Intro to Algebra II

[Implement start year (2013-2014)]

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Unit #4 Polynomial Expressions

Stage 1 – Desired Results

Established Goals

2009 NJCCC Standard(s), Strand(s)/CPI #
(http://www.nj.gov/education/cccs/2009/final.htm)

Common Core Curriculum Standards for Math and English
(http://www.corestandards.org/)

Seeing Structure in Expression A-SSE: 1a, 2, 3a

- Interpret the structure of expressions
- Write expressions in equivalent forms to solve problems

Arithmetic with Polynomials and Rational Expressions A-APR: 1

- Perform arithmetic operations on polynomials

21st Century Themes
(www.21stcenturyskills.org)

___ Global Awareness
_X__Financial, Economic, Business and Entrepreneurial Literacy
___Civic Literacy
___Health Literacy
___Environmental Literacy

21st Century Skills

Learning and Innovation Skills:
_X__Creativity and Innovation
_X__Critical Thinking and Problem Solving
_X__Communication and Collaboration

Information, Media and Technology Skills:
___Information Literacy
___Media Literacy
_X__ICT (Information, Communications and Technology) Literacy

Life and Career Skills:
_X__Flexibility and Adaptability
_X__Initiative and Self-Direction
_X__Social and Cross-Cultural Skills
_X__Productivity and Accountability
_X__Leadership and Responsibility

<table>
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<td><u>Enduring Understandings:</u>
Students will understand that . . .

EU 1
Solutions to polynomial functions have real-world application.

EU 2
Polynomial expressions can be transformed into equivalent forms.

EU 3
The sum, difference, and product of numerals are the precursors to adding, subtracting, and multiplying polynomials.</td>
<td><u>Essential Questions:</u>

EU 1
• How does a polynomial function model real-world situations?
• How do the solutions to a polynomial function have real-world application?

EU 2
• How can we factor polynomials?
• Why is learning the rules of factoring important?
• How is factoring applied in solving real-world problems?

EU 3
• How do we classify monomials as like terms in order to add and subtract?
• How does the distributive property apply to distributing polynomials?</td>
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<td><u>Knowledge:</u>
Students will know . . .

EU 1
• solving a polynomial function will produce the zeros of the function.

EU 2
• factoring is a method based on arithmetic and algebraic rules that reverses polynomial multiplication.

EU 3
• arithmetic and algebraic rules are used to simplify polynomials
• the degree of a polynomial in an equation influences its solution and graph.
• the mechanics of simplifying polynomial expressions.</td>
<td><u>Skills:</u>
Students will be able to . . .

EU 1
• recognize the relationship of the factored form of a polynomial expression, the roots of a polynomial equation and the zeros of a polynomial function.

EU 2
• represent polynomials in completely factored forms using:
➢ Greatest common factor
➢ Trinomial (simple & complex)
➢ Difference of two squares
➢ Factor by grouping

EU 3
• add, subtract, and multiply polynomials using the laws of exponents
• determine the type and degree of a polynomial
• define the properties associated with simplifying polynomials</td>
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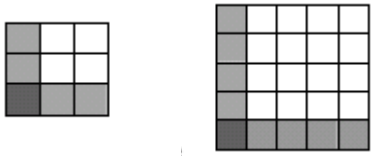
Stage 2 – Assessment Evidence

Recommended Performance Tasks:

- **TASK #1** EU 1, EU 3

An office is in need of a local tile contractor to create decorative tile designs. All the office floors in a particular building are going to be tiled with three colors of tile: black, gray, and white in the pattern shown below. All the offices are square but come in different sizes. An office with three tiles on one side and an office with five tiles on one side are shown. The contractor needs to orchestrate a formula that the tile setters can use to determine how many tiles they need for any size room.



Design a new three color tile pattern for a square room and write a formula for the total number of tiles needed for each color for a room with n tiles along one side of the room.

White tiles cost $1.25 each and black and gray tiles cost $1.50 each. Can a room with 20 tiles along one side be tiled for under $550 using the contractor's design?

Rubric			
Level 4	**Level 3**	**Level 2**	**Level 1**
Student correctly determines a formula for the total number of tiles for a room that has n tiles along one side of the room. Student verifies the formula. Student designs a new three-color tile pattern for a square room and writes a formula for the total number of tiles needed. Student verifies if their design can tile the room for under $550.	Student correctly determines a formula for the total number of tiles for a room that has n tiles along one side of the room. Student may verify the formula. Student designs a new three-color tile pattern for a square room and writes a formula with minor errors for the total number of tiles needed. Student verifies if their design can tile the room for under $550.	Student determines with some error a formula for the total number of tiles for a room that has n tiles along one side of the room. Student designs a new three-color tile pattern for a square room and writes a formula (with error) for the total number of tiles needed. Student may not have verified if their design can tile the room for under $550.	Student determines an incorrect formula for the total number of tiles for a room that has n tiles along one side of the room. Student designs a new three-color tile pattern for a square room.

Other Recommended Evidence: *Tests, Quizzes, Prompts, Self-assessment, Observations, Dialogues, etc.*

- Tests/quizzes on operations with polynomials, factoring polynomials and solving polynomial equations
- “Ticket to leave” at the end of classifying polynomials, multiplying polynomials, and factoring polynomials
- Student explanations of do-nows, homework, and class work
- Class discussions on the most efficient strategy to factor polynomials
- Observations on the connection between the factor of a polynomial expression and the zero of a polynomial function visually on a graph
- Questioning on effective problem-solving strategies: Identify the knowns and unknowns, draw a diagram, develop a verbal model

Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: *Consider the WHERETO elements. Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.*

- Activity #1:
  Excel Self-Check spreadsheet game to test student knowledge on operations with polynomials. Students are to type in their answers in the appropriate cell and receive comments if correct/incorrect. This is a good activity to use as reinforcement after teaching this standard. (A) http://www.ilovemath.org/index.php?option=com_docman&task=cat_view&gid=51

- Activity #2
  This activity focuses on having students make connections among different classes of polynomial functions by exploring graphs. The questions in the activity sheets allow student to make connections between the x-intercepts of the graph of a polynomial and the polynomial's factors. (A/M/T)
  http://illuminations.nctm.org/LessonDetail.aspx?id=L282

- Activity #3: **I Have, Who Has? Game**
  "I Have, Who Has?" is game with a deck of cards containing polynomials in factored or non-factored form meant for groups of three or more. Cards with polynomials in non-factored form are labeled "I Have..." and cards with factored polynomials are labeled "Who Has?" (A/M)

  Deal the deck so that each student has the same number of cards. Students take turns saying "I have..." and then reading an "I have" card from their hand, then saying "Who has" and asking for the factored version of the polynomial they named. The player who has the card has to hand it over in exchange for a card the first player wishes to discard. The first player to pair all of their "I have" cards with its corresponding "Who has" card is the winner. (A/M)

- Activity #4: TI-Nspire

  Polynomials: Factors, Roots and Zeros Investigate graphical and algebraic representations of a polynomial function and its linear factors. (M/T)

  http://education.ti.com/calculators/downloads/US/Activities/Detail?id=16044

- Activity #5: TI –Nspire: Factoring complex trinomials (A/M)
  http://education.ti.com/calculators/timathnspired/US/Activities/Detail?id=11891&sa=5022&t=5035

The following is the suggested sequence of learning activities for the Intro To Algebra II (level3) class and should comprise 33 school days:

- YWBAT utilize the rules of exponents. (A)
- YWBAT classify and simplify polynomials (add, subtract). (A)
- YWBAT multiply polynomials. (A)
- YWBAT factor polynomials using GCF and factor by grouping techniques. (A)
- YWBAT factor trinomials (simple & complex). (A)
- Activity #2: Polynomial Graph Exploration (A/M/T)
- Activity #4: TI-Nspire (M/T)
- YWBAT factor special products (A)
- Activity #3: I Have, Who Has? Game (A/M)
- Activity #5: TI-Nspre Factoring Complex Trinomials (including special products) (A/M)
- YWBAT solve equations by factoring and real-world problem solving. (A)
- Activity #1: Excel Self-Check (A)