

Unit 6: Polynomials and Factoring

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Title Section

Department of Curriculum and Instruction



Belleville Public Schools

Curriculum Guide

Algebra 1 A

Unit 6: Polynomials and Factoring

Belleville Board of Education

102 Passaic Avenue

Belleville, NJ 07109

Prepared by: Annamaria Contella, Tatiana Ryjouk

Dr. Richard Tomko, Ph.D., M.J., Superintendent of Schools
Dr. Giovanni Cusmano, Director of Elementary Education K - 8
Mr. George Droste, Director of Secondary Education

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Unit Overview

- This unit is about operations with polynomials, factoring polynomials and solving quadratic equations by factoring.
- The students should expect to learn how to add and subtract polynomials, multiply a polynomial by a monomial, factor polynomials, solve quadratic equations by factoring.

NJSLS

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.B.3a	Factor a quadratic expression to reveal the zeros of the function it defines.
MA.9-12.A-REI.B.4b	Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .
MA.9-12.A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
MA.9-12.A-REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Exit Skills

By the end of Unit 6 Students Should be able to:

- Classify, add and subtract polynomials.

- Multiply a polynomial by a monomial.
- Multiply two binomials or a binomial by a trinomial.
- Find the degree of a polynomial.
- Write polynomials in ascending and descending order.
- Find special products.
- Factor using the Distributive Property.
- Factor polynomials by grouping.
- Factor trinomials of the form $x^2 + bx + c$ and $ax^2 + bx + c$.
- Factor perfect square trinomials & differences of squares.
- Use the zero product property.

Enduring Understanding

Make sense of problems and persevere in solving them.

Reason abstractly and quantitatively.

Construct viable arguments and critique the reasoning of others.

Model with mathematics.

Use appropriate tools strategically.

Attend to precision.

Look for and make use of structure.

Look for and express regularity in repeated reasoning.

Essential Questions

How can you use the distributive property to multiply binomials?

How can two algebraic expressions that appear to be different be equivalent?

How are the properties of real numbers related to polynomials?

How can you use factoring to solve quadratic equations in standard form when $a=1$?

How can you use factoring to solve quadratic equations in standard form when a is not $=1$?

What patterns and characteristics can you observe in expressions when multiplying/factoring?

Learning Objectives

Students will be able to:

- Classify, add, subtract and simplify polynomials by using like terms.
- Multiply a polynomial by a monomial by the distributive property.
- Multiply two binomials or a binomial by a trinomial by the distributive property or FOIL method.
- Find the degree of a polynomial.
- Write polynomials in ascending and descending order.
- Find special products using the formulas.
- Factor polynomials by using the Distributive Property.
- Factor polynomials by grouping method.
- Factor trinomials of the form $x^2 + bx + c$ and $ax^2 + bx + c$.
- Factor perfect square trinomials & differences of squares.
- Solve quadratic equations by using the zero product property.
- Organize different methods of factoring by creating graphic organizer.

Interdisciplinary Connections

Economics, business, financing, geometry, literacy, science.

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
TECH.8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
TECH.8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

Alignment to 21st Century Skills & Technology

Key SUBJECTS AND 21st CENTURY THEMES

Mastery of key subjects and 21st century themes is essential for all students in the 21st century.

Key subjects include:

- English, reading or language arts
- World languages
- Arts
- Mathematics
- Economics

- Science
- Geography
- History
- Government and Civics

21st Century/Interdisciplinary Themes

- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness

21st Century Skills

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

Suggested Activities & Best Practices

Polynomials:

<https://mathslinks.net/links/algebra-marcus-du-sautoy>

Real- world applications/Quadratic Equations:

<https://www.illustrativemathematics.org/content-standards/HSA/REI/B/4/tasks/586>

Graphic Organizer:

<https://www.teacherspayteachers.com/Product/Factoring-Polynomials-Graphic-Organizer-366550>

Textbook, eAssessment, supplemental materials:

<https://my.mheducation.com/login>

AI Assessment and Learning System:

<https://www.aleks.com/>

Mindset:

<https://www.youtube.com/watch?v=3icoSeGqQtY>

<http://www.youcubed.org/wp-content/uploads/Positive-Classroom-Norms2.pdf>

Teaching Strategies for Improving Algebra Knowledge in Middle and High School Students:

<https://ies.ed.gov/ncee/wwc/PracticeGuide/20>

Coaching Corner:

<https://sites.google.com/belleville.k12.nj.us/thecoachingcorner/home>

Algebra Tools - Functions:

<https://www.state.nj.us/education/aps/cccs/math/NJISTFunctions.pdf>

Algebra Tools - Algebra:

<https://www.state.nj.us/education/aps/cccs/math/NJISTAAlgebra.pdf>

Misc Mathematics materials:

<http://www.mathnstuff.com/>

Algebra Kahoots:

<https://kahoot.com/explore/collections/math-kahoot-algebra/>

Technology Infusion

- Youtube
- Khan academy
- MS Excel
- Office 365
- MS Word
- PodCasts
- MS Powerpoint
- Wikipedia
- Skype
- Twitter
- Ted Talks
- QR Barcode Generator

- Calculator/Graphic calculator
- desmos.com
- geogebra.org

Differentiation

- Cooperative groups
- Board work
- Team work
- Classroom discussions
- Questions and Answers
- Study guide
- Tests/quizzes reviews
- Notes taking/transparencies
- Organizer
- Calculator/graphic calculator
- Posters display
- Extra time

Special Education

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multiple test sessions
- multi-sensory presentation
- preferential seating

- preview of content, concepts, and vocabulary
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

ELL

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarify
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

Intervention Strategies

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes

- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Evidence of Student Learning-CFU's

Please list ways educators may effectively check for understanding in this section.

- Admit Tickets
- Anticipation Guide
- Common benchmarks
- Compare & Contrast
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Illustration
- KWL Chart
- Outline
- Question Stems
- Quizzes
- Self- assessments
- Study Guide
- Teacher Observation Checklist
- Unit tests

Primary Resources

Glencoe McGraw-Hill Algebra1 2014

Glencoe McGraw-Hill Algebra1 2010

Practice Glencoe Algebra1

Ancillary Resources

Houghton Mifflin Harcourt On core Mathematics Algebra 1

Glencoe McGraw-Hill Science and Mathematics Lab Manual