

8.5 Exercises

Concept Check

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

- When following the rules for order of operations, simplify within _____ first.
- Start by simplifying the _____ grouping symbol and working outward.
- When performing multiplication and division, move from _____ to _____.
- When performing addition and subtraction, perform the operations in the order they _____, moving left to right.
- A negative sign in front of a variable means the variable is being multiplied by _____.
- 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.)

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

Practice


Simplify.

- $24 \div 4 \cdot 6$
 - $24 \cdot 4 \div 6$
- $20 \div 5 \cdot 2$
 - $20 \cdot 5 \div 2$
- $15 \div (-3) \cdot 3 - 10$
- $20 \cdot 2 \div 2^2 + 5(-2)$
- $3^2 \div (-9) \cdot (4 - 2^2) + 5(-2)$
- $4^2 \div (-8)(-2) + 3(2^2 - 5^2)$
- $14 \cdot 3 \div (-2) - 6(4)$

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. $2 - 5[(-20) \div (-4) \cdot 2 - 40]$
12. $9 - 6[(-21) \div 7 \cdot 2 - (-8)]$
13. $(7-10)[49 \div (-7) + 20 \cdot 3 - (-10)]$
14. $(9-11)[(-10)^2 \cdot 2 + 6(-5)^2 - 10^2 + 3 \cdot 5]$
15. $8 - 9[(-39) \div (-13) + 7(-2) - (-2)^2]$
16. $6 - 20[(-15) \div 3 \cdot 5 + 6 \cdot 2 \div 3]$
17. $|16 - 20|[32 \div |3 - 5| - 5^2]$
18. $|10 - 30|[4^2 \cdot |5 - 8| \div (-2)^2 + |17 - 18|]$
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.
- Write an expression to describe how much each apron will cost.
 - Evaluate the expression to determine the selling cost of each apron.
 - 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.
- Write an expression to describe how much of a discount the Matthews will receive on their purchase.
 - 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.
- Write an expression to show the balance of Dennis's checking account after 3 days.
 - 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.
- Write an expression to show how much fabric Camila will have left over after making the dresses.
 - Simplify the expression in part a. to determine how much fabric Camila will have left over.
 - 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.
- Write an expression to show how many pounds of potatoes each food kitchen will receive.
 - 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.
- 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.
 - 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.
- Write an expression to describe the total cost of the trip, assuming you are all staying for two nights.
 - 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.

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

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.