CHAPTER 1 REVIEW EXERCISES

Section 1.1

Which elements of the following set are **a.** natural numbers, **b.** whole numbers, **c.** integers, **d.** rational numbers, **e.** irrational numbers, **f.** real numbers?

1. $\left\{\frac{3}{7},\ -\sqrt{4},\ 2^3,\ 5.3,\ |-2.1|,\ \sqrt{17},\ 0\right\}$

Describe the following set using set-builder notation. There may be more than one correct way to do this.

2. $\left\{\frac{1}{2},\frac{1}{4},\frac{1}{6},\frac{1}{8},\frac{1}{10},\ldots\right\}$

Write each set as an interval using interval notation.

3. $4 \le x < 17$

4. $\{x \mid -8 \le x \le -1\}$

Evaluate the absolute value expressions.

5. $-|-4-3|$

6. $-|11-2|$

7. $\left|\sqrt{9}-7\right|$

8. $\left|\sqrt{5}-\sqrt{11}\right|$

9. $-\frac{|x|}{|-x|}$

Write the following rational numbers as ratios of integers.

10. $7.\overline{6}$

11. $-2.0\overline{42}$

12. Liz, Monica, Peter, James, and Melissa are comparing their ages. Liz is older than Peter and Melissa is the youngest. James is the oldest and Peter is older than Monica. Order them from youngest to oldest.

Section 1.2

Identify the components of the algebraic expressions, as indicated.

13. Identify the terms in the expression $\frac{x^2}{2y}+12.1x-\sqrt{y+5}$.

14. Identify the coefficients in the expression $\frac{x^2}{2y}+12.1x-\sqrt{y+5}$.

Evaluate the following algebraic expressions for the given values of the variables.

15. $7y^2-\frac{1}{3}\pi xy+8x^3$ for $x=-2$ and $y=2$

16. $x^2z^3+5\sqrt{3x-2y}$ for $x=2, y=1,$ and $z=-1$

17. $\left|-3x+x^2y\right|-\frac{xy}{2}$ for $x=-3$ and $y=4$

18. $3\sqrt{\frac{xy}{3}}-2y^2$ for $x=2$ and $y=6$

Identify the property that justifies each of the following statements. If one of the cancellation properties is being used to transform an equation, identify the quantity that is being added to both sides or the quantity by which both sides are being multiplied.

19. $-4+x=x-4$

20. $12a^2=8b \Leftrightarrow 3a^2=2b$

21. $(x-3)(z-2)=0 \Rightarrow x-3=0 \text{ or } z-2=0$

Simplify the following set expressions.

22. $(-4,8)\cup[5,13]$

23. $(-4,8)\cap[5,13]$

Section 1.3

Use the properties of exponents to simplify each of the following expressions, writing your answer with only positive exponents.

24. $\left(2^3a^{-2}b^4\right)^{-1}c^{-3}$

25. $\dfrac{-4t^0\left(s^2t^{-2}\right)^{-3}}{2^3st^{-3}}$

26. $\left[\left(3y^{-2}z\right)^{-1}\right]^{-3}$

27. $\dfrac{3^2x^{-4}\left(y^2z\right)^{-2}}{\left(2z^{-3}\right)^{-1}y^{-6}}$

Convert each number from scientific notation to standard notation, or vice versa, as indicated.

28. -3.005×10^{-4}; convert to standard

29. 69,520,000; convert to scientific

Evaluate each expression, using the properties of exponents. Use a calculator only to check your final answer.

30. $\left(3.46\times10^8\right)\left(1.2\times10^4\right)$

31. $\dfrac{2.4\times10^{-12}}{1.2\times10^{-4}}$

32. Sam is making a piñata in the shape of a sphere and needs to know how much candy to buy to fill it. If the radius of the piñata is 10 inches, what is the volume of the piñata?

Section 1.4

Evaluate the following radical expressions.

33. $\sqrt{3^2+4^2}$

34. $\dfrac{\sqrt[3]{\sqrt{15}}}{\sqrt{\sqrt[3]{5}}}$

Simplify the following radical expressions. Rationalize all denominators and use only positive exponents.

35. $\sqrt{25x^{20}}$

36. $\sqrt{16x^2}$

37. $\sqrt[3]{-64x^{-9}y^3}$

38. $\dfrac{\sqrt{3a^3}}{\sqrt{12a}}$

39. $\sqrt[3]{\dfrac{8x^2}{3y^{-4}}}$

40. $\sqrt[4]{\dfrac{a^9b^{-4}}{81}}$

41. $\dfrac{4}{\sqrt{2}-\sqrt{6}}$

42. $\dfrac{3}{\sqrt{x}+\sqrt{2}}$

Simplify the following expressions.

43. $\sqrt{18x^3y} - \sqrt[3]{16x^4y}$

44. $\left(2\sqrt{3} - 5\sqrt{2}\right)^2$

Convert the following expressions from radical notation to exponential notation, or vice versa. Simplify each expression in the process, if possible.

45. $\sqrt{x^{-5}} \cdot \sqrt[4]{x^3}$

46. $\left(49x^4\right)^{\frac{1}{2}}\left(16x^{12}\right)^{\frac{3}{4}}$

Section 1.5

Add or subtract the polynomials, as indicated.

47. $\left(-4m^2 - 5m^3 + 4\right) + \left(m^4 + 7m^2 - 2\right)$

48. $\left(2xy + 3x\right) - \left(8x^2y - 6xy + 3x - y\right)$

Multiply the polynomials, as indicated.

49. $\left(x^2 + y\right)\left(3x - 4y^3\right)$

50. $\left(a + 5b\right)\left(5a - 7ab + 2b\right)$

Section 1.6

Factor each of the following polynomials.

51. $x^2 - x - 12$

52. $2x^2 + x - 15$

53. $6a^2 - 7a - 5$

54. $4a^2 - 9b^4$

55. $36x^6 - y^2$

56. $nx + 3mx - 2ny - 6my$

57. $2x^2 + 6x - 5xy - 15y$

58. $8x^3y^2 + 4x^3y - 12xy^2$

Factor the following algebraic expressions.

59. $\left(3x - 2y\right)^{\frac{4}{3}} - \left(3x - 2y\right)^{\frac{2}{3}}$

60. $8x^{-2} + 5x^{-1}$

Section 1.7

Simplify the following rational expressions, indicating which real values of the variable must be excluded.

61. $\dfrac{x^3 + 6x^2 + 9x}{x^3 - 9x}$

62. $\dfrac{x^2 - 9}{x^3 - 27}$

Perform the indicated operations on the rational expressions and simplify your answer.

63. $\dfrac{1}{x} - \dfrac{3}{x+2} - \dfrac{6}{x^2 + 2x}$

64. $\dfrac{a^3 - 8}{a^2 - 4} \div \dfrac{a^3 + 2a^2 + 4a}{a^3 + 2a^2} \cdot \dfrac{1}{a^2 + a}$

Simplify the complex rational expressions.

65. $\dfrac{\dfrac{1}{2a} - \dfrac{1}{2b}}{\dfrac{2}{a} + \dfrac{2}{b}}$

66. $\dfrac{\dfrac{x}{3} - \dfrac{3}{x}}{-\dfrac{3}{x} + 1}$

67. $\dfrac{\dfrac{x}{y} - \dfrac{y}{x}}{x^{-1} - y^{-1}}$

Section 1.8

Evaluate the following square root expressions.

68. $-\sqrt{-8x}$

69. $i^3\sqrt{-9}$

Simplify the following expressions.

70. $(7-2i)+(9i-5)$

71. $(5-3i)-(-12i)$

72. $(3-i)(6i^2-4)$

73. $\dfrac{17}{4-i}$

74. $\dfrac{2i}{3-i}$

75. $\dfrac{3+4i}{3-4i}$

76. $\left(\sqrt{-3}\right)\left(\sqrt{-16}\right)$

77. $\left(8-\sqrt{-2}\right)^2$

78. $\dfrac{2i\sqrt{-27}}{\sqrt{-16}}$