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 without end.

6. 0: 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. $\sqrt{7}$ forms 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. $-25, -\frac{28}{7}, -\frac{18}{5}, -0.763, -0.333..., 0, \frac{1}{10}, \frac{2}{7}, 9, \frac{283}{5}, 52.8$

22. $-\pi, \frac{\pi}{4}, \sqrt{3}$

24. $-\frac{28}{7}, -25, -\frac{18}{5}, -0.763, -0.333...$

26. 9

28. 1, 2, 3, 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. 5.6 + (−5.6) = 0
Inverse property of addition

36. (−2.6) + 7 = 7 + (−2.6)
Commutative property of addition

38. $\left(-\frac{1}{5}\right)+\left(\frac{1}{5}\right) = 0$
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. $2 \cdot (5 \cdot x) = (2 \cdot 5) \cdot x$
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. $\frac{200}{287} \approx 0.70 = 70\%$
70% of his pass attempts were completed.

58. $35 = 1.27x$

$x = \dfrac{35}{1.27} = 27.55905...$

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.

$-\dfrac{3}{11}$, $-0.5333...$, 0, 2, $\dfrac{55}{7}$, 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 number in 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. $\left|3\dfrac{1}{2}\right| = 3\dfrac{1}{2}$

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

10. $|a| = a$

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

14. $-9 - 6 = -9 + (-6) = -15$

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

18. $(-42) \div 7 = -6$

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

22. $1.4 - (-3.6) = 1.4 + 3.6 = 5$

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

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

28. $\left(\dfrac{4}{\cancel{8}}\right)\left(-\dfrac{\overset{3}{\cancel{15}}}{11}\right) = -\dfrac{4(3)}{11} = -\dfrac{12}{11} = -1\dfrac{1}{11}$

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

32. $-5.9 + 5.9 = 0$

34. $\dfrac{-12}{0}$ Undefined

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

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

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

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

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

46. $12 - 3 - (-4) + 6 - 5 - 8$
$= 12 + (-3) + 4 + 6 + (-5) + (-8)$
$= 9 + 4 + 6 + (-5) + (-8)$
$= 13 + 6 + (-5) + (-8)$
$= 19 + (-5) + (-8)$
$= 14 + (-8)$
$= 6$

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

50. $-7(-3) - 10 + 3(-1) + 8 = 21 - 10 + (-3) + 8$
$= 11 + (-3) + 8$
$= 8 + 8$
$= 16$

52. $10(0.2) + 6 \div (-0.1) = 2 + 6 \div (-0.1)$
$= 2 + (-60)$
$= -58$

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

56. $\dfrac{72 \div (-4) + 3(-4)}{5 - (-5)} = \dfrac{-18 + (-12)}{5 + 5} = \dfrac{-30}{10} = -3$

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

60. $(1.783)(2.5725) - (1.0526)(-5.9812)$
$= 4.5867675 + 6.29581112$
$= 10.88257862$

62. Either two quantities are negative or all are positive. In other words, when multiplying an even number of negative numbers the answer will be positive. When all the quantities being multiplied are positive the answer will be positive.

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. $-\dfrac{1}{2}\pi$, $\sqrt{3}$ are irrational numbers.

66. -16, 0, $\dfrac{19}{2}$, 9.36, $10.\overline{5}$ are rational numbers.

Classroom Quiz 1.2

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

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

3. $15 + 30 \div 3 - 2(6) = 15 + 10 - 2(6)$
$= 15 + 10 - 12$
$= 25 - 12$
$= 13$

1.3 Exercises

2. 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. $(-3)^2 = (-3)(-3) = 9$

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

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

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

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

30. $\sqrt{121} = 11$ because $11^2 = 121$.

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

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

36. $\sqrt{0.25} = 0.5$

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

40. $\sqrt{420 - 20} = \sqrt{400} = 20$

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

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

46. $-\sqrt{-0.49}$ 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. $-3[(4.2+0.5)-0.7] = -3[4.7-0.7]$
$= -3[4]$
$= -12$

62. $10(-1) - 2^5 + \sqrt{144} = 10(-1) - 32 + 12$
$= -10 - 32 + 12$
$= -30$

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

66. $\dfrac{4+2(3^2-12)}{4-6} = \dfrac{4+2(9-12)}{-2}$
$= \dfrac{4+2(-3)}{-2}$
$= \dfrac{4+(-6)}{-2}$
$= \dfrac{-2}{-2}$
$= 1$

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

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

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

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

76. $2^{12} - 2^{10} = 4096 - 1024 = 3072$
There are 3072 more results.

Cumulative Review

77. $a \cdot \dfrac{1}{a} = 1$
Inverse property of multiplication

78. $b + (-b) = 0$
Inverse property of addition

79. $\dfrac{40{,}000-5000}{5000} = \dfrac{35{,}000}{5000} = 7$
There is an increase of 700%.

80. $\dfrac{81{,}000}{27{,}000} = 3$
The pressure is three times greater.

81. Decrease = 2478 − 2132 = 346
$\text{Percent} = \dfrac{346}{2478} \approx 0.14$
The percent decrease is 14%.

82. 56% of 28,307 = 0.56 × 28,307 ≈ 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. $\frac{-7+4(-2)+5}{3-8} = \frac{-7+(-8)+5}{3-8} = \frac{-10}{-5} = 2$

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

How Am I Doing? Sections 1.1–1.3

1. π, $\sqrt{7}$ are irrational real numbers.

2. $\sqrt{9}, -5, 3, \frac{6}{2}, 0$ are integers.

3. $\sqrt{3}$ belongs to the irrational number set and the real number set.

4. $(x + y) + z = x + (y + z)$
The associative property of addition

5. $12\left(\frac{1}{12}\right) = 1$
The inverse property of multiplication

6. $30 \div (-6) + 3 - 2(-5) = -5 + 3 - 2(-5)$
$= -5 + 3 + 10$
$= -2 + 10$
$= 8$

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

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

15. $(-4)^3 + 2(3^2 - 2^2) = -64 + 2(9 - 4)$
$= -64 + 2(5)$
$= -64 + 10$
$= -54$

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. $\left|2^2 - 5 - 6\right| = \left|4 - 5 - 6\right| = \left|-7\right| = 7$

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

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. $(4y^2)(2y) = 4(2)y^{2+1} = 8y^3$

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. $-9a^3b^5(-ab)^0 = -9a^3b^5(1) = -9a^3b^5$

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

24. $$\begin{aligned}\left(\frac{3}{4}mn^{-2}\right)(8m^{-4}n^3) &= \frac{3}{4}\cdot 8m^{1-4}n^{-2+3}\\ &= 6m^{-3}n^1\\ &= \frac{6n}{m^3}\end{aligned}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

60. $\left(\dfrac{25x^{-1}y^{-6}}{5x^{-4}y^{-6}}\right)^{-2} = (5x^{-1-(-4)})^{-2}$

$= (5x^3)^{-2}$

$= 5^{-2}x^{3(-2)}$

$= 5^{-2}x^{-6}$

$= \dfrac{1}{5^2x^6}$

$= \dfrac{1}{25x^6}$

62. $\dfrac{9^{-2}\cdot 8^{-10}}{9^{-1}\cdot 8^{-9}} = 9^{-2-(-1)}8^{-10-(-9)}$

$= 9^{-1}8^{-1}$

$= \dfrac{1}{9\cdot 8}$

$= \dfrac{1}{72}$

64. $(-12x^5y^{-2})\left(\dfrac{3}{4}x^{-6}y^3\right) = -12\cdot\dfrac{3}{4}x^{5-6}y^{-2+3}$

$= -9x^{-1}y^1$

$= -\dfrac{9y}{x}$

66. $\dfrac{1.98364\times10^{-14}}{4.32571\times10^{-16}} \approx 0.458569807\times10^2$

$\approx 4.58569807\times10^1$

68. $759 = 7.59\times10^2$

70. $405{,}300{,}000 = 4.053\times10^8$

72. $0.0654 = 6.54\times10^{-2}$

74. $0.0000048 = 4.8\times10^{-6}$

76. $4.006\times10^6 = 4{,}006{,}000$

78. $7.07\times10^{-3} = 0.00707$

80. $6.668\times10^{-9} = 0.000000006668$

82. $(1.8\times10^{-3})(4.0\times10^8) = (1.8)(4.0)(10^{-3})(10^8)$

$= 7.2\times10^{-3+8}$

$= 7.2\times10^5$

84. $\dfrac{10.5\times10^{-10}}{2.1\times10^2} = \dfrac{10.5}{2.1}\times10^{-10-2} = 5\times10^{-12}$

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

Moths and butterflies are 1500 times more sensitive.

88. $(5.87\times10^{12})(5\times10^3) = 29.35\times10^{15}$

$= 2.935\times10^{16}$

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

90. $\dfrac{4.90\times10^{11}}{2\times10^4} = \dfrac{4.90}{2}\times10^{11-4}$

$= 2.45\times10^7$

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

Cumulative Review

91. $\dfrac{\text{mass of Jupiter}}{\text{mass of Mercury}} = \dfrac{2.09\times10^{24}}{3.64\times10^{20}}$

$= 0.5742\times10^4$

$= 5742$ times greater

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

92. $\dfrac{1 \text{ cal}}{2.78\times10^{-7} \text{ kW-hr}}\cdot 5.56\times10^3 \text{ kW-hr}$

$= 2\times10^{10}$ calories

There are 2×10^{10} calories.

93. $-9+14\div(-2)+5^2 = -9+14\div(-2)+25$

$= -9+(-7)+25$

$= -16+25$

$= 9$

94. $-6^2+16\div2 = -36+16\div2 = -36+8 = -28$

Classroom Quiz 1.4

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

2. $\left(\dfrac{4a^3b^{-5}}{b^2}\right)^2 = (4a^3b^{-7})^2$
$= 4^2a^{3(2)}b^{-7(2)}$
$= 16a^6b^{-14}$
$= \dfrac{16a^6}{b^{14}}$

3. $0.000000765 = 7.65\times10^{-7}$

1.5 Exercises

2. It is $3y^3z$ since x is multiplied by $3y^3z$.

4. $5x^3,\ 3x^2,\ -2y,\ -8$

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 $-\dfrac{1}{2}a^2b^2$ is $-\dfrac{1}{2}$, of $-\dfrac{10}{3}a^2b$ is -10, and of $-\dfrac{4}{5}ab$ is $-\dfrac{4}{5}$.

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

14. $10a + 6b - 7a + 2b = 3a + 8b$

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

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

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

22. $\dfrac{5}{8}m + \dfrac{4}{5}n + \dfrac{1}{2}m - \dfrac{1}{5}n = \dfrac{5}{8}m + \dfrac{4}{5}n + \dfrac{4}{8}m - \dfrac{1}{5}n$
$= \dfrac{9}{8}m + \dfrac{3}{5}n$

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

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

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

30. $-3x(x^3 + 2x^2 - x)$
$= -3x(x^3) - 3x(2x^2) - 3x(-x)$
$= -3x^4 - 6x^3 + 3x^2$

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

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

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

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

40. $5xy^2(y^3 - y^2 + 3x + 1)$
$= 5xy^5 - 5xy^4 + 15x^2y^2 + 5xy^2$

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

44. $5(x-2) + x(3x-8) - (x-2)$
$= 5x - 10 + 3x^2 - 8x - x + 2$
$= 3x^2 - 4x - 8$

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

48. $4(xy-1) - (x-3) = 4xy - 4 - x + 3 = 4xy - x - 1$

50. $4x^4 - 7x^3 - 12x^4 + 6x^3 = (4-12)x^4 + (6-7)x^3$
$= -8x^4 - x^3$

52. $3[3(3x+6) - 5(5x-9)] = 3[9x + 18 - 25x + 45]$
$= 27x + 54 - 75x + 135$
$= -48x + 189$

54. $2x[4 - (3x - 2y)] = 2x[4 - 3x + 2y]$
$= 8x - 6x^2 + 4xy$

Cumulative Review

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

56. $\sqrt{81}-5(3-5+2)=9-5(3-5+2)$
$=9-5(0)$
$=9-0$
$=9$

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

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

59. $\dfrac{1{,}893{,}500 \text{ organisms}}{\text{inch}}\dfrac{1 \text{ inch}}{0.0254 \text{ meters}}$
$=\dfrac{1{,}893{,}500 \text{ organisms}}{0.0254 \text{ meters}}\dfrac{1000 \text{ meter}}{\text{kilometer}}$
$\approx \dfrac{7.4547\times10^{10} \text{ organisms}}{\text{kilometer}}$
You would find 7.4547×10^{10} organisms in 1 kilometer.

60. $4167 \text{ meter}\left(\dfrac{\text{ft}}{0.305 \text{ meter}}\right)\left(\dfrac{2\%}{1000 \text{ ft}}\right)$
$\approx 27.3\%$ loss
There would be a 27.3% loss.

Classroom Quiz 1.5

1. $4x^2y(2x-3y+5x^2)$
$=4x^2y(2x)+4x^2y(-3y)+4x^2y(5x^2)$
$=8x^3y-12x^2y^2+20x^4y$

2. $-3x^2(2x-5y)+5(2x^3+3x^2y)$
$=-6x^3+15x^2y+10x^3+15x^2y$
$=4x^3+30x^2y$

3. $2[5(3x-2)-4(2x+3)]=2(15x-10-8x-12)$
$=2(7x-22)$
$=14x-44$

1.6 Exercises

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

4. $x^2+3x-12=(-5)^2+3(-5)-12$
$=25+(-15)-12$
$=-2$

6. $-4x-x^2+7=-4(3)-(3)^2+7$
$=-12-9+7$
$=-21+7$
$=-14$

8. $6x^2-3x+5=6(5)^2-3(5)+5$
$=6(25)-15+5$
$=150-15+5$
$=140$

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

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

14. $-2ay+6ab-y=-2(-3)(-1)+6(-3)(2)-(-1)$
$=-6-36+1$
$=-41$

16. $\sqrt{b^2-4ac}=\sqrt{3^2-4(-1)(-2)}=\sqrt{9-8}=\sqrt{1}=1$

18. $3x^2-7x-2=3(-0.56736)^2-7(-0.56736)-2$
$=2.93721$ to five decimal places

20. $F=\dfrac{9}{5}(30)+32=54+32=86°\text{F}$

22. $C=\dfrac{5(-40)-160}{9}=-40°\text{C}$

24. $T=2\pi\sqrt{\dfrac{L}{g}}$
$T=2(3.14)\sqrt{\dfrac{512}{32}}$
$T=25.12$
It will take the cable 25.12 seconds.

26. $A=p(1+rt)$
$=\$5000[1+(0.04)(4)]$
$=\$5000(1.16)$
$=\$5800$
The amount will be \$5800.

28. $A=p(1+rt)$
$=\$3500[1+(0.07)(6)]$
$=\$3500(1.42)$
$=\$4970$
The amount to be repaid is \$4970.

30. $S = \frac{1}{2}gt^2 = \frac{1}{2}(32)(6)^2 = 576$
The distance is 576 feet.

32. $S = \frac{1}{2}gt^2 = \frac{1}{2}(32)(4)^2 = 256$
The bolt will fall 256 feet.

34. $z = \frac{Rr}{R+r} = \frac{35(15)}{35+15} = \frac{525}{50} = \frac{21}{2} = 10\frac{1}{2}$
The value of z is $10\frac{1}{2}$.

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

38. $C = \pi d = 3.14(0.2) = 0.628$
The circumference is 0.628 meter.

40. $A = \frac{1}{2}ab = \frac{1}{2} \cdot 12 \cdot 14 = 84$
The area is 84 m^2.

42. $A = ab = 8\left(\frac{43}{4}\right) = 86$
The area is 86 cm^2.

44. $S = 2lw + 2wh + 2lh$
$S = 2(1.8)(1) + 2(1)(1) + 2(1.8)(1)$
$S = 9.2$
The surface area is 9.2 in.^2.

46. $P = b + c + d + e$
$P = 5.2 + 6.1 + 3.5 + 2.2$
$P = 17$
The perimeter is 17 meters.

48. a. $V = \frac{4}{3}\pi r^3$
$V = \frac{4}{3}(3.14)(2.9)^3$
$V \approx 102.11$
The volume is 102.11 cm^3.

b. $S = 4\pi r^2$
$S = 4(3.14)(2.9)^2$
$S \approx 105.63$
The surface area is 105.63 cm^2.

50. $A = \pi r^2 = 3.14(6)^2 = 113.04$
$C = \pi(12) = 3.14(12) = 37.68$
The area is 113.04 cm^2 and the circumference is 37.68 cm.

Cumulative Review

51. $(6x^{-4}y^3z^0)^2 = \left(\frac{6y^3}{x^4}\right)^2 = \frac{6^2y^{3\cdot2}}{x^{4\cdot2}} = \frac{36y^6}{x^8}$

52. $\left(\frac{2x^3}{3y}\right)^3 = \frac{2^3x^{3\cdot3}}{3^3y^3} = \frac{8x^9}{27y^3}$

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

54. $2^3 - 4^2 + \sqrt{9 \cdot 2 - 2} = 8 - 16 + \sqrt{18-2}$
$= -8 + \sqrt{16}$
$= -8 + 4$
$= -4$

55. 12,000,000 – 0.30(19,000,000)
= 6,300,000
There were 6,300,000 people on the Internet at 9 P.M. but were not on the Internet at 2 P.M.

56. 180(0.95) = 171 living graduates
171(0.69) = 118 graduates attending
118 + 0.77(118) = 209 including spouses
209 + 22 faculty = 231 people attending
The total number of people at the reunion was 231.

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.

Use Math to Save Money

1. \$13,710 – \$12,360 = \$1350
The difference between MSRP and the invoice price is \$1350.

2. $\frac{\$1350}{\$12,360} \approx 0.11 = 11\%$
The profit margin on a full price sale is 11%.

3. 5% of \$12,360 = 0.05 × \$12,360 = \$618

4. \$12,360 + \$618 = \$12,978
Using the 5% profit margin, Rachael should plan on paying \$12,978.

5. \$12,978 – \$500 = \$12,478
The car will cost \$12,478 after the rebate.

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 · 1 = 10
Identity property of multiplication

d. 10 + 4 = 4 + 10
Commutative property of addition

e. 2 · 9 = 9 · 2
Commutative property of multiplication

f. 5 · (4 · 6) = (5 · 4) · 6
Associative property of multiplication

g. $8\left(\frac{1}{8}\right) = 1$
Inverse property of multiplication

h. 5(2 + 6) = 5 · 2 + 5 · 6
Distributive property of multiplication over addition

i. –14 + 14 = 0
Inverse property of addition

2. 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

3. a. 19 – (–6) = 19 + 6 = 25

b. –8.4 – 2.1 = –8.4 + (–2.1) = –10.5

4. a. (–8)(–6) = 48

b. –36 ÷ (–9) = 4

c. 3(–6) = –18

d. –40 ÷ 5 = –8

5. $9-3(1-3)^2+21\div(-3) = 9-3(-2)^2+21\div(-3)$
$= 9-3(4)+21\div(-3)$
$= 9-12+(-7)$
$= -3+(-7)$
$= -10$

6. a. |7| = 7

b. |–10| = 10

c. $\left|-\frac{3}{5}\right| = \frac{3}{5}$

d. |1.25| = 1.25

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

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

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

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

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

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

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

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

The area is $40\ \text{ft}^2$.

Chapter 1 Review Problems

1. –5: Integer, Rational, Real

2. $\dfrac{7}{8}$: 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. $-\dfrac{4}{5}\div\left(-\dfrac{12}{5}\right) = -\dfrac{4}{5}\cdot\left(-\dfrac{5}{12}\right) = \dfrac{1}{3}$

13. $-\dfrac{5}{6}\left(\dfrac{7}{10}\right) = -\dfrac{7}{12}$

14. 5 + 6 – 2 – 5 = 11 – 2 – 5 = 9 – 5 = 4

15. –3.6(–1.5) = 5.4

16. 0 ÷ (–14) = 0

17. 7 ÷ 0 undefined

18. –17 + (+17) = 0

19. 17 – 3(6) = 17 – 18 = –1

20. $\dfrac{5-8}{2-7-(-2)} = \dfrac{-3}{-5+2} = \dfrac{-3}{-3} = 1$

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. $\frac{(5^{-1}x^{-2})^{-1}}{(2^{-2}y)^{-3}} = \frac{5^{-1(-1)}x^{-2(-1)}}{2^{-2(-3)}y^{-3}} = \frac{5^1x^2}{2^6y^{-3}} = \frac{5x^2y^3}{64}$

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

36. $0.00721 = 7.21\times10^{-3}$

37. $(5,300,000)(2,000,000,000)$
$= (5.3\times10^6)(2.0\times10^9)$
$= 10.6\times10^{15}$
$= 1.06\times10^{16}$

38. $-x+8+6x^2+7x-4 = 6x^2+(7-1)x+8-4$
$= 6x^2+6x+4$

39. $-5ab^2(a^3+2a^2b-3b-4)$
$= -5a^4b^2-10a^3b^3+15ab^3+20ab^2$

40. $3x(x-7)-(x^2+1) = 3x^2-21x-x^2-1$
$= 2x^2-21x-1$

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

42. $5x^2-3xy-2y^3 = 5(2)^2-3(2)(-1)-2(-1)^3$
$= 5(4)-6(-1)-2(-1)$
$= 20+6+2$
$= 28$

43. $V = \pi r^2 h$
$V = 3.14(3)^2(8)$
$V = 226.08$
The volume is 226.08 cubic inches.

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

45. $A = \frac{1}{2}(b_1 + b_2)h$
$A = \frac{1}{2}(26+34)14$
$A = 420$
The area is 420 square inches.

46. $9(-2) + (-28 \div 7)^3 - 5 = 9(-2) + (-4)^3 - 5$
$= -18 + (-64) - 5$
$= -82 - 5$
$= -87$

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

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

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

50. $0.000058 = 5.8\times10^{-5}$

51. $8.95\times10^7 = 89{,}500{,}000$

52. $4x^2 - x^3 + 7x - 5x^2 + 6x^3 - 2x$
$= (-1+6)x^3 + (4-5)x^2 + (7-2)x$
$= 5x^3 - x^2 + 5x$

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

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

55. $5a^2 - 3ab + 4b = 5(-3)^2 - 3(-3)(-2) + 4(-2)$
$= 5(9) + 9(-2) + (-8)$
$= 45 - 18 - 8$
$= 19$

56. $A = \pi r^2$
$A = 3.14(4)^2$
$A = 50.24$
The area is $50.24\ \text{m}^2$.

57. $T = 2\pi\sqrt{\frac{L}{g}} = 2(3.14)\sqrt{\frac{512}{32}}$
$T = 25.12$
The period of the pendulum is 25.12 seconds.

58. $\frac{2}{3}(6x - 9y) - (x - 2y) = 4x - 6y - x + 2y$
$= 3x - 4y$

59. $A = p(1 + rt)$
$= 3200(1 + 0.09\times2)$
$= 3200(1 + 0.18)$
$= 3200(1.18)$
$= 3776$
The amount to be repaid is \$3776.

How Am I Doing? Chapter 1 Test

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

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

3. $(8 \cdot x)3 = 3(8 \cdot x)$
Commutative property of multiplication

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

5. $(4-5)^2-3(-2)\div 3=(-1)^2-(-6)\div 3$
$=1-(-2)$
$=1+2$
$=3$

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

7. $(5x^{-3}y^{-5})(-2x^3y^0)=5(-2)x^{-3+3}y^{-5+0}$
$=-10x^0y^{-5}$
$=-\dfrac{10}{y^5}$

8. $\left(\dfrac{5a^{-2}b}{a}\right)^2=\dfrac{5^2a^{-2(2)}b^2}{a^2}$
$=\dfrac{25a^{-4}b^2}{a^2}$
$=\dfrac{25b^2}{a^{2-(-4)}}$
$=\dfrac{25b^2}{a^6}$

9. $7x-9x^2-12x-8x^2+5x$
$=(7-12+5)x+(-9-8)x^2$
$=0x-17x^2$
$=-17x^2$

10. $5a+4b-6a^2+b-7a-2a^2$
$=(-6-2)a^2+(5-7)a+(4+1)b$
$=-8a^2-2a+5b$

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

12. $0.000002186=2.186\times10^{-6}$

13. $2.158\times10^9=2{,}158{,}000{,}000$

14. $(3.8\times10^{-5})(4\times10^{-2})=(3.8\times4)\times10^{-5-2}$
$=15.2\times10^{-7}$
$=1.52\times10^{-6}$

15. $2x^2(x-3y)-x(4-8x^2)$
$=2x^3-6x^2y-4x+8x^3$
$=10x^3-6x^2y-4x$

16. $2[-3(2x+4)+8(3x-2)]$
$=2[-6x-12+24x-16]$
$=2[18x-28]$
$=36x-56$

17. $2x^2-3x-6=2(-4)^2-3(-4)-6$
$=2(16)+(-3)(-4)-6$
$=32+12-6$
$=44-6$
$=38$

18. $5x^2+3xy-y^2=5(3)^2+3(3)(-3)-(-3)^2$
$=5(9)+(-27)-9$
$=45-27-9$
$=18-9$
$=9$

19. $A=\dfrac{1}{2}(b_1+b_2)$
$A=\dfrac{1}{2}(6+7)(12)=78$
The area is $78\ \text{m}^2$.

20. $A=\pi r^2=3.14(6)^2=113.04$
The area is $113.04\ \text{m}^2$.

21. $A = p(1 + rt)$
$A = \$8000(1 + 0.05(3))$
$A = \$9200$
The amount to be repaid is \$9200.