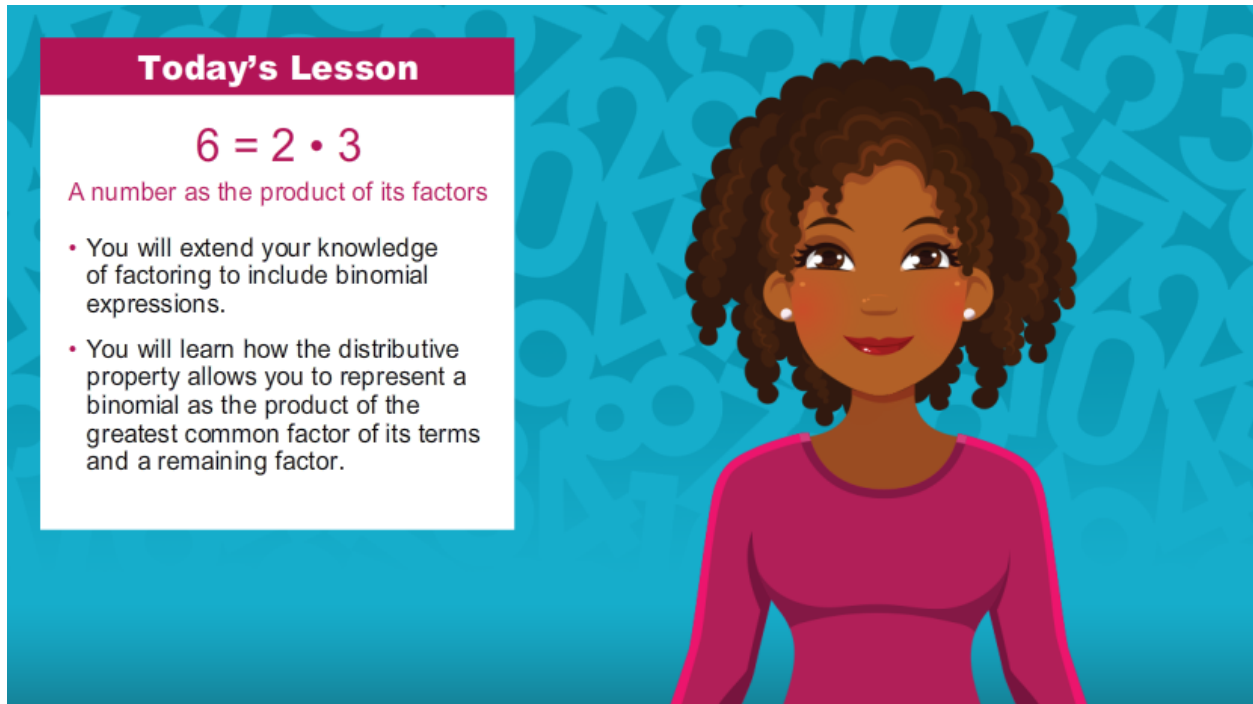


Module 3: Adding and Subtracting Polynomials

Topic 3 Content: Factoring Binomials

Introduction

A graphic for a lesson introduction. On the left, a white box with a pink header contains the text 'Today's Lesson', the equation $6 = 2 \cdot 3$, the phrase 'A number as the product of its factors', and two bullet points. On the right, a woman with curly hair and a pink top is shown against a blue background with mathematical symbols.

Today's Lesson

$$6 = 2 \cdot 3$$

A number as the product of its factors

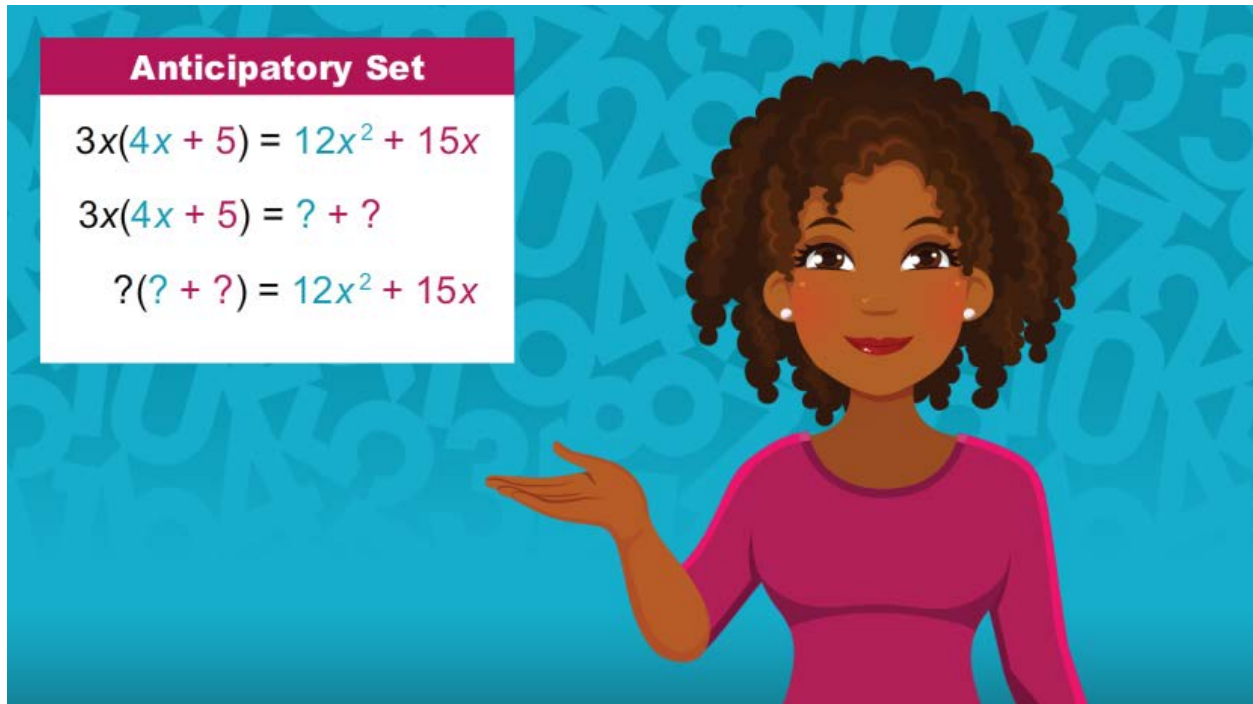
- You will extend your knowledge of factoring to include binomial expressions.
- You will learn how the distributive property allows you to represent a binomial as the product of the greatest common factor of its terms and a remaining factor.

Hello and welcome! You are probably fairly comfortable with how to represent a number as the product of its factors. In this lesson, you will extend your knowledge of factoring to include binomial expressions. You will learn how the distributive property allows you to represent a binomial as the product of the greatest common factor of its terms and a remaining factor.

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Anticipatory Set



The graphic features a woman with dark curly hair and a pink top, gesturing towards a white box with a pink header. The header reads "Anticipatory Set". Inside the box are three equations:

$$3x(4x + 5) = 12x^2 + 15x$$
$$3x(4x + 5) = ? + ?$$
$$?(? + ?) = 12x^2 + 15x$$

Take for example, the product of $3x$ and $(4x + 5)$. You have learned how to use the distributive property to evaluate products like this one.

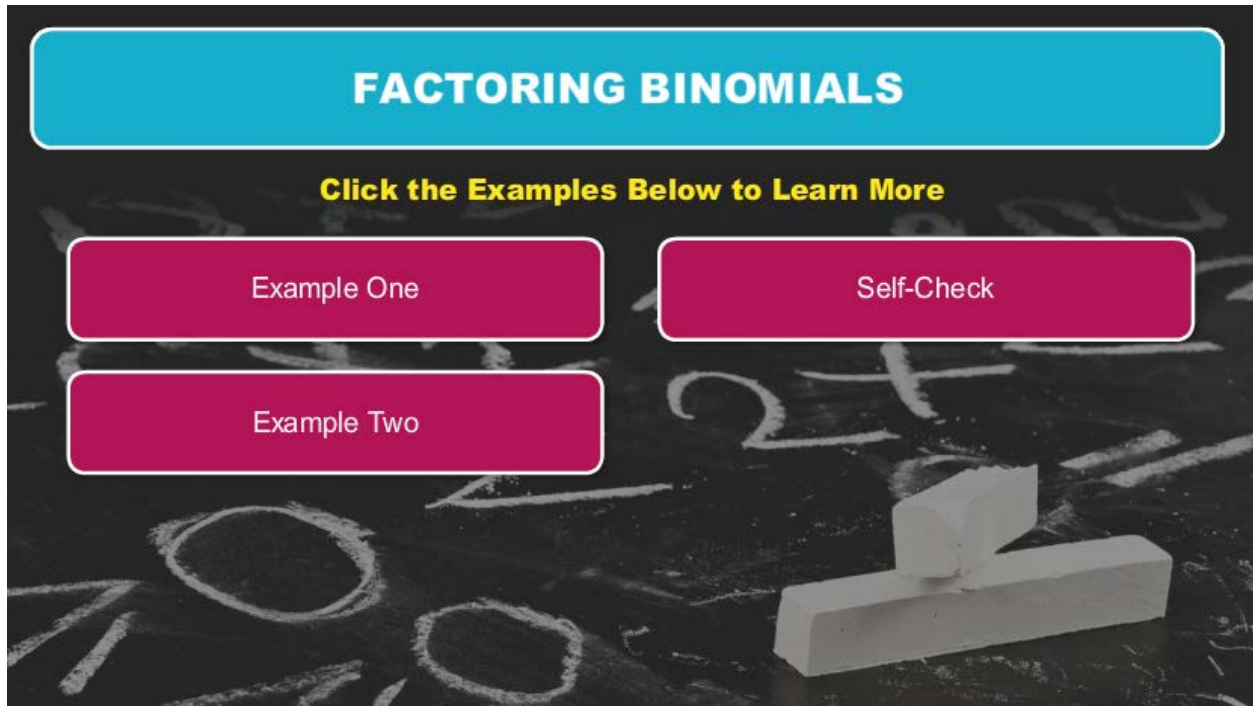
$$3x(4x + 5) = 12x^2 + 15x$$

The terms $3x$ and $4x + 5$ are factors of the binomial $12x^2 + 15x$.

In this lesson, you will solve a problem similar to this but in reverse. Instead of being given factors and using the distributive property to determine the product, you will be given a product and must use the distributive property to determine the factors.

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Factoring Binomials

An interactive interface for factoring binomials. At the top, a blue rounded rectangle contains the text "FACTORING BINOMIALS" in white. Below this, a yellow text prompt says "Click the Examples Below to Learn More". There are three pink rounded rectangular buttons: "Example One" on the top left, "Example Two" on the bottom left, and "Self-Check" on the top right. The background is a chalkboard with faint mathematical drawings and a white geometric block.

Click the examples below to learn more.

- Example One
- Example Two
- Self-Check

Module 3: Adding and Subtracting Polynomials
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Example 1

EXAMPLE 1

Factor completely: $20x^2 - 30x$

$$20x^2 = 2 \cdot 2 \cdot 5 \cdot x \cdot x$$
$$-30x = -1 \cdot 2 \cdot 3 \cdot 5 \cdot x$$
$$\text{GCF} = 2 \cdot 5 \cdot x = 10x$$

The Greatest Common Factor is $10x$.

Factor completely:

$$20x^2 - 30x$$

The first step to factoring the binomial completely is to determine the greatest common factor of its terms. You can achieve this by factoring each term completely.

$$20x^2 = 2 \cdot 2 \cdot 5 \cdot x \cdot x$$
$$-30x = -1 \cdot 2 \cdot 3 \cdot 5 \cdot x$$

The terms each have a factor of 2, a factor of 5, and a factor of x . Therefore, the greatest common factor is $10x$.

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Example 1 (continued)

EXAMPLE 1

Factor completely: $20x^2 - 30x$

$$\frac{20x^2}{10x} = 2x \quad \frac{-30x}{10x} = -3$$
$$20x^2 - 30x = 10x(2x - 3)$$

The Greatest Common Factor is $10x$.

[Menu](#)

Now that you have identified the greatest common factor, you will need to factor it out of the original expression. To accomplish this, divide each term of the binomial by the greatest common factor.

$$\frac{20x^2}{10x} = 2x ; \text{ and}$$

$$\frac{-30x}{10x} = -3$$

So, when factored completely,

$$20x^2 - 30x = 10x(2x - 3).$$

Module 3: Adding and Subtracting Polynomials

Topic 3 Content: Factoring Binomials

Example 2

EXAMPLE 2

Factor completely: $9y + 24$

$9y = ?$

$24 = ?$

GCF =

What is the greatest common factor of $9y$ and 24 ?

Enter your answer and click **SUBMIT**.

Submit

Factor completely: $9y + 24$

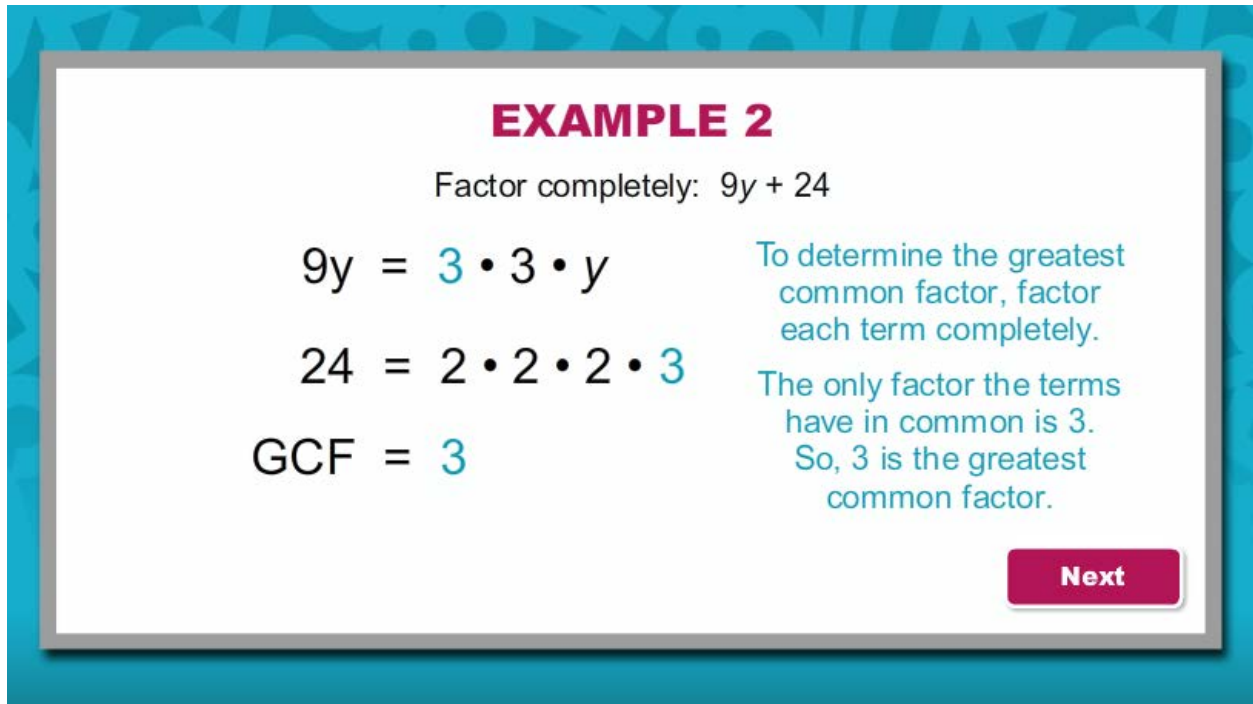
To factor the binomial completely, begin by determining the greatest common factor of $9y$ and 24 .

What is the greatest common factor of $9y$ and 24 ?

Module 3: Adding and Subtracting Polynomials

Topic 3 Content: Factoring Binomials

Example 2 (continued)



EXAMPLE 2

Factor completely: $9y + 24$

$$9y = 3 \cdot 3 \cdot y$$
$$24 = 2 \cdot 2 \cdot 2 \cdot 3$$
$$\text{GCF} = 3$$

To determine the greatest common factor, factor each term completely.

The only factor the terms have in common is 3. So, 3 is the greatest common factor.

Next

To determine the greatest common factor, factor each term completely.

$$9y = 3 \cdot 3 \cdot y$$
$$24 = 2 \cdot 2 \cdot 2 \cdot 3$$

The only factor the terms have in common is 3. So, 3 is the greatest common factor.

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Example 2 (continued)

EXAMPLE 2

Factor completely: $9y + 24$

$$\frac{9y}{3} = ? \quad \frac{24}{3} = ?$$
$$9y + 24 = 3(\text{ })$$

To find the unknown factor, divide each terms by the greatest common factor.
Enter your answer above and click **SUBMIT**.

Submit

Now that you have identified the greatest common factor, you will need to factor it out of the original expression. To accomplish this, divide each term of the binomial by the greatest common factor.

When factored completely, $9y + 24 = 3(?)$.

Module 3: Adding and Subtracting Polynomials
Topic 3 Content: Factoring Binomials

Example 2 (continued)

EXAMPLE 2

Factor completely: $9y + 24$

$$\frac{9y}{3} = 3y \qquad \frac{24}{3} = 8$$
$$9y + 24 = 3(3y + 8)$$

After dividing each term of the expression by 3, you find that
 $9y + 24 = 3(3y + 8)$.

Next

After dividing each term of the expression by 3, you find that

$$\frac{9y}{3} = 3y,$$

and

$$\frac{24}{3} = 8.$$

Therefore, when factored completely,

$$9y + 24 = 3(3y + 8).$$

Module 3: Adding and Subtracting Polynomials

Topic 3 Content: Factoring Binomials

Example 2 (continued)

EXAMPLE 2

Factor completely: $9y + 24$

$3(3y + 8)$

$9y + 24$

You may use the distributive property to verify that your factors are correct.

It is important to mention that you are also able to use the distributive property to verify that your factors are correct. Multiply your factors and verify that the result is the original binomial expression.

$$3 \cdot 3y = 9y$$

$$3 \cdot 8 = 24$$

Therefore,

$$3(3y + 8) = 9y + 24.$$

The product is equivalent to the original expression. So, your factors are correct.

Module 3: Adding and Subtracting Polynomials
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Self-Check 1

Self-Check

Factor completely: $18 - 14x$

$18 - 14x = \square (\square)$

Drag the correct terms below to the appropriate spots above.

2 3 4

$6 - 5x$ $6 - 7x$ $9 - 7x$

SUBMIT

Solve the problem in the image above to check your understanding of the content.

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Self-Check 1: Answer

Correct

That's correct! First, you must find the greatest common factor of the terms of the binomial.

$$18 = 2 \cdot 3 \cdot 3$$
$$14x = 2 \cdot 7 \cdot x$$

The greatest common factor is 2.

Now, divide each term of the expression by the greatest common factor.

$$\frac{18}{2} = 9$$
$$\frac{14x}{2} = 7x$$

Therefore, when factored completely,

$$18 - 14x = 2(9 - 7x)$$

Continue

SUBMIT

For your reference, the image above shows the correct solution to the self-check problem.

Module 3: Adding and Subtracting Polynomials

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Conclusion



The image shows a digital interface for a lesson conclusion. On the left, a white box with a pink header titled "Today's Lesson" contains a checkmark and the text "Used the distributive property to factor binomials completely". Below this are two pink buttons: "Exit Lesson" and "Restart Lesson". To the right of the box is a cartoon illustration of a smiling woman with dark curly hair, wearing a pink long-sleeved top. The background is a blue pattern of mathematical symbols like pi, infinity, and numbers.

Congratulations! You have reached the conclusion of this lesson in Algebra I. In this lesson, you learned how to use the distributive property to factor binomials completely.