ALGEBRA 2

Unit 3 Student Workbook

Polynomials & Factoring

Practice • STRIDES Notes • Progress-Check Preparation

Name	Class	Date
_____	_____	_____

How to Use This Workbook

1. LEARN - Open the matching Unit 3 website lesson. Read the explanation and work each example before revealing a solution.

2. STRIDES - Build your own notes: Subject/Topic, Rules, Supporting Illustrations, Important Definitions, Demonstration Example, and Explain the Steps.

3. PRACTICE - Complete Guided Practice first, then Independent Practice. Show enough work that another person can follow your reasoning.

4. CHECK - Use the readiness checklist. When every statement is true without an example in front of you, take the two-question subsection Skills Check.

5. FIX IT - If a skill is not secure, identify the exact error, correct a similar problem, and retry.

Unit 3 Road Map

Lesson	Topic	Core Decision	Progress Check
3.1	Multiplying Polynomials	What must be distributed, and which terms are actually like terms?	2 questions
3.2	Factoring Trinomials: a = 1	Which two numbers multiply to c and add to b?	2 questions
3.3	Factoring Trinomials: a > 1	Which pair multiplies to ac and adds to b, and how does it create grouping?	2 questions
3.4	Special Factoring Cases	Is there a GCF, difference of squares, sum of cubes, or difference of cubes?	2 questions
3.5	Polynomial Division	Should I use long division or synthetic division, and is the divisor written correctly?	2 questions

LESSON 3.1

Multiplying Polynomials

Learning Objective: I can multiply polynomials using the distributive property, combine like terms, and write the result in standard form.

Before You Start

Every term in one factor must multiply every term in the other factor.

When multiplying powers with the same base, add exponents.

Combine terms only when their variable parts and exponents match.

Build Your STRIDES Notes

Complete this while using the matching website lesson. Write the mathematics in your own words.

S - Subject / Topic

3.1 - Multiplying Polynomials

T - Rules

What rules, patterns, or restrictions control this skill?

R - Supporting Illustrations

Draw a model, organizer, factor-pair table, area model, or division setup that helps you see the structure.

I - Important Definitions

Define the vocabulary you need for this lesson.

D - Demonstration Example

Choose one worked example from the website and reproduce it with all steps.

E - Explain the Steps

Describe the process in words so you could follow it tomorrow without the example.

Guided Practice

Use your notes and the website as needed. Show the structure of the method, not just the final answer.

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

Distribute one monomial to every term.

2. $(x + 6)(x - 2)$

Use distribution and combine like terms.

3. $(2x - 3)(x^2 + 4x - 5)$

Organize all six products before combining.

Independent Practice

Complete these without opening a worked solution. Check by reversing the operation whenever possible.

1. $-5x^2(2x^3 + x - 7)$

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

3. $(x - 4)^2$

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

5. $(4x - 3)(x^2 + x - 2)$

6. Explain why FOIL is not a complete rule for multiplying a binomial by a trinomial.

Am I Ready for the Progress Check?

Check each statement only when you can do it without copying an example.

- ☐ I distribute to every term without skipping one.
- ☐ I add exponents only when multiplying the same base.
- ☐ I combine only like terms.
- ☐ I write the final polynomial in descending powers.

If you cannot check every box, return to the matching website example and correct one practice problem before taking the Progress Check.

LESSON 3.2

Factoring Trinomials: a = 1

Learning Objective: I can factor trinomials of the form $x^2 + bx + c$ and remove a greatest common factor before factoring.

Before You Start

Check for a GCF before using another factoring method.

For $x^2 + bx + c$, find two numbers whose product is c and whose sum is b.

Use the signs of b and c to narrow the factor pair.

Build Your STRIDES Notes

Complete this while using the matching website lesson. Write the mathematics in your own words.

S - Subject / Topic

3.2 - Factoring Trinomials: a = 1

T - Rules

What rules, patterns, or restrictions control this skill?

R - Supporting Illustrations

Draw a model, organizer, factor-pair table, area model, or division setup that helps you see the structure.

I - Important Definitions

Define the vocabulary you need for this lesson.

D - Demonstration Example

Choose one worked example from the website and reproduce it with all steps.

E - Explain the Steps

Describe the process in words so you could follow it tomorrow without the example.

Guided Practice

Use your notes and the website as needed. Show the structure of the method, not just the final answer.

1. $x^2 + 9x + 20$

Find a factor pair of 20 that adds to 9.

2. $x^2 - 3x - 28$

The signs differ because c is negative.

3. $3x^2 + 24x + 45$

Remove the GCF first.

Independent Practice

Complete these without opening a worked solution. Check by reversing the operation whenever possible.

1. $x^2 + 12x + 35$

2. $x^2 - 10x + 21$

3. $x^2 + 2x - 48$

4. $x^2 - x - 30$

5. $4x^2 + 28x + 48$

6. $-2x^2 + 14x - 24$

Am I Ready for the Progress Check?

Check each statement only when you can do it without copying an example.

- ☐ I check for a GCF first.
- ☐ I can use product and sum to choose a factor pair.
- ☐ I can predict whether factor signs match or differ.
- ☐ I multiply my factors to verify the original trinomial.

If you cannot check every box, return to the matching website example and correct one practice problem before taking the Progress Check.

LESSON 3.3

Factoring Trinomials: a > 1

Learning Objective: I can factor trinomials with a leading coefficient greater than 1 using the AC method and grouping.

Before You Start

Check for a GCF first.

Compute ac, then find two numbers that multiply to ac and add to b.

Split the middle term and factor by grouping.

The grouped binomial factors must match before the final step.

Build Your STRIDES Notes

Complete this while using the matching website lesson. Write the mathematics in your own words.

S - Subject / Topic

3.3 - Factoring Trinomials: a > 1

T - Rules

What rules, patterns, or restrictions control this skill?

R - Supporting Illustrations

Draw a model, organizer, factor-pair table, area model, or division setup that helps you see the structure.

I - Important Definitions

Define the vocabulary you need for this lesson.

D - Demonstration Example

Choose one worked example from the website and reproduce it with all steps.

E - Explain the Steps

Describe the process in words so you could follow it tomorrow without the example.

Guided Practice

Use your notes and the website as needed. Show the structure of the method, not just the final answer.

1. $6x^2 + 11x + 3$

ac = 18; find a pair that adds to 11.

2. $8x^2 - 2x - 3$

ac = −24; the pair must have opposite signs.

3. $10x^2 + 25x + 15$

Remove the GCF before AC.

Independent Practice

Complete these without opening a worked solution. Check by reversing the operation whenever possible.

1. $6x^2 + 13x + 6$

2. $8x^2 + 10x + 3$

3. $12x^2 - 7x - 10$

4. $15x^2 + 2x - 8$

5. $18x^2 + 21x + 6$

6. Explain why splitting bx into two terms does not change the value of the polynomial.

Am I Ready for the Progress Check?

Check each statement only when you can do it without copying an example.

- ☐ I calculate ac correctly.
- ☐ My two numbers multiply to ac and add to b.
- ☐ I can split the middle term and factor by grouping.
- ☐ I factor out a GCF before AC when needed.
- ☐ I multiply the final factors to check.

If you cannot check every box, return to the matching website example and correct one practice problem before taking the Progress Check.

LESSON 3.4

Factoring Special Cases

Learning Objective: I can recognize and factor a difference of squares and sums or differences of cubes, after checking for a GCF.

Before You Start

Difference of squares: $a^2 - b^2 = (a + b)(a - b)$.

Sum of cubes: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$.

Difference of cubes: $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$.

A sum of two squares does not use the difference-of-squares pattern.

Build Your STRIDES Notes

Complete this while using the matching website lesson. Write the mathematics in your own words.

S - Subject / Topic

3.4 - Factoring Special Cases

T - Rules

What rules, patterns, or restrictions control this skill?

R - Supporting Illustrations

Draw a model, organizer, factor-pair table, area model, or division setup that helps you see the structure.

I - Important Definitions

Define the vocabulary you need for this lesson.

D - Demonstration Example

Choose one worked example from the website and reproduce it with all steps.

E - Explain the Steps

Describe the process in words so you could follow it tomorrow without the example.

Guided Practice

Use your notes and the website as needed. Show the structure of the method, not just the final answer.

1. $49x^2 - 16$

Identify each square, then use conjugate factors.

2. $x^3 + 64$

Recognize 64 as 4^3.

3. $27y^3 - 125$

Recognize $(3y)^3 - 5^3$.

Independent Practice

Complete these without opening a worked solution. Check by reversing the operation whenever possible.

1. $81x^2 - 25$

2. $16a^2 - 121b^2$

3. $x^3 + 216$

4. $8m^3 - 27$

5. $3x^3 - 75x$

6. Explain how factoring out a GCF can reveal a special pattern that was hidden.

Am I Ready for the Progress Check?

Check each statement only when you can do it without copying an example.

- ☐ I check for a GCF first.
- ☐ I can identify perfect squares and perfect cubes.
- ☐ I use difference of squares only when the terms are subtracted.
- ☐ I use the correct cube sign pattern.
- ☐ I continue until the expression is factored completely.

If you cannot check every box, return to the matching website example and correct one practice problem before taking the Progress Check.

LESSON 3.5

Division of Polynomials

Learning Objective: I can divide polynomials using long division and use synthetic division when the divisor is an appropriate linear factor.

Before You Start

Long division cycle: divide, multiply, subtract, bring down, repeat.

Write polynomials in descending powers and use zero placeholders for missing powers.

For synthetic division by $x - c$, use c in the setup.

Check with dividend = divisor × quotient + remainder.

Build Your STRIDES Notes

Complete this while using the matching website lesson. Write the mathematics in your own words.

S - Subject / Topic

3.5 - Division of Polynomials

T - Rules

What rules, patterns, or restrictions control this skill?

R - Supporting Illustrations

Draw a model, organizer, factor-pair table, area model, or division setup that helps you see the structure.

I - Important Definitions

Define the vocabulary you need for this lesson.

D - Demonstration Example

Choose one worked example from the website and reproduce it with all steps.

E - Explain the Steps

Describe the process in words so you could follow it tomorrow without the example.

Guided Practice

Use your notes and the website as needed. Show the structure of the method, not just the final answer.

1. $(x^2 + 6x + 8) \div (x + 2)$

Set up polynomial long division and follow the full cycle.

2. $(2x^2 + 7x + 4) \div (x + 3)$

Expect a possible remainder; do not force the division to be exact.

3. $(x^3 - 5x^2 + 2x + 8) \div (x - 4)$

Use 4 in the synthetic setup.

Independent Practice

Complete these without opening a worked solution. Check by reversing the operation whenever possible.

1. $(x^2 + 9x + 20) \div (x + 4)$

2. $(2x^2 + 3x - 5) \div (x - 1)$

3. $(x^3 + 2x^2 - 5x - 6) \div (x + 3)$

4. $(2x^3 - 7x^2 + 0x + 3) \div (x - 2)$

5. Use synthetic division: $(x^3 - 6x^2 + 11x - 6) \div (x - 1)$

6. Explain why a missing x-term must be represented by a zero coefficient in synthetic division.

Am I Ready for the Progress Check?

Check each statement only when you can do it without copying an example.

- ☐ I can decide when synthetic division is allowed.
- ☐ I use the zero of the divisor with the correct sign.
- ☐ I include zero placeholders for missing powers.
- ☐ I can state quotient and remainder clearly.
- ☐ I can verify the result using multiplication and addition.

If you cannot check every box, return to the matching website example and correct one practice problem before taking the Progress Check.

Unit 3 Final STRIDES Synthesis

Use this page after Lesson 3.5. Your goal is to build a decision guide for the entire unit.

When I see a polynomial expression, how do I decide whether to multiply, factor, or divide?

My factoring decision tree: GCF → trinomial → difference of squares → cubes → check again

Three errors I am most likely to make and how I will catch them

Unit Readiness

☐ I can multiply polynomials and combine like terms.
☐ I can factor a = 1 trinomials completely.
☐ I can use the AC method when a > 1.
☐ I can recognize difference of squares and sum/difference of cubes.
☐ I can use long division and synthetic division correctly.
☐ I can verify multiplication/factoring by reversing the operation.
☐ I can explain what polynomial expressions represent in an area/perimeter context.