Applications Connections Extensions ACE

Applications

1. Find the values of each pair of expressions.

a. $-12 + (-4 + 9)$ $\quad [-12 + (-4)] + 9$

b. $(14 - 20) - 2^3$ $\quad 14 - (20 - 2^3)$

c. $[14 + (-20)] + -8$ $\quad 14 + [-20 + (-8)]$

d. $-1 - [-1 + (-1)]$ $\quad [-1 - (-1)] + (-1)$

e. Which cases lead to expressions with different results? Explain.

2. Find the value of each expression.

a. $(5 - 3) \div (-2) \times (-1)$ **b.** $2 + (-3) \times 4 - (-5)$

c. $4 \times 2 \times (-3) + (-10) \div 5$ **d.** $-3 \times [2 + (-10)] - 2^2$

e. $(4 - 20) \div 2^2 - 5 \times (-2)$ **f.** $10 - [50 \div (-2 \times 25) - 7] \times 2^2$

3. Draw and label the edges and areas of a rectangle to illustrate each pair of equivalent expressions.

a. $(3 + 2) \cdot 12 = 3 \cdot 12 + 2 \cdot 12$

b. $9 \cdot 3 + 9 \cdot 5 = 9 \cdot (3 + 5)$

c. $x \cdot (5 + 9) = 5x + 9x$

d. $2 \cdot (x + 8) = 2x + 16$

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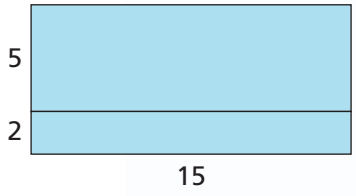
4. Write equivalent expressions to show two different ways to find the area of each rectangle. Use the ideas of the Distributive Property.

a.



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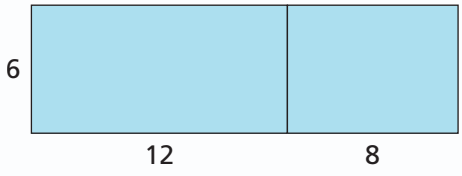

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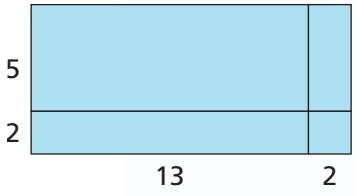

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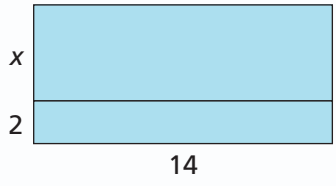


5. Rewrite each expression in an equivalent form to show a simpler way to do the arithmetic. Explain how you know the two results are equal without doing any calculations.

a. $(-150 + 270) + 30$

b. $(43 \times 120) + [43 \times (-20)]$

c. $23 + (-75) + 14 + (-23) - (-75)$

d. $(0.8 \times -23) + (0.8 \times -7)$

6. Without doing any calculations, determine whether each number sentence is true. Explain. Then check your answer.

a. $50 \times 432 = (50 \times 400) + (50 \times 32)$

b. $50 \times 368 = (50 \times 400) - (50 \times 32)$

c. $-50 \times (-800) = (-50 \times (-1{,}000)) + (-50 \times 200)$

d. $-50 + (400 \times 32) = (-50 + 400) \times (-50 + 32)$

e. $(-70 \times 20) + (-50 \times 20) = (-120) \times 20$

f. $6 \times 17 = 6 \times 20 - 6 \times 3$

7. For each part, use the Distributive Property to write an equivalent expression.

a. $-2 \times [5 + (-8)]$

b. $(-3 \cdot 2) - [-3 \cdot (-12)]$

c. $x \cdot (-3 + 5)$

d. $(-7x) + (4x)$

e. $2x \cdot [2 - (-4)]$

f. $(x) - (3x)$

Connections

Find the sum, difference, product, or quotient.

8. $-10 \times (-11)$

9. -10×11

10. $10 - 11$

11. $-3 \div (-12)$

12. $3^2 \times 2^2$

13. $3^2 \times (-2)^2$

14. $-24 - (-12)$

15. $\frac{-24}{-12}$

16. $-48 \div 4^2$

17. 50×70

18. $50 \times (-70)$

19. $2{,}200 \div (-22)$

20. $-50 \times (-120)$

21. $-139 + 899$

22. $5{,}600 - 7{,}800$

23. $-4{,}400 - (-1{,}200)$

24. $\frac{-9{,}900}{-99}$

25. $-580 + (-320)$

26. When using negative numbers and exponents, parentheses are sometimes needed to make it clear what you are multiplying.

-5^4 can be thought of as "the opposite of 5^4" or
$-(5^4) = -(5 \cdot 5 \cdot 5 \cdot 5) = -625$

$(-5)^4$ can be thought of as "negative five to the fourth power" or
$-5 \cdot (-5) \cdot (-5) \cdot (-5) = 625$

Indicate whether each expression will be negative or positive.

a. -3^2 **b.** $(-6)^3$ **c.** $(-4)^4$ **d.** -1^6 **e.** $(-3)^4$

27. The following list shows the yards gained and lost on each play by the Mathville Mudhens in the fourth quarter of their last football game:

$$-8, 20, 3, 7, -15, 4, -12, 32, 5, 1$$

Write an expression that shows how to compute their average gain or loss per play. Then compute the average.

28. Complete each number sentence.

a. $-34 + (-15) =$ ■ **b.** $-12 \times (-23) =$ ■

c. $-532 \div (-7) =$ ■ **d.** $-777 - (-37) =$ ■

e. Write a fact family for part (a). **f.** Write a fact family for part (b).

29. Write a related fact. Use it to find the value of n that makes the sentence true.

a. $n - (-5) = 35$ **b.** $4 + n = -43$

c. $-2n = -16$ **d.** $\frac{n}{4} = -32$

30. Multiple Choice Which set of numbers is in order from least to greatest?

A. 31.4, −14.2, −55, 75, −0.05, 0.5, 3.140

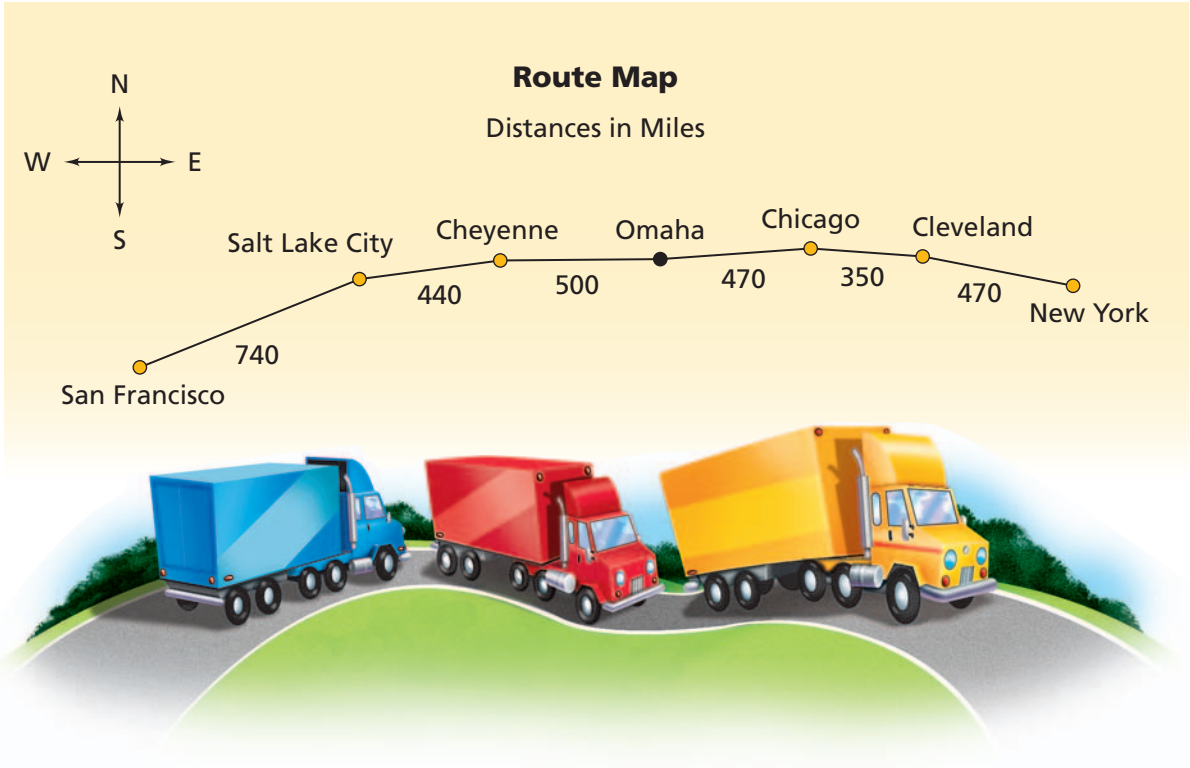
B. $\frac{2}{5}$, $\frac{-3}{5}$, $\frac{8}{7}$, $\frac{-9}{8}$, $\frac{-3}{2}$, $\frac{5}{3}$

C. −0.2, −0.5, 0.75, 0.6, −1, 1.5

D. None of these

31. Find the absolute values of the numbers for each set in Exercise 30. Write them in order from least to greatest.

32. A trucking company carries freight along a highway from New York City to San Francisco. Its home base is in Omaha, Nebraska, which is about halfway between the two cities. Truckers average about 50 miles per hour on this route.



Make a number line to represent this truck route. Put Omaha at 0. Use positive numbers for cities east of Omaha and negative numbers for cities west of Omaha. Then write number sentences to answer each question.

a. A truck leaves Omaha heading east and travels for 7 hours. About how far does the truck go? Where on the number line does it stop?

b. A truck leaves Omaha heading west and travels for 4.5 hours. About how far does the truck go? Where on the number line does it stop?

c. A truck heading east arrives in Omaha. About where on the number line was the truck 12 hours earlier?

d. A truck heading west arrives in Omaha. About where on the number line was the truck 11 hours earlier?

33. Insert parentheses (or brackets) in each expression where needed to show how to get each result.

a. $1 + (-3) \times (-4) = 8$

b. $1 + (-3) \times (-4) = 13$

c. $-6 \div (-2) + (-4) = 1$

d. $-6 \div (-2) + (-4) = -1$

e. $-4 \times 2 - 10 = -18$

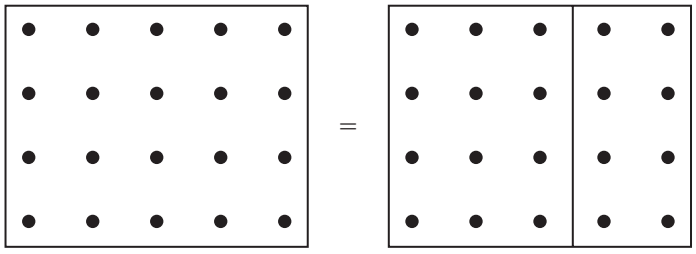
f. $-4 \times 2 - 10 = 32$

34. A grocery store receipt shows 5% state tax due on laundry detergent and a flower bouquet.

Laundry Detergent	$7.99	T
Flower Bouquet	$3.99	T

Does it matter whether the tax is calculated on each separate item or the total cost? Explain.

35. You can use dot patterns to illustrate distributive properties for operations on whole numbers. Write a number sentence to represent the pair of dot patterns.



Extensions

Copy each pair of expressions in Exercises 36–40. Insert < or > to make a true statement.

36. $-23 \blacksquare -45$

37. $-23 + 10 \blacksquare -45 + 10$

38. $-23 - 10 \blacksquare -45 - 10$

39. $-23 \times 10 \blacksquare -45 \times 10$

40. $-23 \times (-10) \blacksquare -45 \times (-10)$

Based on your results in Exercises 36–40, complete each statement. Test your ideas with other numerical cases, or develop another kind of explanation, perhaps using chip board or number line ideas.

41. If $a > b$, then $a + c \blacksquare b + c$.

42. If $a > b$, then $a - c \blacksquare b - c$.

43. If $a > b$, then $a \times c \blacksquare b \times c$.

44. Find the value for n that makes the sentence true.

a. $n - (-24) = 12$ **b.** $2.5n = -10$ **c.** $2.5n + (-3) = -13$

45. Complete each pair of calculations.

a. $12 \div (-8 + 4) = \blacksquare$ $[12 \div (-8)] + (12 \div 4) = \blacksquare$

b. $-12 \div [-5 - (-3)] = \blacksquare$ $[-12 \div (-5)] - [-12 \div (-3)] = \blacksquare$

c. $4 \div (-2 - 6) = \blacksquare$ $(4 \div -2) - (4 \div 6) = \blacksquare$

d. $3 \div (5 + 6) = \blacksquare$ $(3 \div 5) + (3 \div 6) = \blacksquare$

e. What can you conclude from parts (a)–(d) about the Distributive Property?

46. When you find the mean (average) of two numbers, you add them together and divide by 2.

a. Is the operation of finding the average of two numbers commutative? Give examples.

b. Does multiplication distribute over the averaging operation? That is, will a number a times the average of two numbers, x and y, give the same thing as the average of ax and ay? Give examples.