

09 Polynomials and Factoring

Content Area: **Mathematics**
Course(s):
Time Period: **Week1**
Length: **1 Week**
Status: **Published**

Stage 1: Desired Results

Unit Overview/ Rationale

In this unit students learn that a single quantity may be represented by many different expressions. The facts about a quantity may be expressed by many different equations (or inequalities). Another understanding developed is that all of the facts of arithmetic and algebra follow from certain properties.

Standards & Indicators

Common Core: Mathematics, Common Core: Grade 8, Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

MA.9-12.A-APR.A.1

Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

MA.9-12.A-SSE.A.2

Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be

factored as $(x^2 - y^2)(x^2 + y^2)$.

MA.9-12.A-SSE.A.1

Interpret expressions that represent a quantity in terms of its context.

MA.9-12.A-SSE.A.1a

Interpret parts of an expression, such as terms, factors, and coefficients.

MA.9-12.A-SSE.A.1b

Interpret complicated expressions by viewing one or more of their parts as a single entity.

Big Ideas - Students will understand that...

- Monomials can be used to form larger expressions called polynomials. Polynomials can be added and subtracted.
- There are several ways to find the product of two binomials, including models, algebra, and tables.
- Some trinomials of the form ax^2+bx+c and some polynomials of a degree greater than 2 can be factored to equivalent forms which are the product of two binomials.

Essential Questions - What provocative questions will foster inquiry and transfer of learning

- Can two algebraic expressions that appear to be different be equivalent?
- How are the properties of real numbers related to polynomials?

Content - Students will know...

Key vocabulary:

binomial, degree of a monomial, degree of a polynomial, difference of two squares, factoring by grouping, monomial, perfect-square trinomial, polynomial, standard form of a polynomial, trinomial

Skills - Students will be able to...

- Add and subtract polynomial expressions.
- Multiply polynomial expressions.

-Factor polynomials.

-Use the Commutative and Associative Properties to manipulate polynomial expressions.

-Use the Distributive Property to multiply polynomials and factor polynomials.

Stage 2: Assessment Evidence

Assessment

Stage 3: Learning Plan

Learning Activities

Activities:

Students will write polynomials in standard form. Students will add and subtract polynomials.

Formative Assessment:

Teacher observation of student work in small-group and independent practice.

Closure:

Students will be asked to add or subtract two polynomials and write in standard form.

Example:

Find the difference of $3x^3 - 7x^2 + 5$ and $2x^2 - 9x - 1$.

Sample Solution:

$$(3x^3 - 7x^2 + 5) - (2x^2 - 9x - 1)$$

$$3x^3 - 7x^2 + 5 - 2x^2 + 9x + 1$$

$$3x^3 - 9x^2 + 9x + 6$$

Activities:

Students will multiply polynomials. Students will factor polynomials by determining the GCF. Students will simplify

when needed.

Formative Assessment:

Teacher observation of student work in small-group and independent practice.

Closure:

Students will be asked to multiply polynomials or factor out the GCF.

Example:

What is the factored form of $10y^4 - 12y^3 + 4y^2$?

Sample Solution:

$$10y^4 - 12y^3 + 4y^2$$

$$2y^2(5y^2) - 2y^2(6y) + 2y^2(2)$$

$$2y^2(5y^2 - 6y + 2)$$

Activities:

Students will multiply binomials. Students will simplify and write in standard form.

Formative Assessment:

Teacher observation of student work in small-group and independent practice.

Closure:

Students will be asked to use the Distributive Property to multiply polynomials.

Example:

What is the simplified form of $(4x - 3)(3x + 2)$?

Sample Solution:

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

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

$$12x^2 + 8x - 9x - 6$$

$$12x^2 - x - 6$$

Activities:

Students will factor quadratic trinomials.

Formative Assessment:

Teacher observation of student work in small-group and independent practice.

Closure:

Students will be asked to write a trinomial as a product of two binomials. A GCF may also need to be factored.

Example:

What is the factored form of

$$-2h^2 + 4h + 70?$$

Sample Solution:

$$-2h^2 + 4h + 70$$

$$(-2)(h^2) - (-2)(2h) - (-2)(35)$$

$$-2[h^2 - 2h - 35]$$
$$-2[(h + 5)(h - 7)]$$

Activities:

Students will factor special case trinomials.

Formative Assessment:

Teacher observation of student work in small-group and independent practice.

Closure:

Students will be asked to factor a perfect-square trinomial. Students will be asked to factor a trinomial with a difference of two square terms.

Example:

What is the factored form of
 $81t^2 - 90t + 25$?

Sample Solution:

$$81t^2 - 90t + 25$$
$$(9t)^2 - 90t + 5^2$$
$$(9t)^2 - 2(9t)(5) + 5^2$$
$$(9t - 5)^2$$

Activities:

Students will factor a polynomial with four or more terms by grouping.

Formative Assessment:

Teacher observation of student work in small-group and independent practice.

Closure:

Students will be asked to factor a polynomial with four or more terms. Grouping will be used.

Example:

What is the factored form of
 $6d^4 + 4d^3 - 6d^2 - 4d$?

Sample Solution:

$$6d^4 + 4d^3 - 6d^2 - 4d$$
$$2d(3d^3 + 2d^2 - 3d - 2)$$
$$2d[(3d^3 + 2d^2) - (3d + 2)]$$
$$2d[(d^2)(3d + 2) - (3d + 2)]$$
$$2d[(d^2 - 1)(3d + 1)]$$
$$2d[(d - 1)(d + 1)(3d + 1)]$$

Resources

Pearson, Algebra 1 c. 2012

Chapter 8: Polynomials and Factoring