Lesson 4: Writing Sums as Products and Products as Sums

Classwork

Exercise 1

Rewrite the expressions as a product of two factors.

a. $72t + 8$

b. $55a + 11$

c. $36z + 72$

d. $144q - 15$

e. $3r + 3s$

Exercise 2

a. Write the product and sum of the expressions being represented in the rectangular array.

b. Factor $48j + 60k + 24$ by finding the greatest common factor of the terms.

Example 3

For each expression, write each sum as a product of two factors. Emphasize the importance of the distributive property. Use various equivalent expressions to justify equivalency.

a. $2 \cdot 3 + 5 \cdot 3$

b. $(2 + 5) + (2 + 5) + (2 + 5)$

c. $2 \cdot 2 + (5 + 2) + (5 \cdot 2)$

d. $x \cdot 3 + 5 \cdot 3$

e. $(x + 5) + (x + 5) + (x + 5)$

f. $2x + (5 + x) + 5 \cdot 2$

g. $x \cdot 3 + y \cdot 3$

h. $(x + y) + (x + y) + (x + y)$

i. $2x + (y + x) + 2y$

Example 4

A new miniature golf and arcade opened up in town. For convenient ordering, a play package is available to purchase. It includes two rounds of golf and 20 arcade tokens, plus three dollars off. There is a group of six friends purchasing this package. Let g represent the cost of a round of golf and let t represent the cost of a token. Write two different expressions that represent the total amount this group spent. Explain how each expression describes the situation in a different way.

Exercise 5

a. What is the opposite of $(-6v + 1)$?

b. Using the distributive property, write an equivalent expression for part (a).

Example 6

Rewrite $5a - (a - 3b)$ in standard form. Justify each step applying the rules for subtracting and the distributive property.

Exercise 6

Expand each expression and collect like terms.

a. $-3(2p - 3q)$

b. $-a - (a - b)$

Problem Set

1. Write each expression as the product of two factors.

   a. $1 \cdot 3 + 7 \cdot 3$ b. $(1 + 7) + (1 + 7) + (1 + 7)$ c. $2 \cdot 1 + (1 + 7) + (7 \cdot 2)$

   d. $h \cdot 3 + 6 \cdot 3$ e. $(h + 6) + (h + 6) + (h + 6)$ f. $2h + (6 + h) + 6 \cdot 2$

   g. $j \cdot 3 + k \cdot 3$ h. $(j + k) + (j + k) + (\mathrm{j} + \mathrm{k})$ i. $2j + (k + j) + 2k$

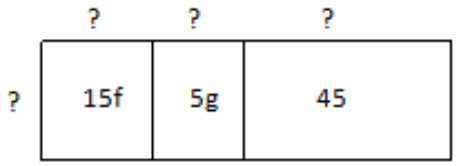
2. Write each sum as a product of two factors.

   a. $6 \cdot 7 + 3 \cdot 7$ b. $(8 + 9) + (8 + 9) + (8 + 9)$ c. $4 + (12 + 4) + (5 \cdot 4)$

   d. $2\mathrm{y} \cdot 3 + 4 \cdot 3$ e. $(\mathrm{x} + 5) + (\mathrm{x} + 5)$ f. $3\mathrm{x} + (2 + \mathrm{x}) + 5 \cdot 2$

   g. $\mathrm{f} \cdot 6 + \mathrm{g} \cdot 6$ h. $(\mathrm{c} + \mathrm{d}) + (\mathrm{c} + \mathrm{d}) + (\mathrm{c} + \mathrm{d}) + (\mathrm{c} + \mathrm{d})$ i. $2\mathrm{r} + \mathrm{r} + \mathrm{s} + 2\mathrm{s}$

3. Use the following rectangular array to answer the questions below.



   a. Fill in the missing information.
   b. Write the sum represented in the rectangular array.
   c. Use the missing information from part (a) to write the sum from part (b) as a product of two factors.

4. Write the sum as a product of two factors.
   a. $81w + 48$
   b. $10 - 25t$
   c. $12a + 16b + 8$

5. Xander goes to the movies with his family. Each family member buys a ticket and two boxes of popcorn. If there are five members of his family, let t represent the cost of a ticket and p represent the cost of a box of popcorn. Write two different expressions that represent the total amount his family spent. Explain how each expression describes the situation in a different way.

6. Write each expression in standard form.
   a. $-3(1-8m-2n)$
   b. $5-7(-4q+5)$
   c. $-(2h-9)-4h$
   d. $6(-5r-4)-2(r-7s-3)$

7. Combine like terms to write each expression in standard form.
   a. $(r-s)+(s-r)$
   b. $(-r+s)+(s-r)$
   c. $(-r-s)-(-s-r)$
   d. $(r-s)+(s-t)+(t-r)$
   e. $(r-s)-(s-t)-(t-r)$