992) in the expression $E + t$.
 $505 + 7 = 512$
So, if the average verbal score was 505 points in 1999, the average math score was 512.
62. a. $\frac{n}{1} \quad \frac{3n}{3 \cdot 1 = 3}$
 $\frac{n}{2} \quad \frac{3n}{3 \cdot 2 = 6}$
 $\frac{n}{3} \quad \frac{3n}{3 \cdot 3 = 9}$
 $\frac{n}{4} \quad \frac{3n}{3 \cdot 4 = 12}$
So, the cost of 1, 2, 3, or 4 loaves is \$3, \$6, \$9, or \$12, respectively.
- b. Each loaf costs \$3. The price per loaf is a constant while the number of loaves is a variable. In the expression $3n$, the constant is 3 and the variable is n .
- c. Answers may vary. For each additional loaf purchased, the total cost increases by \$3.
64. a. $\frac{t}{1} \quad \frac{2t}{2 \cdot 1 = 2}$
 $\frac{t}{2} \quad \frac{2t}{2 \cdot 2 = 4}$
 $\frac{t}{3} \quad \frac{2t}{2 \cdot 3 = 6}$
 $\frac{t}{4} \quad \frac{2t}{2 \cdot 4 = 8}$
So, the elevator rises 2, 4, 6, or 8 yards after 1, 2, 3, or 4 seconds, respectively.
- b. The elevator is rising at a rate of 2 yards per second. The speed is a constant while the number of seconds rising is a variable. In the expression, $2t$, the constant is 2 and the variable is t .
- c. Answers may vary. For each additional second the elevator rises, the total distance risen increases by 2 yards.
66. Answers may vary.
68. Answers may vary.

Homework 2.2

2. The numerator of $\frac{2}{5}$ is 2.

4. $18 = 2 \cdot 9$
 $= 2 \cdot (3 \cdot 3)$
 $= 2 \cdot 3 \cdot 3$

6. $24 = 4 \cdot 6$
 $= (2 \cdot 2) \cdot (2 \cdot 3)$
 $= 2 \cdot 2 \cdot 2 \cdot 3$

8. $27 = 3 \cdot 9$
 $= 3 \cdot (3 \cdot 3)$
 $= 3 \cdot 3 \cdot 3$

10. $105 = 5 \cdot 21$
 $= 5 \cdot (3 \cdot 7)$
 $= 3 \cdot 5 \cdot 7$

12. $\frac{10}{14} = \frac{2 \cdot 5}{2 \cdot 7} = \frac{2}{2} \cdot \frac{5}{7} = \frac{5}{7}$

14. $\frac{7}{28} = \frac{7 \cdot 1}{7 \cdot 4} = \frac{7}{7} \cdot \frac{1}{4} = \frac{1}{4}$

16. $\frac{27}{54} = \frac{3 \cdot 3 \cdot 3}{3 \cdot 3 \cdot 3 \cdot 2} = \frac{3 \cdot 3 \cdot 3}{3 \cdot 3 \cdot 3} \cdot \frac{1}{2} = \frac{1}{2}$

18. $\frac{49}{63} = \frac{7 \cdot 7}{7 \cdot 3 \cdot 3} = \frac{7}{7} \cdot \frac{7}{3 \cdot 3} = \frac{7}{3 \cdot 3} = \frac{7}{9}$

20. $\frac{9}{81} = \frac{3 \cdot 3}{3 \cdot 3 \cdot 3 \cdot 3} = \frac{3 \cdot 3}{3 \cdot 3} \cdot \frac{1}{3 \cdot 3} = \frac{1}{3 \cdot 3} = \frac{1}{9}$

22. $\frac{15}{18} = \frac{3 \cdot 5}{3 \cdot 3 \cdot 2} = \frac{3}{3} \cdot \frac{5}{3 \cdot 2} = \frac{5}{3 \cdot 2} = \frac{5}{6}$

24. $\frac{6}{7} \cdot \frac{4}{9} = \frac{6 \cdot 4}{7 \cdot 9} = \frac{2 \cdot 3 \cdot 2 \cdot 2}{7 \cdot 3 \cdot 3} = \frac{2 \cdot 2 \cdot 2}{7 \cdot 3} = \frac{8}{21}$

26. $\frac{2}{3} \cdot \frac{5}{6} = \frac{2 \cdot 5}{3 \cdot 6} = \frac{2 \cdot 5}{3 \cdot 2 \cdot 3} = \frac{5}{3 \cdot 3} = \frac{5}{9}$

28. $\frac{5}{12} \cdot 2 = \frac{5}{12} \cdot \frac{2}{1} = \frac{5 \cdot 2}{2 \cdot 2 \cdot 3} = \frac{5}{2 \cdot 3} = \frac{5}{6}$

30. $\frac{7}{12} \div \frac{2}{3} = \frac{7}{12} \cdot \frac{3}{2} = \frac{7 \cdot 3}{12 \cdot 2} = \frac{7 \cdot 3}{2 \cdot 2 \cdot 3 \cdot 2} = \frac{7 \cdot 3}{2 \cdot 2 \cdot 2} = \frac{7}{8}$

32. $\frac{4}{7} \div \frac{8}{3} = \frac{4}{7} \cdot \frac{3}{8} = \frac{4 \cdot 3}{7 \cdot 8} = \frac{2 \cdot 2 \cdot 3}{7 \cdot 2 \cdot 2 \cdot 2} = \frac{3}{7 \cdot 2} = \frac{3}{14}$

34. $\frac{4}{9} \div 2 = \frac{4}{9} \cdot \frac{1}{2} = \frac{4 \cdot 1}{9 \cdot 2} = \frac{2 \cdot 2}{3 \cdot 3 \cdot 2} = \frac{2}{3 \cdot 3} = \frac{2}{9}$

36. $\frac{5}{9} + \frac{2}{9} = \frac{5+2}{9} = \frac{7}{9}$

38. $\frac{2}{15} + \frac{8}{15} = \frac{2+8}{15} = \frac{10}{15} = \frac{2 \cdot 5}{3 \cdot 5} = \frac{2}{3}$

40. $\frac{5}{7} - \frac{2}{7} = \frac{5-2}{7} = \frac{3}{7}$

42. $\frac{13}{18} - \frac{9}{18} = \frac{13-9}{18} = \frac{4}{18} = \frac{2 \cdot 2}{2 \cdot 3 \cdot 3} = \frac{2}{3 \cdot 3} = \frac{2}{9}$

44. The LCD is 9:
 $\frac{1}{3} + \frac{5}{9} = \frac{1}{3} \cdot \frac{3}{3} + \frac{5}{9} = \frac{3}{9} + \frac{5}{9} = \frac{8}{9}$

46. The LCD is 24:
 $\frac{3}{8} + \frac{1}{6} = \frac{3}{8} \cdot \frac{3}{3} + \frac{1}{6} \cdot \frac{4}{4} = \frac{9}{24} + \frac{4}{24} = \frac{13}{24}$

48. The LCD is 7:
 $2 + \frac{3}{7} = \frac{2}{1} \cdot \frac{7}{7} + \frac{3}{7} = \frac{14}{7} + \frac{3}{7} = \frac{17}{7}$

50. The LCD is 4:
 $\frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{1}{2} \cdot \frac{2}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4}$

52. The LCD is 42:
 $\frac{5}{6} - \frac{4}{7} = \frac{5}{6} \cdot \frac{7}{7} - \frac{4}{7} \cdot \frac{6}{6} = \frac{35}{42} - \frac{24}{42} = \frac{11}{42}$

54. The LCD is 7:
 $1 - \frac{9}{7} = \frac{1}{1} \cdot \frac{7}{7} - \frac{9}{7} = \frac{7}{7} - \frac{9}{7} = \frac{-2}{7} = -\frac{2}{7}$

56. $\frac{62}{62} = 1$

58. $\frac{215}{1} = 215$

Homework 2.2: Operations with Fractions

60. $\frac{713}{0}$ is undefined since division by 0 is not defined.

62. $\frac{0}{798} = 0$

64. $\frac{173}{190} \cdot \frac{190}{173} = \frac{173 \cdot 190}{173 \cdot 190} = 1$

66. $\frac{345}{917} - \frac{345}{917} = \frac{345 - 345}{917} = \frac{0}{917} = 0$

68. Substitute 3 for x and 12 for z in the expression

$$\frac{z}{x} :$$

$$\frac{12}{3} = \frac{3 \cdot 2 \cdot 2}{3 \cdot 1} = \frac{2 \cdot 2}{1} = \frac{4}{1} = 4$$

70. Substitute 4 for w , 3 for x , 5 for y , and 12 for z in

the expression $\frac{y}{z} \cdot \frac{w}{x}$:

$$\frac{5}{12} \cdot \frac{4}{3} = \frac{5 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 3 \cdot 3} = \frac{5}{3 \cdot 3} = \frac{5}{9}$$

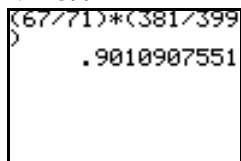
72. Substitute 3 for x , 5 for y , and 12 for z in the

expression $\frac{y}{x} + \frac{y}{z}$: $\frac{5}{3} + \frac{5}{12}$

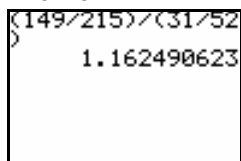
The LCD is 12:

$$\frac{5}{3} + \frac{5}{12} = \frac{5 \cdot 4}{3 \cdot 4} + \frac{5}{12} = \frac{20}{12} + \frac{5}{12} = \frac{25}{12}$$

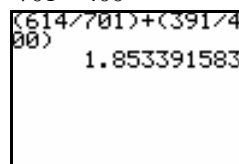
74. $\frac{67}{71} \cdot \frac{381}{399} \approx 0.901$



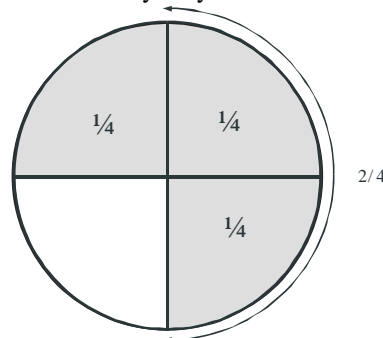
76. $\frac{149}{215} \div \frac{31}{52} \approx 1.162$



78. $\frac{614}{701} + \frac{391}{400} \approx 1.853$



80. Answers may vary.



82. The perimeter of a rectangle is given by the expression $2L + 2W$. Substitute $\frac{2}{3}$ for W and $\frac{3}{4}$ for L in the expression.

$$\begin{aligned} 2 \cdot \frac{3}{4} + 2 \cdot \frac{2}{3} &= \frac{2 \cdot 3}{1 \cdot 4} + \frac{2 \cdot 2}{1 \cdot 3} \\ &= \frac{2 \cdot 3}{2 \cdot 2} + \frac{2 \cdot 2}{3} \\ &= \frac{3}{2} + \frac{4}{3} \end{aligned}$$

The LCD is 6:

$$\frac{3}{2} \cdot \frac{3}{3} + \frac{4}{3} \cdot \frac{2}{2} = \frac{9}{6} + \frac{8}{6} = \frac{17}{6}$$

The perimeter of the picture is $\frac{17}{6}$ feet.

84. Let m = the fraction of income for mortgage and f = the fraction of income for food. The fraction remaining is given by the expression $1 - m - f$. Substitute $\frac{1}{3}$ for m and $\frac{1}{6}$ for f in the expression.

$$\begin{aligned} 1 - m - f &= 1 - \frac{1}{3} - \frac{1}{6} \\ &= \frac{1}{1} - \frac{1}{3} - \frac{1}{6} \\ &= \frac{6}{6} - \frac{2}{6} - \frac{1}{6} \\ &= \frac{6 - 2 - 1}{6} = \frac{3}{6} = \frac{1}{2} \end{aligned}$$

So, $\frac{1}{2}$ of the income remains.

ISM Chapter 2: Operations and Expressions

86. The quotient of 5 and the number.

Total Time (hours)	Cost per Hour (dollars per hour)
2	$45 \div 2$
3	$45 \div 3$
4	$45 \div 4$
5	$45 \div 5$
t	$45 \div t$

So, if a session lasts for t hours, the total cost per hour will be $45 \div t$ dollars.

90. a. i. $\frac{2}{3} \cdot \frac{3}{2} = \frac{2 \cdot 3}{3 \cdot 2} = \frac{6}{6} = 1$

ii. $\frac{4}{7} \cdot \frac{7}{4} = \frac{4 \cdot 7}{7 \cdot 4} = \frac{28}{28} = 1$

iii. $\frac{1}{6} \cdot \frac{6}{1} = \frac{1 \cdot 6}{6 \cdot 1} = \frac{6}{6} = 1$

b. Answers may vary. The product of a fraction and its reciprocal equals 1.

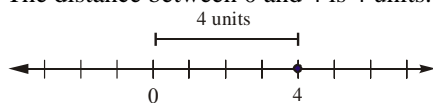
92. Answers may vary. For addition of fractions, one cannot simply add the numerators and denominators. First get a common denominator, then add numerators, keeping the common denominator.

$$\frac{2}{3} + \frac{5}{6} = \frac{2}{3} \cdot \frac{2}{2} + \frac{5}{6} = \frac{4}{6} + \frac{5}{6} = \frac{4+5}{6} = \frac{9}{6} = \frac{3}{2}$$

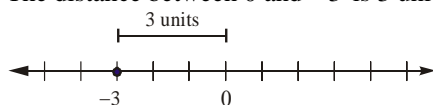
94. Answers may vary. The student should have multiplied the numerator by 3 instead of the denominator. Rewrite 3 as $\frac{3}{1}$ and then multiply across.

$$3 \cdot \frac{7}{2} = \frac{3}{1} \cdot \frac{7}{2} = \frac{3 \cdot 7}{1 \cdot 2} = \frac{21}{2}$$

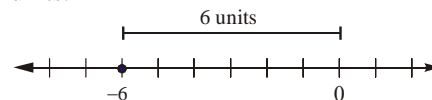
96. a. i. The distance between 0 and 4 is 4 units.



ii. The distance between 0 and -3 is 3 units.



iii. The distance between 0 and -6 is 6 units.



b. The distance between 0 and a number on a number line is equal to the absolute value of the number.

98. a. i. $5 + (-2) = 3$

ii. $7 + (-1) = 6$

iii. $8 + (-3) = 5$

b. When adding two numbers with different signs, if the positive number is farther from 0 on a number line, the result will be positive.

c. i. $2 + (-5) = -3$

ii. $1 + (-7) = -6$

iii. $3 + (-8) = -5$

d. When adding two numbers with different signs, if the positive number is closer to 0 on a number line, the result will be negative.

e. i. $4 + (-4) = 0$

ii. $7 + (-7) = 0$

iii. $9 + (-9) = 0$

f. When adding two numbers with different signs, if the two numbers are the same distance from 0 on a number line, the result will be 0.

g. i. $6 + (-4) = 2$

ii. $3 + (-7) = -4$

iii. $6 + (-6) = 0$

h. When adding two numbers with different signs, take the absolute value of the two numbers and subtract the smaller absolute value from the larger. The sign of the result is the same as the sign of the number with the larger absolute value.

Homework 2.3

2. $-(-9) = 9$
4. $-(-(-2)) = -(2) = -2$
6. $|6| = 6$ because 6 is a distance of 6 units from 0 on a number line.
8. $|-1| = 1$ because -1 is a distance of 1 unit from 0 on a number line.
10. $-|5| = -(5) = -5$
12. $-|-9| = -(9) = -9$
14. The numbers have different signs so subtract the smaller absolute value from the larger.
 $|5| - |-3| = 5 - 3 = 2$
 Since $|5|$ is greater than $|-3|$, the sum is positive.
 $5 + (-3) = 2$
16. The numbers have the same sign so add the absolute values.
 $|-3| + |-2| = 3 + 2 = 5$
 The numbers are negative, so the sum is negative.
 $-3 + (-2) = -5$
18. The numbers have different signs so subtract the smaller absolute value from the larger.
 $|-9| - |6| = 9 - 6 = 3$
 Since $|-9|$ is greater than $|6|$, the sum is negative.
 $6 + (-9) = -3$
20. The numbers have different signs so subtract the smaller absolute value from the larger.
 $|4| - |-3| = 4 - 3 = 1$
 Since $|4|$ is greater than $|-3|$, the sum is positive.
 $-3 + 4 = 1$
22. The numbers have the same sign so add the absolute values.
 $|-9| + |-5| = 9 + 5 = 14$
 The numbers are negative, so the sum is negative.
 $-9 + (-5) = -14$
24. The numbers have different signs so subtract the smaller absolute value from the larger.
 $|8| - |-2| = 8 - 2 = 6$
 Since $|8|$ is greater than $|-2|$, the sum is positive.
 $8 + (-2) = 6$
26. $8 + (-8) = 0$ because the numbers are opposites and the sum of opposites is 0.
28. $-7 + 7 = 0$ because the numbers are opposites and the sum of opposites is 0.
30. The numbers have different signs so subtract the smaller absolute value from the larger.
 $|17| - |-14| = 17 - 14 = 3$
 Since $|17|$ is greater than $|-14|$, the sum is positive.
 $17 + (-14) = 3$
32. The numbers have different signs so subtract the smaller absolute value from the larger.
 $|-89| - |57| = 89 - 57 = 32$
 Since $|-89|$ is greater than $|57|$, the sum is negative.
 $-89 + 57 = -32$
34. The numbers have the same sign so add the absolute values.
 $|-347| + |-594| = 347 + 594 = 941$
 The numbers are negative, so the sum is negative.
 $-347 + (-594) = -941$
36. $127,512 + (-127,512) = 0$ because the numbers are opposites and the sum of opposites is 0.
38. The numbers have the same sign so add the absolute values.
 $|-3.7| + |-9.9| = 3.7 + 9.9 = 13.6$
 The numbers are negative, so the sum is negative.
 $-3.7 + (-9.9) = -13.6$

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- 40.** The numbers have different signs so subtract the smaller absolute value from the larger.

$$|7| - |-0.3| = 7 - 0.3 = 6.7$$

Since $|7|$ is greater than $|-0.3|$, the sum is

positive.

$$-0.3 + 7 = 6.7$$

- 42.** The numbers have different signs so subtract the smaller absolute value from the larger.

$$|37.05| - |-19.26| = 37.05 - 19.26 = 17.79$$

Since $|37.05|$ is greater than $|-19.26|$, the sum is positive.

$$37.05 + (-19.26) = 17.79$$

- 44.** The numbers have different signs so subtract the smaller absolute value from the larger.

$$\left| \frac{2}{5} \right| - \left| -\frac{1}{5} \right| = \frac{2}{5} - \frac{1}{5} = \frac{1}{5}$$

Since $\left| \frac{2}{5} \right|$ is greater than $\left| -\frac{1}{5} \right|$, the sum is

positive.

$$\frac{2}{5} + \left(-\frac{1}{5} \right) = \frac{1}{5}$$

- 46.** The numbers have different signs so subtract the smaller absolute value from the larger.

$$\left| -\frac{5}{6} \right| - \left| \frac{1}{6} \right| = \frac{5}{6} - \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$$

Since $\left| -\frac{5}{6} \right|$ is greater than $\left| \frac{1}{6} \right|$, the sum is

negative.

$$-\frac{5}{6} + \frac{1}{6} = -\frac{2}{3}$$

- 48.** The numbers have the same sign so add the absolute values.

$$\left| -\frac{2}{3} \right| + \left| -\frac{5}{6} \right| = \frac{2}{3} + \frac{5}{6} = \frac{2}{3} \cdot \frac{2}{2} + \frac{5}{6} = \frac{4}{6} + \frac{5}{6} = \frac{9}{6} = \frac{3}{2}$$

The numbers are negative, so the sum is negative.

$$-\frac{2}{3} + \left(-\frac{5}{6} \right) = -\frac{3}{2}$$

- 50.** The numbers have different signs so subtract the smaller absolute value from the larger.

$$\left| -\frac{3}{4} \right| - \left| \frac{2}{3} \right| = \frac{3}{4} - \frac{2}{3} = \frac{3}{4} \cdot \frac{3}{3} - \frac{2}{3} \cdot \frac{4}{4} = \frac{9}{12} - \frac{8}{12} = \frac{1}{12}$$

Since $\left| -\frac{3}{4} \right|$ is greater than $\left| \frac{2}{3} \right|$, the sum is

negative.

$$\frac{2}{3} + \left(-\frac{3}{4} \right) = -\frac{1}{12}$$

52. $-7498.34 + 6435.28 = -1063.06$

54. $-38,487.26 + (-83,205.87) = -121,693.13$

56. $-\frac{37}{642} + \left(-\frac{25}{983} \right) \approx -0.08$

- 58.** Substitute -4 for a and 3 for b in the expression $b + a$ and then find the sum:

$$(3) + (-4) = -4 + 3 = -1$$

- 60.** Substitute 3 for b and -2 for c in the expression $b + c$ and then find the sum:

$$(3) + (-2) = -2 + 3 = 1$$

- 62.** $x + 3$

Substitute -6 for x in the expression and then find the sum:

$$(-6) + 3 = -3$$

- 64.** $x + (-8)$

Substitute -6 for x in the expression and then find the sum:

$$(-6) + (-8) = -14$$

- 66.** The balance is $-112.50 + 170$ dollars.

The numbers have different signs so subtract the smaller absolute value from the larger.

$$|170| - |-112.50| = 170 - 112.50 = 57.50$$

Since $|170|$ is greater than $|-112.50|$, the sum is positive.

$$-112.50 + 170 = 57.50$$

So, the balance is \$57.50.

Homework 2.3: Adding Real Numbers

68. We can find the final balance by finding the balance after each transaction.

Transaction	Balance
Paycheck	$-135.00 + 549.00 = 414.00$
FedEx Kinko's	$414.00 - 10.74 = 403.26$
ATM	$403.26 - 21.50 = 381.76$
Barnes and Noble	$381.76 - 17.19 = 364.57$

So, the final balance is \$364.57.

70. The new balance is $-2739 + 530$.
The numbers have different signs so subtract the smaller absolute value from the larger.

$$|-2739| - |530| = 2739 - 530 = 2209$$

Since $|-2739|$ is greater than $|530|$, the sum is negative.

$$-2739 + 530 = -2209$$

So, the new balance is -2209 dollars.

72. The balance after sending the check is $-873 + 500 = -373$.

The balance after buying the racquet is $-373 + (-249) = -622$.

The balance after buying the outfit is $-622 + (-87) = -709$.

So, the final balance is -709 dollars.

74. The current temperature is $-12 + 8$.
The numbers have different signs so subtract the smaller absolute value from the larger.

$$|-12| - |8| = 12 - 8 = 4$$

Since $|-12|$ is greater than $|8|$, the sum is negative.

$$-12 + 8 = -4$$

So, the current temperature is -4°F .

76. a.
- | Retail Price (dollars) | Sale Price (dollars) |
|------------------------|----------------------|
| 125 | $125 + (-15)$ |
| 150 | $150 + (-15)$ |
| 175 | $175 + (-15)$ |
| 200 | $200 + (-15)$ |
| r | $r + (-15)$ |

From the last row of the table, we see that the expression $r + (-15)$ represents the sale price (in dollars).

- b. Evaluate $r + (-15)$ for $r = 173$.

$$173 + (-15) = 158$$

The sale price is \$158.

78. a.
- | Decrease in Temp ($^\circ\text{F}$) | Current Temp ($^\circ\text{F}$) |
|---------------------------------------|-----------------------------------|
| 1 | $-2 + (-1)$ |
| 2 | $-2 + (-2)$ |
| 3 | $-2 + (-3)$ |
| 4 | $-2 + (-4)$ |
| x | $-2 + (-x)$ |

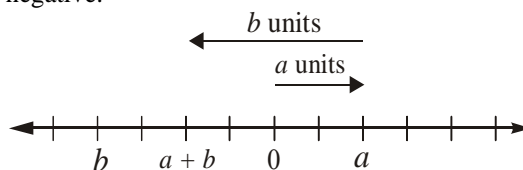
From the last row of the table, we see that the expression $-2 + (-x)$ represents the current temperature (in $^\circ\text{F}$).

- b. Evaluate $-2 + (-x)$ for $x = 7$.

$$-2 + (-7) = -9$$

The current temperature is -9°F .

80. If a is positive and b is negative (but with a larger absolute value), the sum $a + b$ will be negative.



82. If $a + b$ is positive, then both numbers are positive, or the numbers have opposite signs but the number with the larger absolute value is positive.

84. a. Substitute -2 for a and 5 for b :

$$a + b = (-2) + 5 = 3$$

- b. Substitute -2 for a and 5 for b :

$$b + a = 5 + (-2) = 3$$

- c. The results are the same.

- d. Substitute -4 for a and -9 for b :

$$a + b = -4 + (-9) = -13$$

$$b + a = -9 + (-4) = -13$$

The results are the same.

- e. Answers may vary.

- f. Yes; when adding two quantities, the order of the addition does not matter.

ISM Chapter 2: Operations and Expressions

Homework 2.4

2. $3 - 7 = 3 + (-7) = -4$

4. $-3 - 9 = -3 + (-9) = -12$

6. $5 - (-1) = 5 + 1 = 6$

8. $-7 - (-3) = -7 + 3 = -4$

10. $-4 - 7 = -4 + (-7) = -11$

12. $-4 - (-7) = -4 + 7 = 3$

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

16. $-100 - 257 = -100 + (-257) = -357$

18. $-1939 - (-352) = -1939 + 352 = -1587$

20. $5.8 - 3.7 = 5.8 + (-3.7) = 2.1$

22. $-1.7 - 7.4 = -1.7 + (-7.4) = -9.1$

24. $3.1 - (-3.1) = 3.1 + 3.1 = 6.2$

26. $-159.24 - (-7.8) = -159.24 + 7.8 = -151.44$

28. $-\frac{1}{5} - \frac{4}{5} = -\frac{1}{5} + \left(-\frac{4}{5}\right) = -\frac{5}{5} = -1$

30. $-\frac{4}{9} - \left(-\frac{7}{9}\right) = -\frac{4}{9} + \frac{7}{9} = \frac{3}{9} = \frac{1}{3}$

32. $\frac{5}{12} - \left(-\frac{1}{6}\right) = \frac{5}{12} + \frac{1}{6}$
 $= \frac{5}{12} + \frac{1}{6} \cdot \frac{2}{2}$
 $= \frac{5}{12} + \frac{2}{12}$
 $= \frac{7}{12}$

34. $-\frac{2}{3} - \frac{2}{5} = -\frac{2}{3} + \left(-\frac{2}{5}\right)$
 $= -\frac{2}{3} \cdot \frac{5}{5} + \left(-\frac{2}{5} \cdot \frac{3}{3}\right)$
 $= -\frac{10}{15} + \left(-\frac{6}{15}\right)$
 $= -\frac{16}{15}$

36. $-3 + 9 = 6$

38. $-4 - (-3) = -4 + 3 = -1$

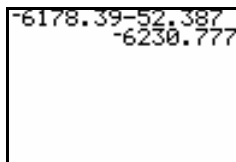
40. $-\frac{5}{6} + \frac{1}{6} = -\frac{4}{6} = -\frac{2}{3}$

42. $-6.4 + 3.5 = -2.9$

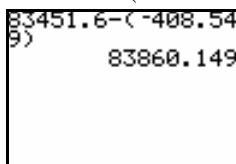
44. $-5 + (-8) = -13$

46. $5 - 9 = 5 + (-9) = -4$

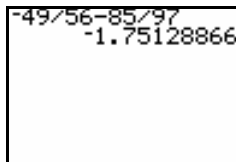
48. $-6178.39 - 52.387 \approx -6230.78$



50. $83,451.6 - (-408.549) \approx 83,860.15$



52. $-\frac{49}{56} - \frac{85}{97} \approx -1.75$



54. $-12 + 18 = 6$

So, the current temperature is 6°F .

56. $-13 - (-2) = -13 + 2 = -11$

The change in temperature is -11°F .

Homework 2.4: Change in a Quantity and Subtracting Real Numbers

58. a. $9 - (-6) = 9 + 6 = 15$

The change in temperature is 15°F .

- b.** To estimate the change in temperature over the past hour, we divide the change over three hours by 3.

$$\frac{15}{3} = 5$$

The estimated change in temperature over the past hour is 5°F .

- c.** Answers may vary. The change in temperature is affected by the time of day in addition to the weather conditions. Thus, temperature change need not be uniform.

60. $29,035 - (-1312) = 29,035 + 1312 = 30,347$

The change in elevation is 30,347 feet.

62. a.

Year	Population	Change in population
1996	40	–
1997	86	$86 - 40 = 46$
1998	112	$112 - 86 = 26$
1999	118	$118 - 112 = 6$
2000	177	$177 - 118 = 59$
2001	218	$218 - 177 = 41$
2002	273	$273 - 218 = 55$

- b.** The greatest increase in population was 59 wolves between 1999 and 2000.
- c.** The smallest change in population was 6 wolves between 1998 and 1999.
- d.** No; the change in population is the difference between births and deaths. An increase of 26 wolves means there were 26 more births than deaths.

64. a.

Years	Changes in Sales (thous. of cars)	Sales (thous. of cars)
1995–1996	42	$340 + 42 = 382$
1996–1997	2	$382 + 2 = 384$
1997–1998	16	$384 + 16 = 400$
1998–1999	3	$400 + 3 = 403$
1999–2000	1	$403 + 1 = 404$
2000–2001	10	$404 + 10 = 414$
2001–2002	–16	$414 + (-16) = 398$
2002–2003	–1	$398 + (-1) = 397$
2003–2004	–12	$397 + (-12) = 385$

So, there were 385 thousand cars sold in 2004.

- b.** Increasing sales are indicated by positive changes. Thus, sales were increasing during the period 1995 – 2001.

- c.** Decreasing sales are indicated by negative changes. Thus, retail sales were decreasing during the period 2001 – 2004.

66. a.

Current Value (dollars)	Change in Value (dollars)
30	$30 - 35$
35	$35 - 35$
40	$40 - 35$
45	$45 - 35$
x	$x - 35$

From the last row of the table, we see that the expression $x - 35$ represents the change in value (in dollars) of the stock.

- b.** Evaluate $x - 35$ for $x = 44$:
 $44 - 35 = 9$
 So, if the current value is \$44, the stock has increased in value by \$9 from last year.

68. a.

Change in Pop.	Current Pop.
10	$10 + 820$
20	$20 + 820$
30	$30 + 820$
40	$40 + 820$
c	$c + 820$

From the last row of the table, we see that the expression $c + 820$ represents the current population.

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- b.** Evaluate $c + 820$ for $c = -25$:
 $-25 + 820 = 795$
So, if the change in population is -25 , the current population would be 795 due to the decrease in population of 25 deer in the past year.
- 70.** The student changed the order of the subtraction without changing the sign of the result.
 $2 - 6 = 2 + (-6) = -4$
- 72. a. i.** $2 - 8 = 2 + (-8) = -6$
ii. $3 - 9 = 3 + (-9) = -6$
iii. $1 - 5 = 1 + (-5) = -4$
- b.** Answers may vary. Since the quantity decreased, the final number is smaller than the beginning number. When finding the change in quantity, we subtract the beginning number from the final number. Since the final number is smaller, the result will be negative.
- 74.** Evaluate $a + c$ for $a = -5$ and $c = -7$:
 $(-5) + (-7) = -12$
- 76.** Evaluate $c - a$ for $a = -5$ and $c = -7$:
 $(-7) - (-5) = -7 + 5 = -2$
- 78.** Evaluate $b - a$ for $a = -5$ and $b = 2$:
 $(2) - (-5) = 2 + 5 = 7$
- 80.** $x - 4$
Evaluate the expression for $x = -5$:
 $-5 - 4 = -5 + (-4) = -9$
- 82.** $x - 5$
Evaluate the expression for $x = -5$:
 $(-5) - 5 = -5 + (-5) = -10$
- 84.** $x - (-6)$
Evaluate the expression for $x = -5$:
 $(-5) - (-6) = -5 + 6 = 1$
- 86. a. i.** $-2(-5) = 10$
ii. $-4(-6) = 24$
iii. $-7(-9) = 63$
- b.** Answers may vary. The results are all positive.
- c.** $-3(-7) = 3(7) = 21$
- d.** Answers may vary. To multiply two negative numbers, multiply their absolute values.
- 88.** Answers may vary. In the first situation, the values were on the same side of 0 on a number line, so we subtract to find the distance between the two values on the number line. In the second situation, the values are on opposite sides of 0 on a number line. In this case, we add the distance each number is from 0 to get the overall distance between the numbers.

Homework 2.5

- 2.** $91\% = 91.0\% = 0.91$
- 4.** $4\% = 4.0\% = 0.04$
- 6.** $0.01 = 1\%$
- 8.** $3.8\% = 0.038$
- 10.** $0.089 = 8.9\%$
- 12.** $0.67(4) = 2.68$; so, 67% of \$4 is \$2.68.
- 14.** $0.08(4000) = 320$; so, 8% of 4000 students is 320 students.
- 16.** $0.064(3500) = 224$; so, 6.4% of 3500 cars is 224 cars.
- 18.** Since the numbers have different signs, the product is negative: $-5(4) = -20$
- 20.** Since the numbers have the same sign, the product is positive: $-8(-9) = 72$
- 22.** Since the numbers have different signs, the product is negative: $5(-2) = -10$
- 24.** Since the numbers have different signs, the quotient is negative: $-63 \div 7 = -9$

Homework 2.5: Ratios, Percents, and Multiplying and Dividing Real Numbers

26. Since the numbers have different signs, the quotient is negative: $24 \div (-3) = -8$

28. Since the numbers have the same sign, the quotient is positive: $-1 \div (-1) = 1$

30. Since the numbers have the same sign, the product is positive: $-124(-29) = 3596$

32. Since the numbers have different signs, the quotient is negative: $1008 \div (-21) = -48$

34. Since the numbers have the same sign, the product is positive: $-0.3(-0.3) = 0.09$

36. Since the numbers have different signs, the product is negative: $3.7(-5.24) = -19.388$

38. Since the numbers have different signs, the quotient is negative: $-0.12 \div 0.3 = -0.4$

40. Since the numbers have different signs, the quotient is negative: $\frac{9}{-3} = 9 \div (-3) = -3$

42. Since the numbers have the same sign, the quotient is positive: $\frac{-72}{-8} = -72 \div (-8) = 9$

44. Since the numbers have different signs, the product is negative: $\frac{1}{3} \left(-\frac{7}{5} \right) = -\frac{7}{15}$

46. Since the numbers have the same sign, the product is positive: $\left(-\frac{7}{25} \right) \left(-\frac{5}{21} \right) = \frac{35}{525} = \frac{1}{15}$

48. Since the numbers have different signs, the quotient is negative:
 $-\frac{5}{7} \div \frac{15}{8} = -\frac{5}{7} \cdot \frac{8}{15} = -\frac{40}{105} = -\frac{8}{21}$

50. Since the numbers have the same sign, the quotient is positive:

$$-\frac{3}{8} \div \left(-\frac{9}{20} \right) = \frac{3}{8} \cdot \frac{20}{9} = \frac{60}{72} = \frac{5}{6}$$

52. $-9 + (-4) = -13$

54. $-49 \div (7) = -7$

56. $-2 - 7 = -2 + (-7) = -9$

58. $(-5)(-9) = 45$

60.
$$\begin{aligned} -\frac{8}{3} + \left(-\frac{5}{9} \right) &= -\frac{8}{3} \cdot \frac{3}{3} + \left(-\frac{5}{9} \right) \\ &= -\frac{24}{9} + \left(-\frac{5}{9} \right) \\ &= \frac{-24 + (-5)}{9} \\ &= -\frac{29}{9} \end{aligned}$$

62. $\frac{9}{2} \left(-\frac{4}{21} \right) = -\frac{36}{42} = -\frac{6}{7}$

64.
$$\begin{aligned} -\frac{3}{8} - \left(-\frac{1}{10} \right) &= -\frac{3}{8} + \frac{1}{10} \\ &= -\frac{3 \cdot 5}{8 \cdot 5} + \frac{1 \cdot 4}{10 \cdot 4} \\ &= -\frac{15}{40} + \frac{4}{40} \\ &= \frac{-15 + 4}{40} \\ &= -\frac{11}{40} \end{aligned}$$

66.
$$\begin{aligned} -\frac{22}{9} \div \left(-\frac{33}{18} \right) &= -\frac{22}{9} \cdot \left(-\frac{18}{33} \right) \\ &= \frac{2 \cdot 11 \cdot 2 \cdot 9}{9 \cdot 3 \cdot 11} \\ &= \frac{2 \cdot 2}{3} \\ &= \frac{4}{3} \end{aligned}$$

68. $\frac{-15}{35} = -\frac{3 \cdot 5}{7 \cdot 5} = -\frac{3}{7}$

70. $\frac{-35}{-21} = \frac{7 \cdot 5}{7 \cdot 3} = \frac{5}{3}$

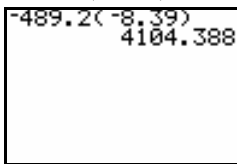
72. $\frac{5}{-6} + \frac{1}{6} = \frac{-5}{6} + \frac{1}{6} = \frac{-5 + 1}{6} = \frac{-4}{6} = -\frac{2}{3}$

ISM Chapter 2: Operations and Expressions

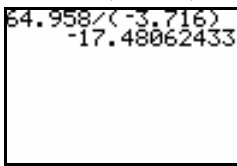
74. $\frac{2}{3} - \left(\frac{1}{-3}\right) = \frac{2}{3} + \frac{1}{3} = \frac{2+1}{3} = \frac{3}{3} = 1$

76. $\frac{1}{4} + \frac{5}{-6} = \frac{1}{4} \cdot \frac{3}{3} + \frac{-5}{6} \cdot \frac{2}{2}$
 $= \frac{3}{12} + \frac{-10}{12}$
 $= \frac{3+(-10)}{12}$
 $= -\frac{7}{12}$

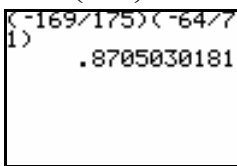
78. $-489.2(-8.39) \approx 4104.39$



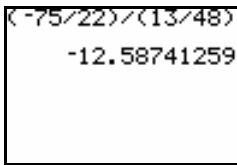
80. $64.958 \div (-3.716) \approx -17.48$



82. $-\frac{169}{175} \left(-\frac{64}{71}\right) \approx 0.87$



84. $-\frac{75}{22} \div \frac{13}{48} \approx -12.59$



86. Evaluate ac for $a = -6$ and $c = -8$:

$(-6)(-8) = 48$

88. Evaluate $\frac{b}{a}$ for $a = -6$ and $b = 4$:

$\frac{4}{-6} = -\frac{2}{3}$

90. Evaluate $-bc$ for $b = 4$ and $c = -8$:

$-(4)(-8) = -(-32) = 32$

92. Evaluate $-\frac{a}{c}$ for $a = -6$ and $c = -8$:

$-\frac{(-6)}{(-8)} = -\frac{3}{4}$

94. $\frac{w}{4}$

Evaluate the expression for $w = -8$:

$\frac{(-8)}{4} = -2$

96. $-2w$

Evaluate the expression for $w = -8$:

$-2(-8) = 16$

98. $\frac{9}{15} = \frac{3}{5}$

100. $\frac{8.52 \text{ million}}{1.43 \text{ million}} = \frac{8.52}{1.43} \approx \frac{5.96}{1}$

So, about 6 times as many Americans attend baseball games than attend bowling competitions.

102. $\frac{6 \text{ million viewers}}{2.9 \text{ million viewers}} \approx \frac{2.07}{1}$

So, there were about twice as many viewers of Good Morning America than of This Morning Show/Early Show.

104. a. $\frac{2 \text{ cups mushrooms}}{4 \text{ cups cooked noodles}} = \frac{0.5 \text{ cup mushrooms}}{1 \text{ cup cooked noodles}}$

For each cup of cooked noodles, a half cup of sliced mushrooms is required.

b. $\frac{4 \text{ cups cooked noodles}}{2 \text{ cups mushrooms}} = \frac{2 \text{ cups cooked noodles}}{1 \text{ cup mushrooms}}$

For each cup of sliced mushrooms, 2 cups of cooked noodles are required.

106. a. $\frac{19,227,088}{8,698,879} \approx \frac{2.21}{1}$

The population of New York is about 2.21 times as great as the population of New Jersey.

Homework 2.6: Exponents and Order of Operations

- b.** $\frac{571,951}{155,959} \approx \frac{3.67}{1}$
The land area of Alaska is about 3.67 as large as the land area of California.
- c.** Alaska: $\frac{655,435}{571,951} \approx \frac{1.15}{1}$
California: $\frac{35,893,799}{155,959} \approx \frac{230.15}{1}$
Michigan: $\frac{10,112,620}{56,804} \approx \frac{178.03}{1}$
New Jersey: $\frac{8,698,879}{7417} \approx \frac{1172.83}{1}$
New York: $\frac{19,227,088}{47,214} \approx \frac{407.23}{1}$
- d.** New Jersey has the largest population density, while Alaska has the smallest.
- e.** Answers may vary. The individual is not correct. Although Michigan has a larger population than New Jersey, it also has a larger land area which serves to lower its population density.
- 108. a.** $\frac{-6810 \text{ dollars}}{-2950 \text{ dollars}} = \frac{681}{295} \approx \frac{2.31}{1}$
- b.** For each \$1 he pays towards his Sears account, he should pay about \$2.31 towards his Visa account.
- 110.** $0.35(1590) = 556.50$
 $-1590 + 556.5 = -1033.50$
The new balance would be -1033.50 dollars.
- 112.** $3(13.99) = 41.97$
 $0 - 41.97 = -41.97$
The new balance is -41.97 dollars.
- 114. a.** $-2 + 3 = 1$
- b.** $-2(3) = -6$
- c.** The first statement is clearer because it indicates an operation as well. From parts (a) and (b), we see that just having one negative number and one positive number is not enough to guarantee that the result is negative.
- d.** Answers may vary.
- 116. a.** Negative; the quotient of two numbers with opposite signs is negative.
- b.** Negative; the quotient of two numbers with opposite signs is negative.
- c.** No; the variables a and b can take on positive or negative values, so the sign of the result is not clear without knowing the signs of a and b .
- 118.** Answers may vary.
 $(-4)(3) = (-4) + (-4) + (-4)$
- 120.** If ab is positive, we can say that the two numbers have the same sign. We cannot say if the two numbers are positive or negative, but we do know they have the same sign.
- 122.** If $\frac{a}{b}$ is negative, we can say that the two numbers have different signs. We cannot say which is positive and which is negative, but we do know they have different signs.
- 124. a.** $(-1)(-1) = 1$
 $(-1)(-1)(-1) = -1$
 $(-1)(-1)(-1)(-1) = 1$
 $(-1)(-1)(-1)(-1)(-1) = -1$
- b.** Multiplying -1 by itself an even number of times yields 1 as the result, while doing so an odd number of times results in -1 .
- c.** Since the number of -1 's is even, the result will be 1.
- d.** Since the number of -1 's is odd, the result will be -1 .

Homework 2.6

2. $3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 9 \cdot 3 \cdot 3 = 27 \cdot 3 = 81$

4. $5^3 = 5 \cdot 5 \cdot 5 = 25 \cdot 5 = 125$

6. $-7^2 = -(7 \cdot 7) = -49$

8. $(-7)^2 = (-7)(-7) = 49$

ISM Chapter 2: Operations and Expressions

$$10. \left(\frac{3}{5}\right)^3 = \left(\frac{3}{5}\right)\left(\frac{3}{5}\right)\left(\frac{3}{5}\right) = \frac{27}{125}$$

$$12. 8 \cdot (2-6) = 8(-4) = -32$$

$$14. (2+8)(3-8) = (10)(-5) = -50$$

$$16. \begin{aligned} -6 - (4-7) + 5 &= -6 - (-3) + 5 \\ &= -6 + 3 + 5 \\ &= -3 + 5 \\ &= 2 \end{aligned}$$

$$18. \frac{3-9}{2-4} = \frac{-6}{-2} = 3$$

$$20. \frac{4-7}{-3-(-1)} = \frac{-3}{-3+1} = \frac{-3}{-2} = \frac{3}{2}$$

$$22. \frac{1-9}{2-(-4)} = \frac{-8}{2+4} = \frac{-8}{6} = -\frac{4}{3}$$

$$24. 2-3 \cdot 5 = 2-15 = -13$$

$$26. 1+9 \cdot (-4) = 1+(-36) = -35$$

$$28. -16 \div (-4) \cdot 2 = 4 \cdot 2 = 8$$

$$30. 3-7+1 = -4+1 = -3$$

$$32. \begin{aligned} -2(2-5) + 10 \div 5 &= -2(-3) + 10 \div 5 \\ &= 6 + 10 \div 5 \\ &= 6 + 2 \\ &= 8 \end{aligned}$$

$$34. \begin{aligned} 6(2+3) - 5 \cdot 7 &= 6(5) - 5 \cdot 7 \\ &= 30 - 35 \\ &= -5 \end{aligned}$$

$$36. \begin{aligned} \frac{5}{6} + \frac{2}{3} \div \frac{2}{5} &= \frac{5}{6} + \frac{2}{3} \cdot \frac{5}{2} \\ &= \frac{5}{6} + \frac{10}{6} \\ &= \frac{15}{6} \\ &= \frac{5}{2} \end{aligned}$$

$$38. 8-3^2 = 8-9 = -1$$

$$40. 8(-2)^3 = 8(-8) = -64$$

$$42. \frac{5^2}{2^5} = \frac{5 \cdot 5}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} = \frac{25}{32}$$

$$44. \begin{aligned} 5^2 + 2^5 &= 25 + 32 \\ &= 57 \end{aligned}$$

$$46. \begin{aligned} -20 \div 2^2 &= -20 \div 4 \\ &= -5 \end{aligned}$$

$$48. \begin{aligned} 4^3 - (-4)^3 &= 64 - (-64) \\ &= 64 + 64 \\ &= 128 \end{aligned}$$

$$50. \begin{aligned} 4(-2)^2 - 3 &= 4(4) - 3 \\ &= 16 - 3 \\ &= 13 \end{aligned}$$

$$52. \begin{aligned} 2(-4)^2 + 3(-4) - 7 &= 2(16) + 3(-4) - 7 \\ &= 32 + (-12) - 7 \\ &= 20 - 7 \\ &= 13 \end{aligned}$$

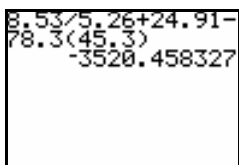
$$54. \frac{10 - (-2)^2}{3^3} = \frac{10 - (4)}{27} = \frac{6}{27} = \frac{2}{9}$$

$$56. \begin{aligned} 4 + (3-6)^2 - 2 &= 4 + (-3)^2 - 2 \\ &= 4 + 9 - 2 \\ &= 13 - 2 \\ &= 11 \end{aligned}$$

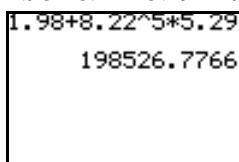
$$58. \begin{aligned} (9-7)^2 \cdot (-3) - 2^4 &= (2)^2 \cdot (-3) - 2^4 \\ &= 4(-3) - 16 \\ &= -12 - 16 \\ &= -12 + (-16) \\ &= -28 \end{aligned}$$

Homework 2.6: Exponents and Order of Operations

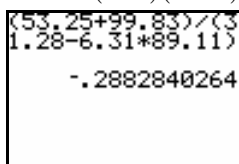
60. $8.53 \div 5.26 + 24.91 - 78.3(45.3) \approx -3520.46$



62. $1.98 + 8.22^5 \cdot 5.29 \approx 198,526.78$



64. $\frac{53.25 + 99.83}{31.28 - (6.31)(89.11)} \approx -0.29$



66. Evaluate $ac - b$ for $a = -2$, $b = -4$, and $c = 3$:
 $(-2)(3) - (-4) = -6 + 4 = -2$

68. Evaluate $c \div a + abc$ for $a = -2$, $b = -4$, and $c = 3$:

$$\begin{aligned} 3 \div (-2) + (-2)(-4)(3) &= -\frac{3}{2} + 24 \\ &= -\frac{3}{2} + \frac{48}{2} \\ &= \frac{45}{2} \end{aligned}$$

70. Evaluate $c^2 - b^2$ for $b = -4$ and $c = 3$:
 $(3)^2 - (-4)^2 = 9 - 16 = -7$

72. Evaluate $-cb^2 + a^2$ for $a = -2$, $b = -4$, and $c = 3$:
 $-3(-4)^2 + (-2)^2 = -3(16) + (-2)^2$
 $= -48 + 4$
 $= -44$

74. Evaluate $\frac{a^2 - b}{c^2 - b}$ for $a = -2$, $b = -4$, and $c = 3$:
 $\frac{(-2)^2 - (-4)}{(3)^2 - (-4)} = \frac{4 - (-4)}{9 - (-4)} = \frac{4 + 4}{9 + 4} = \frac{8}{13}$

76. Substitute $a = 5$, $b = -1$, $c = -4$, and $d = 7$ in the expression $\frac{a-b}{c-d}$:

$$\frac{(5) - (-1)}{(-4) - (7)} = \frac{5 + 1}{-4 + (-7)} = \frac{6}{-11} = -\frac{6}{11}$$

78. Substitute $a = -2$, $b = 6$, $c = 5$, and $d = -1$ in the expression $\frac{a-b}{c-d}$:

$$\frac{(-2) - (6)}{(5) - (-1)} = \frac{-2 + (-6)}{5 + 1} = \frac{-8}{6} = -\frac{4}{3}$$

80. Substitute $a = -3$, $b = -5$, $c = -8$, and $d = -3$ in the expression $\frac{a-b}{c-d}$:

$$\frac{(-3) - (-5)}{(-8) - (-3)} = \frac{-3 + 5}{-8 + 3} = \frac{2}{-5} = -\frac{2}{5}$$

82. Evaluate $5x^2$ for $x = -3$:
 $5(-3)^2 = 5(9) = 45$

84. Evaluate $-4x^2 + 4$ for $x = -3$:
 $-4(-3)^2 + 4 = -4(9) + 4$
 $= -36 + 4$
 $= -32$

86. Evaluate $4x^2 + x - 2$ for $x = -3$:
 $4(-3)^2 + (-3) - 2 = 4(9) + (-3) - 2$
 $= 36 + (-3) - 2$
 $= 33 - 2$
 $= 31$

88. a.

Years Since 2001	Number of pieces of stolen equipment
0	$121 \cdot 0 + 805$
1	$121 \cdot 1 + 805$
2	$121 \cdot 2 + 805$
3	$121 \cdot 3 + 805$
4	$121 \cdot 4 + 805$
t	$121t + 805$

From the last row of the table, we see that the expression $121t + 805$ represents the number of pieces of equipment stolen from California construction sites t years after 2001.

ISM Chapter 2: Operations and Expressions

- b.** Substitute 10 for t in $121t + 805$:
 $121(10) + 805 = 1210 + 805 = 2015$
 So, in 2011 (10 years after 2001) the number of pieces of equipment stolen from California construction sites is predicted to be 2015.

90. a.

Years Since 1990	Percent
0	$-1.2 \cdot 0 + 85$
1	$-1.2 \cdot 1 + 85$
2	$-1.2 \cdot 2 + 85$
3	$-1.2 \cdot 3 + 85$
4	$-1.2 \cdot 4 + 85$
t	$-1.2t + 85$

From the last row of the table, we see that the expression $-1.2t + 85$ represents the percentage of companies offering traditional benefit plans t years since 1990.

- b.** Substitute 20 for t in $-1.2t + 85$:
 $-1.2(20) + 85 = -24 + 85 = 61$
 So, 61% of companies in 2010 will offer traditional benefit plans.

92. $-3 - \frac{8}{x}$

Evaluate the expression for $x = -4$:

$$\begin{aligned} -3 - \frac{8}{-4} &= -3 - (-2) \\ &= -3 + 2 \\ &= -1 \end{aligned}$$

94. $x + x(-5)$

Evaluate the expression for $x = -4$:

$$-4 + (-4)(-5) = -4 + 20 = 16$$

- 96.** Substitute 3 for r in the expression $\frac{4}{3}\pi r^3$:

$$\frac{4}{3}\pi(3)^3 = \frac{4}{3}\pi(27) = 36\pi$$

So, the volume is $36\pi \approx 113.10$ cubic inches.

- 98.** In the first line, the student only squared 3 instead of -3 . Should be:

$$(-3)^2 + 4(-3) + 5 = 9 + (-12) + 5 = -3 + 5 = 2$$

- 100.** The student did not perform multiplication and division in the correct order (from left to right).
 $16 \div 2 \cdot 4 = 8 \cdot 4 = 32$.

102. a. $(12 \div 3) \cdot 2 = 4 \cdot 2 = 8$

b. $12 \div (3 \cdot 2) = 12 \div 6 = 2$

- c.** Yes, the order makes a difference:

L-R: $12 \div 3 \cdot 2 = 4 \cdot 2 = 8$ (part (a))

R-L: $12 \div 3 \cdot 2 = 12 \div 6 = 2$ (part (b))

- d.** Order of operations dictates that we multiply and divide from left to right in the order that they appear. Therefore,
 $12 \div 3 \cdot 2 = 4 \cdot 2 = 8$

104. a. $(2 + 3) + 4 = 5 + 4 = 9$

b. $2 + (3 + 4) = 2 + 7 = 9$

- c.** The results are the same.

d. $(4 + (-2)) + 5 = 2 + 5 = 7$

$4 + (-2 + 5) = 4 + 3 = 7$

The results are the same.

- e.** Answers may vary. In each case, the results should be the same.

- f.** Yes; this is the Associative Property of Addition.

- g.** Answers may vary. For a series of additions, the way in which the additions are grouped does not matter.

- 106.** Answers may vary.

Chapter 2 Review Exercises

1. $8 + (-2) = 6$

2. $(-5) + (-7) = -12$

3. $6 - 9 = 6 + (-9) = -3$

4. $8 - (-2) = 8 + 2 = 10$

Chapter 2 Review Exercises

5. Since the numbers have different signs, the product will be negative: $8(-2) = -16$
6. Since the numbers have different signs, the quotient will be negative: $8 \div (-2) = -4$
7. $-24 \div (10 - 2) = -24 \div (8) = -3$
8. $(2 - 6)(5 - 8) = (-4)(-3) = 12$
9. $\frac{7-2}{2-7} = \frac{5}{-5} = -\frac{5}{5} = -1$
10. $\frac{2-8}{3-(-1)} = \frac{2-8}{3+1} = \frac{-6}{4} = -\frac{6}{4} = -\frac{3}{2}$
11. $\frac{3-5(-6)}{-2-1} = \frac{3-(-30)}{-2-1}$
 $= \frac{3+30}{-2+(-1)}$
 $= \frac{33}{-3}$
 $= -\frac{33}{3}$
 $= -11$
12. $3(-5) + 2 = -15 + 2 = -13$
13. $-4 + 2(-6) = -4 + (-12) = -16$
14. $2 - 12 \div 2 = 2 - 6 = -4$
15. $4(-6) \div (-3) = -24 \div (-3) = 8$
16. $8 \div (-2) \cdot 5 = (-4) \cdot 5 = -20$
17. $2(4 - 7) - (8 - 2) = 2(-3) - (6)$
 $= (-6) - (6)$
 $= (-6) + (-6)$
 $= -12$
18. $-2(3 - 6) + 18 \div (-9) = -2(-3) + 18 \div (-9)$
 $= 6 + 18 \div (-9)$
 $= 6 + (-2)$
 $= 4$
19. $-14 \div (-7) - 3(1 - 5) = -14 \div (-7) - 3(-4)$
 $= 2 - 3(-4)$
 $= 2 - (-12)$
 $= 2 + 12$
 $= 14$
20. Since the numbers have the same sign, the product will be positive: $-0.3(-0.2) = 0.06$
21. $4.2 - (-6.7) = 4.2 + 6.7 = 10.9$
22. $\frac{4}{9} \left(-\frac{3}{10} \right) = -\frac{12}{90} = -\frac{2}{15}$
23. $\left(-\frac{8}{15} \right) \div \left(-\frac{16}{25} \right) = \left(-\frac{8}{15} \right) \left(-\frac{25}{16} \right)$
 $= \frac{8}{15} \cdot \frac{25}{16}$
 $= \frac{200}{240}$
 $= \frac{5}{6}$
24. $\frac{5}{9} - \left(-\frac{2}{9} \right) = \frac{5}{9} + \frac{2}{9} = \frac{5+2}{9} = \frac{7}{9}$
25. $-\frac{5}{6} + \frac{7}{8} = -\frac{5}{6} \cdot \frac{4}{4} + \frac{7}{8} \cdot \frac{3}{3}$
 $= \frac{-20}{24} + \frac{21}{24}$
 $= \frac{-20+21}{24}$
 $= \frac{1}{24}$
26. $\frac{-5}{2} - \frac{7}{-3} = \frac{-5}{2} + \frac{7}{3}$
 $= \frac{-5}{2} \cdot \frac{3}{3} + \frac{7}{3} \cdot \frac{2}{2}$
 $= \frac{-15}{6} + \frac{14}{6}$
 $= \frac{-15+14}{6}$
 $= -\frac{1}{6}$

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27. $(-8)^2 = (-8)(-8) = 64$

28. $-8^2 = -(8 \cdot 8) = -64$

29. $2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$

30. $\left(\frac{3}{4}\right)^3 = \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{3 \cdot 3 \cdot 3}{4 \cdot 4 \cdot 4} = \frac{27}{64}$

31. $-6(3)^2 = -6(3 \cdot 3) = -6(9) = -54$

32. $24 \div 2^3 = 24 \div (2 \cdot 2 \cdot 2)$
 $= 24 \div 8$
 $= 3$

33. $(-2)^3 - 4(-2) = (-2)(-2)(-2) - 4(-2)$
 $= -8 - 4(-2)$
 $= -8 - (-8)$
 $= -8 + 8$
 $= 0$

34. $\frac{2^3}{3+3^2} = \frac{2 \cdot 2 \cdot 2}{3+(3 \cdot 3)} = \frac{8}{3+9} = \frac{8}{12} = \frac{2}{3}$

35. $\frac{17 - (-3)^2}{5 - 4^2} = \frac{17 - (-3)(-3)}{5 - (4 \cdot 4)}$
 $= \frac{17 - 9}{5 - 16}$
 $= \frac{8}{-11}$
 $= -\frac{8}{11}$

36. $-3(2)^2 - 4(2) + 1 = -3(2 \cdot 2) - 4(2) + 1$
 $= -3(4) - 4(2) + 1$
 $= -12 - 8 + 1$
 $= -20 + 1$
 $= -19$

37. $24 \div (3 - 5)^3 = 24 \div (-2)^3$
 $= 24 \div [(-2)(-2)(-2)]$
 $= 24 \div (-8)$
 $= -3$

38. $7^2 - 3(2 - 5)^2 \div (-3) = 7^2 - 3(-3)^2 \div (-3)$
 $= (7 \cdot 7) - 3[(-3)(-3)] \div (-3)$
 $= 49 - 27 \div (-3)$
 $= 49 - (-9)$
 $= 49 + 9$
 $= 58$

39. $\frac{-18}{-24} = \frac{18}{24} = \frac{2 \cdot 3 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 3} = \frac{3}{2 \cdot 2} = \frac{3}{4}$

40. $\frac{-28}{35} = -\frac{28}{35} = -\frac{2 \cdot 2 \cdot 7}{5 \cdot 7} = -\frac{2 \cdot 2}{5} = -\frac{4}{5}$

41. $-5.7 + 2.3^4 \div (-9.4) \approx -8.68$

42. $\frac{3.5(17.4) - 97.6}{54.2 \div 8.4 - 65.3} \approx 0.62$

43. Substitute $\frac{1}{4}$ for W and $\frac{5}{6}$ for L in the expression $2L + 2W$:

$$2\left(\frac{5}{6}\right) + 2\left(\frac{1}{4}\right) = \frac{2}{1} \cdot \frac{5}{6} + \frac{2}{1} \cdot \frac{1}{4}$$

$$= \frac{10}{6} + \frac{2}{4}$$

$$= \frac{10}{6} + \frac{1}{2}$$

$$= \frac{10}{6} + \frac{1}{2} \cdot \frac{3}{3}$$

$$= \frac{10}{6} + \frac{3}{6}$$

$$= \frac{13}{6}$$

So, the perimeter of the rectangle is $\frac{13}{6} = 2\frac{1}{6}$ yards.

44. $-4789 + 800 - (102.99 + 3.50)$
 $= -4789 + 800 - 106.49$
 $= -3989 - 106.49$
 $= -4095.49$
 The student now owes the credit card company \$4095.49.
45. $27,800 - 32,500 = -4700$
 The plane had a change in altitude of -4700 feet.
46. a. $-8 - 4 = -12$
 The change in temperature is -12°F .
- b. Divide the change for the past three hours by 3 to estimate the change over 1 hour.
 $\frac{-12}{3} = -4$
 The estimated change of the past hour is -4°F .
- c. Answers may vary. Temperature need not change uniformly.
47. a. $50 - 24 = 26$
 The change in private contributions to Democratic conventions from 1996 to 2000 was \$26 million.
- b. $3 - 8 = -5$
 The change in the private contributions to Republican conventions from 1984 to 1988 was -5 million dollars.
- c. The greatest change in private contributions to Democratic conventions occurred between 1996 and 2000. The change was \$26 million [from part (a)].
- d. $64 - 22 = 42$
 The greatest change in private contributions to Republican conventions occurred between 2000 and 2004. The change was \$42 million.
48. $\frac{145.5 \text{ million ringtones}}{63.6 \text{ million ringtones}} \approx \frac{2.29}{1}$
 The number of ringtones sold in 2004 was about 2.29 times the number sold in 2003.
49. $75\% = 75.0\% = 0.75$
50. $2.9\% = 0.029$
51. $0.87(43) = 37.41$
 So, 87% of \$43 is \$37.41.
52. $0.08(925) = 74$
 So, 8% of 925 students is 74 students.
53. $-5493 + 0.2(5493) = -5493 + 1098.6$
 $= -4394.4$
 The new balance is -4394.4 dollars.
54. Substitute 2 for a and -4 for c in the expression $ac + c \div a$:
 $(2)(-4) + (-4) \div (2) = -8 + (-4) \div (2)$
 $= -8 + (-2)$
 $= -10$
55. Substitute 2 for a , -5 for b , and -4 for c in the expression $b^2 - 4ac$:
 $(-5)^2 - 4(2)(-4) = (-5)(-5) - 4(2)(-4)$
 $= 25 - (-32)$
 $= 25 + 32$
 $= 57$
56. Substitute 2 for a , -5 for b , and -4 for c in the expression $a(b - c)$:
 $(2)((-5) - (-4)) = 2(-5 + 4)$
 $= 2(-1)$
 $= -2$
57. Substitute 2 for a , -5 for b , and -4 for c in the expression $\frac{-b - c^2}{2a}$:
 $\frac{-(-5) - (-4)^2}{2(2)} = \frac{-(-5) - (-4)(-4)}{2(2)}$
 $= \frac{5 - 16}{4}$
 $= \frac{-11}{4}$
 $= -\frac{11}{4}$

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58. Substitute -4 for c in the expression $2c^2 - 5c + 3$:

$$2(-4)^2 - 5(-4) + 3 = 2(-4)(-4) - 5(-4) + 3$$

$$= 32 - (-20) + 3$$

$$= 32 + 20 + 3$$

$$= 52 + 3$$

$$= 55$$

59. Substitute 2 for a , -5 for b , -4 for c , and 10 for d in the expression $\frac{a-b}{c-d}$:

$$\frac{(2)-(-5)}{(-4)-(-10)} = \frac{2+5}{-4+(-10)} = \frac{7}{-14} = -\frac{7}{14} = -\frac{1}{2}$$

60. $x + 5$
Evaluate the expression for $x = -3$:

$$(-3) + 5 = 2$$

61. $-7 - x$
Evaluate the expression for $x = -3$:

$$-7 - (-3) = -7 + 3 = -4$$

62. $2 - x(4)$
Evaluate the expression for $x = -3$:

$$2 - (-3)(4) = 2 - (-12)$$

$$= 2 + 12$$

$$= 14$$

63. $1 + \frac{-24}{x}$
Evaluate the expression for $x = -3$:

$$1 + \frac{-24}{-3} = 1 + 8 = 9$$

64. Substitute 650 for T and 13 for n .

$$\frac{650}{13} = 50$$

Each player must pay \$50 for the team to join the softball league.

65. a.

Time (hours)	Volume of Water (cubic feet)
0	$-50 \cdot 0 + 400$
1	$-50 \cdot 1 + 400$
2	$-50 \cdot 2 + 400$
3	$-50 \cdot 3 + 400$
4	$-50 \cdot 4 + 400$
t	$-50t + 400$

From the last row of the table, we see that the expression $-50t + 400$ represents the volume of water (in cubic feet) remaining in the basement after water has been pumped out for t hours.

b. Substitute 7 for t in $-50t + 400$:

$$-50(7) + 400 = -350 + 400 = 50$$

After 7 hours of pumping, there will be 50 cubic feet of water remaining in the basement.

Chapter 2 Test

- $-8 - 5 = -8 + (-5) = -13$
- Since the two numbers have the same sign, the product will be positive: $-7(-9) = 63$
- $-3 + 9 \div (-3) = -3 + (-3) = -6$
- $(4 - 2)(3 - 7) = (2)(-4) = -8$
- $\frac{4 - 7}{-1 - 5} = \frac{-3}{-6} = \frac{1}{2}$
- $5 - (2 - 10) \div (-4) = 5 - (-8) \div (-4)$
 $= 5 - 2$
 $= 3$
- $-20 \div 5 - (2 - 9)(-3) = -20 \div 5 - (-7)(-3)$
 $= -4 - 21$
 $= -25$
- Since the two numbers have different signs, the product will be negative: $0.4(-0.2) = -0.08$

9. $-\frac{27}{10} \div \frac{18}{75} = -\frac{27}{10} \cdot \frac{75}{18}$
 $= -\frac{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5 \cdot 5}{2 \cdot 5 \cdot 2 \cdot 3 \cdot 3} = -\frac{3 \cdot 3 \cdot 5}{2 \cdot 2} = -\frac{45}{4}$
10. $-\frac{3}{10} + \frac{5}{8} = -\frac{3}{10} \cdot \frac{4}{4} + \frac{5}{8} \cdot \frac{5}{5}$
 $= \frac{-12}{40} + \frac{25}{40}$
 $= \frac{-12+25}{40}$
 $= \frac{13}{40}$
11. $3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 81$
12. $-4^2 = -(4 \cdot 4) = -16$
13. $7 + 2^3 - 3^2 = 7 + (2 \cdot 2 \cdot 2) - (3 \cdot 3)$
 $= 7 + 8 - 9$
 $= 15 - 9$
 $= 6$
14. $1 - (3 - 7)^2 + 10 \div (-5) = 1 - (-4)^2 + 10 \div (-5)$
 $= 1 - (-4)(-4) + 10 \div (-5)$
 $= 1 - 16 + (-2)$
 $= -15 + (-2)$
 $= -17$
15. $\frac{84}{-16} = -\frac{84}{16} = -\frac{2 \cdot 2 \cdot 3 \cdot 7}{2 \cdot 2 \cdot 2 \cdot 2} = -\frac{3 \cdot 7}{2 \cdot 2} = -\frac{21}{4}$
16. $5 - 9 = 5 + (-9) = -4$
The current temperature is -4°F .
17. a. $6.5 - 5.8 = 0.7$
The change in the tax audit rate from 2001 to 2003 was 0.7 audit per 1000 tax returns.
- b. $5.8 - 9.0 = -3.2$
The change in the tax audit rate from 1999 to 2001 was -3.2 audits per 1000 tax returns.
- c. Answers may vary. The table seems to indicate the IRS increases the audit rate during weaker economic times.
18. $\frac{19.82}{9.14} \approx \frac{2.17}{1}$
The average ticket price in 2004 was about 2.17 times the average price in 1991.
19. Substitute -6 for a , -2 for b , and 5 for c in the expression $ac - \frac{a}{b}$:
 $(-6)(5) - \frac{(-6)}{(-2)} = -30 - \frac{(-6)}{(-2)}$
 $= -30 - 3$
 $= -30 + (-3)$
 $= -33$
20. Substitute -6 for a , -2 for b , 5 for c , and -1 for d in the expression $\frac{a-b}{c-d}$:
 $\frac{(-6) - (-2)}{(5) - (-1)} = \frac{-6 + 2}{5 + 1} = \frac{-4}{6} = -\frac{4}{6} = -\frac{2}{3}$
21. Substitute -6 for a , -2 for b , and 5 for c in the expression $a + b^3 + c^2$:
 $(-6) + (-2)^3 + (5)^2 = (-6) + (-2)(-2)(-2) + (5 \cdot 5)$
 $= -6 + (-8) + 25$
 $= -14 + 25$
 $= 11$
22. Substitute -6 for a , -2 for b , and 5 for c in the expression $b^2 - 4ac$:
 $(-2)^2 - 4(-6)(5) = (-2)(-2) - 4(-6)(5)$
 $= 4 - (-120)$
 $= 4 + 120$
 $= 124$
23. $2x - 3x$
Evaluate the expression for $x = -5$:
 $2(-5) - 3(-5) = -10 - (-15)$
 $= -10 + 15$
 $= 5$
24. $\frac{-10}{x} - 6$
Evaluate the expression for $x = -5$:
 $\frac{-10}{-5} - 6 = 2 - 6 = -4$

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Years since 1999	Number of Books Published
0	$7 \cdot 0 + 25$
1	$7 \cdot 1 + 25$
2	$7 \cdot 2 + 25$
3	$7 \cdot 3 + 25$
4	$7 \cdot 4 + 25$
t	$7t + 25$

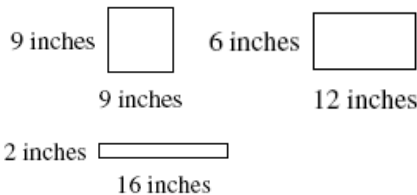
From the last row of the table, we see that the expression $7t + 25$ represents the number of books on obesity published in the year that is t years after 1999.

- b. Substitute 11 for t in $7t + 25$:
 $7(11) + 25 = 77 + 25 = 102$

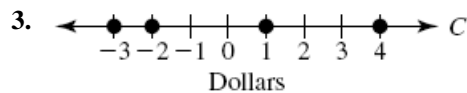
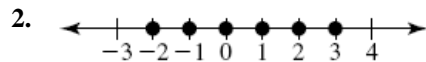
So, in 2010 (11 years after 1999) there will be 102 books on obesity published.

Cumulative Review of Chapters 1 – 2

1. a. Answers may vary. Some possibilities:

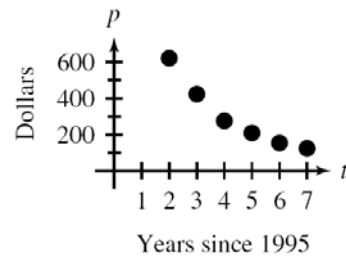


- b. W and L are variables because their values are not fixed.
 c. P is a constant because the perimeter is fixed at 36 inches.



4. The x -coordinate is -5 .
 5. Independent variable: t
 Dependent variable: V

6. a.



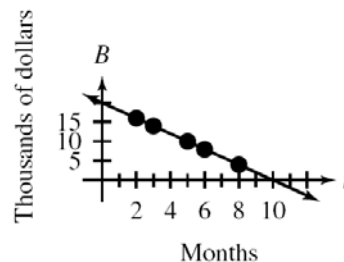
- b. The average price was the most in 1997.
 c. The average price was the least in 2002.
 d. The average price decreased the most between 1997 and 1998. The change in price was $425 - 625 = -200$ dollars.
 e. The average price decreased the least between 2001 and 2002. The change in price was $120 - 150 = -30$ dollars.
7. The input $x = -4$ leads to the output $y = -3$, so $y = -3$ when $x = -4$.

8. The output $y = 1$ originates from the input $x = 4$, so $y = 1$ when $x = 4$.

9. The line and the y -axis intersect at the point $(0, -1)$ so the y -intercept is $(0, -1)$.

10. The line and the x -axis intersect at the point $(2, 0)$, so the x -intercept is $(2, 0)$.

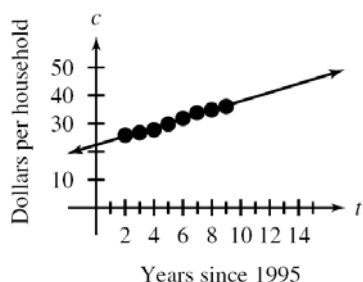
11. a.



- b. The input $t = 4$ leads to the output $B = 12$, so the balance is \$12 thousand after 4 months.
 c. The output $B = 6$ originates from the input $t = 7$, so the balance will be \$6 thousand after 7 months.

- d. The line and the B -axis intersect at the point $(0, 20)$, so the B -intercept is $(0, 20)$. The original balance was \$20 thousand when she was laid off.
- e. The line and the t -axis intersect at the point $(10, 0)$, so the t -intercept is $(10, 0)$. The checking account will be depleted after 10 months.

12. a.,
b.



- c. The line and the c -axis intersect at the point $(0, 22)$, so the c -intercept is $(0, 22)$. The average monthly spending on cable TV per household in 1995 was \$22.
- d. The output $c = 43$ originates roughly from the input $t = 13$, so the average monthly spending will be \$43 in 2008.
- e. For 2010, the input is $t = 15$. The input $t = 15$ leads roughly to the output $c = 46$, so the average monthly spending will be \$46 in 2010.

$$13. \frac{3(-8)+15}{2-7(2)} = \frac{-24+15}{2-14} = \frac{-9}{-12} = \frac{3}{4}$$

$$14. \begin{aligned} -4(3)+6-20 \div (-10) &= -12+6-20 \div (-10) \\ &= -12+6-(-2) \\ &= -12+6+2 \\ &= -6+2 \\ &= -4 \end{aligned}$$

$$15. \begin{aligned} \left(-\frac{14}{15}\right) \div \left(-\frac{35}{27}\right) &= \left(-\frac{14}{15}\right) \left(-\frac{27}{35}\right) \\ &= \frac{14}{15} \cdot \frac{27}{35} \\ &= \frac{2 \cdot 7 \cdot 3 \cdot 3 \cdot 3}{3 \cdot 5 \cdot 5 \cdot 7} \\ &= \frac{2 \cdot 3 \cdot 3}{5 \cdot 5} \\ &= \frac{18}{25} \end{aligned}$$

$$16. \begin{aligned} \frac{3}{8} - \frac{5}{6} &= \frac{3}{8} \cdot \frac{3}{3} - \frac{5}{6} \cdot \frac{4}{4} \\ &= \frac{9}{24} - \frac{20}{24} \\ &= \frac{9-20}{24} \\ &= -\frac{11}{24} \end{aligned}$$

$$17. \begin{aligned} 4 - (7-9)^4 + 20 \div (-4) \\ &= 4 - (-2)^4 + 20 \div (-4) \\ &= 4 - (-2)(-2)(-2)(-2) + 20 \div (-4) \\ &= 4 - 16 + 20 \div (-4) \\ &= 4 - 16 + (-5) \\ &= -12 + (-5) \\ &= -17 \end{aligned}$$

$$18. \frac{5-3^2}{4^2+2} = \frac{5-(3 \cdot 3)}{(4 \cdot 4)+2} = \frac{5-9}{16+2} = \frac{-4}{18} = -\frac{4}{18} = -\frac{2}{9}$$

$$19. \begin{aligned} -3-5 &= -8 \\ \text{The change in temperature is } &-8^\circ \text{F.} \end{aligned}$$

$$20. \begin{aligned} -2692+850-23 &= -1842-23 = -1865 \\ \text{The student will now owe the credit card} & \\ \text{company } &\$1865. \end{aligned}$$

$$21. \begin{aligned} \text{Substitute 1 for } a, -4 \text{ for } b, -3 \text{ for } c, \text{ and 7 for } & \\ d \text{ in the expression } \frac{a-b}{c-d}: & \\ \frac{(1)-(-4)}{(-3)-(-7)} &= \frac{1+4}{-3+(-7)} = \frac{5}{-10} = -\frac{5}{10} = -\frac{1}{2} \end{aligned}$$

ISM Chapter 2: Operations and Expressions

22. Substitute 2 for a , -3 for b , and -5 for c in the expression $b^2 - 4ac$:

$$\begin{aligned} (-3)^2 - 4(2)(-5) &= (-3)(-3) - 4(2)(-5) \\ &= 9 - (-40) \\ &= 9 + 40 \\ &= 49 \end{aligned}$$

23. $x - \frac{(-12)}{x}$

Evaluate the expression for $x = -4$:

$$\begin{aligned} (-4) - \frac{(-12)}{(-4)} &= (-4) - 3 \\ &= (-4) + (-3) \\ &= -7 \end{aligned}$$

24. $-2x + 7$

Evaluate the expression for $x = -4$:

$$-2(-4) + 7 = 8 + 7 = 15$$

25. Evaluate $\frac{100(v-42)}{42}$ for $v = 45$:

$$\frac{100(45-42)}{42} = \frac{100(3)}{42} = \frac{300}{42} = \frac{50}{7} \approx 7.14$$

A stock value today of \$45 represents about a 7.14% growth of the investment.

26. a.

Years since 2000	Sales (thousands of cameras)
0	$4 \cdot 0 + 15$
1	$4 \cdot 1 + 15$
2	$4 \cdot 2 + 15$
3	$4 \cdot 3 + 15$
4	$4 \cdot 4 + 15$
t	$4t + 15$

From the last row of the table, we see that the expression $4t + 15$ represents the sales (in thousands of cameras) in the year that is t years since 2000.

- b. Evaluate $4t + 15$ for $t = 11$:

$$4(11) + 15 = 44 + 15 = 59$$

In 2011 (11 years after 2000), the camera company will sell 59 thousand cameras.