3.5 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. When following the rules for order of operations, simplify within _____ _____ first.
2. Start by simplifying the _____ grouping symbol and working outward.
3. When performing multiplication and division, move from _____ to _____.
4. When performing addition and subtraction, perform the operations in the order they _____, moving left to right.
5. A negative sign in front of a variable means the variable is being multiplied by ____.
6. Parentheses, brackets, and braces are known as _____ symbols.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

7. If there are no grouping symbols, multiplication should always be performed before addition.
8. When following the rules for order of operations, powers indicated by exponents should be evaluated last.
9. The square root symbol is a grouping symbol.
10. A well-known mnemonic device for remembering the rules for order of operations is SADMEP.

Practice

Simplify.

1. **a.** $24 \div 4 \cdot 6$

   b. $24 \cdot 4 \div 6$

2. **a.** $20 \div 5 \cdot 2$

   b. $20 \cdot 5 \div 2$

3. $15 \div (-3) \cdot 3 - 10$
4. $20 \cdot 2 \div 2^2 + 5(-2)$
5. $3^2 \div (-9) \cdot (4 - 2^2) + 5(-2)$
6. $4^2 \div (-8)(-2) + 3(2^2 - 5^2)$
7. $14 \cdot 3 \div (-2) - 6(4)$

8. $6(13-15)^2 \cdot 8 \div 2^2 + 3(-1)$

9. $-10+15 \div (-5) \cdot 3^2 - 10^2$

10. $16 \cdot 3 \div (2^2 - 5)$

11. $2-5\left[(-20) \div (-4) \cdot 2 - 40\right]$

12. $9-6\left[(-21) \div 7 \cdot 2 - (-8)\right]$

13. $(7-10)\left[49 \div (-7) + 20 \cdot 3 - (-10)\right]$

14. $(9-11)\left[(-10)^2 \cdot 2 + 6(-5)^2 - 10^2 + 3 \cdot 5\right]$

15. $8-9\left[(-39) \div (-13) + 7(-2) - (-2)^2\right]$

16. $6-20\left[(-15) \div 3 \cdot 5 + 6 \cdot 2 \div 3\right]$

17. $|16-20|\left[32 \div |3-5| - 5^2\right]$

18. $|10-30|\left[4^2 \cdot |5-8| \div (-2)^2 + |17-18|\right]$

19. $(-10)+(-2)+|2-4|$

20. $|16-20|+(-10)^2+5^2$

21. $\frac{3}{8} \cdot \frac{4}{5} + \frac{1}{15}$

22. $\frac{1}{4} \cdot \frac{12}{15} + \frac{2}{7}$

23. $\frac{1}{3} \div \frac{1}{2} - \frac{5}{6} \cdot \frac{3}{4}$

24. $\frac{2}{9} \div \frac{14}{3} - \frac{1}{6} \cdot \frac{4}{7}$

25. $\left(\frac{5}{6}\right)^2 \div \frac{5}{12} - \frac{3}{8}$

26. $\left(\frac{2}{5}\right)^2 \cdot \frac{5}{8} + \frac{1}{5} \div \frac{3}{4}$

27. $\frac{7}{6} \cdot 2^2 - \frac{2}{3} \div \frac{1}{2}$

28. $\frac{3}{4} \div 3^2 - 4\left(\frac{1}{2}\right)^2$

29. $\left(-\frac{3}{4}\right) \div \left(-\frac{3}{5}\right) \cdot \frac{7}{8} + \frac{3}{16}$

30. $\left(-\frac{2}{3}\right) \div \frac{7}{12} - \frac{2}{7} + \left(-\frac{1}{2}\right)^2$

31. $\left(-\frac{9}{10}\right) + \frac{5}{8} \cdot \frac{4}{5} \div \frac{6}{10} + \frac{2}{3}$

32. $\frac{5}{8} \div \frac{5}{2} + \left(-\frac{1}{2}\right)^2 \cdot \frac{2}{5}$

33. $-0.7-8.5 \div 1.7$

34. $-0.4-2.6 \cdot 1.5$

35. $(3.1+1.1) \div (5.7-6.9)$

36. $(3.2-6.5) \cdot 2^2$

37. $-15 \div \left(\frac{1}{4} - \frac{7}{8}\right)$

38. $-12 \div \left(\frac{1}{2} + \frac{1}{10}\right)$

39. $(-5-7) \div -4-8$

40. $4(-2)^2 - 10 \div 5 + 1$

Solve.

41. Find the average of the five numbers: –7, 8, –3, 5, and 2.

42. Find the average of the six numbers: –1, –2, –3, 3, 2, and 1.

43. If the square of $\frac{7}{8}$ is subtracted from the square of $\frac{3}{4}$, what is the difference?

44. Find the quotient if the sum of $\frac{1}{5}$ and $\frac{2}{15}$ is divided by the difference between $\frac{7}{8}$ and $\frac{3}{4}$.

Use a graphing calculator to evaluate each expression.

45. $3.4 \div 4 + 5 \cdot 8.32$

46. $8.1 \div 5 + 16.3 \cdot 7$

47. $0.75 \div 1.5 + 7 \cdot 3.1^2$

48. $1.05 \div (-3) \cdot 3.7 - 1.1^2$

49. $6.32 \cdot 8.4 \div 16.8 + 3.5^2$

50. $(82.7 + 16.2) \div (14.83 - 19.83)^2$

Applications

Solve.

51. Madeline sells homemade aprons online and needs to determine how to charge for each apron. To create each apron, she spends \$8.50 on supplies and it takes her $1\frac{1}{4}$ hours to cut and sew each one. Madeline wants to charge \$11 per hour of work plus the cost of supplies.

a. Write an expression to describe how much each apron will cost.

b. Evaluate the expression to determine the selling cost of each apron.

c. Madeline will sew a name or initials onto the apron for an additional charge of \$1.75 per letter. If Kathy orders an apron and wants her name sewn onto it, how much will the apron cost?

52. The Matthews family, a family of 4, is planning a trip to New York City. During their visit, they want to see the Broadway play *Beetlejuice*. The tickets cost \$102 each. The Matthews purchase the tickets online and the website charges a service fee of \$7.50 per ticket. The website is running a sale where the Matthews can get 10% off of their entire purchase.

a. Write an expression to describe how much of a discount the Matthews will receive on their purchase.

b. What is the final purchase price of the tickets?

53. Dennis overdrew his checking account and ended up with a balance of –\$42. The bank charged a \$35 overdraft fee and an additional \$5 fee for every day the account was overdrawn. Dennis left his account overdrawn for 3 days.

a. Write an expression to show the balance of Dennis's checking account after 3 days.

b. Simplify the expression in part a. to find the balance of Dennis's checking account after 3 days.

54. Camila is a seamstress and is creating bridesmaid dresses. She has 115 yards of satin fabric. For each dress, the skirt requires 3 yards of satin and the bodice requires 1.5 yards of satin. She plans to make 20 dresses.

a. Write an expression to show how much fabric Camila will have left over after making the dresses.

b. Simplify the expression in part a. to determine how much fabric Camila will have left over.

c. Camila wants to make shawls from the leftover fabric. Each shawl requires 1.25 yards of satin. Can she make 15 shawls?

55. During harvest season, farmers donate fresh food to a local food kitchen. To make sure the food doesn't spoil, the food kitchen distributes the food between themselves and 5 other food kitchens in the area. One farmer donates $12\frac{1}{2}$ pounds of potatoes, another farmer donates $15\frac{3}{4}$ pounds of potatoes, and a third farmer donates $11\frac{3}{4}$ pounds of potatoes. The food kitchen finds that $1\frac{1}{4}$ pounds of the donated potatoes are rotten.

a. Write an expression to show how many pounds of potatoes each food kitchen will receive.

b. Simplify the expression from part a. to determine how many pounds of potatoes each food kitchen will receive.

56. Casey wants to put together some back-to-school gifts for local families in need. She has contacted companies directly and worked out deals to get backpacks for $10 each, headphones for $4 each, a pack of crayons for $0.50 each, and a combo pack consisting of a notebook, a folder, and a pencil for $1 per combo pack.

a. Write an expression to describe how much each gift will cost Casey, assuming each gift consists of one backpack, one pair of headphones, one pack of crayons, and 2 combo packs.

b. How much will Casey spend in total if she is able to give 5 back-to-school gifts?

57. You and three friends are planning a weekend trip. You plan to share a hotel room that is $225 a night, go on a city tour that costs $20 per person, and go to a baseball game that is $15 per person.

a. Write an expression to describe the total cost of the trip, assuming you are all staying for two nights.

b. If you split the cost equally, how much will each person pay for the trip, not counting additional expenses?

Writing & Thinking

58. Explain, in your own words, why the following expression cannot be evaluated.

$$\left(24-2^4\right)+6(3-5)\div\left(3^2-9\right)$$

59. Consider any number between 0 and 1. If you square this number, will the result be larger or smaller than the original number? Is this always the case? Explain.

60. Consider any number between −1 and 0. If you square this number, will the result be larger or smaller than the original number? Is this always the case? Explain.