Section	Suggested Problems
P.1	33, 39,43,45,57,63,67,75,83,89,91,95,99

THESE PROBLEMS ARE ON THE NEXT PAGE.

For Thought

True or False? Explain.

1. Zero is the only number that is both rational and irrational.
2. Between any two distinct rational numbers there is another rational number.
3. Between any two distinct real numbers there is an irrational number.
4. Every real number has a multiplicative inverse.
5. If a is not less than and not equal to 3, then a is greater than 3.
6. If $a \leq w$ and $w \leq z$, then $a < z$.
7. For any real numbers a, b, and c, $a - (b - c) = (a - b) - c$.
8. If a and b are any two real numbers, then the distance between a and b on the number line is $a - b$.
9. Calculators give only rational answers.
10. For any real numbers a and b, the opposite of $a + b$ is $a - b$.

P.1 Exercises

Match each given statement with its symbolic form and determine whether the statement is true or false. If the statement is false, correct it.

1. The number $\sqrt{2}$ is a real number.
2. The number $\sqrt{3}$ is rational.
3. The number 0 is not an irrational number.
4. The number -6 is not an integer.
5. The set of integers is a subset of the real numbers.
6. The set of irrational numbers is a subset of the rationals.
7. The set of real numbers is not a subset of the rational numbers.
8. The set of natural numbers is not a subset of the whole numbers.

a. $\sqrt{3} \in Q$ **b.** $-6 \notin J$ **c.** $R \not\subseteq Q$

d. $I \subseteq Q$ **e.** $\sqrt{2} \in R$ **f.** $N \not\subseteq W$

g. $J \subseteq R$ **h.** $0 \notin I$

Determine which elements of the set $\{-3.5, -\sqrt{2}, -1, 0, 1, \sqrt{3}, 3.14, \pi, 4.3535\ldots, 5.090090009\ldots\}$ *are members of the following sets.*

9. Real numbers
10. Rational numbers
11. Irrational numbers
12. Integers
13. Whole numbers
14. Natural numbers

Complete each statement using the property named.

15. $7 + x =$ _____, commutative
16. $5(4y) =$ _____, associative
17. $5(x + 3) =$ _____, distributive
18. $-3(x - 4) =$ _____, distributive
19. $5x + 5 =$ _____, distributive
20. $-5x + 10 =$ _____, distributive
21. $-13 + (4 + x) =$ _____, associative
22. $yx =$ _____, commutative
23. $0.125($_____$) = 1$, multiplicative inverse
24. $-3 + ($_____$) = 0$, additive inverse

Use the properties of opposites to complete each equation.

25. $-(-\sqrt{3}) =$ _____
26. $-1(-6.4) =$ _____
27. $-1(x^2 - y^2) =$ _____
28. $-(1 - a^2) =$ _____

Use the symbolic definition of absolute value to simplify each expression.

29. $|7.2|$
30. $|0/3|$
31. $|-\sqrt{5}|$
32. $|-3/4|$

Find the distance on the number line between each pair of numbers.

33. 8, 13 **34.** 1, 99 **35.** −5, 17

36. 22, −9 **37.** −6, −18 **38.** −3, −14

39. $-\frac{1}{2}, \frac{1}{4}$ **40.** $-\frac{1}{2}, -\frac{3}{4}$

Evaluate each exponential expression.

41. 2^3 **42.** 3^4 **43.** -7^2 **44.** -9^2

45. $(-4)^2$ **46.** $(-10)^2$ **47.** $\left(-\frac{1}{4}\right)^3$ **48.** $\left(-\frac{3}{4}\right)^4$

Evaluate each expression.

49. $(2 \cdot 5) - (3 \cdot 6)$ **50.** $(5 - 3)(2 - 6)$

51. $|3 - (4 \cdot 5)| - 5$ **52.** $5 - |4 - (2 \cdot 3)|$

53. $|-4 \cdot 3| - |-3 \cdot 5|$ **54.** $(-8 \cdot 3) - |-3 \cdot 7|$

55. $\dfrac{-2 - (-6)}{-5 - (-9)}$ **56.** $\dfrac{4 - (-3)}{-3 - (-1)}$

Use the order of operations to evaluate each expression.

57. $4 - 5 \cdot 3^2$ **58.** $4 + 2(-6)^2$

59. $3 - 4 + 5 - 7 - 4$ **60.** $4 - 3 + 2 - 5 + 6$

61. $3 \cdot 6 + 2 \cdot 4$ **62.** $-2 \cdot 9 + 3 \cdot 5$

63. $26 \cdot \frac{1}{5} \div \frac{1}{2} \cdot 5$ **64.** $\frac{4}{3} \cdot 50(0.75) \div 2$

65. $(3 \cdot 4 - 1)(1 + 2 \cdot 4)$ **66.** $-2 - 3(5 - 2 \cdot 8)$

67. $2 - 3\,|3 - 4 \cdot 6|$ **68.** $1 - (3 - |1 - 2 \cdot 3|)$

69. $7^2 - 2(-3)(-6)$ **70.** $(-3)^2 - 4(-2)(-5)$

71. $3 - 4(5 - 3 \cdot 2)^2$ **72.** $1 - 3(6 \cdot 5 - 4 \cdot 8)^2$

73. $\dfrac{2(5 - 2)^2}{5^2 - 4^2}$ **74.** $\dfrac{(2 - 3 \cdot 4)^2}{3^2 + 4^2}$

Evaluate each expression if $a = -2$, $b = 3$, and $c = 4$.

75. $b^2 - 4ac$ **76.** $(b - 4ac)^2$

77. $\dfrac{a - c}{b - c}$ **78.** $\dfrac{a^2 - c}{b^3 + c^4}$

79. $a^2 - b^2$ **80.** $a^2 + b^2$

81. $(a - b)(a + b)$ **82.** $(a + b)^2$

83. $(a - b)(a^2 + ab + b^2)$ **84.** $(a + b)(a^2 - ab + b^2)$

85. $a^b + c^b$ **86.** $(a + c)^b$

Use the properties of the real numbers to simplify each expression.

87. $-5x + 3x$ **88.** $-5x - (-8x)$

89. $x - 0.15x$ **90.** $x + 3 - 0.9x$

91. $-3(2xy)$ **92.** $\frac{1}{2}(8wz)$

93. $\frac{1}{2}(6 - 4x)$ **94.** $\frac{1}{4}(8x - 4)$

95. $\dfrac{6x - 2y}{2}$ **96.** $\dfrac{-9 - 6x}{-3}$

97. $(3 - 4x) + (x - 9)$ **98.** $(9x - 3) + (4 - 6x)$

99. $-2(4 - x) - 3(3 - 3x)$ **100.** $5(4 - 2x) - 2(x - 5)$

Solve each problem.

101. *Target Heart Rate* The expression $0.60(220 - a - r) + r$ is used to obtain the target heart rate for a cardiovascular workout for a nonathletic male with age a and resting heart rate r (Stevens Creek Software, www.stevenscreek.com).

a. Simplify the expression.

b. Find the target heart rate for a 20-year-old nonathletic male with resting heart rate of 70 beats per minute.

c. Simplify the expression $0.60\left(205 - \frac{a}{2} - r\right) + r$, which is used for an athletic male.

102. *Target Heart Rate* The expression $0.60(226 - a - r) + r$ is used to obtain the target heart rate for a cardiovascular workout for a nonathletic female with age a and resting heart rate r (Stevens Creek Software, www.stevenscreek.com).

a. Simplify the expression.

b. The accompanying table shows the target heart rate for a 22-year-old nonathletic female for various resting heart rates. Find the missing entries.

Table for Exercise 102

Resting Heart Rate	Target Heart Rate
55	144.4
60	146.4
65	
70	150.4
75