Appendix 2.2.2 Curriculum Map

Algebra 2 A

Unit 1: Complex Numbers and Quadratic Functions

Unit Summary

This unit will explain the methods for solving quadratic equations, graphing quadratic functions and their transformations, and performing operations on complex numbers.

Student Learning Objectives

Upon successful completion of this unit, students will be able to:

- describe properties of parabolas
- find the maximum and minimum values of quadratic functions
- graph quadratic functions using x-intercepts
- describe transformations of quadratic functions
- write transformations of quadratic functions
- define and use the imaginary unit *i*
- add, subtract, multiply and divide complex numbers
- solve a quadratic equation with complex solutions by taking square roots
- solve quadratic equations by graphing
- solve quadratic equations by factoring
- solve quadratic equations by completing the square and the quadratic formula
- analyze the discriminant to determine the number and type of solutions
- solve real-life problems with quadratic equations
- write quadratic functions in vertex form
- solve systems of non-linear equations algebraically
- solve systems of non-linear equations graphically
- graph quadratic inequalities in two variables
- solve quadratic inequalities in one variable

Students will be expected to reach a 3.0 (Meets Expectations) or higher on the unit assessment (please refer to grading information in the My Resources link for more information on the scale grading system).

Enduring Understandings

- The graph of any quadratic function is a transformation of the graph of the parent quadratic function.
- For any quadratic function in standard form, the values a, b and c provide key information about its graph.
- To find the zeros of a quadratic function, you must set the equation equal to zero.
- You can solve a quadratic equation in standard form in more than one way.
- A basis for the complex numbers is a number whose square is -1.

Essential Questions/What is the Purpose for Learning This?

Make sure you can answer these questions before attempting the Unit Test.

- How do you describe the graph of $f(x) = a(x - h)^2 + k$?
- How do the constants a, h and k affect the graph of the quadratic function $f(x) = a(x - h)^2 + k$?
- What are the subsets of the set of complex numbers?
- How does the graph of a quadratic equation tell you the number of real solutions of the equation?
- How can you complete the square for a quadratic equation?
- How can you solve a nonlinear system of equations?
- How can you solve a quadratic inequality?

Lesson Content

Lesson 1: Characteristics of Quadratic Functions and Transformations--describe properties of parabolas; find the maximum and minimum values of quadratic functions; graph quadratic functions using x-intercepts; describe transformations of quadratic functions; write transformations of quadratic functions

Lesson 2: Complex Numbers--define and use the imaginary unit; add, subtract, multiply and divide complex numbers; solve a quadratic equation with complex solutions by taking square roots

Lesson 3: Solving Quadratic Equations and Literal Quadratic Equations--solve quadratic equations by graphing; solve quadratic equations by factoring; solve quadratic equations by completing the square and the quadratic formula; analyze the discriminant to determine the number and type of solutions; solve real-life problems with quadratic equations; write quadratic functions in vertex form

Lesson 4: Non-Linear Systems of Equations--solve systems of non-linear equations algebraically; solve systems of non-linear equations graphically

Lesson 5: Quadratic Inequalities--graph quadratic inequalities in two variables; solve quadratic inequalities in one variable

Unit 2: Polynomial Functions

Unit Summary

This unit will explain the methods for factoring and solving polynomial equations, graphing polynomial functions and their transformations, and performing operations on polynomials.

Student Learning Objectives

Upon successful completion of this unit, students will be able to:

- add, subtract and multiply polynomials
- use Pascal's Triangle to expand binomials
- use long division to divide a polynomial by a polynomial
- use synthetic division to divide a polynomial by a binomial
- factor polynomials
- use the Factor Theorem
- find solutions of polynomial equations and zeros of polynomial functions
- use the Rational Roots Theorem
- use the Fundamental Theorem of Algebra
- use Descartes' Rule of Signs
- find conjugate pairs of complex zeros of polynomial functions
- identify polynomial functions by their graph
- graph polynomial functions using tables and end behavior
- use x-intercepts to graph polynomial functions
- find turning points and identify local maximums and minimums of polynomial functions
- describe transformations of polynomial functions
- write transformations of polynomial functions
- identify even and odd functions

Enduring Understandings

- The properties of integers apply to polynomials.

- Factors are a subset of a product and with the distributive property allow options in solving polynomial equations.
- Multiplying and factoring polynomials are related.
- Solving polynomial equations involves the reversal of operations, the distributive property and rules of exponents.

Essential Questions/What is the Purpose for Learning This?

Make sure you can answer these questions before attempting the Unit Test.

- How can you cube a binomial?
- How can you use the factors of a cubic polynomial to solve a division problem involving a polynomial?
- How can you factor a polynomial?
- How can you determine whether a polynomial equation has a repeated solution?
- How can you determine whether a polynomial equation has imaginary solutions?
- What are some common characteristics of the graphs of cubic and quartic polynomial functions?
- How many turning points can the graph of a polynomial function have?
- How can you transform the graph of a polynomial function?

Lesson Content

Lesson 1: Add, Subtract, Multiply and Divide Polynomials--add, subtract and multiply polynomials; use Pascal's Triangle to expand binomials; use long division to divide a polynomial by a polynomial; use synthetic division to divide a polynomial by a binomial

Lesson 2: Factoring Polynomials--factor polynomials; use the Factor Theorem

Lesson 3: Solving Polynomial Equations and the Fundamental Theorem of Algebra--find solutions of polynomial equations and zeros of polynomial functions; use the Rational Roots Theorem; use the Fundamental Theorem of Algebra; use Descartes' Rule of Signs; find conjugate pairs of complex zeros of polynomial functions

Lesson 4: Graphing Polynomial Functions and Transformations--identify polynomial functions by their graph; graph polynomial functions using tables and end behavior; use x-intercepts to graph polynomial functions; find turning points and identify local maximums and minimums of polynomial functions; describe transformations of polynomial functions; write transformations of polynomial functions; identify even and odd functions

Unit 3: Rational Functions

Unit Summary
This unit will explain the methods for performing operations with rational expressions, solving rational equations, and graphing rational functions and their transformations.

Student Learning Objectives
Upon successful completion of this unit, students will be able to:

- classify direct and inverse variation
- write inverse variation equations
- graph rational functions
- translate rational functions
- simplify rational expressions
- multiply rational expressions
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- divide rational expressions
- add rational expressions
- subtract rational expressions
- simplify complex fractions
- solve rational equations by cross-multiplying
- solve rational equations by using the least common denominator
- find the inverse of a rational function

Enduring Understandings

- A rational function is a ratio of polynomial functions.
- If a rational function is in simplified form, and the polynomial in the denominator is not a constant, then the graph of the function exhibits asymptotic behavior.
- Operations with rational expressions use the same processes as operations with fractions.
- When solving a rational equation, multiplying by the common denominator can result in extraneous solutions.

Essential Questions/What is the Purpose for Learning This?
Make sure you can answer these questions before attempting the Unit Test.

- Are two quantities inversely proportional if an increase in one corresponds to a decrease in the other?
- What kinds of asymptotes are possible for a rational function?
- Are a rational expression and its simplified form equivalent?

Lesson Content
Lesson 1: Inverse Variation--classify direct and inverse variation; write inverse variation equations

Lesson 2: Graphing Rational Functions and Transformations--graph rational functions; translate rational functions
Lesson 3: Add, Subtract, Multiply and Divide Rational Expressions--simplify rational expressions; multiply rational expressions; divide rational expressions; add rational expressions; subtract rational expressions; simplify complex fractions

Lesson 4: Solving Rational Equations--solve rational equations by cross-multiplying; solve rational equations by using the least common denominator; find the inverse of a rational function

Unit 4: Radical Functions

Unit Summary

This unit will explain the methods for simplifying radicals, solving and graphing radical equations, and performing operations and compositions with radical functions.

Student Learning Objectives

Upon successful completion of this unit, students will be able to:

- find n^{th} roots
- evaluate expressions with rational exponents
- simplify expressions with rational exponents
- perform operations with radicals
- graph radical functions
- write transformations of radical functions
- solve equations containing radicals and rational exponents
- solve radical inequalities
- add, subtract, multiply and divide functions
- compose functions
- find inverses of functions

Enduring Understandings

- Corresponding to every power there is a root.
- You can combine like radicals using properties of real numbers.

- You can write a radical expression in an equivalent form using a fractional (rational) exponent instead of a radical sign.
- Solving a square root equation may require that you square each side of the equation. This process can introduce extraneous solutions

Essential Questions/What is the Purpose for Learning This?

Make sure you can answer these questions before attempting the Unit Test.

- To simplify the nth root of an expression, what must be true about the expression?
- When you square each side of an equation, is the resulting equation equivalent to the original?
- How are a function and its inverse function related?

Lesson Content

Lesson 1: Radicals and Rational Exponents--find n^{th} roots; evaluate expressions with rational exponents; simplify expressions with rational exponents; perform operations with radicals

Lesson 2: Graphing Radical Functions and Transformations--graph radical functions; write transformations of radical functions

Lesson 3: Solving Radical Equations and Inequalities--solve equations containing radicals and rational exponents; solve radical inequalities

Lesson 4: Function Operations, Composition and Inverse Radical Functions--add, subtract, multiply and divide functions; compose functions; find inverses of functions

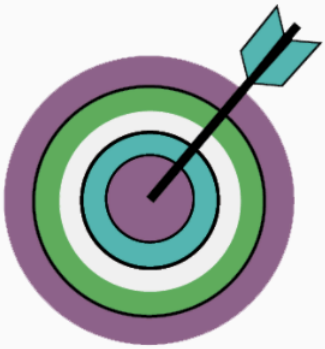
Appendix 2.2.2 Sample Lesson Plan

Lesson 1: Solving Simple Linear Equations

Algebra 1A Unit 1: Solving Linear Equations

Folder Contents

- When you finish this lesson, you will be able to:
- Reading Assignment
- Watch This
- Try This
- Try This Worksheet
- Journal Activity
- Alg1A Unit 1 Lesson 1 Quiz: Solve Simple Linear Equations



When you finish this lesson, you will be able to:

- solve linear equations using addition and subtraction
- solve linear equations using multiplication and division
- use algebra tiles to solve simple linear equations
- use linear equations to solve real-life problems

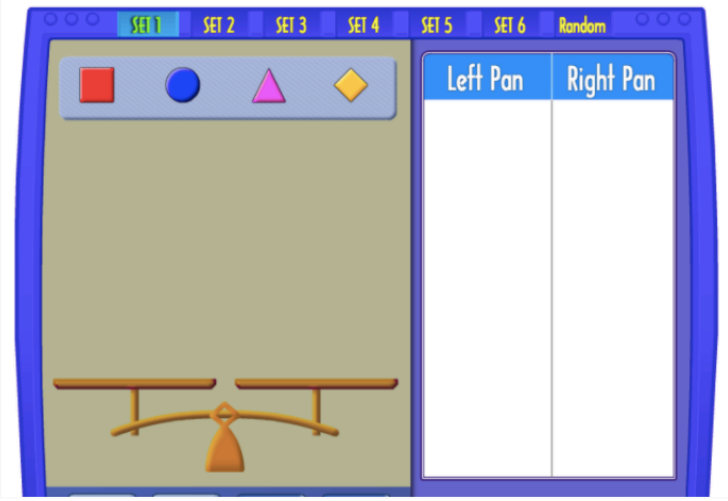
Reading Assignment

Algebra 1A Unit 1: Solving Linear Equations > Lesson 1: Solving Simple Linear Equations

Folder Contents

- What is a linear equation?
- Solving Linear Equations Using Addition and Subtraction
- Video: Solving Linear Equations Using Addition and Subtration
- Solving Linear Equations Using Multiplication and Division
- Video: Solving Linear Equations Using Multiplication and Division
- Video Example: Using Algebra Tiles to Solve a Simple Linear Equation
- Video Example: Using a Linear Equation to Solve a Real-Life Problem

In this lesson, you learned that solving an equation is like balancing a scale. Use the activity below to practice using the properties of equality. Click on the picture below to begin!



Journal Activity Algebra 1A Unit 1: Solving Linear Equations > Lesson 1: Solving Simple Linear Equations

Zia Learning

Write and solve an equation to answer the question below.

In this lesson you saw real-world examples of solving equations. One place you will see equations is right in your own bank account. One of the reasons people put their money in the bank is to earn interest. You've probably heard the phrase "money doesn't grow on trees" but earning interest on your money is one way that your money really can grow! How can you determine just how much money you are earning through interest? Try the example below.

Imagine you had a bank account.

After earning interest, the balance of a checking account is $560. The new balance is 7/3 of the original. How much interest was earned? Solve this problem in this journal and be sure to show your work!