



Radnor High School Course Syllabus

Modified 7/8/2013

Advanced Algebra 1 0414

Credits: 1
Unweighted
Length: Year
Format: Meets Daily

Grades: 9
Prerequisite: 8th grade math or teacher
recommendation

Overall Description of Course

Advanced Algebra 1 is a College Preparatory level course.

College Preparatory level courses will feature moderate pacing and workload with teacher guidance to assist in the mastery of the material. Students enrolled on this level should be seeking to satisfy college requirements/expectations of mathematics courses but not necessarily have an interest in pursuing math related college majors.

The goal of this course is to develop algebraic concepts, skills and abstract thinking. Problem solving will be used to enhance the understanding of the skills and concepts. Topics included are listed below. This course moves at an accelerated pace with a rigorous approach to algebraic concepts, skills, and applications. The advanced program of mathematics courses prepares students for college-level calculus. This course meets all Keystone assessment anchors and PA common core standards.

MARKING PERIOD 1 – TOPICS

Basics of Algebra

- Expressing Numbers
- Working with Algebraic Expressions
- Understanding Equations & Inequalities
- Data Representation
- Coordinate Graphing
- Translating Between Words and Symbols

The Rules of Algebra

- Solving Equations
- Properties of Equality
- The Substitution and Distributive Properties
- Applications of Equation Solving

Signed Numbers

- The Number Line
- Comparing Numbers on the Number Line
- Operations With Real Numbers

Working With Equations

- Solving Linear Equations
- The Distributive Property in Equations
- Rate Problems
- Equations with Absolute Value
- Extracting Square Roots

Graphing

- Tables, Graphs and Equations
- Slope-Intercept Form of an Equation
- Slope, Including Slopes of Parallel and Perpendicular Lines
- Other Forms of Linear Equations
- Nonlinear Graphing

Proportions & Rational Equations

- Ratio and Proportion
- Applications of Proportion
- Direct and Inverse Variation

Formulas & Functions

- Working with Formulas
- Special Formulas of Geometry
- Using the Quadratic Formula
- Literal Equations
- Functions and Relations
- Function Notation and Graphing

MARKING PERIOD 2 – TOPICS

Working With Inequalities

- Solving Inequalities
- Applications
- Set Operations
- Compound Inequalities, including Absolute Value Inequalities
- Two-variable inequalities

System of Equations

- Solving Systems of Equations by Graphing
- Solving Systems of Equations Using the Substitution Method
- The Combination Algorithm
- Solving Systems of Inequalities

Measures of dispersion and central tendency

- Mean, median, mode, range, interquartile range, quartiles
- Stem/leaf plots
- Box-and-whisker plots

Exponents

- Large Numbers
- Multiplication Properties of Exponents
- Division Properties of Exponents
- Negative and Zero Exponents

MARKING PERIOD 3 – TOPICS

Scientific notation

Polynomials

- Definition of a Polynomial
- Addition and Subtraction of Polynomials
- Multiplication of Polynomials
- Special Multiplications
- Factoring Trinomials
- Factoring Other Polynomials
- Factoring special products
- Factoring by grouping

Rational Equations and Functions

- Ratio and proportion
- Percents
- Simplifying rational expressions
- +, -, *, ÷ rational expressions
- Solving rational equations

Probability

- Probability and odds
- Probability using combinations/permutations
- Probability of compound events

MARKING PERIOD 4 – TOPICS

Radicals

- Simplifying Radicals
- Rationalizing
- Radical Equations

Quadratics

- Graphing the Parabola
- Graphing Absolute Value Functions
- Completing the Square in Quadratic Functions
- X-intercepts; using the Discriminant
- Projectile Motion

Comparing linear, exponential, quadratic models

- Exponential growth/decay

Reason quantitatively and use units to solve problems.

N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.

N-Q.3. Choose a level

Interpret the structure of expressions.

A-SSE.1. Interpret expressions that represent a quantity in terms of its context.★

Interpret parts of an expression, such as terms, factors, and coefficients.

Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P .*

A-SSE.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 $(x^2 - y^2)(x^2 + y^2)$.*

Write expressions in equivalent forms to solve problems.

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

a. Factor a quadratic expression to reveal the zeros of the function it defines.

Perform arithmetic operations on polynomials.

A-APR.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.

Create equations that describe numbers or relationships.

A-CED.1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*

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

A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law $V = IR$ to highlight resistance R .*

Understand solving equations as a process of reasoning and explain the reasoning.

A-REI.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.

Solve equations and inequalities in one variable.

A-REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Solve systems of equations.

A-REI.5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

A-REI.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

Represent and solve equations and inequalities graphically.

A-REI.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

A-REI.11. Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

A-REI.12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Understand the concept of a function and use function notation.

F-IF.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.

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

Build a function that models a relationship between two quantities.

F-BF.1. Write a function that describes a relationship between two quantities.*

Determine an explicit expression, a recursive process, or steps for calculation from a context.

Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*

(+) Compose functions. *For example, if $T(y)$ is the temperature in the atmosphere as a function of height, and $h(t)$ is the height of a weather balloon as a function of time, then $T(h(t))$ is the temperature at the location of the weather balloon as a function of time.*

F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*

Keystone Connections:

- A1.1.1.4** Use estimation strategies in problem solving situations.
- A1.1.2.1** Write, solve, and/or graph linear equations using various methods.
- A1.1.3.1** Write, solve, and/or graph linear inequalities using various methods.
- A1.2.1.1** Analyze and/or use patterns or relations.
- A1.2.1.2** Interpret and/or use linear functions and their equations, graphs, or tables
- A1.1.1.1** Represent and/or use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, square roots, and exponents).
- A1.1.2.1** Write, solve, and/or graph linear equations using various methods.
- A1.2.1.1** Analyze and/or use patterns or relations.
- A1.2.1.2** Interpret and/or use linear functions and their equations, graphs, or tables.
- A1.2.2.1** Describe, compute, and/or use the rate of change (slope) of a line.
- A1.2.2.1** Describe, compute, and/or use the rate of change (slope) of a line.
- A1.2.2.2** Analyze and/or interpret data on a scatter plot.
- A1.2.3.2** Use data displays in problem-solving settings and/or to make predictions
- A1.1.3.1** Write, solve, and/or graph linear inequalities using various methods.
- A1.1.2.2** Write, solve, and/or graph systems of linear equations using various methods.
- A1.1.3.2** Write, solve, and/or graph systems of linear inequalities using various methods.
- A1.1.1.3** Use exponents, roots, and/or absolute values to solve problems
- A1.1.1.2** Apply number theory concepts to show relationships between real numbers in problem-solving settings.
- A1.1.1.5** Simplify expressions involving polynomials.
- A1.1.1.3** Use exponents, roots, and/or absolute values to solve problems
- A1.1.1.1** Represent and/or use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, square roots, and exponents).
(A1.1.1.1.2 Simplify square roots)
- A1.1.1.3** Use exponents, roots, and/or absolute values to solve problems.
- A1.1.1.5** Simplify expressions involving polynomials.
- A1.2.3.1** Use measures of dispersion to describe a set of data.
- A1.2.3.2** Use data displays in problem-solving settings and/or to make predictions.
- A1.2.3.3** Apply probability to practical situations.

Student Objectives:

- To develop algebraic skills and concepts which enhance problem solving ability.
- To reason and communicate mathematically and to become confident in their own ability.
- To value mathematics and appreciate the power of mathematical abstraction and symbolism.
- To represent situations which facilitate the use of variable quantities with expressions, equations, and inequalities.
- To use tables and graphs as tools to interpret expressions, equations, and inequalities.

Materials & Texts

Algebra 1– McDougal, Littell & Co. – 2001 ed.

Scientific or graphing calculator

Activities, Assignments, & Assessments

ACTIVITIES

Discovery Modules for various topics

ASSIGNMENTS

Assignment sheets will be distributed periodically throughout the school year. Homework will be assigned on a daily basis. Individual assignments for each chapter can be viewed on the Mathematics Department page of Radnor High School's web site.

ASSESSMENTS

Grades will be based on quizzes and tests. In addition, teachers may use homework, group activities, and/or projects for grading purposes. All students will take departmental midyear and final exams. The Radnor High School grading system and scale will be used to determine letter grades.

Terminology

New terminology will be introduced at appropriate times within the development of the topics of the course. See topics list.

Media, Technology, Web Resources

Scientific or Graphing Calculator