

Understanding and Applying Quadratic Relationships

Grade: 8 (Algebra & Geometry 1)

Duration: 6 Weeks

Summary:

Students will identify, compute with, and factor polynomial expressions. Students will learn to recognize the special products of polynomials, factor polynomials, solve quadratic equations by applying the zero product property, and apply quadratic functions to real life situations.

LEARNING FOCUS

COMPELLING QUESTION:

From a graphical, symbolic, and numerical standpoint, how are quadratic functions unique? What distinguishes applications that involve quadratic questions?

CONCEPTS

Solving quadratic equations
Representing and applying quadratic functions
Operations with polynomials

LEARNING DISPOSITIONS

Students are especially challenged to tap into their resourcefulness and resilience during this unit when factoring advanced quadratic expressions.

ENDURING UNDERSTANDING

- The graphs of quadratic functions always form parabolas.
- Quadratic equations may have 0, 1, or 2 solutions.
- Quadratic equations must have an x^2 term.
- The use of inverse operations does not always enable one to solve an equation.

- Models are necessary to investigate, explain and make mathematical predictions
- Equivalent mathematical relationships can be expressed in more than one way.
- The operations of addition, subtraction, multiplication and division hold the same fundamental meanings no matter the domain to which they are applied.
- Comparing mathematical patterns or relationships either algebraically or graphically helps us see that there are classes of relationships with common characteristics and helps us describe each member of the class

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ESSENTIAL QUESTIONS

- What are differences between linear and quadratic equations?
- What types of real world situations are modeled by quadratic relationships?
- How are polynomial operations similar and different to whole number operations?

- *What do you mean by the degree of a polynomial?*
- *Will learning to manipulate polynomials help you in solving real life problems?*
- *Is it helpful to know how many terms in an expression?*
- *Why is it important to write expressions in standard form?*
- *Why is the F.O.I.L method so widely known and used?*
- *Is it important to be able to factor quadratic expressions?*

STANDARDS & BENCHMARKS [Learning Goals]

NCTM: Curriculum Focal Points, NCTM: Grade 8, Connections to the Focal Points

Algebra:

Students encounter some nonlinear functions (such as the inverse proportions that they studied in grade 7 as well as basic quadratic and exponential functions) whose rates of change contrast with the constant rate of change of linear functions.

KNOWLEDGE

Students will identify, compute with, and factor polynomial expressions. Students will learn to recognize the special products of polynomials, factor polynomials, solve quadratic equations by applying the zero product property, and apply quadratic functions to real life situations.

SKILLS

1. Understand how to add and subtract polynomials.
2. Understand how to graph parabolas but using the “3 point method”
3. Understand how to classify polynomials according to the number of terms they have and their degree.
More completely understand how to graph parabolas by using the “3 point method”
BLACK-Deriving the equation for a quadratic function given information about its graph
Graphing parabolas with graphing software
4. Understand how to multiply polynomials by using the distributive property (THEN, understand the FOIL memory tool).
BLUE-Special product patterns
BLACK-Distance, rate, time applications
5. Understand, recognize, and USE Special Product Patterns to multiply polynomials.
BLUE-Special product patterns
BLACK-Distance, rate, time applications

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6. Solve and graph quadratic equations that have already been factored.
BLACK-
Deriving the equation of a quadratic function given information about its graph.
Graphing quadratic inequalities.
7. Factoring and Solving quadratic equations that have a leading coefficient of 1.
BLUE-Using substitution to solve quadratic equations
BLACK-Pythagorean Theorem application
8. Factoring and Solving quadratic equations with a leading coefficient other than 1.
BLUE-
Using substitution to solve quadratic equations
Distance, Rate, Time applications
BLACK-
Radical Equations
The Quadratic Formula
9. Factoring and Solving Quadratic Equations that contain special product patterns
BLUE-
The Quadratic Formula
Similar rectangles
BLACK-
Deriving and applying the difference of two cubes pattern
Using the graphing application

LEARNING EVIDENCE

Polynomials and Quadratic Equations
Formative: Unit Assessments

Polynomials and Quadratic Equations
Summative: Unit Assessments

Polynomials and Quadratic Equations
Pre-Assessment: Unit Assessments

LEARNING PLAN

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2. Understand how to graph parabolas but using the “3 point method”
3. Understand how to classify polynomials according to the number of terms they have and their degree.
More completely understand how to graph parabolas by using the “3 point method”
BLACK-
Deriving the equation for a quadratic function given information about its graph

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- Graphing parabolas with graphing software
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BLACK-Radical Equations
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BLUE-The Quadratic Formula
Similar rectangles
BLACK-Deriving and applying the difference of two cubes pattern
Using the graphing application

REFLECTION

it might be nice to have more time for practice with word problems and conceptual connections to the meaning of the discriminant

it might be worthwhile to have our kids write about their understanding of some big picture connections in this unit. here's a first crack at some prompts.

Theme 1: Understanding, applying, and graphing quadratic functions

To what types of real life situations do quadratic functions apply? How do these types of situations compare to those represented by linear and exponential functions?

How are quadratic functions graphed? Compare and contrast how we understand the graphs of quadratic functions with how we understand the graphs of linear functions.

Theme 2: Solving quadratic equations

What are various ways of solving quadratic equations? Compare and contrast the process of solving quadratic

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equations with the process of solving linear equations.

Theme 3: Performing math operations with polynomials

How do we add, subtract, and multiply polynomials? Compare and contrast how we perform these operations with polynomials to how we perform them with whole numbers.