|  |
| --- |
|  |

Lesson 11: Factoring Expressions

Student Outcomes

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

Classwork

Fluency Exercise (5 minutes): GCF

*Sprint*: Refer to the Sprints and Sprint Delivery Script sections in the Module Overview for directions on how to administer a Sprint.

Example 1 (8 minutes)

*Scaffolding:*

For students struggling with variables, you can further solidify the concept by having them replace the variables with whole numbers to prove that the expressions are equivalent.

**Example 1**

* 1. **Use the model to answer the following questions.**

How many fives are in the model?

How many threes are in the model?

**MP.7**

What does the expression represent in words?

The sum of two groups of five and two groups of three.

What expression could we write to represent the model?

* 1. Use the new model and the previous model to answer the next set of questions.

How many fives are in the model?

How many threes are in the model?

What does the expression represent in words?

Two groups of the sum of five and three.

What expression could we write to represent the model?

or

* 1. Is the model in part (a) equivalent to the model in part (b)?

**MP.7**

Yes, because both expressions have two s and two s. Therefore, .

* 1. What relationship do we see happening on either side of the equal sign?

On the left hand side, is being multiplied by and then by before adding the products together. On the right hand side, the and are added first and then multiplied by .

* 1. In Grade 5 and in Module 2 of this year, you have used similar reasoning to solve problems. What is the name of the property that is used to say that is the same as ?

The name of the property is the distributive property.

Example 2 (5 minutes)

Example 2

Now, we will take a look at an example with variables. Discuss the questions with your partner.

What does the model represent in words?

plus plus plus , two ’s plus two ’s, two times plus two times

What does mean?

means that there are 's or .

How many 's are in the model?

How many ’are in the model?

What expression could we write to represent the model?

How many 's are in the expression?

How many 's are in the expression?

What expression could we write to represent the model?

**MP.7**

Are the two expressions equivalent?

Yes, both models include 'and’Therefore,

Example 3 (8 minutes)

Example 3

Use GCF and the distributive property to write equivalent expressions.



What is the question asking us to do?

We need to rewrite the expression as an equivalent expression in factored form , which means the expression is written as the product of factors. The number outside of the parentheses is the GCF.

How would Problem 1 look if we expanded each term?

What is the GCF in Problem 1?

How can we use the GCF to rewrite this?

goes on the outside and will go inside the parentheses.

* Let’s use the same ideas for Problem 2. Start by expanding the expression and naming the GCF.



What is the question asking us to do?

We need to rewrite the expression as an equivalent expression in factored form, which means the expression is written as the product of factors. The number outside of the parentheses is the GCF.

How would Problem 2 look if we expanded each term?

What is the GCF in Problem 2?

The GCF is .

How can we use the GCF to rewrite this?

**MP.7**

I will factor out the from both terms and place it in front of the parentheses. I will place what is left in the terms inside the parentheses: .



Is there a greatest common factor in Problem 3?

Yes, when I expand I can see that each term has a common factor .

Rewrite the expression using the distributive property.



Explain how you used GCF and the distributive property to rewrite the expression in Problem 4.

I first expanded each term. I know that goes into , so used it in the expansion.

I determined that , or , is the common factor. So, on the outside of the parentheses I wrote, and on the inside I wrote the leftover factor, .

Why is there a in the parentheses?

When I factor out a number, I am leaving behind the other factor that multiplies to make the original number. In this case, when I factor out an from , I am left with a because .

**MP.7**

How is this related to the first two examples?

In the first two examples, we saw that we could rewrite the expressions by thinking about groups.

We can either think of as groups of and groups of or as groups of the sum of . This shows that is the same as .

Exercises (12 minutes)

If times allows, you could have students practice these questions on white boards or small personal boards.

Exercises

1. Apply the distributive property to write equivalent expressions.
2. Evaluate each of the expressions below.
   1. and and

* 1. and

* 1. and

* 1. Explain any patterns that you notice in the results to parts (a)–(c).

Both expressions in parts (a)–(c) evaluated to the same number when the indicated value was substituted for the variable. This shows that the two expressions are equivalent for the given values.

* 1. What would happen if other values were given for the variables?

Because the two expressions in each part are equivalent, they evaluate to the same number, no matter what value is chosen for the variable.

Closing (3 minutes)

How can use you use your knowledge of GCF and the distributive property to write equivalent expressions?

We can use our knowledge of GCF and the distributive property to change expressions from standard form to factored form.

Find the missing value that makes the two expressions equivalent.

Explain how you determine the missing number.

I would expand each term and determine the greatest common factor. The greatest common factor is the number that is placed on the blank line.

Lesson Summary

An Expression in Factored Form: An expressionthat is a product of two or more expressions is said to be in *factored form*.

Exit Ticket (4 minutes)

Name Date

Lesson 11: Factoring Expressions

Exit Ticket

Use greatest common factor and the distributive property to write equivalent expressions in factored form.

Exit Ticket Sample Solutions

Use greatest common factor and the distributive property to write equivalent expressions in factored form.

Problem Set Sample Solutions

1. Use models to prove that is equivalent to .
2. Use greatest common factor and the distributive property to write equivalent expressions in factored form for the following expressions.

or

Greatest Common Factor–Round 1

Number Correct: \_\_\_\_\_\_

Directions: Determine the greatest common factor of each pair of numbers.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |

Greatest Common Factor–Round 1 [KEY]

Directions: Determine the greatest common factor of each pair of numbers.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |

Greatest Common Factor–Round 2

Number Correct: \_\_\_\_\_\_

Improvement: \_\_\_\_\_\_

Directions: Determine the greatest common factor of each pair of numbers.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |

Greatest Common Factor–Round 2 [KEY]

Directions: Determine the greatest common factor of each pair of numbers.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |
|  | GCF of and |  |  |  | GCF of and |  |