

Lesson 4: Writing Products as Sums and Sums as Products

Classwork

Example 1

a. $2(x + 5)$	
b. $3(x + 4)$	
c. $6(x + 1)$	
d. $7(x - 3)$	
e.	$5x + 30$
f.	$8x + 8$
g.	$3x - 12$
h.	$15x + 20$

Exercise 1

Rewrite the expressions as a product of two factors.

a. $72t + 8$

c. $36z + 72$

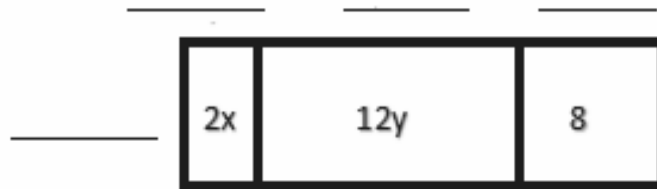
e. $3r + 3s$

b. $55a + 11$

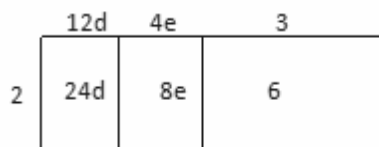
d. $144q - 15$

Example 2

Let the variables x and y stand for positive integers, and let $2x$, $12y$, and 8 represent the area of three regions in the array. Determine the length and width of each rectangle if the width is the same for each rectangle.

**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.

Exercise 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 3

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 \$3.00 off the regular price. 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 4

- a. What is the opposite of $(-6v + 1)$?
- b. Using the distributive property, write an equivalent expression for part (a).

Example 5

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

Exercise 5

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.

- $1 \cdot 3 + 7 \cdot 3$
- $(1 + 7) + (1 + 7) + (1 + 7)$
- $2 \cdot 1 + (1 + 7) + (7 \cdot 2)$
- $h \cdot 3 + 6 \cdot 3$
- $(h + 6) + (h + 6) + (h + 6)$
- $2h + (6 + h) + 6 \cdot 2$
- $j \cdot 3 + k \cdot 3$
- $(j + k) + (j + k) + (j + k)$
- $2j + (k + j) + 2k$

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

- $6 \cdot 7 + 3 \cdot 7$
- $(8 + 9) + (8 + 9) + (8 + 9)$
- $4 + (12 + 4) + (5 \cdot 4)$
- $2y \cdot 3 + 4 \cdot 3$
- $(x + 5) + (x + 5)$
- $3x + (2 + x) + 5 \cdot 2$
- $f \cdot 6 + g \cdot 6$
- $(c + d) + (c + d) + (c + d) + (c + d)$
- $2r + r + s + 2s$

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

	?	?	?
?	15f	5g	45

- Fill in the missing information.
 - Write the sum represented in the rectangular array.
 - 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.
- $81w + 48$
 - $10 - 25t$
 - $12a + 16b + 8$

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.
- $-3(1 - 8m - 2n)$
 - $5 - 7(-4q + 5)$
 - $-(2h - 9) - 4h$
 - $6(-5r - 4) - 2(r - 7s - 3)$
7. Combine like terms to write each expression in standard form.
- $(r - s) + (s - r)$
 - $(-r + s) + (s - r)$
 - $(-r - s) - (-s - r)$
 - $(r - s) + (s - t) + (t - r)$
 - $(r - s) - (s - t) - (t - r)$