Lesson 3: Writing Products as Sums and Sums as Products

Classwork

Opening Exercise

Solve the problem using a tape diagram. A sum of money was shared between George and Brian in a ratio of $3:4$. If the sum of money was $\$56.00$, how much did George get?

Example 1

Represent $3 + 2$ using a tape diagram.

Represent $x + 2$ using a tape diagram.

Draw a rectangular array for $3(3 + 2)$.

Draw an array for $3(x + 2)$.

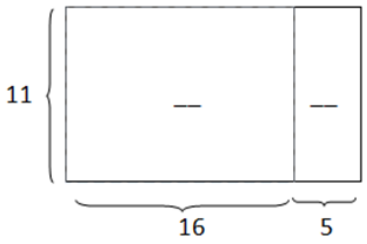
Key Terms

Distributive Property: The distributive property can be written as the identity

$$a(b + c) = ab + ac \text{ for all numbers } a, b, \text{ and } c.$$

Exercise 1

Determine the area of each region using the distributive property.



Example 2

Draw a tape diagram to represent each expression.

a. $(x + y) + (x + y) + (x + y)$

b. $(x + x + x) + (y + y + y)$

c. $3x + 3y$

d. $3(x + y)$

Example 3

Find an equivalent expression by modeling with a rectangular array and applying the distributive property to the expression $5(8x + 3)$.

Exercise 2

For parts (a) and (b), draw an array for each expression and apply the distributive property to expand each expression. Substitute the given numerical values to demonstrate equivalency.

a. $2(x + 1), x = 5$

b. $10(2c + 5), c = 1$

For parts (c) and (d), apply the distributive property. Substitute the given numerical values to demonstrate equivalency.

c. $3(4f - 1), f = 2$

d. $9(-3r - 11), r = 10$

Example 4

Rewrite the expression $(6x + 15) \div 3$ in standard form using the distributive property.

Exercise 3

Rewrite the expressions as a sum.

a. $(2b + 12) \div 2$

b. $(20r - 8) \div 4$

c. $(49g - 7) \div 7$

Example 5

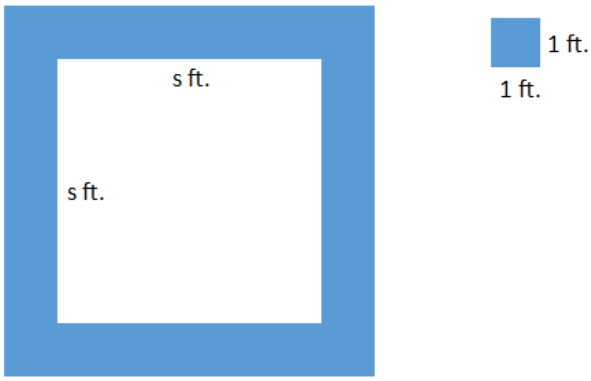
Expand the expression $4(x + y + z)$.

Exercise 4

Expand the expression from a product to a sum by removing grouping symbols using an area model and the repeated use of distributive property: $3(x + 2y + 5z)$.

Example 6

A square fountain area with side length s ft. is bordered by a single row of square tiles as shown. Express the total number of tiles needed in terms of s three different ways.



Problem Set

1.

a. Write two equivalent expressions that represent the rectangular array below.

b. Verify informally that the two equations are equivalent using substitution.

2. You and your friend made up a basketball shooting game. Every shot made from the free throw line is worth 3 points, and every shot made from the half-court mark is worth 6 points. Write an equation that represents the total amount of points, P, if f represents the number of shots made from the free throw line, and h represents the number of shots made from half-court. Explain the equation in words.

3. Use a rectangular array to write the products in standard form.

a. $2(x + 10)$

b. $3(4b + 12c + 11)$

4. Use the distributive property to write the products in standard form.

a. $3(2x - 1)$

b. $10(b + 4c)$

c. $9(g - 5h)$

d. $7(4n - 5m - 2)$

e. $a(b + c + 1)$

f. $(8j - 3l + 9)6$

g. $(40s + 100t) \div 10$

h. $(48p + 24) \div 6$

i. $(2b + 12) \div 2$

j. $(20r - 8) \div 4$

k. $(49g - 7) \div 7$

l. $(14g + 22h) \div \frac{1}{2}$

5. Write the expression in standard form by expanding and collecting like terms.

a. $4(8m - 7n) + 6(3n - 4m)$

b. $9(r - s) + 5(2r - 2s)$

c. $12(1 - 3g) + 8(g + f)$