

Cedar Grove School District

Cedar Grove, NJ

2016 | CGHS

Algebra II

Approved by the Cedar Grove Board of Education

Superintendent of Schools

Mr. Michael J. Fetherman

Board of Education

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Mr. Peter Prvulovic

Algebra II

Course Description

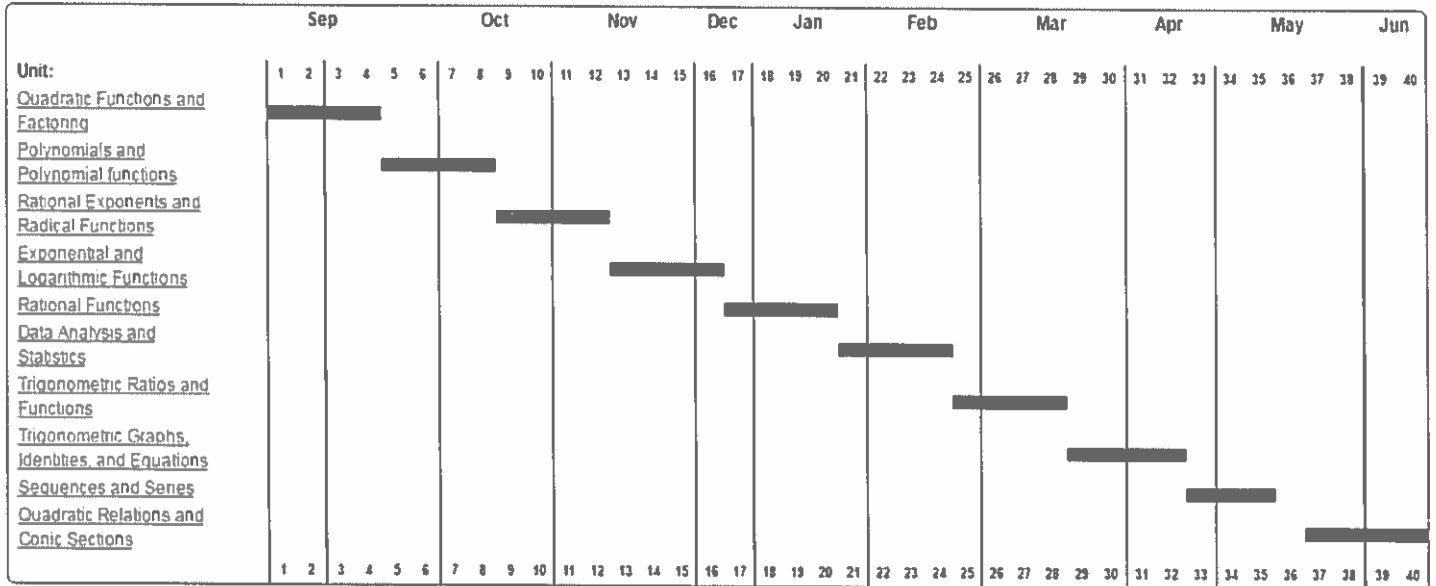
This college preparatory course includes a study of real numbers, equations, inequalities, coordinate geometry, functions, rational expressions, and applications through word problems. Quadratic equations, probability, and exponentials will also be emphasized, as well as an introduction to trigonometry and logarithmic functions.

Prerequisite: Successful completion of Algebra I and Geometry.

**This curriculum was written in accordance with the
NEW JERSEY Student Learning STANDARDS
for Mathematics.**

The standards can be viewed at <http://www.state.nj.us/education/aps/cccs/math/>

Algebra II Unit Calendar





Unit Planner: Quadratic Functions and Factoring Algebra II

Thursday, September 1, 2016, 2:31PM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Algebra II (D) > Week 1 - Week 4

Lauritano, Heather; Oehm, Joan

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: HS: Num/Quantity

The Complex Number System

HSN-CN.A. Perform arithmetic operations with complex numbers.

HSN-CN.A.2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

HSN-CN.C. Use complex numbers in polynomial identities and equations.

HSN-CN.C.7. Solve quadratic equations with real coefficients that have complex solutions.

Mathematical Practice

MP. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.4. Model with mathematics.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

MP.8. Look for and express regularity in repeated reasoning.

NJ: HS: Algebra

Seeing Structure in Expressions

HSA-SSE.B. Write expressions in equivalent forms to solve problems.

HSA-SSE.B.3a. Factor a quadratic expression to reveal the zeros of the function it defines.

Reasoning with Equations & Inequalities

HSA-REI.B. Solve equations and inequalities in one variable.

HSA-REI.B.4. Solve quadratic equations in one variable.

HSA-REI.B.4a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

HSA-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 .

NJ: HS: Functions

Interpreting Functions

HSF-IF.C. Analyze functions using different representations.

Enduring Understandings

The message conveyed by the data depends on how the data is collected, represented, and summarized. Algebraic representation can be used to generalize patterns and relationships.

Essential Questions

How can you use trinomials to model the height of a projectile (throwing a ball into the air)?
What is the purpose of using the graphing calculator to draw several polynomials? Is it better to draw by hand? What is the advantage of the calculator?
When grouping common factors, why might it be important to notice when two things have a common link?
Why is it important to identify patterns before factoring?
How does a parabola model help us to understand jumping and velocity?

Content

1. Graph quadratic functions in Standard Form
2. Graph quadratic functions in Vertex or Intercept Form
3. Solve equations (with $a=1$) by factoring
4. Solve equations (with a not equal to 1) by factoring
5. Solve Quadratic Equations by Finding Square Roots
6. Perform Operations with Complex Numbers
7. Complete the Square
8. Use the Quadratic Formula and the Discriminant
9. Graph and Solve Quadratic Inequalities

Skills

1. Graph the parent function of a parabola.
Define properties of the quadratic with different c values.
Define properties of the quadratic with different b and c values.
Find the minimum and maximum values of a quadratic
Solve multi step problems
2. Explain how to convert from standard form to vertex form
Explain how to convert from standard form to intercept form
Graph quadratic functions in Vertex or Intercept Form
Change from intercept and vertex form back to standard form
3. Factor trinomials in standard form, where $a=0$
Factor with special patterns
Use a quadratic equation as a model
Find the zeros of a quadratic function
4. Factor trinomials in standard form, where a does not equal zero
Factor with special patterns, where a does not equal zero
Solve quadratic equations
Find the zeros of a quadratic function
5. Use properties of square roots.
Rationalize denominator of fractions
Solve quadratic equations in non-standard form
Model a dropped object with a quadratic equation
6. Solve quadratic equations involving imaginary numbers
Add and subtract complex numbers
Multiply complex numbers
Divide complex numbers
Plot complex numbers
7. Solve quadratic equations by finding square roots
Make a perfect square trinomial
Write a quadratic function in vertex form
Find the maximum value of a quadratic function

8.
Solve an equation with two real solutions
Solve an equation with one real solution
Solve an equation with two imaginary solutions
Use the discriminant
Solve a vertical motion problem
9.
Graph a quadratic inequality
Graph a system of quadratic inequalities
Solve quadratic inequalities by graphing
Solve quadratic inequalities algebraically

Stage 2: Assessment Evidence

Assessments

Summative: Written Test

Quizzes and Tests

Summative: Written Test

Midterms/Final Exams

Formative: Other Visual Assessments

Class Participation Teacher Observation

Formative: Other written assessments

Homework/Projects

Stage 3: Learning Plan

Learning Activities

- Lecture
- Class discussions
- Multiple Intelligences Activities
- Cooperative Learning Structures
- Guided Practice
- Performance Assessments
- Projects
- Simulation activities
- Technology infusion
- Differentiated Instruction
- State and standardized test preparation
- Homework review
- Test review

Resources

§ **Textbook:** *Algebra 2 Common Core Standard Edition*

Larson, Boswell, Kanold, Stiff
Holt McDougal , 2012

§ **Supplementary Materials**

§ **Websites**

www.classzone.com

§ **Calculators**

Graphing calculator (TI-83 Plus, or TI-84)

§ **Technology**

Video tutor with Practice, using Overhead projector and/or SMART Board technology



Unit Planner: Polynomials and Polynomial functions Algebra II

Thursday, September 1, 2016, 2:31PM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Algebra II (D) > Week 5 - Week 8

Lauritano, Heather; Oehm, Joan

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: HS: Num/Quantity

The Real Number System

HSN-RN.A. Extend the properties of exponents to rational exponents.

HSN-RN.A.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.

Mathematical Practice

MP. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

MP.2. Reason abstractly and quantitatively.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

NJ: HS: Algebra

Seeing Structure in Expressions

HSA-SSE.A. Interpret the structure of expressions.

HSA-SSE.A.2. Use the structure of an expression to identify ways to rewrite it.

Arithmetic with Polynomials & Rational Functions

HSA-APR.A. Perform arithmetic operations on polynomials.

HSA-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.

HSA-APR.B. Understand the relationship between zeros and factors of polynomials.

HSA-APR.B.2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a , the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.

NJ: HS: Functions

Interpreting Functions

HSF-IF.C. Analyze functions using different representations.

HSF-IF.C.7a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

HSF-IF.C.7c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

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Enduring Understandings

A polynomial graph is used to model several real world applications. By simplifying expressions involving powers, students will be able to apply these skills to higher order applications.

Essential Questions

How can you graph a polynomial function?
What are special product patterns?
How can you solve a higher degree polynomial equation?
If you know one zero of a polynomial, how can you determine another zero?

Content

1. Use Properties of Exponents
2. Evaluate and Graph Polynomial Functions
3. Add, Subtract and Multiply Polynomials
4. Factor and Solve Polynomial Equations
5. Apply the Remainder and Factor Theorems

Skills

1. Evaluate Numerical Expressions
Use scientific notation
Simplify expression
2. Identify polynomial functions
Use direct substitution
Use synthetic substitution
Analyze end behavior
Graph polynomial functions
3. Add polynomials vertically and horizontally
Subtract polynomials vertically and horizontally
Multiply polynomials vertically and horizontally
Multiply three binomials
Use special product patterns
4. Find common monomial factor
Factor the sum or difference of two cubes
Factor by grouping
5. Use polynomial long division
Use synthetic division
Factor polynomials

Stage 2: Assessment Evidence

Assessments

Summative: Written Test

Quizzes and Tests

Summative: Written Test

Midterms/Final Exams

Formative: Other Visual Assessments

Class Participation Teacher Observation

Formative: Other written assessments

Homework/Projects

Stage 3: Learning Plan

Learning Activities

- Lecture
- Class discussions
- Multiple Intelligences Activities
- Cooperative Learning Structures

Resources

§ **Textbook:** *Algebra 2 Common Core Standard Edition*

- Guided Practice
- Performance Assessments
- Projects
- Simulation activities
- Technology infusion
- Differentiated Instruction
- State and standardized test preparation
- Homework review
- Test review

Larson, Boswell, Kanold, Stiff
Holt McDougal , 2012
§ **Supplementary Materials**

§ **Websites**
www.classzone.com

§ **Calculators**
Graphing calculator (TI-83 Plus, or TI-84)

§ **Technology**
Video tutor with Practice, using Overhead projector
and/or SMART Board technology



Unit Planner: Rational Exponents and Radical Functions Algebra II

Thursday, September 1, 2016, 2:31PM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Algebra II (D) > Week 9 - Week 12

Lauritano, Heather; Oehm, Joan

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: HS: Num/Quantity

The Real Number System

HSN-RN.A. Extend the properties of exponents to rational exponents.

HSN-RN.A.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.

HSN-RN.A.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Mathematical Practice

MP. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.4. Model with mathematics.

MP.6. Attend to precision.

MP.7. Look for and make use of structure.

NJ: HS: Algebra

Reasoning with Equations & Inequalities

HSA-REI.A. Understand solving equations as a process of reasoning and explain the reasoning.

HSA-REI.A.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

NJ: HS: Functions

Building Functions

HSF-BF.A. Build a function that models a relationship between two quantities.

HSF-BF.A.1. Write a function that describes a relationship between two quantities.

HSF-BF.A.1a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

HSF-BF.A.1b. Combine standard function types using arithmetic operations.

HSF-BF.A.1c. (+) Compose functions.

HSF-BF.B. Build new functions from existing functions.

HSF-BF.B.4. Find inverse functions.

HSF-BF.B.4a. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. For example, $f(x) = 2x^3$ for $x > 0$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$.

HSF-BF.B.4b. (+) Verify by composition that one function is the inverse of another.

HSF-BF.B.4c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.

HSF-BF.B.4d. (+) Produce an invertible function from a non-invertible function by restricting the domain.

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Enduring Understandings

Being able to handle rational and radical computations will enable the student to solve, graph, and rewrite critical equations. Patterns and relationships can be represented numerically, graphically, symbolically, and verbally. The relationships among the operations and their properties promote computational fluency. The exploration of the zeros of rational functions provides an introduction to the asymptotic behavior of functions.

Essential Questions

What is the relationship between n th roots and rational exponents?
How are the properties of rational exponents related to the properties of integer exponents?
How do you find the inverse relation of a given function?

Content

1. Evaluate N th roots and Use Rational Expressions
2. Apply properties of rational exponents
3. Perform function operations and compositions
4. Use Inverse functions
5. Solve radical equations

Skills

1. Find n th roots
Evaluate expressions
Approximate roots
Solve equations
2. Use properties of exponents
Apply properties of exponents
Use properties of radicals
Write radicals in simplest form
Add and subtract like radicals and roots
Simplifying expressions involving variables
Write variable expressions in simplest form
Add and subtract expression involving variables
3. Add and subtract functions
Multiply and divide functions
Find compositions of functions
4. Find an inverse relation
Verify that functions are inverses
Find the inverse of a power function
Find the inverse of a cubic function
5. Solve a radical equation
Solve an equation with a rational exponent
Deal with extraneous solutions
Solve an equation with two radicals

Stage 2: Assessment Evidence

Assessments

Summative: Written Test
Quizzes and Tests
Summative: Written Test
Midterms/Final Exams

Formative: Other Visual Assessments
Class Participation Teacher Observation
Formative: Other written assessments
Homework/Projects

Stage 3: Learning Plan

Learning Activities

- Lecture
- Class discussions
- Multiple Intelligences Activities
- Cooperative Learning Structures
- Guided Practice
- Performance Assessments
- Projects
- Simulation activities
- Technology infusion
- Differentiated Instruction
- State and standardized test preparation
- Homework review
- Test review

Resources

§ **Textbook:** *Algebra 2 Common Core Standard Edition*

Larson, Boswell, Kanold, Stiff
Holt McDougal , 2012

§ **Supplementary Materials**

§ **Websites**

www.classzone.com

§ **Calculators**

Graphing calculator (TI-83 Plus, or TI-84)

§ **Technology**

Video tutor with Practice, using Overhead projector
and/or SMART Board technology



Unit Planner: Exponential and Logarithmic Functions

Algebra II

Thursday, September 1, 2016, 2:32PM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Algebra II (D) > Week 13 - Week 16

Lauritano, Heather; Oehm, Joan

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: HS: Functions

Interpreting Functions

HSF-IF.C. Analyze functions using different representations.

HSF-IF.C.7e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

Building Functions

HSF-BF.B. Build new functions from existing functions.

HSF-BF.B.5. (+) Use the inverse relationship between exponents and logarithms to solve problems involving exponents and logarithms.

Linear, Quadratic, and Exponential Models

HSF-LE.A. Construct and compare linear and exponential models and solve problems.

HSF-LE.A.4. Understand the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to $ab^c = d$ where a , c , and d are numbers and the base b is 2, 10, or e ; evaluate the logarithm using technology.

Mathematical Practice

MP. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.2. Reason abstractly and quantitatively.

MP.4. Model with mathematics.

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Enduring Understandings

Exponential and logarithmic functions are inverses.
Exponential and logarithmic functions exhibit asymptotic behavior.
Properties of exponents and logarithms are related and can be used to simplify expressions and solve equations

Essential Questions

What does the graph of an exponential growth function look like?
What does the graph of an exponential decay function look like?
When is the natural base e useful?
What is the relationship between exponential and logarithmic functions?
How can you use a calculator to evaluate a logarithm when the base is not 10 or e ?
Why do logarithmic equations sometimes have extraneous solutions?

Content

1. Graph Exponential growth functions

Skills

1.

2. Graph exponential decay functions
3. Use functions involving e
4. Evaluate logarithms and graph logarithmic functions
5. Apply properties of logarithms
6. Solve exponential and logarithmic equations

- Graph $y=b^x$, where $b>1$
 Graph $y=ab^x$, where $b>1$
 Graph $y=ab^{x-h}+k$, where $b>1$
 Solve interest problems
2. Graph $y=b^x$, where $0<b<1$
 $y=ab^x$, where $0<b<1$
 Graph $y=ab^{x-h}+k$, where $0<b<1$
 3. Simplify natural base expressions
 Evaluate natural base expressions
 Graph natural base functions
 Solve continuously compounded interest problems
 4. Rewrite logarithmic equations
 Evaluate logarithms
 Evaluate a logarithmic model
 Use inverse properties
 Find inverse functions
 Graph logarithmic functions
 5. Use properties of logarithms
 Expand a logarithmic expression
 Use the change-of-base formula
 Use properties of logarithms in real life
 6. Solve by equating exponents
 Taking a logarithm of each side
 Use an exponential model
 Solve a logarithmic equation
 Exponentiate each side of an equation
 Use a logarithmic model

Stage 2: Assessment Evidence

Assessments

Summative: Written Test

Quizzes and Tests

Summative: Written Test

Midterms/Final Exams

Formative: Other Visual Assessments

Class Participation Teacher Observation

Formative: Other written assessments

Homework/Projects

Stage 3: Learning Plan

Learning Activities

- Lecture
- Class discussions
- Multiple Intelligences Activities
- Cooperative Learning Structures
- Guided Practice
- Performance Assessments
- Projects
- Simulation activities
- Technology infusion
- Differentiated Instruction
- State and standardized test preparation
- Homework review

Resources

§ **Textbook:** *Algebra 2 Common Core Standard Edition*

Larson, Boswell, Kanold, Stiff
 Holt McDougal , 2012

§ **Supplementary Materials**

§ **Websites**
www.classzone.com

§ **Calculators**

Test review

Graphing calculator (TI-83 Plus, or TI-84)

§ **Technology**

Video tutor with Practice, using Overhead projector and/or SMART Board technology

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Unit Planner: Rational Functions Algebra II

Thursday, September 1, 2016, 2:32PM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Algebra II (D) > Week 17 - Week 20

Lauritano, Heather; Oehm, Joan

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: HS: Num/Quantity

Mathematical Practice

MP. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

MP.2. Reason abstractly and quantitatively.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

MP.7. Look for and make use of structure.

MP.8. Look for and express regularity in repeated reasoning.

NJ: HS: Algebra

Arithmetic with Polynomials & Rational Functions

HSA-APR.D. Rewrite rational expressions.

HSA-APR.D.6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.

HSA-APR.D.7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Creating Equations

HSA-CED.A. Create equations that describe numbers or relationships.

HSA-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

Reasoning with Equations & Inequalities

HSA-REI.A. Understand solving equations as a process of reasoning and explain the reasoning.

HSA-REI.A.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

NJ: HS: Functions

Interpreting Functions

HSF-IF.C. Analyze functions using different representations.

HSF-IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

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Enduring Understandings

- Solve rational functions
- Interpret graphs and discover characteristics of rational functions
- Recognize rational functions and the division of two polynomial functions

Essential Questions

- What are the differences between direct, inverse, and joint variation?
- What does the graph of a rational function look like?
- What are the steps for graphing a general rational function?
- What are the steps for adding or subtracting rational expressions with different denominators?

Content

1. Model inverse and joint variation
2. Multiply and divide rational expressions
3. Add and subtract rational expressions
4. Solve rational equations

Skills

1. Classify direct and inverse variation
Write an inverse variation equation
Write an inverse variation model
Check data for inverse variation
Write a joint variation equations
Compare different types of variation
2. Simplify a rational expression
Multiply rational expressions
Multiply rational expressions by polynomials
Divide rational expressions
Divide a rational expression by a polynomial
3. Add or subtract with like denominators
Find a least common multiple
Add with unlike denominators
Subtract with unlike denominators
Simplify complex fractions
4. Solve a rational equation by cross multiplying
Write and use a rational model
Solve a rational equation with two solutions
Check for extraneous solutions
Solve a rational equations given a function

Stage 2: Assessment Evidence

Assessments

Summative: Written Test

Quizzes and Tests

Summative: Written Test

Midterms/Final Exams

Formative: Other Visual Assessments

Class Participation Teacher Observation

Formative: Other written assessments

Homework/Projects

Stage 3: Learning Plan

Learning Activities

Resources

- Lecture
- Class discussions
- Multiple Intelligences Activities
- Cooperative Learning Structures
- Guided Practice
- Performance Assessments
- Projects
- Simulation activities
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- Test review

§ **Textbook:** *Algebra 2 Common Core Standard Edition*

Larson, Boswell, Kanold, Stiff
Holt McDougal , 2012

§ **Supplementary Materials**

§ **Websites**

www.classzone.com

§ **Calculators**

Graphing calculator (TI-83 Plus, or TI-84)

§ **Technology**

Video tutor with Practice, using Overhead projector and/or SMART Board technology



Unit Planner: Data Analysis and Statistics Algebra II

Thursday, September 1, 2016, 2:36PM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Algebra II (D) > Week 21 - Week 24

Lauritano, Heather; Oehm, Joan

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: HS: Num/Quantity

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

MP.2. Reason abstractly and quantitatively.

MP.3. Construct viable arguments and critique the reasoning of others.

MP.4. Model with mathematics.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

MP.7. Look for and make use of structure.

NJ: HS: Algebra

Arithmetic with Polynomials & Rational Functions

HSA-APR.C. Use polynomial identities to solve problems.

HSA-APR.C.5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n , where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.

NJ: HS: Stats/Prob

Interpreting Categorical & Quantitative Data

HSS-ID.A. Summarize, represent, and interpret data on a single count or measurement variable

HSS-ID.A.4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets and tables to estimate areas under the normal curve.

Making Inferences & Justifying Conclusions

HSS-IC.A. Understand and evaluate random processes underlying statistical experiments

HSS-IC.A.1. Understand that statistics is a process for making inferences about population parameters based on

a random sample from that population.

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Enduring Understandings

Statistical analysis and graphic displays often reveal patterns in seemingly random data or populations, enabling predictions. We can gather, organize and display data to communicate and justify results in the real world. We can analyze data to make inferences and/or predictions, based on surveys, experiments, probability and observational studies.

Essential Questions

How can you determine the value of a combination or permutation without using the formula?
Where are the values in a normal distribution that rarely occur displayed on a normal curve?
What should be true of the sample when you conduct a survey?

Content

1. Use combinations, permutations, and the Binomial theorem
2. Use normal distributions
3. Select and draw conclusions from samples

Skills

1. Find combinations
Find permutations
Differentiate between multiplying and adding permutations or combinations
Expand a power of a binomial sum
Expand a power of a binomial difference
2. Find a normal probability
Interpret normally distributed data
Use a z-score and the standard normal table
3. Classify samples
Identify a biased sample
Choose an unbiased sample
Find a margin of error

Stage 2: Assessment Evidence

Assessments

Summative: Written Test

Quizzes and Tests

Summative: Written Test

Midterms/Final Exams

Formative: Other Visual Assessments

Class Participation Teacher Observation

Formative: Other written assessments

Homework/Projects

Stage 3: Learning Plan

Learning Activities

- Lecture
- Class discussions
- Multiple Intelligences Activities
- Cooperative Learning Structures
- Guided Practice
- Performance Assessments
- Projects
- Simulation activities
- Technology infusion
- Differentiated Instruction
- State and standardized test preparation
- Homework review
- Test review

Resources

§ **Textbook:** *Algebra 2 Common Core Standard Edition*

Larson, Boswell, Kanold, Stiff
Holt McDougal , 2012

§ **Supplementary Materials**

§ **Websites**
www.classzone.com

§ **Calculators**
Graphing calculator (TI-83 Plus, or TI-84)

§ **Technology**

Video tutor with Practice, using Overhead projector and/or SMART Board technology

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Unit Planner: Trigonometric Ratios and Functions Algebra II

Thursday, September 1, 2016, 2:36PM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Algebra II (D) > Week 25 - Week 28

Lauritano, Heather; Oehm, Joan

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: HS: Functions

Trigonometric Functions

HSF-TF.A. Extend the domain of trigonometric functions using the unit circle.

HSF-TF.A.1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

HSF-TF.A.2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

HSF-TF.B. Model periodic phenomena with trigonometric functions.

HSF-TF.B.6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

MP.2. Reason abstractly and quantitatively.

MP.3. Construct viable arguments and critique the reasoning of others.

MP.4. Model with mathematics.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

NJ: HS: Geometry

Similarity, Right Triangles, & Trigonometry

HSG-SRT.C. Define trigonometric ratios and solve problems involving right triangles

HSG-SRT.C.6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

HSG-SRT.D. Apply trigonometry to general triangles

HSG-SRT.D.11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown

measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

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Enduring Understandings

The ability to use sine, cosine and tangent is essential to solving problems. Using the angle of depression and angle of elevation will enable a student to compute various real world models involving triangles. Triangles are fundamental aesthetic, structural elements that are useful in many disciplines such as art, architecture, and engineering.

Essential Questions

How are trigonometric functions used in right triangles?
What is radian measure?
How can you evaluate trigonometric functions of any angle?
How are inverse trigonometric functions used?
When can the law of sines be used to solve a triangle?
In which cases can the law of cosines be used to solve a triangle?

Content

1. Use trigonometry with right triangles
2. Define general angles and use radian measure
3. Evaluate trigonometric functions
4. Evaluate inverse trigonometric functions
5. Apply the law of sines
6. Apply the law of cosines

Skills

1. Evaluate trigonometric functions
Find an unknown side of a right triangle
Use a calculator to solve a right triangle
Use angle of elevation
2. Draw angles in standard position
Find coterminal angles
Convert between degrees and radians
Find arc length and area of a sector
3. Evaluate trigonometric functions given a point
Use the unit circle
Find reference angles
Use reference angles to evaluate functions
Calculate horizontal distance traveled
Model with trigonometric functions
4. Evaluate inverse trigonometric functions
Solve a trigonometric equation
Write and solve a trigonometric equation
5. Solve a triangle for AAS or ASA case
Solve the SSA case with one solution
Examine the SSA case with no solution
Solve the SSA case with two solutions
Find the area of a triangle
6. Solve a triangle for the SAS case
Solve a triangle for the SSS case
Use law of cosines in real life

Stage 2: Assessment Evidence

Assessments

Summative: Written Test

Quizzes and Tests

Summative: Written Test

Midterms/Final Exams

Formative: Other Visual Assessments

Class Participation Teacher Observation

Formative: Other written assessments

Homework/Projects

Stage 3: Learning Plan

Learning Activities

- Lecture
- Class discussions
- Multiple Intelligences Activities
- Cooperative Learning Structures
- Guided Practice
- Performance Assessments
- Projects
- Simulation activities
- Technology infusion
- Differentiated Instruction
- State and standardized test preparation
- Homework review
- Test review

Resources

§ **Textbook:** *Algebra 2 Common Core Standard Edition*

Larson, Boswell, Kanold, Stiff
Holt McDougal, 2012

§ **Supplementary Materials**

§ **Websites**

www.classzone.com

§ **Calculators**

Graphing calculator (TI-83 Plus, or TI-84)

§ **Technology**

Video tutor with Practice, using Overhead projector and/or SMART Board technology



Unit Planner: Trigonometric Graphs, Identities, and Equations Algebra II

Thursday, September 1, 2016, 2:36PM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Algebra II (D) > Week 29 - Week 32

Lauritano, Heather; Oehm, Joan

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: HS: Functions

Interpreting Functions

HSF-IF.C. Analyze functions using different representations.

HSF-IF.C.7e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

Trigonometric Functions

HSF-TF.B. Model periodic phenomena with trigonometric functions.

HSF-TF.B.5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

HSF-TF.B.7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.

HSF-TF.C. Prove and apply trigonometric identities.

HSF-TF.C.8. Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to calculate trigonometric ratios.

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

MP.2. Reason abstractly and quantitatively.

MP.3. Construct viable arguments and critique the reasoning of others.

MP.4. Model with mathematics.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

MP.7. Look for and make use of structure.

MP.8. Look for and express regularity in repeated reasoning.

Enduring Understandings

The ability to graph and transform trigonometric functions is essential to modeling and solving problems. They are used for modeling many different natural and mechanical phenomena (populations, waves, engines, acoustics, electronics, UV intensity, growth of plants and animals, etc).

Essential Questions

How do the graphs of sine and cosine compare to the tangent graph?
 How can a trigonometric graph be moved on the coordinate plane?
 How can you verify that a trigonometric equation is an identity?
 How can you write the general solution of a trigonometric equation?

Content

1. Graph sine, cosine, and tangent functions
2. Translate and reflect trigonometric graphs
3. Verify trigonometric identities
4. Solve trigonometric equations

Skills

1. Graph sine and cosine functions
Graph a tangent function
2. Graph a vertical translation
Graph a horizontal translation
Graph a model for circular motion
Combine a translation and a reflection
3. Find trigonometric values
Simplify a trigonometric expression
Verify a trigonometric identity
4. Solve a trigonometric equation
Solve a trigonometric equation in an interval
Solve real-life trigonometric equations

Stage 2: Assessment Evidence

Assessments

Summative: Written Test

Quizzes and Tests

Summative: Written Test

Midterms/Final Exams

Formative: Other Visual Assessments

Class Participation Teacher Observation

Formative: Other written assessments

Homework/Projects

Stage 3: Learning Plan

Learning Activities

- Lecture
- Class discussions
- Multiple Intelligences Activities
- Cooperative Learning Structures
- Guided Practice
- Performance Assessments
- Projects
- Simulation activities
- Technology infusion
- Differentiated Instruction
- State and standardized test preparation
- Homework review
- Test review

Resources

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Atlas Version 8.2

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Unit Planner: Sequences and Series Algebra II

Thursday, September 1, 2016, 2:36PM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Algebra II (D) > Week 33 - Week 35

Lauritano, Heather; Oehm, Joan

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: HS: Algebra

Seeing Structure in Expressions

HSA-SSE.B. Write expressions in equivalent forms to solve problems.

HSA-SSE.B.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

HSA-SSE.B.3a. Factor a quadratic expression to reveal the zeros of the function it defines.

HSA-SSE.B.3b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

HSA-SSE.B.3c. Use the properties of exponents to transform expressions for exponential functions.

HSA-SSE.B.4. Derive and/or explain the derivation of the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.

NJ: HS: Functions

Interpreting Functions

HSF-IF.A. Understand the concept of a function and use function notation.

HSF-IF.A.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

HSF-IF.A.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

NJ: HS: Geometry

Mathematical Practice

MP. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

MP.2. Reason abstractly and quantitatively.

MP.3. Construct viable arguments and critique the reasoning of others.

MP.4. Model with mathematics.

MP.5. Use appropriate tools strategically.

MP.8. Look for and express regularity in repeated reasoning.

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Enduring Understandings

All arithmetic and geometric sequences can be expressed recursively and explicitly. Some other sequences also can be expressed in both ways but others cannot. Arithmetic sequences are identifiable by a common difference and can be modeled by linear functions. Infinite arithmetic series always diverge. The sums of finite arithmetic and geometric series can be computed with easily derivable formulas. Identifiable sequences and series are found in many naturally occurring objects.

Essential Questions

How can you write a single expression for sums?
How can you tell that a sequence is arithmetic?
How can you find the sum of the terms of a geometric series?
When does an infinite geometric series have a sum, and when does it not have a sum?

Content

1. Define and use sequences and series
2. Analyze arithmetic sequences and series
3. Analyze geometric sequences and series
4. Find sums of infinite geometric series (time permitting)

Skills

1.
Write terms of sequences
Write rules for sequences
Write series using summation notation
Find the sum of a series
Use a formula for a sum
2.
Identify arithmetic sequences
Write a rule for the n th term
Write a rule given a term and common difference
Write a rule given two terms
Use an arithmetic sequence in real life
3.
Identify geometric sequences
Write a rule for the n th term
Write a rule given a term and common ratio
Write a rule given two terms
Find the sum of a geometric series
Use an geometric sequence in real life
4.
Find partial sums
Find sums of infinite geometric series
Use an infinite series as a model
Write a repeating decimal as a fraction

Stage 2: Assessment Evidence

Assessments

Summative: Written Test

Quizzes and Tests

Summative: Written Test

Midterms/Final Exams

Formative: Other Visual Assessments

Class Participation Teacher Observation

Formative: Other written assessments

Homework/Projects

Stage 3: Learning Plan

Learning Activities

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Resources

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Unit Planner: Quadratic Relations and Conic Sections Algebra II

Thursday, September 1, 2016, 2:36PM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Algebra II (D) > Week 37 - Week 40

Lauritano, Heather; Oehm, Joan

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: HS: Num/Quantity

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.2. Reason abstractly and quantitatively.

MP.3. Construct viable arguments and critique the reasoning of others.

MP.5. Use appropriate tools strategically.

MP.7. Look for and make use of structure.

MP.8. Look for and express regularity in repeated reasoning.

NJ: HS: Algebra

Reasoning with Equations & Inequalities

HSA-REI.C. Solve systems of equations.

HSA-REI.C.7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.

NJ: HS: Geometry

Expressing Geometric Properties with Equations

HSG-GPE.A. Translate between the geometric description and the equation for a conic section

HSG-GPE.A.1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

HSG-GPE.A.2. Derive the equation of a parabola given a focus and directrix.

HSG-GPE.A.3. (+) Derive the equations of ellipses and hyperbolas given two foci for the ellipse, and two directrices of a hyperbola.

HSG-GPE.B. Use coordinates to prove simple geometric theorems algebraically

HSG-GPE.B.4. Use coordinates to prove simple geometric theorems algebraically.

Enduring Understandings

To be able to identify the graphs of conic sections from their equations and write the equation from the graph.

Essential Questions

If you are given the coordinates of the endpoints of the diameter of a circle, how can you find the center and the radius of the circle?

Which two features of a parabola are equidistant from its vertex?

What information do you need to be able to write the equation of a circle with center $(0, 0)$?

What points do you need to write an equation of an ellipse?

What kind of figure can be used to locate the vertices and asymptotes of a hyperbola?

How do you identify and graph a conic if it is translated from the general equation for that conic?

How can you identify the points of intersection of two distinct conics?

Content

1. Apply the distance and midpoint formulas
2. Graph and write equations of parabolas
3. Graph and write equations of circles
4. Graph and write equations of ellipses (time permitting)
5. Graph and write equations of hyperbolas (time permitting)
6. Translate and classify conic sections (time permitting)
7. Solve quadratic systems (time permitting)

Skills

1. Classify a triangle using the distance formula
Find the midpoint of a line segment
Find a perpendicular bisector
2. Graph an equation of a parabola
Write an equation of a parabola
3. Graph an equation of a circle
Write an equation of a circle
Write a circular model
Apply a circular model
4. Graph an equation of an ellipse
Write an equation given a vertex and a co-vertex
Write an equation given a vertex and focus
5. Graph an equation of a hyperbola
Write an equation of a hyperbola
6. Write the equation of a translated circle
Graph the equation of translated hyperbolas
Write an equation of a translated parabola
Write an equation of a translated ellipse
Identify symmetries of conic sections
Classify a conic
7. Solve a linear-quadratic system by graphing
Solve a linear-quadratic system by substitution
Solve a quadratic system by elimination
Solve a real-life quadratic system

Stage 2: Assessment Evidence

Assessments

Summative: Written Test

Quizzes and Tests

Summative: Written Test

Midterms/Final Exams

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Class Participation Teacher Observation

Formative: Other written assessments

Stage 3: Learning Plan**Learning Activities**

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