Lesson 12: Distributing Expressions

Student Outcomes

- Students model and write equivalent expressions using the distributive property. They move from the factored form to the expanded form of an expression.

Classwork

Opening Exercise (3 minutes)

> **Opening Exercise**
>
> a. Create a model to show 2×5.
>
> | 5 | 5 |
> |---|---|
>
> b. Create a model to show $2 \times b$, or $2b$.
>
> | b | b |
> |---|---|

Example 1 (8 minutes)

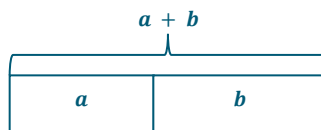> **Example 1**
>
> Write an expression that is equivalent to $2(a + b)$.

MP.7

- In this example, we have been given the factored form of the expression.
- To answer this question, we can create a model to represent $2(a + b)$.
- Let's start by creating a model to represent $(a + b)$.

> **Create a model to represent $(a + b)$.**
>
>
>
> The expression $2(a + b)$ tells us that we have 2 of the $(a + b)$'s. Create a model that shows 2 groups of $(a + b)$.
>
>

> **How many a's and how many b's do you see in the diagram?**
>
> *There are 2 a's and 2 b's.*
>
> **How would the model look if we grouped together the a's and then grouped together the b's?**
>
> $$2a \qquad\qquad\qquad 2b$$
>
> | a | a | b | b |
> |:---:|:---:|:---:|:---:|
>
> **What expression could we write to represent the new diagram?**
>
> $2a + 2b$

- This expression is written in expanded form.

> **What conclusion can we draw from the models about equivalent expressions?**
>
> $2(a + b) = 2a + 2b$

- To prove that these two forms are equivalent, let's substitute some values for a and b and see what happens.

MP.7

> Let $a = 3$ and $b = 4$.
>
> | $2(a + b)$ | $2a + 2b$ |
> |:---:|:---:|
> | $2(3 + 4)$ | $2(3) + 2(4)$ |
> | $2(7)$ | $6 + 8$ |
> | 14 | 14 |

- Note: If students do not believe yet that the two are equal, continue substituting more values for a and b until they are convinced.

> **What happens when we double $(a + b)$?**
>
> *We double a, and we double b.*

Example 2 (5 minutes)

> **Example 2**
>
> **Write an expression that is equivalent to double $(3x + 4y)$.**
>
> **How can we rewrite double $(3x + 4y)$?**
>
> *Double is the same as multiplying by two.*
>
> $2(3x + 4y)$ *or* $6x + 8y$

EUREKA MATH™

Is this expression in factored form, expanded form, or neither?

The first expression is in factored form, and the second expression is in expanded form.

Let's start this problem the same way that we started the first example. What should we do?

We can make a model of $3x + 4y$.

$3x$	$4y$

How can we change the model to show $2(3x + 4y)$?

We can make two copies of the model.

$3x + 4y$		$3x + 4y$	
$3x$	$4y$	$3x$	$4y$

Are there terms that we can combine in this example?

$6x$		$8y$	
$3x$	$3x$	$4y$	$4y$

Yes. There are 6 x's and 8 y's.

So, the model is showing $6x + 8y$.

What is an equivalent expression that we can use to represent $2(3x + 4y)$?

$2(3x + 4y) = 6x + 8y$

This is the same as $2(3x) + 2(4y)$.

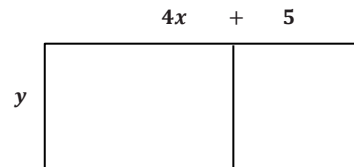**Summarize how you would solve this question without the model.**

When there is a number outside the parentheses, I would multiply it by all the terms on the inside of the parentheses.

Example 3 (3 minutes)

Example 3

Write an expression in expanded form that is equivalent to the model below.

$$4x \quad + \quad 5$$

y

What factored expression is represented in the model?

$y(4x + 5)$

MP.7

How can we rewrite this expression in expanded form?

$y(4x) + y(5)$

$4xy + 5y$

Example 4 (3 minutes)

MP.7

- How can we use our work in the previous examples to write the following expression?

Example 4

Write an expression in expanded form that is equivalent to $3(7d + 4e)$.
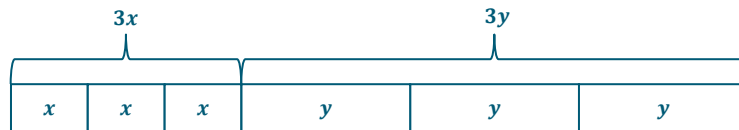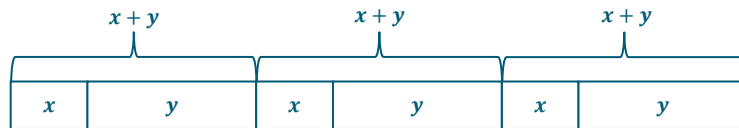
We will multiply $3 \times 7d$ and $3 \times 4e$.

We would get $21d + 12e$. So, $3(7d + 4e) = 21d + 12e$.
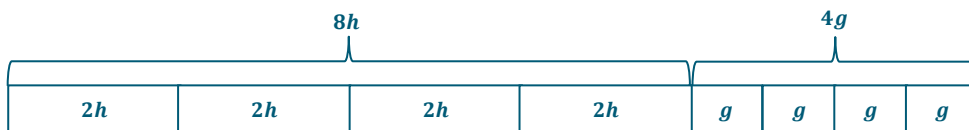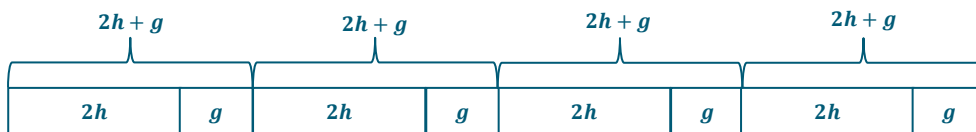
Exercises (15 minutes)

Exercises

Create a model for each expression below. Then, write another equivalent expression using the distributive property.

1. $3(x + y)$

$3x + 3y$

2. $4(2h + g)$

$8h + 4g$

Apply the distributive property to write equivalent expressions in expanded form.

3. $8(h + 3)$

    $8h + 24$
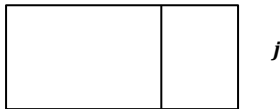
4. $3(2h + 7)$

    $6h + 21$

5. $5(3x + 9y)$

    $15x + 45y$

6. $4(11h + 3g)$

    $44h + 12g$

7.

    $7jk + 12jm$

8. $a(9b + 13)$

    $9ab + 13a$

Closing (3 minutes)

- State what the expression $a(b + c)$ represents.
    - *a groups of the quantity b plus c*
- Explain in your own words how to write an equivalent expression in expanded form when given an expression in the form of $a(b + c)$. Then, create your own example to show off what you know.
    - *To write an equivalent expression, I would multiply a times b and a times c. Then, I would add the two products together.*
    - *Examples will vary.*
- State what the equivalent expression in expanded form represents.
    - *ab + ac means a groups of size b plus a groups of size c.*

Exit Ticket (5 minutes)

Name _____   Date _____

Lesson 12: Distributing Expressions

Exit Ticket

Use the distributive property to write the following expressions in expanded form.

1. $2(b + c)$

2. $5(7h + 3m)$

3. $e(f + g)$

Exit Ticket Sample Solutions

Use the distributive property to write the following expressions in expanded form.

1. $2(b + c)$

   $2b + 2c$

2. $5(7h + 3m)$

   $35h + 15m$

3. $e(f + g)$

   $ef + eg$

Problem Set Sample Solutions

1. Use the distributive property to write the following expressions in expanded form.

   a. $4(x + y)$

      $4x + 4y$

   b. $8(a + 3b)$

      $8a + 24b$

   c. $3(2x + 11y)$

      $6x + 33y$

   d. $9(7a + 6b)$

      $63a + 54b$

   e. $c(3a + b)$

      $3ac + bc$

   f. $y(2x + 11z)$

      $2xy + 11yz$

2.   Create a model to show that $2(2x + 3y) = 4x + 6y$.