

Chapter 1

Exercise Set 1.1

2. A rational number can be written as $\frac{x}{y}$ where x and y are integers and y is not zero. Rational numbers can be thought of as fractional parts of integers.
4. A repeating decimal contains digits that repeat in a pattern without end.
6. 0 is a whole number: Whole, Integer, Rational, Real
8. $-\frac{144}{4}$ is a quotient of integers: Integer, Rational, Real
10. $10.\overline{59}$ is a repeating decimal: Rational, Real
12. $-5\frac{1}{2}$ can be written as -5.5 which is a terminating decimal: Rational, Real
14. $\sqrt{7}$ is a number whose decimal is nonterminating and nonrepeating: Irrational, Real
16. 1.314278619... is a nonrepeating and nonterminating decimal: Irrational, Real
18. 54.989898... is a repeating decimal: Rational, Real
20. $-25, -\frac{28}{7}, -\frac{18}{5}, -0.763, -0.333..., 0, \frac{1}{10}, \frac{2}{7}, 9, 52.8, \frac{283}{5}$
22. $-\pi, \frac{\pi}{4}, \sqrt{3}$
24. $-25, -\frac{28}{7}, -\frac{18}{5}, -0.763, -0.333...$
26. 9
28. 4, 5, 6, 7, 8, 9
30. $(6 + 1) + 3 = 6 + (1 + 3)$
Associative property of addition
32. $4\left(\frac{1}{3} + 6\right) = 4 \cdot \frac{1}{3} + 4 \cdot 6$
Distributive property of multiplication over addition
34. $-12.4 + 12.4 = 0$
Inverse property of addition
36. $-0.9 + 5 = 5 + (-0.9)$
Commutative property of addition
38. $-\frac{1}{5} + \frac{1}{5} = 0$
Inverse property of addition
40. $0 + \pi = \pi$
Identity property of addition
42. $3\left(-\frac{x}{2}\right) = -\frac{x}{2}(3)$
Commutative property of multiplication
44. $3 \cdot (8 \cdot w) = (3 \cdot 8) \cdot w$
Associative property of multiplication
46. $y \cdot \frac{1}{y} = 1$
Inverse property of multiplication
48. The additive inverse of -1.3 is 1.3 .
50. The multiplicative inverse of -10 is $-\frac{1}{10}$.
52. Mount Kea: $13,784 - (-18,000) = 31,784$ feet
Mount Everest: $29,022 - 12,000 = 17,022$ feet.
The distance from base to peak is 31,784 feet for Mauna Kea and 17,022 feet for Mount Everest.
The set of such mountains is the empty set.
54. $1,000,000 + 20(100) = 1,002,000$
You would obtain \$1,002,000.
56. $\frac{304}{435} \approx 0.70 = 70\%$
70% of his pass attempts were completed.

58. $35 = 1.27x$

$$x = \frac{35}{1.27} = 27.55905\dots$$

In 2007, to the nearest tenth, cars achieved 27.6 miles per gallon.

Classroom Quiz 1.1

1. The rational numbers include integers and quotients of integers.

$$-0.5333\dots, -\frac{3}{11}, 0, 2, \frac{55}{7}, 23.5, 77.222$$

2. The positive irrational number is $\sqrt{7}$.

3. $-8.5 + 8.5 = 0$ illustrates the inverse property of addition.

1.2 Exercises

2. To multiply or divide two real numbers with the same sign, multiply or divide the absolute values of the numbers as indicated. The sign of the answer will be positive. To multiply or divide two real numbers with different signs, multiply or divide the absolute values as indicated. The sign of the answer will be negative.

4. $|-27| = 27$

6. $\left|3\frac{1}{2}\right| = 3\frac{1}{2}$

8. $|2 - 6| = |-4| = 4$

10. $|a| = a$

12. $-17 + (-3) = -20$

14. $-5 - 11 = -5 + (-11) = -16$

16. $(-16)(-2) = 32$

18. $-54 \div 6 = -9$

20. $1.2(-5) = -6$

22. $5.5 - (-14.5) = 5.5 + 14.5 = 20$

24. $-\frac{7}{9} + \frac{1}{2} = -\frac{14}{18} + \frac{9}{18} = -\frac{5}{18}$

26. $3.6 \div (-3) = -1.2$

28. $\left(\frac{4}{8}\right)\left(-\frac{15}{11}\right) = -\frac{4(3)}{11} = -\frac{12}{11}$ or $-1\frac{1}{11}$

30. $9\left(-\frac{1}{3}\right) + (-4)(3) = -3 + (-12) = -15$

32. $-5.9 + 5.9 = 0$

34. $\frac{-12}{0}$ is undefined.

36. $\frac{0}{4} = 0$

38. $\frac{-5+5}{6} = \frac{0}{6} = 0$

40. $\frac{-4+(-4)}{-20} = \frac{-8}{-20} = \frac{2}{5}$

42. $\frac{9}{20} + \left(-\frac{1}{5}\right) = \frac{9}{20} + \left(-\frac{4}{20}\right) = \frac{5}{20} = \frac{1}{4}$

44. $-\frac{4}{5} \div \frac{7}{10} = -\frac{4}{5} \times \frac{10}{7} = -\frac{40}{35} = -\frac{8}{7}$ or $-1\frac{1}{7}$

$$\begin{aligned} 46. \quad & 12 - 3 - (-4) + 6 - 5 - 8 \\ & = 12 + (-3) + 4 + 6 + (-5) + (-8) \\ & = 9 + 4 + 6 + (-5) + (-8) \\ & = 13 + 6 + (-5) + (-8) \\ & = 19 + (-5) + (-8) \\ & = 14 + (-8) \\ & = 6 \end{aligned}$$

48. $\frac{12-2(6)}{1-5} = \frac{12-12}{1-5} = \frac{0}{-4} = 0$

$$\begin{aligned} 50. \quad & -9(-1) - 12 + 4(-2) + 3 = 9 - 12 + (-8) + 3 \\ & = 9 + (-12) + (-8) + 3 \\ & = -3 + (-8) + 3 \\ & = -11 + 3 \\ & = -8 \end{aligned}$$

52. $12(0.5) - 5 \div 0.2 = 6 - 25 = -19$

54. $\frac{3(5)+1}{4(-1)-2} = \frac{15+1}{-4-2} = \frac{16}{-6} = -\frac{8}{3}$ or $-2\frac{2}{3}$

$$\begin{aligned}
 56. \quad \frac{2(11) - 54 \div (-3)}{2 - (-3)} &= \frac{22 - (-18)}{2 + 3} \\
 &= \frac{22 + 18}{5} \\
 &= \frac{40}{5} \\
 &= 8
 \end{aligned}$$

$$58. -2.4(5) - 1.6(2) = -12 - 3.2 = -15.2$$

$$\begin{aligned}
 60. \quad 1.783(2.5725) - 1.0526(-5.9812) \\
 = 4.5867675 + 6.2958112 \\
 = 10.88257862
 \end{aligned}$$

62. Either two quantities are negative or all are positive. In other words, if the result is positive, an even number of the numbers being multiplied are negative.

Cumulative Review

$$63. 5 + 17 = 17 + 5$$

Commutative property of addition

$$64. 4 \cdot (3 \cdot 6) = (4 \cdot 3) \cdot 6$$

Associative property of multiplication

$$65. -\frac{1}{2}\pi, \sqrt{3} \text{ are irrational numbers.}$$

$$66. -16, 0, 9.36, \frac{19}{2}, 10.\bar{5} \text{ are rational numbers.}$$

Classroom Quiz 1.2

$$1. 2 + 5(-3) = 2 + (-15) = -13$$

$$2. 1.6 - (-2.9) = 1.6 + 2.9 = 4.5$$

$$\begin{aligned}
 3. \quad 15 + 30 \div 3 - 2(6) &= 15 + 10 - 2(6) \\
 &= 15 + 10 - 12 \\
 &= 25 - 12 \\
 &= 13
 \end{aligned}$$

1.3 Exercises

2. When a negative number is raised to an odd power, the result is negative.

4. No; $-a^n$ means the opposite of a^n . If a^n is negative, $-a^n$ will be positive.

6. The principle square root is the positive square root.

$$8. 12 \cdot 12 \cdot 12 \cdot 12 \cdot 12 \cdot 12 \cdot 12 = 12^7$$

$$10. (-8)(-8)(-8)(-8) = (-8)^4$$

$$12. a \cdot a \cdot a \cdot a \cdot b \cdot b \cdot b = a^4 \cdot b^3$$

$$14. 7^3 = 7 \cdot 7 \cdot 7 = 343$$

$$16. (-4)^3 = (-4)(-4)(-4) = -64$$

$$18. -3^4 = -(3)(3)(3)(3) = -81$$

$$20. (-8)^2 = (-8)(-8) = 64$$

$$22. \left(-\frac{1}{5}\right)^3 = \left(-\frac{1}{5}\right)\left(-\frac{1}{5}\right)\left(-\frac{1}{5}\right) = -\frac{1}{125}$$

$$24. \left(\frac{3}{2}\right)^4 = \left(\frac{3}{2}\right)\left(\frac{3}{2}\right)\left(\frac{3}{2}\right)\left(\frac{3}{2}\right) = \frac{81}{16}$$

$$26. (-0.5)^2 = (-0.5)(-0.5) = 0.25$$

$$28. (0.03)^3 = (0.03)(0.03)(0.03) = 0.000027$$

$$30. \sqrt{121} = 11$$

$$32. -\sqrt{64} = -8$$

$$34. \sqrt{\frac{1}{36}} = \frac{\sqrt{1}}{\sqrt{36}} = \frac{1}{6}$$

$$36. \sqrt{0.36} = 0.6$$

$$38. \sqrt{12 + 24} = \sqrt{36} = 6$$

$$40. \sqrt{950 - 50} = \sqrt{900} = 30$$

$$42. \sqrt{\frac{1}{9} + \frac{3}{9}} = \sqrt{\frac{4}{9}} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3}$$

$$44. \sqrt{-49} \text{ is not a real number.}$$

$$46. -\sqrt{-0.49} \text{ is not a real number.}$$

$$48. 4(3 - 5) + 9 = 4(-2) + 9 = -8 + 9 = 1$$

$$50. 16 \div (-8) - 6(-2) = -2 - (-12) = -2 + 12 = 10$$

$$52. (-8)(-5) + 7^2 = (-8)(-5) + 49 = 40 + 49 = 89$$

$$54. (8 - 6 - 7)^2 \div 5 - 6 = (-5)^2 \div 5 + (-6) \\ = 25 \div 5 + (-6) \\ = 5 + (-6) \\ = -1$$

$$56. -5(-10) + (-4)^3 - (-20) = 50 + (-64) + 20 = 6$$

$$58. -8^2 - 4(1 - 12) = -64 - 4(-11) \\ = -64 - (-44) \\ = -64 + 44 \\ = -20$$

$$60. -4[(2.5 - 1.3) - 4.2] = -4[1.2 - 4.2] = -4[-3] = 12$$

$$62. -1(12) - 2^5 + \sqrt{121} = -1(12) - 32 + 11 \\ = -12 - 32 + 11 \\ = -33$$

$$64. \frac{15 + 5^2 - 10}{3 + 2} = \frac{15 + 25 - 10}{5} = \frac{30}{5} = 6$$

$$66. \frac{6 + 3(4^2 - 20)}{12 - 6} = \frac{6 + 3(16 - 20)}{6} \\ = \frac{6 + 3(-4)}{6} \\ = \frac{6 + (-12)}{6} \\ = \frac{-6}{6} \\ = -1$$

$$68. \frac{-3 + |3^3 - 30|}{2 - 6} = \frac{-3 + |27 - 30|}{-4} \\ = \frac{-3 + |-3|}{-4} \\ = \frac{-3 + 3}{-4} \\ = \frac{0}{-4} \\ = 0$$

$$70. \frac{\sqrt{(-2)^2 - 3} + 3}{6 - |3 \cdot 2 - 8|} = \frac{\sqrt{4 + (-3)} + 3}{6 - |6 - 8|} \\ = \frac{\sqrt{1} + 3}{6 - |-2|} \\ = \frac{1 + 3}{6 - 2} \\ = \frac{4}{4} \\ = 1$$

$$72. \frac{\sqrt{4 \cdot 7 + 2^3}}{3^2 - 5} = \frac{\sqrt{4 \cdot 7 + 8}}{9 - 5} \\ = \frac{\sqrt{28 + 8}}{4} \\ = \frac{\sqrt{36}}{4} \\ = \frac{6}{4} \\ = \frac{3}{2} \text{ or } 1\frac{1}{2}$$

$$74. (0.325)^4 \approx 0.0111566406$$

$$76. 2^{12} - 2^{10} = 4096 - 1024 = 3072$$

There are 3072 more results.

Cumulative Review

$$77. a \cdot \frac{1}{a} = 1$$

Inverse property of multiplication

$$78. b + (-b) = 0$$

Inverse property of addition

$$79. \frac{40,000 - 5000}{5000} = \frac{35,000}{5000} = 7$$

There has been an increase of 700%.

$$80. \frac{81,000}{27,000} = 3$$

The pressure is three times greater.

$$81. \text{Increase} = 849 - 731 = 118$$

$$\text{Percent} = \frac{118}{731} \approx 0.16$$

The percent increase was 16%.

82. 56% of $28,307 = 0.56 \times 28,307 \approx 15,852$
Abdul-Jabar made 15,852 field goals during his career.

Classroom Quiz 1.3

$$1. \left(\frac{2}{5}\right)^4 = \left(\frac{2}{5}\right)\left(\frac{2}{5}\right)\left(\frac{2}{5}\right)\left(\frac{2}{5}\right) = \frac{16}{625}$$

$$2. \frac{-7+4(-2)+5}{3-8} = \frac{-7+(-8)+5}{3-8} = \frac{-10}{-5} = 2$$

$$\begin{aligned} 3. & (7-12)^2 + 24 \div (-6) - \sqrt{4+5} \\ & = (-5)^2 + 24 \div (-6) - \sqrt{9} \\ & = 25 + 24 \div (-6) - 3 \\ & = 25 + (-4) - 3 \\ & = 18 \end{aligned}$$

Use Math to Save Money

- $\$13,710 - \$12,360 = \$1350$
The difference between MSRP and the invoice price is \$1350.
- $\frac{\$1350}{\$12,360} \approx 0.11 = 11\%$
The profit margin on a full-price sale is 11%.
- 5% of $\$12,360 = 0.05 \times \$12,360 = \$618$
- $\$12,360 + \$618 = \$12,978$
Using the 5% profit margin, Rachael should plan on paying \$12,978.
- $\$12,978 - \$500 = \$12,478$
The car will cost \$12,478 after the rebate.

How Am I Doing? Sections 1.1–1.3

(Available online through MyMathLab or from the Instructor's Resource Center.)

- π , $\sqrt{7}$ are irrational real numbers.
- $\sqrt{9}$, -5 , 3 , $\frac{6}{2}$, 0 are integers.
- $\sqrt{3}$ belongs to the irrational number set and the real number set.
- $(x+y)+z = x+(y+z)$
Associative property of addition

$$5. 12\left(\frac{1}{12}\right) = 1$$

Inverse property of multiplication

$$\begin{aligned} 6. 30 \div (-6) + 3 - 2(-5) &= -5 + 3 - 2(-5) \\ &= -5 + 3 + 10 \\ &= -2 + 10 \\ &= 8 \end{aligned}$$

$$7. 6\left(-\frac{2}{3}\right) + (-5)(-2) = -4 + 10 = 6$$

$$8. \frac{20+(5)(-2)}{3-7} = \frac{20+(-10)}{-4} = \frac{10}{-4} = -\frac{5}{2}$$

$$9. \frac{-5+(-5)}{-15} = \frac{-10}{-15} = \frac{2}{3}$$

$$10. -9 + 6(-2) - (-3) = -9 - 12 + 3 = -21 + 3 = -18$$

$$11. \sqrt{\frac{16}{49}} = \frac{\sqrt{16}}{\sqrt{49}} = \frac{4}{7}$$

$$12. \sqrt{0.81} = 0.9$$

$$13. 4^4 = 4 \cdot 4 \cdot 4 \cdot 4 = 256$$

$$\begin{aligned} 14. 12 - \sqrt{3^3 + 6(-3)} &= 12 - \sqrt{27 + (-18)} \\ &= 12 - \sqrt{9} \\ &= 12 - 3 \\ &= 9 \end{aligned}$$

$$\begin{aligned} 15. (-4)^3 + 2(3^2 - 2^2) &= -64 + 2(9 - 4) \\ &= -64 + 2(5) \\ &= -64 + 10 \\ &= -54 \end{aligned}$$

$$16. \frac{4-5^2}{14-\sqrt{16+9}} = \frac{4-25}{14-\sqrt{25}} = \frac{-21}{14-5} = \frac{-21}{9} = -\frac{7}{3}$$

$$17. |2^2 - 5 - 6| = |4 - 5 - 6| = |-7| = 7$$

$$18. \frac{\sqrt{(-2)^2 + 5}}{|12-15|} = \frac{\sqrt{4+5}}{|-3|} = \frac{\sqrt{9}}{3} = \frac{3}{3} = 1$$

1.4 Exercises

$$2. 4^{-3} = \frac{1}{4^3} = \frac{1}{64}$$

$$4. y^{-4} = \frac{1}{y^4}$$

$$6. (-2)^{-5} = \frac{1}{(-2)^5} = \frac{1}{-32} = -\frac{1}{32}$$

$$8. \left(-\frac{1}{2}\right)^{-4} = \frac{1}{\left(-\frac{1}{2}\right)^4} = \frac{1}{\frac{1}{16}} = 16$$

$$10. y^{10} \cdot y = y^{10+1} = y^{11}$$

$$12. 12^5 \cdot 12^9 = 12^{5+9} = 12^{14}$$

$$14. (-5a)(3a^2) = -5(3)a^{1+2} = -15a^3$$

$$16. (-15x^4y)(-6xy^5) = -15(-6)x^{4+1}y^{1+5} = 90x^5y^6$$

$$18. -6a^2b^0 = -6a^2(1) = -6a^2$$

$$20. -7a^4b^3(-2ab)^0 = -7a^4b^3(1) = -7a^4b^3$$

$$\begin{aligned} 22. (5^0a^3b^4)(-2a^3b^0) &= (a^3b^4)(-2a^3) \\ &= -2a^{3+3}b^4 \\ &= -2a^6b^4 \end{aligned}$$

$$\begin{aligned} 24. \left(\frac{1}{2}m^{-1}n\right)(14m^3n^{-2}) &= \frac{1}{2} \cdot 14m^{-1+3}n^{1-2} \\ &= 7m^2n^{-1} \\ &= \frac{7m^2}{n} \end{aligned}$$

$$26. \frac{x^{17}}{x^3} = x^{17-3} = x^{14}$$

$$28. \frac{x^4}{x^7} = x^{4-7} = x^{-3} = \frac{1}{x^3}$$

$$30. \frac{3^{16}}{3^{18}} = 3^{16-18} = 3^{-2} = \frac{1}{3^2} = \frac{1}{9}$$

$$32. \frac{4y^3}{8y} = \frac{y^{3-1}}{2} = \frac{y^2}{2}$$

$$34. \frac{40a^3b}{-5a^3} = -8a^{3-3}b = -8a^0b = -8b$$

$$36. \frac{-24x^5y^8}{-9x^{-1}y^{-2}} = \frac{8x^{5-(-1)}y^{8-(-2)}}{3} = \frac{8}{3}x^6y^{10}$$

$$38. (a^5)^7 = a^{5 \cdot 7} = a^{35}$$

$$40. (2xy^6)^5 = 2^5x^5y^{6 \cdot 5} = 32x^5y^{30}$$

$$42. \left(\frac{x^3}{y^5z^8}\right)^4 = \frac{x^{3 \cdot 4}}{y^{5 \cdot 4}z^{8 \cdot 4}} = \frac{x^{12}}{y^{20}z^{32}}$$

$$\begin{aligned} 44. \left(\frac{5a^3b}{-3a^{-2}b^0}\right)^3 &= \left(\frac{5a^5b}{-3}\right)^3 \\ &= \frac{5^3a^{5 \cdot 3}b^3}{(-3)^3} \\ &= \frac{125a^{15}b^3}{-27} \\ &= -\frac{125a^{15}b^3}{27} \end{aligned}$$

$$46. \left(\frac{3x^{-4}y}{x^{-3}y^2}\right)^{-2} = \left(\frac{3}{xy}\right)^{-2} = \frac{3^{-2}}{x^{-2}y^{-2}} = \frac{x^2y^2}{9}$$

$$\begin{aligned} 48. (x^2y^{-1})^{-2}(3x^{-3})^2 &= x^{(2)(-2)}y^{(-1)(-2)} \cdot 3^2x^{(-3)(2)} \\ &= 9x^{-4}y^2x^{-6} \\ &= 9x^{-4-6}y^2 \\ &= 9x^{-10}y^2 \\ &= \frac{9y^2}{x^{10}} \end{aligned}$$

$$\begin{aligned} 50. \frac{(m^4n^3)^{-1}}{(-5m^{-3}n^4)^2} &= \frac{m^{4(-1)}n^{3(-1)}}{(-5)^2m^{-3(2)}n^{4 \cdot 2}} \\ &= \frac{m^{-4}n^{-3}}{25m^{-6}n^8} \\ &= \frac{m^2}{25n^{11}} \end{aligned}$$

$$52. \frac{3^4 a^{-3}}{3^3 a^4} = 3^{4-3} a^{-3-4} = 3a^{-7} = \frac{3}{a^7}$$

$$54. \left(\frac{2}{5}x^3\right)^{-2} = \left(\frac{2}{5}\right)^{-2} x^{3(-2)} = \left(\frac{5}{2}\right)^2 x^{-6} = \frac{25}{4x^6}$$

$$56. \left(\frac{y}{z^{-4}}\right)^{-3} = \frac{y^{-3}}{z^{(-4)(-3)}} = \frac{y^{-3}}{z^{12}} = \frac{1}{y^3 z^{12}}$$

$$58. \frac{c^{-3}d^{-2}}{c^{-4}d^{-5}} = c^{-3-(-4)}d^{-2-(-5)} = c^{-3+4}d^{-2+5} = cd^3$$

$$\begin{aligned} 60. \left(\frac{25x^{-1}y^{-6}}{5x^{-4}y^{-6}}\right)^{-2} &= (5x^{-1-(-4)})^{-2} \\ &= (5x^3)^{-2} \\ &= 5^{-2}x^{3(-2)} \\ &= 5^{-2}x^{-6} \\ &= \frac{1}{5^2 x^6} \\ &= \frac{1}{25x^6} \end{aligned}$$

$$\begin{aligned} 62. \frac{9^{-2} \cdot 8^{-10}}{9^{-1} \cdot 8^{-9}} &= 9^{-2-(-1)}8^{-10-(-9)} \\ &= 9^{-1}8^{-1} \\ &= \frac{1}{9 \cdot 8} \\ &= \frac{1}{72} \end{aligned}$$

$$\begin{aligned} 64. (-12x^5y^{-2})\left(\frac{3}{4}x^{-6}y^3\right) &= -12 \cdot \frac{3}{4}x^{5-6}y^{-2+3} \\ &= -9x^{-1}y^1 \\ &= -\frac{9y}{x} \end{aligned}$$

$$\begin{aligned} 66. \frac{1.98364 \times 10^{-14}}{4.32571 \times 10^{-16}} &\approx 0.458569807 \times 10^2 \\ &\approx 4.58569807 \times 10^1 \end{aligned}$$

$$68. 759 = 7.59 \times 10^2$$

$$70. 63,200,000 = 6.32 \times 10^8$$

$$72. 0.0654 = 6.54 \times 10^{-2}$$

$$74. 0.000039 = 3.9 \times 10^{-5}$$

$$76. 4.006 \times 10^6 = 4,006,000$$

$$78. 7.07 \times 10^{-3} = 0.00707$$

$$80. 2.512 \times 10^{-8} = 0.00000002512$$

$$\begin{aligned} 82. (3.0 \times 10^{-5})(1.6 \times 10^{10}) &= 3.0(1.6)(10^{-5})(10^{10}) \\ &= 4.8 \times 10^{-5+10} \\ &= 4.8 \times 10^5 \end{aligned}$$

$$84. \frac{8.4 \times 10^{-10}}{2.1 \times 10^2} = \frac{8.4}{2.1} \times 10^{-10-2} = 4 \times 10^{-12}$$

$$86. 300,000 \div 200 = 1500$$

Moths and butterflies are 1500 times more sensitive.

$$\begin{aligned} 88. (5.87 \times 10^{12})(5 \times 10^3) &= 29.35 \times 10^{15} \\ &= 2.935 \times 10^{16} \end{aligned}$$

The light would travel 2.935×10^{16} miles.

$$\begin{aligned} 90. \frac{4.90 \times 10^{11}}{2 \times 10^4} &= \frac{4.90}{2} \times 10^{11-4} \\ &= 2.45 \times 10^7 \end{aligned}$$

It will take 2.45×10^7 seconds to reach the sun.

Cumulative Review

$$\begin{aligned} 91. \frac{\text{mass of Jupiter}}{\text{mass of Mercury}} &= \frac{2.09 \times 10^{24}}{3.64 \times 10^{20}} \\ &\approx 0.5742 \times 10^4 \\ &= 5742 \end{aligned}$$

The mass of Jupiter is about 5742 times greater than the mass of Mercury.

$$\begin{aligned} 92. \frac{1 \text{ cal}}{2.78 \times 10^{-7} \text{ kW-hr}} \cdot 5.56 \times 10^3 \text{ kW-hr} \\ &= 2 \times 10^{10} \text{ calories} \end{aligned}$$

There are 2×10^{10} calories.

$$\begin{aligned}
 93. \quad -9 + 14 \div (-2) + 5^2 &= -9 + 14 \div (-2) + 25 \\
 &= -9 + (-7) + 25 \\
 &= -16 + 25 \\
 &= 9
 \end{aligned}$$

$$94. \quad -6^2 + 16 \div 2 = -36 + 16 \div 2 = -36 + 8 = -28$$

Classroom Quiz 1.4

$$1. \quad \frac{21x^5y^6}{14x^2y^{-4}} = \frac{21}{14}x^{5-2}y^{6-(-4)} = \frac{3}{2}x^3y^{10} = \frac{3x^3y^{10}}{2}$$

$$\begin{aligned}
 2. \quad \left(\frac{4a^3b^{-5}}{b^2} \right)^2 &= (4a^3b^{-7})^2 \\
 &= 4^2a^{3(2)}b^{-7(2)} \\
 &= 16a^6b^{-14} \\
 &= \frac{16a^6}{b^{14}}
 \end{aligned}$$

$$3. \quad 0.000000765 = 7.65 \times 10^{-7}$$

1.5 Exercises

2. The coefficient of x is $3xy^3z$ since x is multiplied by $3y^3z$.

4. The terms of $5x^3 + 3x^2 - 2y - 8$ are $5x^3$, $3x^2$, $-2y$, and -8 .

6. The coefficient of $-4xy$ is -4 , of $9x^2$ is 9 , and of y is 1 .

8. The coefficient of $6x^2$ is 6 , of $-x$ is -1 , and of $-6y$ is -6 .

10. The coefficient of $-6a^2b^3$ is -6 , of $\frac{2}{3}ab^2$ is $\frac{2}{3}$, and of $-\frac{7}{10}ab$ is $-\frac{7}{10}$.

$$12. \quad 11ab - ab = (11 - 1)ab = 10ab$$

$$14. \quad 4a - 3b - 9a + 8b = -5a + 5b$$

$$16. \quad -6y^2 - y + 3y + 2y^2 = -4y^2 + 2y$$

$$18. \quad 2a - ab - 2a - ab = -2ab$$

$$20. \quad 1.2x^2 - x + 0.3x^2 = 1.5x^2 - x$$

$$\begin{aligned}
 22. \quad \frac{5}{8}m + \frac{4}{5}n + \frac{1}{2}m - \frac{1}{5}n &= \frac{5}{8}m + \frac{4}{5}n + \frac{4}{8}m - \frac{1}{5}n \\
 &= \frac{9}{8}m + \frac{3}{5}n
 \end{aligned}$$

$$24. \quad \frac{3}{2}x^2 + 7x + \frac{1}{2}x^2 - 10y = 2x^2 + 7x - 10y$$

$$26. \quad 6y^2 - 1.6y - 3.2y - 3.8y^2 = 2.2y^2 - 4.8y$$

$$28. \quad 7y(4x - 3) = 7y(4x) - 7y(3) = 28xy - 21y$$

$$\begin{aligned}
 30. \quad -3x(x^3 + 2x^2 - x) \\
 &= -3x(x^3) - 3x(2x^2) - 3x(-x) \\
 &= -3x^4 - 6x^3 + 3x^2
 \end{aligned}$$

$$32. \quad -4m^3(2m + 6 - 5mn) = -8m^4 - 24m^3 + 20m^4n$$

$$34. \quad 3ab(a^2 - ab - 4b^2) = 3a^3b - 3a^2b^2 - 12ab^3$$

$$36. \quad \frac{1}{2}(5x - 8y + 4) = \frac{5}{2}x - 4y + 2$$

$$38. \quad \frac{x}{4}(x^2 + 5x - 12) = \frac{x^3}{4} + \frac{5x^2}{4} - 3x$$

$$\begin{aligned}
 40. \quad 5xy^2(y^3 - y^2 + 3x + 1) \\
 &= 5xy^5 - 5xy^4 + 15x^2y^2 + 5xy^2
 \end{aligned}$$

$$42. \quad 1.2x^2(4x - 2xy + 5) = 4.8x^3 - 2.4x^3y + 6x^2$$

$$\begin{aligned}
 44. \quad 5(x - 2) + x(3x - 8) - (x - 2) \\
 &= 5x - 10 + 3x^2 - 8x - x + 2 \\
 &= 3x^2 - 4x - 8
 \end{aligned}$$

$$\begin{aligned}
 46. \quad -3\{3y + 2[y + 2(y - 4)]\} \\
 &= 3\{3y + 2[y + 2y - 8]\} \\
 &= -3\{3y + 2[3y - 8]\} \\
 &= -3\{3y + 6y - 16\} \\
 &= -3\{9y - 16\} \\
 &= -27y + 48
 \end{aligned}$$

$$\begin{aligned}
 48. \quad -(y - 5) + 6(xy - 2) &= -y + 5 + 6xy - 12 \\
 &= 6xy - y - 7
 \end{aligned}$$

$$50. \quad -x^4 + 5x^3 + 9x^4 - 8x^3 = 8x^4 - 3x^3$$

$$\begin{aligned}
 52. \quad 3[3(3x+6)-5(5x-9)] &= 3[9x+18-25x+45] \\
 &= 27x+54-75x+135 \\
 &= -48x+189
 \end{aligned}$$

$$\begin{aligned}
 54. \quad 3x[5-(4x-y)] &= 3x[5-4x+y] \\
 &= 15x-12x^2+3xy
 \end{aligned}$$

Cumulative Review

$$55. \quad 3(-2)^3 - 5(-6) = 3(-8) - 5(-6) = -24 + 30 = 6$$

$$\begin{aligned}
 56. \quad \sqrt{81} - 5(3-5+2) &= 9 - 5(3-5+2) \\
 &= 9 - 5(0) \\
 &= 9 - 0 \\
 &= 9
 \end{aligned}$$

$$57. \quad \frac{5(-2)-8}{3+4-(-3)} = \frac{-10-8}{7+3} = \frac{-18}{10} = \frac{-9}{5} = -1.8$$

$$58. \quad (-3)^5 + 2(-3) = -243 - 6 = -249$$

$$\begin{aligned}
 59. \quad &\frac{1,893,500 \text{ organisms}}{\text{inch}} \cdot \frac{1 \text{ inch}}{0.0254 \text{ meter}} \\
 &= \frac{1,893,500 \text{ organisms}}{0.0254 \text{ meter}} \cdot \frac{1000 \text{ meters}}{\text{kilometer}} \\
 &\approx \frac{7.4547 \times 10^{10} \text{ organisms}}{\text{kilometer}}
 \end{aligned}$$

You would find 7.4547×10^{10} organisms in 1 kilometer.

$$\begin{aligned}
 60. \quad &4167 \text{ meter} \left(\frac{\text{ft}}{0.305 \text{ meter}} \right) \left(\frac{2\%}{1000 \text{ ft}} \right) \\
 &\approx 27.3\% \text{ loss} \\
 &\text{There would be a } 27.3\% \text{ loss.}
 \end{aligned}$$

Classroom Quiz 1.5

$$\begin{aligned}
 1. \quad &4x^2y(2x-3y+5x^2) \\
 &= 4x^2y(2x) + 4x^2y(-3y) + 4x^2y(5x^2) \\
 &= 8x^3y - 12x^2y^2 + 20x^4y
 \end{aligned}$$

$$\begin{aligned}
 2. \quad &-3x^2(2x-5y) + 5(2x^3+3x^2y) \\
 &= -6x^3 + 15x^2y + 10x^3 + 15x^2y \\
 &= 4x^3 + 30x^2y
 \end{aligned}$$

$$\begin{aligned}
 3. \quad &2[5(3x-2)-4(2x+3)] = 2(15x-10-8x-12) \\
 &= 2(7x-22) \\
 &= 14x-44
 \end{aligned}$$

1.6 Exercises

$$2. \quad 11x - 7 = 11(3) - 7 = 33 - 7 = 26$$

$$\begin{aligned}
 4. \quad x^2 + 3x - 12 &= (-5)^2 + 3(-5) - 12 \\
 &= 25 + (-15) - 12 \\
 &= -2
 \end{aligned}$$

$$\begin{aligned}
 6. \quad 5x - x^2 + 10 &= 5(4) - (4)^2 + 10 \\
 &= 20 - 16 + 10 \\
 &= 4 + 10 \\
 &= 14
 \end{aligned}$$

$$\begin{aligned}
 8. \quad 6x^2 - 3x + 5 &= 6(5)^2 - 3(5) + 5 \\
 &= 6(25) - 15 + 5 \\
 &= 150 - 15 + 5 \\
 &= 140
 \end{aligned}$$

$$10. \quad (-5a)^2 = (-5(-2))^2 = (10)^2 = 100$$

$$12. \quad -5a^2 = -5(-2)^2 = -5(4) = -20$$

$$\begin{aligned}
 14. \quad 3ab - 5by - y &= 3(5)(-1) - 5(-1)(-3) - (-3) \\
 &= -15 - 15 + 3 \\
 &= -27
 \end{aligned}$$

$$\begin{aligned}
 16. \quad \sqrt{b^2 - 4ac} &= \sqrt{(-3)^2 - 4(-1)(10)} \\
 &= \sqrt{9 + 40} \\
 &= \sqrt{49} \\
 &= 7
 \end{aligned}$$

$$\begin{aligned}
 18. \quad 3x^2 - 7x - 2 &= 3(-0.56736)^2 - 7(-0.56736) - 2 \\
 &\approx 2.93721
 \end{aligned}$$

$$20. \quad F = \frac{9}{5}(30) + 32 = 54 + 32 = 86^\circ\text{F}$$

$$22. \quad C = \frac{5(-40) - 160}{9} = -40^\circ\text{C}$$

$$\begin{aligned}
 24. \quad T &= 2\pi\sqrt{\frac{L}{g}} \\
 T &\approx 2(3.14)\sqrt{\frac{512}{32}} = 25.12
 \end{aligned}$$

It will take the cable 25.12 seconds.

$$\begin{aligned}
 26. \quad A &= p(1+rt) \\
 &= \$5000[1+(0.05)(3.5)] \\
 &= \$5000(1.175) \\
 &= \$5875
 \end{aligned}$$

The amount will be \$5875.

$$\begin{aligned}
 28. \quad A &= p(1+rt) \\
 &= \$3500[1+(0.07)(6)] \\
 &= \$3500(1.42) \\
 &= \$4970
 \end{aligned}$$

The amount to be repaid is \$4970.

$$30. \quad S = \frac{1}{2}gt^2 = \frac{1}{2}(32)(6)^2 = 576$$

The distance is 576 feet.

$$32. \quad S = \frac{1}{2}gt^2 = \frac{1}{2}(32)(4)^2 = 256$$

The bolt fell 256 feet.

$$34. \quad z = \frac{Rr}{R+r} = \frac{35(15)}{35+15} = \frac{525}{50} = \frac{21}{2} \text{ or } 10\frac{1}{2}$$

The value of z is $10\frac{1}{2}$.

$$36. \quad m = \frac{cx}{c+12} = \frac{10 \cdot 325}{10+12} = \frac{3250}{22} \approx 148$$

Give the child 148 milligrams.

$$38. \quad C = \pi d \approx 3.14(0.2) = 0.628$$

The circumference is 0.628 meter.

$$40. \quad A = \frac{1}{2}ab = \frac{1}{2} \cdot 12 \cdot 14 = 84$$

The area is 84 m^2 .

$$42. \quad A = ab = 8\left(\frac{43}{4}\right) = 86$$

The area is 86 cm^2 .

$$\begin{aligned}
 44. \quad S &= 2lw + 2wh + 2lh \\
 S &= 2(1.8)(1) + 2(1)(1) + 2(1.8)(1) = 9.2
 \end{aligned}$$

The surface area is 9.2 in.^2 .

$$\begin{aligned}
 46. \quad P &= b + c + d + e \\
 P &= 5.8 + 7.8 + 4.5 + 6.1 = 24.2
 \end{aligned}$$

The perimeter is 24.2 meters.

$$\begin{aligned}
 48. \quad a. \quad V &= \frac{4}{3}\pi r^3 \\
 V &\approx \frac{4}{3}(3.14)(2.3)^3 \approx 50.94
 \end{aligned}$$

The volume is 50.94 cubic centimeters.

$$\begin{aligned}
 b. \quad S &= 4\pi r^2 \\
 S &\approx 4(3.14)(2.3)^2 \approx 66.44
 \end{aligned}$$

The surface area is 66.44 square centimeters.

$$50. \quad A = \pi r^2 \approx 3.14(12)^2 \approx 452.16$$

$$C = 2\pi r \approx 2(3.14)(12) \approx 75.36$$

The area is 452.16 square centimeters and the circumference is 75.36 centimeters.

Cumulative Review

$$51. \quad (6x^{-4}y^3z^0)^2 = \left(\frac{6y^3}{x^4}\right)^2 = \frac{6^2y^{3 \cdot 2}}{x^{4 \cdot 2}} = \frac{36y^6}{x^8}$$

$$52. \quad \left(\frac{2x^3}{3y}\right)^3 = \frac{2^3x^{3 \cdot 3}}{3^3y^3} = \frac{8x^9}{27y^3}$$

$$\begin{aligned}
 53. \quad 2\{5 - 2[x - 3(2x + 1)]\} &= 2\{5 - 2[x - 6x - 3]\} \\
 &= 2\{5 - 2[-5x - 3]\} \\
 &= 2\{5 + 10x + 6\} \\
 &= 2\{11 + 10x\} \\
 &= 22 + 20x \\
 &= 20x + 22
 \end{aligned}$$

$$\begin{aligned}
 54. \quad 2^3 - 4^2 + \sqrt{9 \cdot 2 - 2} &= 8 - 16 + \sqrt{18 - 2} \\
 &= -8 + \sqrt{16} \\
 &= -8 + 4 \\
 &= -4
 \end{aligned}$$

$$\begin{aligned}
 55. \quad 12,000,000 - 0.30(19,000,000) \\
 &= 6,300,000
 \end{aligned}$$

There were 6,300,000 people on the Internet at 9 P.M. who were not on the Internet at 2 P.M.

$$\begin{aligned}
 56. \quad 180(0.95) &= 171 \text{ living graduates} \\
 171(0.69) &= 118 \text{ graduates attending} \\
 118 + 0.77(118) &= 209 \text{ including spouses} \\
 209 + 22 \text{ faculty} &= 231 \text{ people attending} \\
 \text{The total number of people at the reunion was} &= 231.
 \end{aligned}$$

Classroom Quiz 1.6

1. $-4x^2 + 6x - 3 = -4(-2)^2 + 6(-2) - 3$
 $= -4(4) + 6(-2) - 3$
 $= -16 - 12 - 3$
 $= -31$
2. $5x^2 - 3xy + y^2 = 5(3)^2 - 3(3)(-5) + (-5)^2$
 $= 5(9) - 3(3)(-5) + 25$
 $= 45 + 45 + 25$
 $= 115$

3. $A = \frac{1}{2}a(b+c)$
 $= \frac{1}{2} \cdot 18(8+13)$
 $= \frac{1}{2} \cdot 18(21)$
 $= 9(21)$
 $= 189$

The area is 189 square meters.

Career Exploration Problems

1. Use $N = 28$ and sum of N responses = 90 in the formula.

$$\left[\left(\frac{\text{sum of } N \text{ responses}}{N} \right) - 1 \right] \times 25$$

$$= \left[\left(\frac{90}{28} \right) - 1 \right] \times 25$$

$$= \left(\frac{62}{28} \right) \times 25$$

$$\approx 55.36$$

Emily's overall score is 55.36.

2. Moderate exercise:

$$\text{Lower limit} = (220 - 22) \times 0.5 = 198 \times 0.5 = 99$$

$$\text{Upper limit} = (220 - 22) \times 0.7$$

$$= 198 \times 0.7$$

$$= 138.6$$

Vigorous exercise:

$$\text{Lower limit} = (220 - 22) \times 0.7$$

$$= 198 \times 0.7$$

$$= 138.6$$

$$\text{Upper limit} = (220 - 22) \times 0.85$$

$$= 198 \times 0.85$$

$$= 168.3$$

For moderate exercise, the lower limit for her target heart rate is 99 beats per minute and the upper limit is 138.6 beats per minute.

For vigorous exercise, the lower limit for her target heart rate is 138.6 beats per minute and the upper limit is 168.3 beats per minute.

3. Use $r = 5\% = 0.05$, $n = 8$, and $R = 125$ in the formula.

$$(1+r)^n \times R = (1+0.05)^8 \times 125$$

$$= (1.05)^8 \times 125$$

$$\approx 185$$

After 8 weeks, Emily's rage of motion will be approximately 185°, so her goal is possible.

You Try It

1. a. $0.5 + 0 = 0.5$
Identity property of addition
- b. $(1 + 9) + 3 = 1 + (9 + 3)$
Associative property of addition
- c. $10 \cdot 1 = 10$
Identity property of multiplication
- d. $10 + 4 = 4 + 10$
Commutative property of addition
- e. $2 \cdot 9 = 9 \cdot 2$
Commutative property of multiplication
- f. $5 \cdot (4 \cdot 6) = (5 \cdot 4) \cdot 6$
Associative property of multiplication
- g. $8\left(\frac{1}{8}\right) = 1$
Inverse property of multiplication
- h. $5(2 + 6) = 5 \cdot 2 + 5 \cdot 6$
Distributive property of multiplication over addition
- i. $-14 + 14 = 0$
Inverse property of addition
2. a. $|7| = 7$
- b. $|-10| = 10$
- c. $\left|-\frac{3}{5}\right| = \frac{3}{5}$
- d. $|1.25| = 1.25$
3. a. $8 + 3 = 11$
- b. $-5 + (-9) = -14$
- c. $-\frac{3}{4} + \frac{1}{4} = -\frac{2}{4} = -\frac{1}{2}$

d. $-18 + 25 = 7$

4. a. $19 - (-6) = 19 + 6 = 25$

b. $-8.4 - 2.1 = -8.4 + (-2.1) = -10.5$

5. a. $(-8)(-6) = 48$

b. $-36 \div (-9) = 4$

c. $3(-6) = -18$

d. $-40 \div 5 = -8$

6. $9 - 3(1 - 3)^2 + 21 \div (-3) = 9 - 3(-2)^2 + 21 \div (-3)$
 $= 9 - 3(4) + 21 \div (-3)$
 $= 9 - 12 + (-7)$
 $= -3 + (-7)$
 $= -10$

7. a. $a^{-5} = \frac{1}{a^5}$

b. $3^{-3} = \frac{1}{3^3} = \frac{1}{27}$

c. $\frac{a^{-2}}{b^{-4}} = \frac{b^4}{a^2}$

8. a. $(3x^4)(4x^3) = 3 \cdot 4 \cdot x^{4+3} = 12x^7$

b. $\frac{24x^6}{8x} = \frac{24}{8} x^{6-1} = 3x^5$

9. a. $m^0 = 1$

b. $8^0 = 1$

c. $(3x)^0 = 1$

10. a. $(3^4)^2 = 3^{4 \cdot 2} = 3^8$

b. $(2a^{-5})^3 = 2^3 a^{(-5)(3)} = 8a^{-15} = \frac{8}{a^{15}}$

c. $\left(\frac{x^2}{4y^3}\right)^{-3} = \frac{x^{2(-3)}}{4^{-3}y^{3(-3)}}$
 $= \frac{x^{-6}}{4^{-3}y^{-9}}$
 $= \frac{4^3y^9}{x^6}$
 $= \frac{64y^9}{x^6}$

11. a. $3124 = 3.124 \times 10^3$

b. $18,250,000 = 1.825 \times 10^7$

c. $27,800,000,000 = 2.78 \times 10^{10}$

d. $0.039 = 3.9 \times 10^{-2}$

e. $0.00021 = 2.1 \times 10^{-4}$

f. $0.0000007 = 7 \times 10^{-7}$

12. $-6a + 12b - 15a^2 - a + 3b + 9a^2$
 $= -6a^2 - 7a + 15b$

13. $5(3x^2 - x + 5) = 15x^2 - 5x + 25$

14. $-2\{3x - 3[6 - 2(x - 1)]\} = -2\{3x - 3[6 - 2x + 2]\}$
 $= -2\{3x - 3[8 - 2x]\}$
 $= -2\{3x - 24 + 6x\}$
 $= -2\{9x - 24\}$
 $= -18x + 48$

15. $3x^2 - 5xy + y^2 = 3(-2)^2 - 5(-2)(3) + 3^2$
 $= 3(4) - 5(-2)(3) + 9$
 $= 12 + 30 + 9$
 $= 51$

16. $A = \frac{1}{2}ab = \frac{1}{2}(16)(5) = 40$

The area is 40 ft^2 .

Chapter 1 Review Problems

1. -5 : Integer, Rational, Real

2. $\frac{7}{8}$: Rational, Real

3. 3: Natural, Whole, Integer, Rational, Real
4. $0.\overline{3}$: Rational, Real
5. 2.1652384...: Irrational, Real
6. Commutative property of addition
7. Associative property of multiplication
8. Yes, all rational numbers are real numbers.
9. $-15 - (-20) = -15 + 20 = 5$
10. $-7.3 + (-16.2) = -23.5$
11. $-8(-6) = 48$
12. $-\frac{4}{5} \div \left(-\frac{12}{5}\right) = -\frac{4}{5} \cdot \left(-\frac{5}{12}\right) = \frac{1}{3}$
13. $-\frac{5}{6} \left(\frac{7}{10}\right) = -\frac{7}{12}$
14. $5 + 6 - 2 - 5 = 11 - 2 - 5 = 9 - 5 = 4$
15. $-3.6(-1.5) = 5.4$
16. $0 \div (-14) = 0$
17. $7 \div 0$ is undefined
18. $-17 + (+17) = 0$
19. $17 - 3(6) = 17 - 18 = -1$
20. $\frac{5-8}{2-7-(-2)} = \frac{-3}{-5+2} = \frac{-3}{-3} = 1$
21. $2\sqrt{49} - 3^2 + 5 = 2(7) - 3^2 + 5$
 $= 14 - 9 + 5$
 $= 5 + 5$
 $= 10$
22. $4(6) - |-8| + (-1)^3 = 24 - 8 + (-1)$
 $= 16 - 1$
 $= 15$
23. $\sqrt{(-1)^2 + 6(4)} + 8 \div (-2) = \sqrt{1+24} + (-4)$
 $= \sqrt{25} + (-4)$
 $= 5 + (-4)$
 $= 1$
24. $\sqrt{\frac{25}{36}} - 2\left(\frac{1}{12}\right) = \frac{5}{6} - \left(\frac{1}{6}\right) = \frac{4}{6} = \frac{2}{3}$
25. $6|-3-1| + 5(-3)(0) - 4^2 = 6|-4| + 0 - 16$
 $= 6(4) - 16$
 $= 24 - 16$
 $= 8$
26. $(-0.4)^3 = (-0.4)(-0.4)(-0.4) = -0.064$
27. $(3xy^2)(-2x^0y)(4x^3y^3) = 3(-2)(4)x^{1+0+3}y^{2+1+3}$
 $= -24x^4y^6$
28. $(5a^4bc^2)(-6ab^2) = 5(-6)a^{4+1}b^{1+2}c^2$
 $= -30a^5b^3c^2$
29. $\frac{16abc^0}{48ab^4c^2} = \left(\frac{16}{48}\right)a^{1-1}b^{1-4}c^{0-2}$
 $= \frac{1}{3}a^0b^{-3}c^{-2}$
 $= \frac{1}{3b^3c^2}$
30. $\left(\frac{-3x^3y}{2x^4z^2}\right)^4 = \frac{(-3)^4(x^3)^4y^4}{2^4(x^4)^4(z^2)^4}$
 $= \frac{81x^{12}y^4}{16x^{16}z^8}$
 $= \frac{81y^4}{16x^{16-12}z^8}$
 $= \frac{81y^4}{16x^4z^8}$
31. $(-2xy^6z^0)^3 = (-2)^3x^3y^{6(3)}(1)^3 = -8x^3y^{18}$
32. $(2x^2y^{-4})(-5x^{-1}y) = -10x^{2-1}y^{-4+1}$
 $= -10xy^{-3}$
 $= -\frac{10x}{y^3}$
33. $\frac{3x^5y^{-6}}{12x^{-2}y} = \frac{x^{5-(-2)}}{4y \cdot y^6} = \frac{x^7}{4y^{1+6}} = \frac{x^7}{4y^7}$
34. $\frac{(5^{-1}x^{-2})^{-1}}{(2^{-2}y)^{-3}} = \frac{5^{-1(-1)}x^{-2(-1)}}{2^{-2(-3)}y^{-3}} = \frac{5^1x^2}{2^6y^{-3}} = \frac{5x^2y^3}{64}$

$$\begin{aligned}
 35. \left(\frac{x^3 y^4}{5x^6 y^8} \right)^3 &= \frac{x^9 y^{12}}{5^3 x^{18} y^{24}} \\
 &= \frac{1}{125 x^{18-9} y^{24-12}} \\
 &= \frac{1}{125 x^9 y^{12}}
 \end{aligned}$$

$$36. 0.00721 = 7.21 \times 10^{-3}$$

$$\begin{aligned}
 37. (5,300,000)(2,000,000,000) \\
 &= (5.3 \times 10^6)(2.0 \times 10^9) \\
 &= 10.6 \times 10^{15} \\
 &= 1.06 \times 10^{16}
 \end{aligned}$$

$$\begin{aligned}
 38. -x + 8 + 6x^2 + 7x - 4 &= 6x^2 + (7-1)x + 8-4 \\
 &= 6x^2 + 6x + 4
 \end{aligned}$$

$$\begin{aligned}
 39. -5ab^2(a^3 + 2a^2b - 3b - 4) \\
 &= -5a^4b^2 - 10a^3b^3 + 15ab^3 + 20ab^2
 \end{aligned}$$

$$\begin{aligned}
 40. 3x(x-7) - (x^2 + 1) &= 3x^2 - 21x - x^2 - 1 \\
 &= 2x^2 - 21x - 1
 \end{aligned}$$

$$\begin{aligned}
 41. 2x^2 - \{2 + x[3 - 2(x-1)]\} \\
 &= 2x^2 - \{2 + x[3 - 2x + 2]\} \\
 &= 2x^2 - \{2 + x[5 - 2x]\} \\
 &= 2x^2 - \{2 + 5x - 2x^2\} \\
 &= 2x^2 - 2 - 5x + 2x^2 \\
 &= 4x^2 - 5x - 2
 \end{aligned}$$

$$\begin{aligned}
 42. 5x^2 - 3xy - 2y^3 &= 5(2)^2 - 3(2)(-1) - 2(-1)^3 \\
 &= 5(4) - 6(-1) - 2(-1) \\
 &= 20 + 6 + 2 \\
 &= 28
 \end{aligned}$$

$$\begin{aligned}
 43. V &= \pi r^2 h \\
 V &\approx 3.14(3)^2(8) = 226.08 \\
 \text{The volume is } &226.08 \text{ cubic inches.}
 \end{aligned}$$

$$\begin{aligned}
 44. A &= \frac{1}{2}bh \\
 A &= \frac{1}{2}(52)(88) = 2288 \\
 \text{The area is } &2288 \text{ square yards.}
 \end{aligned}$$

$$\begin{aligned}
 45. A &= \frac{1}{2}h(b_1 + b_2) \\
 A &= \frac{1}{2}14(26 + 34) = 420
 \end{aligned}$$

The area is 420 square inches.

$$\begin{aligned}
 46. 9(-2) + (-28 \div 7)^3 - 5 &= 9(-2) + (-4)^3 - 5 \\
 &= -18 + (-64) - 5 \\
 &= -82 - 5 \\
 &= -87
 \end{aligned}$$

$$\begin{aligned}
 47. (-7a^2b)(-2a^0b^3c^2) &= -7(-2)a^{2+0}b^{1+3}c^2 \\
 &= 14a^2b^4c^2
 \end{aligned}$$

$$\begin{aligned}
 48. \frac{(3x^{-1}y^2)^3}{(4x^2y^{-2})^2} &= \frac{3^3 x^{-1(3)} y^{2(3)}}{4^2 x^{2(2)} y^{-2(2)}} \\
 &= \frac{27x^{-3}y^6}{16x^4y^{-4}} \\
 &= \frac{27y^{6-(-4)}}{16x^{4-(-3)}} \\
 &= \frac{27y^{10}}{16x^7}
 \end{aligned}$$

$$\begin{aligned}
 49. \left(\frac{3a^{-5}b^0}{2a^{-2}b^3} \right)^2 &= \frac{3^2 a^{-5(2)} (1)^2}{2^2 a^{-2(2)} b^{3(2)}} \\
 &= \frac{9a^{-10-(-4)}}{4b^6} \\
 &= \frac{9a^{-6}}{4b^6} \\
 &= \frac{9}{4a^6b^6}
 \end{aligned}$$

$$50. 0.000058 = 5.8 \times 10^{-5}$$

$$51. 8.95 \times 10^7 = 89,500,000$$

$$\begin{aligned}
 52. 4x^2 - x^3 + 7x - 5x^2 + 6x^3 - 2x \\
 &= (-1+6)x^3 + (4-5)x^2 + (7-2)x \\
 &= 5x^3 - x^2 + 5x
 \end{aligned}$$

$$53. 2a^3b(5a - ab - 3) = 10a^4b - 2a^4b^2 - 6a^3b$$

$$\begin{aligned}
 54. -2\{x + 3[y - 5(x + y)]\} &= -2\{x + 3[y - 5x - 5y]\} \\
 &= -2\{x + 3[-4y - 5x]\} \\
 &= -2\{x - 12y - 15x\} \\
 &= -2\{-14x - 12y\} \\
 &= 28x + 24y
 \end{aligned}$$

$$\begin{aligned}
 55. \quad 5a^2 - 3ab + 4b &= 5(-3)^2 - 3(-3)(-2) + 4(-2) \\
 &= 5(9) + 9(-2) + (-8) \\
 &= 45 - 18 - 8 \\
 &= 19
 \end{aligned}$$

$$\begin{aligned}
 56. \quad A &= \pi r^2 \\
 A &\approx 3.14(4)^2 = 50.24 \\
 \text{The area is } &50.24 \text{ m}^2.
 \end{aligned}$$

$$\begin{aligned}
 57. \quad T &= 2\pi\sqrt{\frac{L}{g}} \\
 2(3.14)\sqrt{\frac{512}{32}} &\approx 25.12 \\
 \text{The period of the pendulum is } &25.12 \text{ seconds.}
 \end{aligned}$$

$$\begin{aligned}
 58. \quad \frac{2}{3}(6x - 9y) - (x - 2y) &= 4x - 6y - x + 2y \\
 &= 3x - 4y
 \end{aligned}$$

$$\begin{aligned}
 59. \quad A &= p(1 + rt) \\
 &= 3200(1 + 0.09 \times 2) \\
 &= 3200(1 + 0.18) \\
 &= 3200(1.18) \\
 &= 3776 \\
 \text{The amount to be repaid is } &\$3776.
 \end{aligned}$$

How Am I Doing? Chapter 1 Test

$$1. \quad \pi, 2\sqrt{5}$$

$$2. \quad -2, 12, \frac{9}{3}, \frac{25}{25}, 0, \sqrt{4}$$

$$\begin{aligned}
 3. \quad (8 \cdot x)3 &= 3(8 \cdot x) \\
 \text{Commutative property of multiplication}
 \end{aligned}$$

$$\begin{aligned}
 4. \quad (7-5)^2 - 18 \div (-3) + \sqrt{10+6} \\
 &= 2^3 + (-18) \div (-3) + \sqrt{16} \\
 &= 8 + (-18) \div (-3) + 4 \\
 &= 8 + 6 + 4 \\
 &= 14 + 4 \\
 &= 18
 \end{aligned}$$

$$\begin{aligned}
 5. \quad (4-5)^2 - 3(-2) \div 3 &= (-1)^2 - (-6) \div 3 \\
 &= 1 - (-2) \\
 &= 1 + 2 \\
 &= 3
 \end{aligned}$$

$$6. \quad \frac{16x^3y}{20x^{-1}y^5} = \frac{4x^{3-(-1)}}{5y^{5-1}} = \frac{4x^4}{5y^4}$$

$$\begin{aligned}
 7. \quad (5x^{-3}y^{-5})(-2x^3y^0) &= 5(-2)x^{-3+3}y^{-5+0} \\
 &= -10x^0y^{-5} \\
 &= -\frac{10}{y^5}
 \end{aligned}$$

$$\begin{aligned}
 8. \quad \left(\frac{5a^{-2}b}{a}\right)^2 &= \frac{5^2a^{-2(2)}b^2}{a^2} \\
 &= \frac{25a^{-4}b^2}{a^2} \\
 &= \frac{25b^2}{a^{2-(-4)}} \\
 &= \frac{25b^2}{a^6}
 \end{aligned}$$

$$\begin{aligned}
 9. \quad 7x - 9x^2 - 12x - 8x^2 + 5x \\
 &= (7 - 12 + 5)x + (-9 - 8)x^2 \\
 &= 0x - 17x^2 \\
 &= -17x^2
 \end{aligned}$$

$$\begin{aligned}
 10. \quad 5a + 4b - 6a^2 + b - 7a - 2a^2 \\
 &= (-6 - 2)a^2 + (5 - 7)a + (4 + 1)b \\
 &= -8a^2 - 2a + 5b
 \end{aligned}$$

$$11. \quad 3xy^2(4x - 3y + 2x^2) = 12x^2y^2 - 9xy^3 + 6x^3y^2$$

$$12. \quad 0.000002186 = 2.186 \times 10^{-6}$$

$$13. \quad 2.158 \times 10^9 = 2,158,000,000$$

$$\begin{aligned}
 14. \quad (3.8 \times 10^{-5})(4 \times 10^{-2}) &= (3.8 \times 4) \times 10^{-5-2} \\
 &= 15.2 \times 10^{-7} \\
 &= 1.52 \times 10^{-6}
 \end{aligned}$$

$$\begin{aligned}
 15. \quad 2x^2(x - 3y) - x(4 - 8x^2) \\
 &= 2x^3 - 6x^2y - 4x + 8x^3 \\
 &= 10x^3 - 6x^2y - 4x
 \end{aligned}$$

$$\begin{aligned}
 16. \quad 2[-3(2x + 4) + 8(3x - 2)] \\
 &= 2[-6x - 12 + 24x - 16] \\
 &= 2[18x - 28] \\
 &= 36x - 56
 \end{aligned}$$

$$\begin{aligned} 17. \quad 2x^2 - 3x - 6 &= 2(-4)^2 - 3(-4) - 6 \\ &= 2(16) + (-3)(-4) - 6 \\ &= 32 + 12 - 6 \\ &= 44 - 6 \\ &= 38 \end{aligned}$$

$$\begin{aligned} 18. \quad 5x^2 + 3xy - y^2 &= 5(3)^2 + 3(3)(-3) - (-3)^2 \\ &= 5(9) + (-27) - 9 \\ &= 45 - 27 - 9 \\ &= 18 - 9 \\ &= 9 \end{aligned}$$

$$\begin{aligned} 19. \quad A &= h \frac{1}{2}(b_1 + b_2) \\ A &= \frac{1}{2}(12)(6 + 7) = 78 \\ \text{The area is } 78 \text{ m}^2. \end{aligned}$$

$$\begin{aligned} 20. \quad A &= \pi r^2 \\ A &\approx 3.14(6)^2 = 113.04 \\ \text{The area is } 113.04 \text{ m}^2. \end{aligned}$$

$$\begin{aligned} 21. \quad A &= p(1 + rt) \\ A &= \$8000(1 + 0.05(3)) = \$9200 \\ \text{The amount to be repaid is } \$9200. \end{aligned}$$