Lesson 23
Factoring Polynomials

Outline

Part A
Factoring $x^2 + bx + c$

- Methods of Factoring — Modeling Factors
- Factoring $x^2 + bx + c$ by ac-Grouping

Part B
Factoring $ax^2 + bx + c$

- Factoring Expressions when $a \neq 1$

Targeted Review

Vocabulary

- area model

Check out **More to Explore** in the Digital Pack to see if there are additional activities for this part of the lesson.

Warm Up

Your student should spend no more than 5 minutes on the Warm Up. This should be a quick review to activate prior knowledge.

Q: How are factoring by grouping and factoring out the GCF related?

A: *After you group the terms, you factor the GCF out of each group. You need to be able to find the GCF if you are factoring by grouping.*

Review factoring by grouping from Lesson 21 before continuing if your student cannot complete these problems. This is a foundational concept that is required for this lesson.

23A EXPLORE

Part A: Factoring $x^2 + bx + c$

Objectives

In this part of the lesson, you will learn about factoring trinomials in the form $x^2 + bx + c$.

By the end of this lesson, you will be able to do the following:

- Demonstrate different methods of factoring trinomials.
- Factor trinomials in standard form when the leading coefficient is equal to 1.

Why?

What method of factoring makes the most sense to you? Determining this by practicing different methods will strengthen your understanding of factoring and help you apply it to real-life scenarios in future lessons.

Warm Up

Factor by grouping.

1) $5x^2 + 10x - 3xy - 6y$

$(5x^2 + 10x) + (-3xy - 6y)$

$5x(x + 2) - 3y(x + 2)$

$(x + 2)(5x - 3y)$

2) $x^2 + 8x + 5x + 40$

$(x^2 + 8x) + (5x + 40)$

$x(x + 8) + 5(x + 8)$

$(x + 8)(x + 5)$

Methods of Factoring—Modeling Factors

- The key to factoring is identifying the factors and _____organizing_____ them to see the _____relationships_____ between the terms.
- Modeling a _____polynomial expression_____ allows you to visualize the expression and find the factors.
- An _____area_____ model uses blocks to form a _____rectangle_____ representing a polynomial expression. This model can be used to find the factors.
- The factors are the _____length_____ and _____width_____ of the rectangle.

EXPLORE 23A

Example 1

Factor.

$x^2 + 5x + 6$

You can use integer blocks, digital manipulatives, or draw blocks to model the expressions.

Plan Model the expression.

Form a rectangular area model.

Write the answer as the product of binomial factors.

Implement

Identify the needed blocks:

- x^2 = one square
- $5x$ = five rectangles
- 6 = six blocks

Form a rectangular area model. Place the x's and units around x^2 until *all* of the terms in the polynomial are represented.

Explain

Label the rectangle, then write the factored expression:

- Horizontal: $x + 3$
- Vertical: $x + 2$

Factored expression: $(x + 3)(x + 2)$

Example 2

Factor.

$x^2 - x - 12$

Implement

Identify the needed blocks.
Create a rectangular area model:

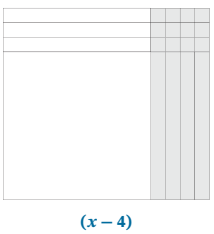
- Use factors of "12" that have a sum or difference of "−1" to create your area model.
- Form the rectangular area model.

Explain

With all terms represented, label the rectangle, then write the factored expression:

- Horizontal: $x - 4$
- Vertical: $x + 3$

Factored expression: $(x - 4)(x + 3)$



Example 1

Your student may choose to build more problems with the digital manipulatives found in the Digital Pack.

Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

Your student may choose to build this problem with the digital manipulatives found in the Digital Pack.

23A EXPLORE

Example 3

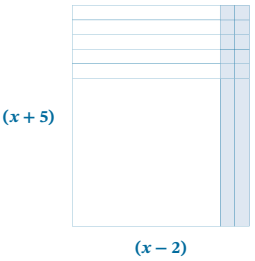
Factor.

$x^2 + 3x - 10$

Implement

Identify the needed blocks.
Form a rectangular area model:

- Use factors of "10" that have a sum or difference of "3" to build your area model.
- Form the rectangular area model.



Explain

With all terms represented, label the rectangle, then write the factored expression:

- Horizontal: $x - 2$
- Vertical: $x + 5$

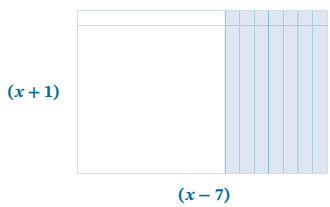
Factored expression: $(x - 2)(x + 5)$

Checkpoint

Factor using an area model. Write your answer as the product of two binomials.

$x^2 - 6x - 7$

$(x - 7)(x + 1)$

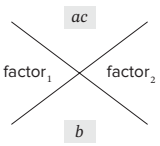


Factoring $x^2 + bx + c$ by ac-Grouping

- The ac-grouping method uses an _____organizer_____ to factor problems by finding the factors of ac that result in b. Then, the four terms are factored algebraically by grouping.
- It is important to write your expression in _____standard form_____, which is _____$ax^2 + bx + c$_____.

EXPLORE 23A

- The goal is to use your knowledge of **sign patterns** and how factors work together to make the expressions.
- You can use an **X organizer** to see how the factors work together before factoring algebraically by grouping.



Example 4

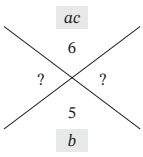
Factor using ac-grouping with an X organizer.

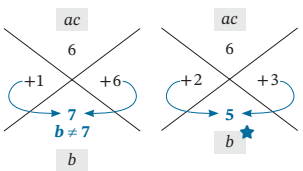
$x^2 + 5x + 6$

Implement

$a = 1, b = 5, c = 6$

$ac = 1 \cdot 6 = 6$





$x^2 + 2x + 3x + 6$

$(x^2 + 2x) + (3x + 6)$

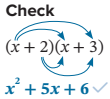
$x(x + 2) + 3(x + 2)$

$(x + 2)(x + 3)$

Explain

- Identify a, b, and c.
- Find the product of a and c.
- An X organizer is used with ac and b from the original expression.
- The left and right terms are found using factors of ac that make b true.
- Write the 4-term polynomial using the given first and last terms and the terms you found.
- Place parentheses around the first two and last two terms.
- Factor out the GCF algebraically.

Check



$x^2 + 5x + 6$ ✓

You can always multiply your factors back together to determine if they are correct. Drawing the arrows to distribute is a great way to complete this check quickly. It also can be completed using mental math.

Example 4

If the sign pattern in the quadratic trinomial were $(-)(+)$, you would organize the terms in the same way. When the last term is negative, you must pay more attention to how the terms work together to form the middle term.

There are a variety of names for the ac-grouping method using an X organizer, such as the X method, X-box method, and the British method. It may be helpful to share these with your student in case they encounter them elsewhere.

Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

Q: What are the factor pairs of 45?

A: *1 and 45, 3 and 15, 5 and 9*

Q: What signs do you need for the binomial factors? Explain.

A: *You need one addition and one subtraction symbol because the last term is negative.*

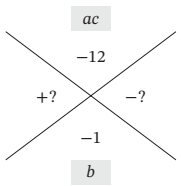
23A EXPLORE

Example 5

Factor using the ac-grouping method.

$x^2 - x - 12$

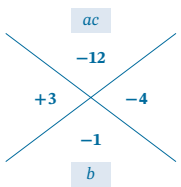
Plan Identify a, b, and c.
Find the product of a and c.
Create an X organizer.
Write a polynomial with four terms.
Factor algebraically.



Implement

$a = 1, b = -1, c = -12$

$ac = 1 \cdot (-12) = -12$



$x^2 + 3x - 4x - 12$

$(x^2 + 3x) + (-4x - 12)$

$x(x + 3) - 4(x + 3)$

$(x + 3)(x - 4)$

Checkpoint

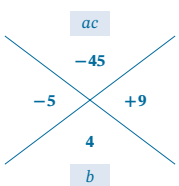
Factor using the ac-grouping method.

$x^2 + 4x - 45$

$(x^2 - 5x) + (9x - 45)$

$x(x - 5) + 9(x - 5)$

$(x - 5)(x + 9)$



PRACTICE 1 23A

Practice 1

Complete the problems on a separate sheet of paper.

Factor. Model or use ac-grouping to find the binomial factors.

1) $x^2 + 7x + 10$ **$(x + 2)(x + 5)$**
2) $x^2 + 2x + 1$ **$(x + 1)(x + 1)$**
3) $x^2 - 7x - 8$ **$(x - 8)(x + 1)$**
4) $x^2 - 8x + 15$ **$(x - 5)(x - 3)$**
5) $x^2 + 9x - 10$ **$(x - 1)(x + 10)$**
6) $x^2 + 6x + 5$ **$(x + 5)(x + 1)$**
7) $x^2 + 30x + 81$ **$(x + 3)(x + 27)$**
8) $x^2 - 24x - 81$ **$(x + 3)(x - 27)$**
9) $x^2 - 48x - 100$ **$(x - 50)(x + 2)$**
10) $x^2 + 21x - 100$ **$(x + 25)(x - 4)$**
11) $x^2 + 34x - 72$ **$(x + 36)(x - 2)$**
12) $x^2 - 15x + 54$ **$(x + 9)(x - 6)$**

13) The area of a rectangle is $x^2 + 18x + 45$ square units. What are the side lengths?

14) Cammy was told that the area of a rectangle was $x^2 + 7x - 18$ square feet and needed to find the individual side lengths. Factor to find the length and width.

15) Suppose $x = 8$ feet in problem 14. What would the lengths of the sides be?
$(8) + 9 = 17$ ft
$(8) - 2 = 6$ ft

Practice 1

Worked solutions for these problems are located in the Digital Pack.

Your student might be able to factor using mental math instead of one of the factoring methods shown. If so, encourage them to show their work on a few problems to understand the process for the next part of the lesson. Then, have them check their work using mental math.

The algebraic method for ac-grouping is shown in the answer key. Any method used should result in the same factored answer.

If needed, your student may choose to build problems 1–6 with the digital manipulatives found in the Digital Pack.

Q: How do you check that your factored answer is correct?

A: *Multiply the binomials back together.*

2) $(x + 1)(x + 1) = (x + 1)^2$

3) Q: How does knowing the sign patterns help determine the factors?

A: *Knowing if both terms will have the same sign and be added or different signs and subtracted narrows down the possible terms you can use.*

Problems 7–12 provide the factored answer only. Some problems are too large to build.

9–10)

Q: Both questions end with the constant -100. How is it possible for there to be two different problems with the last term being equal?

A: *Because there are many factor pairs for 100. Different factor pairs, or signs, will create different expressions.*

13) The side lengths are $x + 3$ units and $x + 15$ units.

14) The side lengths are $x + 9$ feet and $x - 2$ feet.

Q: Why would it not be possible for x to equal 2 or 1?

A: *Because one of the sides would be 0 feet or −1 feet long, and that is not possible for a rectangle.*

Mastery Check

Show What You Know

A) Q: Why is there only one value of k that makes the expression true?

A. *Because 11 has only 1 factor pair.*

B) Your student needs to provide only one of the answers shown.

It can be helpful if your student begins by listing the factor pairs of 15 and recalling the sign patterns for the expression.

Q: What do you know about the factored answer given the signs of the expression?

A: *Both terms will be negative.*

C) Your student needs to provide only one of the answers shown.

If your student is not sure where to start, have them list the factor pairs for the given set of numbers. Four and six are the only values that work given the other parameters.

Say What You Know

Your student should be able to restate the objectives of the lesson in their own words. If your student is unable to restate the lesson objectives, have them go back and reread the objectives and then explain them.

- Demonstrate different methods of factoring trinomials.
- Factor trinomials in standard form when the leading coefficient is equal to 1.

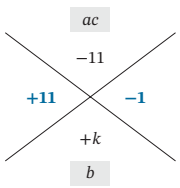
23A MASTERY CHECK

Mastery Check

Show What You Know

Determine *one* value of k that allows you to factor the expression with integers. Write the expression and factor.

A) $x^2 + kx - 11$, where k is positive.



$k = 10$

Eleven has one factor pair $(1 \cdot 11)$. Since k must be positive and the constant is negative, this is the only solution that will make the expression true.

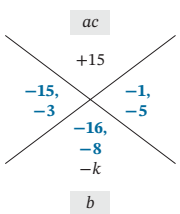
$x^2 + 10x - 11$

$(x^2 + 11x) + (-1x - 11)$

$x(x + 11) - 1(x + 11)$

$(x + 11)(x - 1)$

B) $x^2 - kx + 15$, where k is negative.



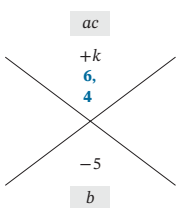
When the middle term is negative and the last term is positive, the binomials will both include subtraction symbols.

$k = -16$, when $(-1 \cdot -15)$ and -8 when $(-3 \cdot -5)$

$x^2 - 16x + 15$		$x^2 - 8x + 15$
$(x^2 - 15x) + (-1x - 15)$	OR	$(x^2 - 3x) + (-5x - 15)$
$x(x - 15) - 1(x - 15)$		$x(x - 3) - 1(x - 3)$
$(x - 15)(x - 1)$		$(x - 3)(x - 5)$

C) Name *one* value of k that allows you to factor the expression with integers. Write the expression and factor. Use the set {4, 5, 6, 7, 8} for possible values of k.

$x^2 - 5x + k$



$k = 6$ when the factors are $-2, -3$
$k = 4$ when the factors are $-1, -4$

$x^2 - 5x + 6$		$x^2 - 5x + 4$
$(x^2 - 3x) + (-2x + 6)$	OR	$(x^2 - 4x) + (-1x + 4)$
$x(x - 3) - 2(x - 3)$		$x(x - 4) - 1(x - 4)$
$(x - 3)(x - 2)$		$(x - 4)(x - 1)$

Say What You Know

In your own words, talk about what you have learned using the objectives for this part of the lesson and your work on this page.

PRACTICE 2 23A

Practice 2

Complete the problems on a separate sheet of paper.

Factor.

1) $x^2 + 9x + 14$ **$(x+2)(x+7)$** **2)** $x^2 - 2x - 15$ **$(x+3)(x-5)$** **3)** $x^2 + 6x - 27$ **$(x+9)(x-3)$**

4) $x^2 - 4x + 3$ **$(x-1)(x-3)$** **5)** $x^2 - 2x - 35$ **$(x-7)(x+5)$** **6)** $x^2 + 8x - 33$ **$(x-3)(x+11)$**

7) $x^2 + 25x + 144$ **$(x+9)(x+16)$** **8)** $x^2 + 24x + 144$ **$(x+12)(x+12)$** **9)** $x^2 + 34x + 64$ **$(x+2)(x+32)$**

10) $x^2 + 63x - 64$ **$(x+64)(x-1)$** **11)** $x^2 - 19x + 90$ **$(x-10)(x-9)$** **12)** $x^2 - 20x + 96$ **$(x-8)(x-12)$**

13) Cam and Jess were factoring the expression $x^2 - 12x - 28$. Both of them found a different answer. Cam's answer was $(x+14)(x-2)$. Jess's answer was $(x-14)(x+2)$.

A) Who is correct? **Jess is correct.**

B) Explain the error in the incorrect answer. Show work to support your reasoning.

14) Bree found the area of a triangle. Her answer was $A = \frac{x^2 - 10x - 39}{2}$. What is the base and the height of the triangle? Explain your thinking.

15) Suppose that $x = 15$ inches in problem 14. What would the lengths of the base and height be? What would the area be? **$A = \frac{1}{2}(2)(18) = 18$ in^2**

Practice 2

Worked solutions for these problems are located in the Digital Pack.

Practice problems are shown using the ac-grouping method. Any method used should result in the same factored answer.

8) $(x+12)(x+12) = (x+12)^2$

This is a perfect square trinomial.

13) Q: How can you determine which answer is correct?

A: *Sample: Multiply the factors to see which answer results in the given expression.*

B) Cam remembered that when the last term is negative, the binomials need one of each sign but did not check that the middle term would be negative when multiplied back together.

$(x+14)(x-2) = x^2 - 2x + 14x - 28 = x^2 + 12x - 28$

Cam's answer has a positive middle term instead of a negative middle term.

14) The formula and the given area are multiplied by one half. The triangle's base and height can be determined if the numerator is factored. The base and height are $(x-13)$ and $(x+3)$ units.

Hint: Factor the numerator. The $\frac{1}{2}$ will not affect the factored solution.

Q: Why is the whole expression divided by 2?

A: *Because the formula for a triangle multiplies everything by $\frac{1}{2}$, which is the same as dividing by 2.*

If needed, have your student go back to the Mastery Check and reapply what they have learned to say and show what they know.

Check out **More to Explore** in the Digital Pack to see if there are additional activities for this part of the lesson.

Warm Up

Your student should spend no more than 5 minutes on the Warm Up. This should be a quick review to activate prior knowledge.

Q: How does factoring relate to multiplying binomials together?

A: *They are inverses of one another. It is also how you can check that your factored answer is correct.*

23B EXPLORE

Part B: Factoring $ax^2 + bx + c$

Objectives

In this part of the lesson, you will learn about factoring trinomials in the form $ax^2 + bx + c$.

By the end of this lesson, you will be able to do the following:

- Factor trinomials in standard form when the leading coefficient is not equal to 1.

Why?

How does changing the leading coefficient change how you factor? Now, more terms within the factors must work together. Factoring problems in this form will allow you to apply factoring to real-life scenarios in future lessons.

Warm Up

Find the product. Show ALL of the steps and terms before simplifying. Name a, b, and c in the quadratic trinomial.

1) $(3x + 8)(4x - 11)$

$12x^2 - 33x + 32x - 88$

$12x^2 - x - 88$

$a = 12, b = -1, c = -88$

2) $(7x + 1)(x - 9)$

$7x^2 - 63x + 1x - 9$

$7x^2 - 62x - 9$

$a = 7, b = -62, c = -9$

Factoring Expressions when $a \neq 1$

- As you encounter more complex expressions, you must find the factoring method that is _____most effective_____ for you.
- A guess and check approach involves trying different _____factor pairs_____ to see if the resulting sum is the given middle term.
  - Do not expect to get the correct answer on the first try.
  - This approach improves your understanding of how signs and terms work together.

EXPLORE 23B

- Factoring can become more complex when the leading **coefficient** is not equal to one.
  - The ac-grouping method can also be used for these trinomials.
  - When $a \neq 1$, you must consider how the first and last terms work together mathematically to make the middle term.
  - Use a **box organizer** to find the GCF of the terms in a more visual manner.

	GCF column 1	GCF column 2
GCF row 1	ax^2	factor$_1$
GCF row 2	factor$_2$	c

Example 1

Factor.

$3x^2 - 2x - 5$

ac

-15

-5 $\quad$ $+3$

-2

b

	GCF column 1	GCF column 2
GCF row 1	$3x^2$	$-5x$
GCF row 2	$+3x$	-5

	$3x$	-5
x	$3x^2$	$-5x$
$+1$	$+3x$	-5

$(3x^2 - 5x) + (3x - 5)$

$x(3x - 5) + 1(3x - 5)$

$(3x - 5)(x + 1)$

Example 2

Factor.

$6x^2 + x - 35$

ac

$-210 =$
$-1 \cdot 2 \cdot 3 \cdot 5 \cdot 7$

-10 $\quad$ $+21$

1

b

×

ac

$-210 =$
$-1 \cdot 2 \cdot 3 \cdot 5 \cdot 7$

$+15$ $\quad$ -14

1

b

	$2x$	$+5$
$3x$	$6x^2$	$+15x$
-7	$-14x$	-35

$(6x^2 + 15x) + (-14x - 35)$

$3x(2x + 5) - 7(2x + 5)$

$(2x + 5)(3x - 7)$

Example 1

Your student may choose to build more problems with the digital manipulatives found in the Digital Pack.

Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

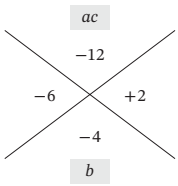
When the leading coefficient is not one, the problems may take some trial and error (this is completely normal).

23B EXPLORE

Example 3

Factor.

$4x^2 - 4x - 3$



	$2x$	-3
$2x$	$4x^2$	$-6x$
$+1$	$+2x$	-3

$(4x^2 - 6x) + (2x - 3)$

$2x(2x - 3) + 1(2x - 3)$

$(2x - 3)(2x + 1)$

Checkpoint

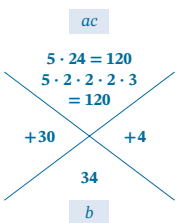
Factor.

$5x^2 + 34x + 24$

$(5x^2 + 30x) + (4x + 24)$

$5x(x + 6) + 4(x + 6)$

$(5x + 4)(x + 6)$



	x	$+6$
$5x$	$5x^2$	$+30x$
$+4$	$+4x$	$+24$

PRACTICE 1 23B

Practice 1

Complete the practice problems on a separate sheet of paper.

Factor.

1) $5x^2 + 18x - 8$ **$(x + 4)(5x - 2)$**

2) $2x^2 - x - 28$ **$(2x + 7)(x - 4)$**

3) $10x^2 - 11x - 8$ **$(5x - 8)(2x + 1)$**

4) $15x^2 - 16x + 1$ **$(15x - 1)(x - 1)$**

5) $15x^2 - 17x - 4$ **$(5x + 1)(3x - 4)$**

6) $3x^2 - 11x + 10$ **$(3x - 5)(x - 2)$**

7) $4x^2 - 13x + 10$ **$(4x - 5)(x - 2)$**

8) $12x^2 + x - 20$ **$(3x + 4)(4x - 5)$**

9) $18x^2 + 33x + 14$ **$(3x + 2)(6x + 7)$**

The area of two rectangles is given. Factor the expressions to find the side lengths.

10) Rectangle A: $3x^2 + 17x + 20$ ft^2

11) Rectangle B: $4x^2 + 17x + 15$ ft^2

12) Suppose $x = 6$. What is the length of the longest side between the two rectangles?
Rectangle B has the longest side of 29 feet.

Practice 1

Worked solutions for these problems are located in the Digital Pack.

The worked solutions have been solved using the algebraic ac-grouping method. Your student should use the method that makes the most sense to them. Remember that $xy = yx$. Therefore, the order of the binomial factors is interchangeable.

1) Q: Why do you need to know which factor pairs are needed for the first and last term of a quadratic expression?

A: *Because the factors of the first and last terms determine the middle term.*

3) Q: How can you check that you correctly factored an expression?

A: *You can check your work by multiplying the factors together to get the given expression.*

5) Q: How are problems 4 and 5 similar?

A: *The leading coefficient is the same in both expressions, and the middle term is negative in both expressions.*

7) Q: How can looking for similarities and differences between expressions help you understand how factoring works?

A: *Sample: It provides a chance to look for patterns and see what terms might work for one expression but not for another.*

10) The side lengths are $(3x + 5)$ and $(x + 4)$ feet.

11) The side lengths are $(4x + 5)$ and $(x + 3)$ feet.

Mastery Check

Show What You Know

A) Recalling the sign patterns from Lesson 22 can make factoring with a leading coefficient less overwhelming.

C) Remind your student that measures of physical objects, like distance, can only be positive values.

Say What You Know

Your student should be able to restate the objectives of the lesson in their own words. If your student is unable to restate the lesson objectives, have them go back and reread the objectives and then explain them.

- Factor trinomials when the leading coefficient is not equal to 1.

23B MASTERY CHECK

Mastery Check

Show What You Know

Audrey knows the total area of a rectangle is $6x^2 - 31x + 35$ square units.

A) Explain how you can determine the signs of the factored expression before factoring.

The factored answer will have two subtraction signs when the signs of the trinomial are subtraction (−) then addition (+).

B) Use the given area of $6x^2 - 31x + 35$ square units to factor the expression to find the side lengths.

$6x^2 - 31x + 35$
$(6x^2 - 10x) + (-21x + 35)$
$2x(3x - 5) - 7(3x - 5)$
$(3x - 5)(2x - 7)$
The side lengths are $3x - 5$ and $2x - 7$ units.

C) Audrey's sibling told her that $x = 3$ for this expression. Explain why this does not make sense.

$3(3) - 5 = 4$ units
$2(3) - 7 = -1$ unit

This does not make sense because one side of the rectangle would be −1 unit. Side lengths cannot be negative values.

Say What You Know

In your own words, talk about what you have learned using the objectives for this part of the lesson and your work on this page.

Lesson Test

After achieving mastery for Parts A and B of this lesson, your student has the option to take the test. Before taking the test, ask your student these questions:

- Do you know all the new vocabulary words?
- Can you explain the objectives?
- Do you know how to check your work?
- Do you know how to use your Formula Sheet?
- Were you able to complete the practice questions without help?

YES

If your student can answer "yes" to all of these questions, decide if your student is ready to take the Lesson Test.

NOT YET

If your student cannot answer "yes" to all of these questions, consider having your student complete some of these options:

- Rework Practice 1.
- Complete Practice 2.
- Review the videos, Guided Notes, and Examples.

PRACTICE 2 23B

Practice 2

Complete the problems on a separate sheet of paper.

Factor.

1) $2x^2 - 5x - 88$ $\mathbf{(2x + 11)(x - 8)}$

2) $14x^2 - 25x + 6$ $\mathbf{(7x - 2)(2x - 3)}$

3) $30x^2 + 13x - 10$ $\mathbf{(6x + 5)(5x - 2)}$

4) $9x^2 - 9x - 40$ $\mathbf{(3x + 5)(3x - 8)}$

5) $9x^2 - 97x - 22$ $\mathbf{(9x + 2)(x - 11)}$

6) $6x^2 + 11x + 3$ $\mathbf{(3x + 1)(2x + 3)}$

7) $2x^2 + 5x - 3$ $\mathbf{(2x - 1)(x + 3)}$

8) $5x^2 + 9x - 2$ $\mathbf{(x + 2)(5x - 1)}$

9) $8a^2 + 30a - 17$ $\mathbf{(4a + 17)(2a - 1)}$

10) $4c^2 + c - 3$ $\mathbf{(c + 1)(4c - 3)}$

11) $3n^2 - 32n + 45$ $\mathbf{(n - 9)(3n - 5)}$

12) $6z^2 - 31z + 35$ $\mathbf{(3z - 5)(2z - 7)}$

Practice 2

Worked solutions for these problems are located in the Digital Pack.

The worked solutions have been solved using the ac-grouping method. Your student should use the method that makes the most sense to them. Remember that $xy = yx$. Therefore, the order of the binomial factors is interchangeable.

If needed, have your student go back to the Mastery Check and reapply what they have learned to say and show what they know.

Lesson Test

Refer to the Part B Mastery Check instructor note to determine if your student is ready for the test.

Targeted Review

Worked solutions for these problems are located in the Digital Pack.

If your student is going to take the Lesson Test, it is recommended that they do so before beginning the Targeted Review.

7) The factored answer will have one addition (+) and one subtraction (−) sign. When the last term is negative, there will always be one of each symbol in the factored answer.

11) Distractor Rationale:

A) Added inner terms rather than multiplying them.

B) Multiplied the numbers from the first terms instead of the outer terms.

C) Switched the signs of the inner and outer terms.

12) Distractor Rationale:

B) A common factor but not the GCF.

C) A binomial factor but not the GCF of all terms.

D) A binomial factor but not the GCF of all terms.

TARGETED REVIEW 23

Targeted Review

In the Targeted Review, you will practice topics you have mastered in earlier lessons. Reviewing these concepts will help you be successful as you work through this unit.

Complete the problems on a separate sheet of paper.

Factor.

1) $\frac{49}{144}c^2 - \frac{1}{9}\left(\frac{7}{12}c + \frac{1}{3}\right)\left(\frac{7}{12}c - \frac{1}{3}\right)$

2) $16x^2 + 24x + 9$ $(4x+3)^2$

3) $121b^2 - 144a^2$ $(11b - 12a)(11b + 12a)$

4) $9x^2 - 6x + 1$ $(3x-1)^2$

5) $5m^2 + 5m - 3mn - 3n$ $(m+1)(5m-3n)$

6) $6a^2 - 21a - 10a + 35$ $(2a-7)(3a-5)$

7) When a given trinomial has only subtraction symbols, what signs will be used in the factored answer? Explain.

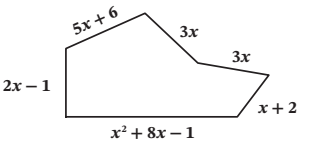
8) Classify the following polynomials by degree and number of terms.

A) $4x^2 + 54x - 320$ **quadratic trinomial**

B) $12p^3 - 60p^2 + 75p + 5$ **cubic polynomial with 4 terms**

C) $2x + 3$ **linear binomial**

9) Find the perimeter of the figure.



$P = x^2 + 22x + 6$ units

10) Solve.
$8(x-3) - 2(x-5) = 0$ $x = \frac{7}{3}$

Multiple Choice

D **11)** Determine the expression equivalent to $(2x+7)(5x-2)$

A) $10x^2 - 4x + 12x - 14$

B) $10x^2 + 10x + 35x - 14$

C) $10x^2 + 4x - 35x - 14$

D) $10x^2 + 35x - 4x - 14$

A **12)** Determine the greatest common factor for the expression:
$2x^3 - 12x^2 - 110x$

A) $2x$

B) 2

C) $(x+5)$

D) $(x-11)$

Problem	1	2	3	4	5	6	7	8	9	10	11	12	13
Lesson Origin	22	22	22	22	21	21	22	20	20	2	20	21	0