



Radnor High School Course Syllabus

Revised 9/1/2011

Algebra 1 0416

Credits: 1.0
Weighted: no
Length: full year
Format: meets daily

Grades: 9
Prerequisite: teacher recommendation

Overall Description of Course

The goal of this course is to develop algebraic skills and concepts and to enhance problem solving ability. Topics will include: polynomial expressions and equations, quadratic functions, irrational numbers, coordinate graphing, graphing linear and quadratic functions, basic statistics, determining and analyzing the slope of lines, and factoring polynomial expressions. Algebra skills and concepts needed to solve equations, inequalities, and systems of equations/inequalities will be developed. Algebraic problem solving techniques will be employed to solve relevant applications.

QUARTER 1

Common Core Standards

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.

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.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*★

F-IF.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

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

Keystone Connections:

Student Objectives:

Overall:

1. To utilize technology using graphing calculators and computers.
2. To make connections between mathematics and the real world.
3. To explore mathematical functions and their relationship to real world applications.
4. To strengthen algebraic skills for standardized tests.
5. To explore number systems and computations.
6. To develop the ability to think critically.
7. To represent situations that involve variable quantities with expressions, equations, and inequalities.

By the end of Quarter 1, students should be able to demonstrate an understanding of:

8. Writing and evaluating variable expressions
9. Checking solutions to equations and inequalities
10. Using verbal and algebraic models
11. Organizing data and representing functions
12. Adding, subtracting, multiplying and dividing real numbers

Materials & Texts

Algebra 1– McDougal, Littell & Co. – 2001 ed.
Scientific calculator
Supplemental materials and additional practice

Activities, Assignments, & Assessments

ACTIVITIES

Connections to Algebra

- Variables in Algebra
- Exponents & Powers
- Order of Operations
- Solutions to Equations & Inequalities
- Translating Variable Expressions
- Reading Bar and Line Graphs, Data
- Introduction to Relations & Functions, Domain and Range.

Properties of Real Numbers

- Number Systems, the Real Number Line, Absolute value and Opposites.
- Addition of Real Numbers
- Subtraction of Real Numbers

- Multiplication of Real Numbers
- The Distributive Property & Combining Like Terms
- Division of Real Numbers, Definition of Reciprocals

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 mid-year and final exams. The Radnor High School grading system and scale will be used to determine letter grades.

Terminology

variable	domain
variable expression	range
numerical expression	
power	real number
exponent	integer
base	opposite
order of operations	absolute value
equation	term
solution	distributive property
inequality	coefficient
modeling	like terms
function	reciprocal

Media, Technology, Web Resources

Scientific calculator

QUARTER 2

Common Core Standards

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.

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.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*

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 .*

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.

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

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).

F-IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★

S-ID.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

S-ID.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Keystone Connections:

Student Objectives:

By the end of Quarter 2, students should be able to demonstrate an understanding of:

13. Solving a linear equation systematically
14. Using ratios, rates and percents
15. Graphing linear equations
16. Finding the slope of a line
17. Determining if a graph represents a function

Materials & Texts

Algebra 1– McDougal, Littell & Co. – 2001 ed.
Scientific calculator
Supplemental materials and additional practice

Activities, Assignments, & Assessments

ACTIVITIES

Solving Linear Equations

- Solving Equations Using Addition and Subtraction
- Solving Equations Using Multiplication and Division
- Solving Multi-Step Equations
- Solving Equations with Variables on Both Sides
- Solving Decimal Equations
- Formulas and Solving Literal Equations
- Rates, Ratios, and Percents

Graphing Linear Equations and Functions

- Cartesian Coordinate Plane and Plotting Points
- Graphing Linear Equations, Solutions to Linear Equations, Horizontal & Vertical Lines
- Graphing Using Intercepts
- Slope as a Definition, Formula
- Direct Variation
- Graph Using Slope-Intercept Form, Parallel Lines
- Functions and Relations, Function Notation

ASSIGNMENTS

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ASSESSMENTS

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Terminology

equivalent equations	rate	x-intercept
inverse operations	unit rate	y-intercept
linear equation	unit analysis	slope
properties of equality	percent	direct variation
identity		slope-intercept form
formula	ordered pair	function notation
ratio	linear equation	

QUARTER 3

Common Core Standards

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.

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.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*

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

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.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.

Keystone Connections:

Student Objectives:

By the end of Quarter 3, students should be able to demonstrate an understanding of:

18. Writing linear equations in slope-intercept form, point-slope form and standard form
19. Using a linear model to solve problems
20. Writing an equation of a line perpendicular to another line
21. Solving and graphing inequalities
22. Solving and graphing absolute-value equations and absolute-value inequalities

Materials & Texts

Algebra 1– McDougal, Littell & Co. – 2001 ed.
Scientific calculator
Supplemental materials and additional practice

Activities, Assignments, & Assessments

ACTIVITIES

Writing Linear Equations

- Writing Linear Equations in Slope-Intercept Form
- Writing Linear Equations in Point-Slope Form
- Writing Linear Equations in Point-Slope Form Using Two Points
- Point-Slope Form of a Linear Equation
- General Linear Form
- Perpendicular lines

Solving and Graphing Linear Inequalities

- Solving One-Step Linear Inequalities
- Solving Multi-Step Linear Inequalities
- Solving Compound Inequalities
- Solving Absolute-Value Equations and Inequalities
- Graphing Linear Inequalities in Two Variables

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ASSESSMENTS

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Terminology

point-slope form	subtraction property of inequality
standard form	multiplication property of inequality
linear model	division property of inequality
rate of change	compound inequality
perpendicular	absolute-value equation
graph of an inequality	absolute-value inequality
addition property of inequality	linear inequality in two variables

QUARTER 4

Common Core Standards

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.

Keystone Connections:

Student Objectives:

By the end of Quarter 4, students should be able to demonstrate an understanding of:

- 23. Multiplying and dividing expressions with exponents
- 24. Adding, subtracting and multiplying polynomials

Materials & Texts

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Scientific calculator
Supplemental materials and additional practice

Activities, Assignments, & Assessments

ACTIVITIES

Exponents

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

Polynomials & Factoring (time permitting):

- Adding and Subtracting Polynomials
- Multiplying Polynomials
- Special Products of Polynomials

- Solving Polynomial Equations in Factored Form (time permitting):
- Factoring $x^2 + bx + c$
- Factoring $ax^2 + bx + c$
- Factoring Special Products

Quadratics Equations and Functions

(time permitting):

- Solving Quadratic Equations by Extracting Square Roots
- Simplifying Radicals
- Solving Quadratics Using the Quadratic Formula
- Quadratic Functions in Standard & Vertex Forms
- Finding x and y -intercepts

ASSIGNMENTS

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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 mid-year and final exams. The Radnor High School grading system and scale will be used to determine letter grades.

Terminology

exponential function	leading coefficient
power	degree of a term
exponent	degree of a polynomial
base	like terms
factor	constant
product of powers property	linear
power of a power property	quadratic
power of a product property	cubic

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Enduring Understandings

Students will understand (that)

- Solving equations requires knowledge of order of operations and inverse operations.
- Some equations will require Algebra skills prior to finding a solution.
- Algebra is a language with an essential vocabulary.
- Unwritten numerical values and inclusion are inferential in mathematical phrases and sentences.
- Solving inequalities is similar to solving equations except that shading (on a number line) is required to show all solutions.
- Solving one-dimensional and two-dimensional equations have similarities and differences.

- Problem solving may involve translating English phrases/sentences into mathematical expressions or equations.
- Rates of change are ratios or rates which can be used to assist in solving two variable equations or problems involving rates.
- Rates of change are used to help mathematicians explain some real world phenomena.
- Solving equations of degree higher than 1 involves other Algebra skills.
- Graphing is required to solve all two variable equations and inequalities.
- Data can be organized using statistical tools of mean, median, mode, box and whisker plots, and stem and leaf plots.
- Functions are relations in which each input value is paired with exactly one output value.
- Functions/Relations are an important part of Algebra.
- Slope is a numerical value that describes the orientation of a line.

Essential Questions