Exercises

Communicate

1. Discuss two times in the past week when you added numbers. What type of numbers did you add? Can you think of occasions when you used any of the other types of numbers?

APPLICATIONS

2. **ETYMOLOGY** Explain what the Commutative Properties of Addition and Multiplication are. Why is the word *commutative* appropriate for these properties?

3. **ETYMOLOGY** Explain what the Associative Properties of Addition and Multiplication are. Why is the word *associative* appropriate for this property?

Guided Skills Practice

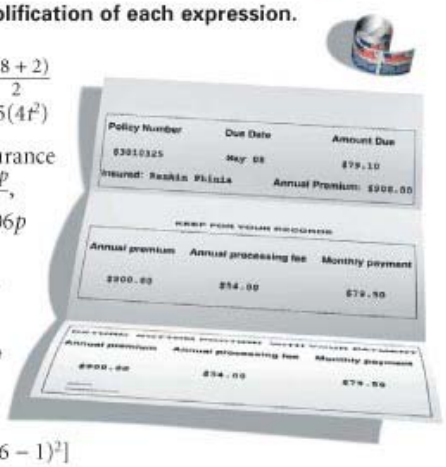
4. Classify $\frac{3}{2}$ and $-2.101001000\ldots$ in as many ways as possible. ***(EXAMPLE 1)***

Write and justify each step in the simplification of each expression. ***(EXAMPLE 2)***

5. $2(b + d)$
6. $-3a + 3a$
7. $\frac{3(8+2)}{2}$
8. $\frac{7-1}{5-2}$
9. $\frac{1}{4}(4 \cdot 5)$
10. $-5(4t^2)$

APPLICATION

11. **BUSINESS** A monthly automotive insurance payment, m, is given by $m = \frac{p}{12} + \frac{0.06p}{12}$, where p is the yearly premium and $0.06p$ represents the annual processing fee. Show that $m = \frac{1.06p}{12}$. Justify each step. ***(EXAMPLE 3)***



Evaluate each expression by using the order of operations. ***(EXAMPLE 4)***

12. $5^2 + 8 \div 4 - 2$
13. $(7 - 3^2)2$
14. $\frac{5 \cdot 6 \div 3 \cdot 7}{12}$
15. $2[14 - 3(6 - 1)^2]$

Practice and Apply

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for Exercises 16–31

Classify each number in as many ways as possible.

16. -23
17. -5.1
18. $\sqrt{3}$
19. $\sqrt{2}$
20. $\frac{2}{3}$
21. $\frac{3}{9}$
22. $-0.\overline{85}$
23. $-1.0\overline{63}$
24. $-\frac{5}{7}$
25. $\sqrt{25}$
26. $\frac{\sqrt{36}}{2}$
27. 1
28. 0
29. $-\pi$
30. $5.010010001\ldots$
31. $\sqrt{28}$

Graph each pair of numbers on a number line.

32. -3 and -2.5
33. -1.5 and -4
34. $\frac{13}{2}$ and 7
35. $4\frac{3}{8}$ and 2
36. $-3.\overline{6}$ and -4
37. $\sqrt{7}$ and 3

State the property that is illustrated in each statement. All variables represent real numbers.

38. $v(3t) = (3t)v$

39. $(25x)y = 25(xy)$

40. $4x + 13y = 13y + 4x$

41. $2.3 + x = x + 2.3$

42. $(2 + 3) + 5 = 2 + (3 + 5)$

43. $(3 + a) + b = 3 + (a + b)$

44. $x\left(\frac{1}{x}\right) = 1$, where $x \neq 0$

45. $\frac{x}{3} \cdot \frac{3}{x} = 1$, where $x \neq 0$

46. $-7 + 7 = 0$

47. $0 = 2x + (-2x)$

48. $1 \cdot (3x) = 3x$

49. $63 \cdot 1 = 63$

50. $-5x + 0 = -5x$

51. $x + y = 0 + x + y$

52. $m(x^2 + x) = mx^2 + mx$

53. $2(3 - y) = 2 \cdot 3 - 2y$

54. $4yw = 4wy$

55. $5(127) = 127(5)$

Evaluate each expression by using the order of operations.

56. $3 \cdot 2^2 + 3$

57. $6 \div 3 \cdot 2$

58. $2^2(2 + 3) + 5$

59. $6 \div (3 - 1) \cdot 5$

60. $-3 \cdot 5^2 + 16$

61. $5(2 - 3)^2$

62. $(3 - 2) + (5 - 4) - 2$

63. $30 - 3 \times 2 + 6 \div 3$

64. $16 \div 2 \times 6 - 1$

65. $(2^2 + 1) + 4 \div 2$

66. $6 \div 3 - (10 - 3^2)$

67. $2^{(3-1)} + (3 - 1)$

68. $3 \cdot 4 - 2^{(4-1)}$

69. $\frac{8 - 2}{3} + (2 + 1)$

70. $2 \cdot 4 + \frac{14}{5 + 2}$

71. Complete the following investigation:

a. Count the number of items in your home that display numbers.

b. What types of numbers are represented?

c. Name two examples of integers and two examples of rational numbers that you found.

CHALLENGE

72. Can a number be both rational and irrational? Explain your reasoning.

CONNECTION

73. **STATISTICS** While trying to find the average of 8, 10, 14, and 16, Ron entered 8 [+] 10 [+] 14 [+] 16 [÷] 4 [=] into a calculator and got 36 for an answer.

a. Did Ron get the correct average of 8, 10, 14, and 16? Explain.

b. What keystrokes should Ron have used?

74. **CULTURAL CONNECTION: ASIA** Ancient Babylonians used rational numbers as approximations of irrational numbers. For example, the Babylonians knew that the diagonal of a square was $\sqrt{2}$ times the length of a side. For the value of $\sqrt{2}$, the Babylonians used 1.4142. They thought this value was close enough for their practical purposes.

Use a calculator for the following exercises:

a. Show that $\sqrt{2}$ does not equal exactly 1.4142.

b. Find $\sqrt{2}$ on your calculator. Write down the result. Enter this number in your calculator, and square it. Is the result equal to 2? Explain why or why not.