Big Ideas Math: 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

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

First terms, $(x + 1)(x + 2) \rightarrow x(x) = x^2$

Outer terms, $(x + 1)(x + 2) \rightarrow x(2) = 2x$

Inner terms, and $(x + 1)(x + 2) \rightarrow 1(x) = x$

Last 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

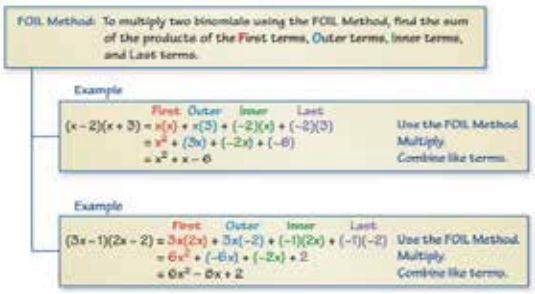
- $x^2 + bx + c = (x + p)(x + q)$ when $p + q = b$ and $pq = c$. When c is negative, p and q have different signs.
- $x^2 - 4x - 5 = (x + 1)(x - 5)$

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.