Big Ideas Math: California Algebra 1

# Parent Newsletter

## Chapter 7: Polynomial Equations and Factoring

## Students will...

- Find the degrees of monomials.
- Classify polynomials.
- Add and subtract polynomials.
- Multiply binomials using the Distributive Property, a table, or the FOIL method.
- Multiply binomials and trinomials.
- Use patterns to multiply polynomials.
- Solve polynomial equations in factored form.
- Factor polynomials using the greatest common factor.
- Solve polynomial equations by factoring.
- Factor trinomials of the form $x^2 + bx + c$.
- Factor trinomials of the form $ax^2 + bx + c$.
- Factor differences of two squares.
- Factor perfect square trinomials.
- Factor polynomials by grouping.
- Factor polynomials completely.

## Standards

**California Common Core:**
A.SSE.1a,
A.SSE.2,
A.SSE.3a,
A.APR.1,
A.REI.4b

## Essential Questions

- How can you use algebra tiles to model and classify polynomials?
- How can you add polynomials? How can you subtract polynomials?
- How can you multiply two binomials?
- What are the patterns in the special products $(a + b)(a - b)$, $(a + b)^2$, and $(a - b)^2$?
- How can you solve a polynomial equation that is written in factored form?
- How can you use common factors to write a polynomial in factored form?
- How can you factor the trinomial $x^2 + bx + c$ into the product of two binomials?
- How can you factor the trinomial $ax^2 + bx + c$ into the product of two binomials?
- How can you recognize and factor special products?

## Key Terms

A ***monomial*** is a number, a variable, or a product of a number and one or more variables with whole number exponents.

The ***degree of a monomial*** is the sum of the exponents of the variables in the monomial.

A ***polynomial*** is a monomial or a sum of monomials.

A polynomial with two terms is a ***binomial***.

A polynomial with three terms is a ***trinomial***.

The ***degree of a polynomial*** is the greatest degree of its terms.

The ***FOIL Method*** is a shortcut for multiplying two binomials.

A polynomial is in ***factored form*** when it is written as a product of factors.

When one side of an equation is a polynomial in factored form and the other side is 0, use the ***Zero-Product Property*** to solve the polynomial equation.

The solutions of a polynomial equation are also called ***roots***.

A process to factor polynomials with four terms is called ***factoring by grouping***.

A ***prime polynomial*** is a polynomial that cannot be factored as a product of polynomials with integer coefficients.

A factorable polynomial with integer coefficients is said to be ***factored completely*** when no more factors can be found and it is written as the product of prime factors.

## Games

- A Dicey Polynomial Situation
- Make My Team
- Polynomial Tic-Tac-Toe

These are available online in the *Game Closet* at www.bigideasmath.com

## Key Ideas

### FOIL Method

To multiply two binomials using the FOIL Method, find the sum of the products of the

**F**irst terms, $(x + 1)(x + 2) \rightarrow x(x) = x^2$

**O**uter terms, $(x + 1)(x + 2) \rightarrow x(2) = 2x$

**I**nner terms, and $(x + 1)(x + 2) \rightarrow 1(x) = x$

**L**ast terms. $(x + 1)(x + 2) \rightarrow 1(2) = 2$

$(x + 1)(x + 2) = x^2 + 2x + x + 2 = x^2 + 3x + 2$

### Sum and Difference Pattern

- $(a + b)(a - b) = a^2 - b^2$
- $(x + 3)(x - 3) = x^2 - 3^2$
  $= x^2 - 9$

### Square of a Binomial Pattern

- $(a + b)^2 = a^2 + 2ab + b^2$
- $(x + 3)^2 = x^2 + 2(x)(3) + 3^2$
  $= x^2 + 6x + 9$

- $(a - b)^2 = a^2 - 2ab + b^2$
- $(x - 3)^2 = x^2 - 2(x)(3) + 3^2$
  $= x^2 - 6x + 9$

### Zero-Product Property

- If the product of two real numbers is 0, then at least one of the numbers is 0.
- If $a$ and $b$ are real numbers and $ab = 0$, then $a = 0$ or $b = 0$.

### Factoring Polynomials Using the GCF

Step 1: Find the greatest common factor (GCF) or the terms.

Step 2: Use the Distributive Property to write the polynomials as a product of the GCF and its remaining factors.

### Factoring $x^2 + bx + c$ When $c$ is Positive

- $x^2 + bx + c = (x + p)(x + q)$ when $p + q = b$ and $pq = c$. When $c$ is positive, $p$ and $q$ have the same sign as $b$.
- $x^2 + 6x + 5 = (x + 1)(x + 5)$
  $x^2 - 6x + 5 = (x - 1)(x - 5)$

### Factoring $x^2 + bx + c$ When $c$ is Negative

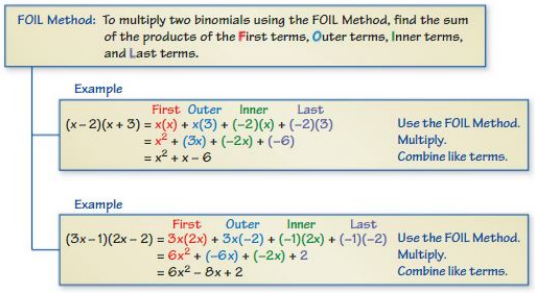
- $x^2 + bx + c = (x + p)(x + q)$ when $p + q = b$ and $pq = c$. When $c$ is negative, $p$ and $q$ have different signs.
- $x^2 - 4x - 5 = (x + 1)(x - 5)$

### Difference of Two Squares Pattern

- $a^2 - b^2 = (a + b)(a - b)$
- $x^2 - 9 = x^2 - 3^2$
  $= (x + 3)(x - 3)$

## Reference Tools

An Idea and Examples Chart can be used to organize information about a concept. Students fill in the top rectangle with a term and its definition or description. Students fill in the rectangles that follow with example to illustrate the term.




## What's the Point?

The ability to add, subtract, or multiply polynomials is useful in real-life for finding the perimeter or area of figures such as gardens.


The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 7: Bird Dropping Food STEM Video is available online at www.bigideasmath.com.

## Quick Review

- Before adding or subtracting polynomials, it is helpful to identify the like terms.
- $(x + 3)^2 \neq x^2 + 9$. Rewrite $(x + 3)^2$ as $(x + 3)(x + 3)$ and check your answer using the FOIL Method.
- When the leading coefficient of a factorable trinomial is 1 and the constant term is negative, encourage your student to begin by writing $(x - \_)(x + \_)$ and then think about the pairs of factors.