BERKELEY HEIGHTS PUBLIC SCHOOLS
BERKELEY HEIGHTS, NEW JERSEY

GOVERNOR LIVINGSTON H. S.
MATHEMATICS DEPARTMENT

ALGEBRA 1
#MAY0910

ALGEBRA 1 CONCEPTS
#MAY0900

Curriculum Guide

REVISED

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This curriculum may be modified through varying techniques, strategies, and materials, as per an individual student's Individualized Educational Plan (IEP)

Approved by the Berkeley Heights Board of Education
at the regular meeting held on 11/14/13.

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VISION STATEMENT

Mathematical modeling and problem-solving is at the heart of the curriculum at the Algebra I level. Mathematical modeling consists of recognizing and clarifying mathematical structures that are embedded in other contexts, formulating a problem in mathematical terms, using mathematical strategies to reach a solution, and interpreting the solution in the context of the original problem. During this course, students will be developing the process of solving practical problems by representing and analyzing a situation using symbols, graphs, tables, or diagrams. They will learn to distinguish between relevant and irrelevant information, identify missing information, acquire needed information, and be able to decide whether an exact or approximate answer is called for, with attention paid to the appropriate level of precision. Students will also develop strategies for checking the validity of their solutions through multiple independent methods.

Effective communication using the language of mathematics is essential for all math courses and will be emphasized throughout this course. The development of mathematical definitions, notation, terminology, syntax and logic will be imbedded in the course studies. Students will be required to explain their solutions using multiple representations in both a written and oral format.

MISSION STATEMENT

Skills that will be acquired in Algebra 1 will cover a range of algebraic topics. A conceptual understanding of the properties and operations of real numbers with emphasis on ratio, rates, and proportion and numerical expressions containing exponents and radicals will be reviewed. Operations with polynomial expressions, factoring polynomials, and the use of algebraic radical expressions will be introduced and expanded. Students will learn to analyze, represent, and graph linear functions including those involving absolute value, as well as be able to recognize and use linear models in problem-solving situations. The graphical representations of linear equations and inequalities will be used to represent contextual situations. Solving linear systems and systems of inequalities will extend the students' initial knowledge of the linear equation. Students will also begin to represent simple quadratic functions in multiple ways and use quadratic models, as well as solve quadratic equations. Finally, connections to algebra will be made through the interpretation of linear trends in data, the comparison of data using summary statistics, probability and counting principles, and the evaluation of data-based reports in media. Problems will be posed which involve multiple steps and will require the student to synthesize math vocabulary, signs, symbols, and their newly acquired skills while developing solutions. Technology will be integrated into lessons, which will include (but may not be limited to) the use of graphing calculators, computers, mathematical software programs, online lessons, and video presentations.

Algebra 1 is intended for students in grades 7 through 12. Five credits are given for this full year course when it is taken in high school. National and state standards are aligned and integrated throughout the curriculum.

COURSE PROFICIENCIES

COURSE OBJECTIVES

1. To model relationships using variables, expressions, and equations; to simplify and evaluate algebraic expressions, and to operate on rational numbers. (12.A-SSE.1a, b, 2; 12.CED-1; 7.NS-1, 2;)

2. To solve one step and multi-step equations, to use formulas in an application, and to solve literal equations for a specified variable. (12.A-REI.1, 3; 12.A-CED.4; 9.1/12A.1)

3. To calculate three measures of central tendency and determine the most representative measure of central tendency for a set of data. (6.SP.5c)

4. To solve and graph both simple and compound inequalities and absolute value equations by using the knowledge of solving equations. (12.A-REI.1, 3; 12.A-CED.1)

5. To use the characteristics of ratio and proportions to solve proportions, find dimensions of similar figures, solve percent problems, and find the probability of both simple and compound events. (12.A-REI.1, 3; 12.N-Q.1; 7.SP.7, 8; 9.1/12A.1)

6. To reinforce practical applications relating equations and graphs to real life events. (12.F-IF.1, 4, 5, 6; 12.S-ID.7;12.N-Q.1)

7. To use functional notation to model function rules, to find the difference for an arithmetic sequence, and to write rules for the sequence. (12.F-IF.1, 2, 3)

8. To understand slope as rate of change, use the slope of a line to graph it from the equation written in one of three forms, and use a graphing calculator to verify. (12.F-IF.4, 6, 7a; 12.F-LE.2; 12.S-ID.7; 12.A-REI.10)

9. To find the solution to a linear system by graphing and other algebraic methods, and using a graphing calculator to verify. Students will also use linear systems to model real life applications. (12.A-CED.2; 12.A-REI, 6; 12.F-LE.5; 9.1/12A.1)

10. To graph linear inequalities. (12.A-CED2, 3; 12.A-REI.12, 12.F-LE.5)

11. To apply the properties of exponents and evaluate exponential equations, scientific notation, and other exponential expressions. (8.EE.4, 12.F-IF.7e, 8b; 12.F-LE.1A, 3)

12. To combine monomials, binomials, and polynomials by using the operations of addition, subtraction, and multiplication. (12.A-APR.1)

13. To factor trinomials and to recognize certain special patterns in trinomials. (12.A-SSE.2)

COURSE PROFICIENCIES (continued)

14. To solve quadratic equations by using the square root, factoring, or the quadratic formula and verify on a graphing calculator. (12.A-REI.4a, b; 12.A-SSE.3a, 12.F-IF.8a)

15. To graph a factorable quadratic function by various methods and verify on a graphing calculator and to understand the nature of the graph of a quadratic function. (12.F-IF.7a)

16. To use, simplify, and combine radical expressions, to apply the Pythagorean Theorem, th distance formula, and the midpoint formula. (8.G.7, 8; 12.A-REI.4b; 12.N-RN.2; 12.G-SRT.8)

17. To use counting methods such as the basic counting principle, permutations, and combinations in both simple and complex situations. (9.1/12A.1)

STUDENT PROFICIENCIES

The student will be able to:

1. Model numerical relationships using variables, equations, and formulas. (12.A-SSE.1a, b, 2; 12.A-CED.1, 4; 12.A-REI.3)
2. Translate English phrases and sentences into algebraic expressions and equations. (12.A-SSE.1a, 2; 12.A-CED.1)
3. Write, simplify, and evaluate algebraic expressions and equations. (12.A-SSE.1a,b)
4. Evaluate expressions using exponents. (12.A-SSE.2; 12.A-IF.8; 12.N-RN.1)
5. Use order of operations, the distributive property, and combining like terms to simplify and evaluate expressions. (12.A-SSE.1a, b, 2)
6. Classify and compare numbers; use counterexamples. (12.A-SSE.1a, b, 2)
7. Add, subtract, multiply, and divide real numbers. (7.NS.1, 2)
8. Find opposites and absolute value. (12.A-REI.1,3)
9. Add matrices, multiply matrices by a scalar, and determine if two matrices are equal. (12.N-VM.8)
10. Simplify absolute value expressions. (12.A-REI.1, 3)
11. Define and use the properties of addition and multiplication. (12.A-SSE.1b, 2)
12. Graph points on a coordinate plane and analyze data using scatter plots. (12.S-ID.6a, c)
13. Visualize a line of best fit from a scatter plot. (12.S-ID.6a, c, 8)
14. Solve one and two step equations. (12.A-REI.1, 3)
15. Solve multi-step equations and equations with variables on both sides. (12.A-REI.1, 3; 9.1/12A.1)
16. Use formulas to solve equations. (12.A-CED.4; 12.A-REI.3)
17. Transform formulas (define one variable in terms of another). (12.A-CED.4; 12.A-REI.3)
18. Find mean, median, and mode and make use of visual representations of a set of data. (6.SP.5c)

STUDENT PROFICIENCIES (continued)

19. Graph and write inequalities in one variable. (12.A-CED.1; 12.A-REI.3)

20. Solve inequalities using addition, subtraction, multiplication, and division and identify solutions to inequalities. (12.A-CED.1; 12.A-REI.3)

21. Solve multi-step inequalities and inequalities with variables on both sides. (12.A-CED.1; 12.A-REI.3)

22. Solve compound inequalities (joined by AND or OR). (12.A-CED.1; 12.A-REI.3)

23. Solve absolute value equations and inequalities. (12.A-CED.1; 12.A-REI.1, 3)

24. Define and use ratios and rates. (12.A-CED.1; 12.A-REI.3)

25. Define and solve proportions. (12.A-CED.1; 12.A-REI.3)

26. Use proportions to find missing measures of similar figures and solve percent problems. (12.A-CED.1; 12.A-REI.3; 9.1/12A.1)

27. Find percent of change [and percent error]. (12.N-Q.1, 12.A-REI.3; 9.1/12A.1)

28. Find theoretical and experimental probability. (7.SP.7; 9.1/12A.1)

29. Find probability of independent and compound events. (7.SP.8; 9.1/12A.1)

30. Interpret, sketch, and analyze graphs from real world situations. (12.A-REI.10)

31. Identify and evaluate functions and relations. (12.A-REI.10; 12.F-IF.1, 2)

32. Model and write functions using rules, tables, graphs, and real world situations. (12.F-IF.1, 2)

33. Use inductive reasoning in continuing number patterns. (12.F-IF.3; 12.F-BF.1a, 2; 12.F-LE.2)

34. Write rules for arithmetic sequences. (12.F-IF.3; 12.F-BF.1a, 2; 12.F-LE.2)

35. Find rates of change from tables and graphs and equate rate of change with slope. (12.F-IF.6; 12.F-LE.1a)

36. Write linear equations in slope-intercept form and graph linear equations. (12.F-BF.1; 12.F-LE.2)

37. Graph linear equations using intercepts. (12.F-IF.4, 7a;12.F-LE.2)

38. Write a linear equation in standard form. (12.F-BF.1)

39. Write a linear equation using given data (regular level only). (12.F-BF.1; 12F-LE.2)

40. Determine whether two lines are perpendicular, parallel, or coinciding based on their slopes and intercepts. (12.F-LE.2; 12.S-ID.7)

41. Write the equation for a line of best fit and use it to make predictions. (12.S-IS.6a, c, 8)

42. Solve systems by graphing, substitution, and elimination. (12.A-CED.3; 12.A-REI.5, 6; 9.1/12A.1)

43. Analyze special types of systems (one, no, many solutions). (12.A-REI.5, 6)

44. Write systems of linear equations. (12.A-CED.2, 3)

45. Graph linear inequalities. (12.A-CED.3; 12.A-REI.12)

46. Write and use linear inequalities when modeling real-world situations (regular level only). (12.A-CED.3; 9.1/12A.1)

47. Simplify expressions with zero and negative exponents. (12.A-SSE.2)

48. Evaluate exponential expressions. (12.A-SSE.2; 12.F-IF.8b)

49. Write numbers in scientific and standard notation. (12.A-SSE.2)

50. Work with numbers in scientific notation including very large or very small numbers. (12.A-SSE.2)

51. Learn and apply the rules of exponents. (12.A-SSE.2; 12.F-IF.8b)

52. Describe polynomials according to the number of terms and the degree. (12.A-APR.1)

53. Add, subtract, and multiply polynomials. (12.A-APR.1)

54. Factor a monomial from a polynomial. (12.A-APR.1)

55. Multiply binomials using the FOIL method. (12.A-APR.1)

56. To multiply trinomials by binomials. (12.A-APR.1)

57. Find the square of a binomial and factor the difference of squares. (12.A-APR.1)

STUDENT PROFICIENCIES (continued)

58. Factor trinomials of the type $ax^2 + bx + c$, perfect-square trinomials, and the difference of squares. (12.A-SSE.2)

59. Factor polynomials with four terms by grouping (regular level only). (12.A-SSE.2)

60. Graph a quadratic function by making a table of values. (12.F-IF.4, 7a)

61. Identify the vertex of a parabola from a graph, and use graphing calculator to verify the results. (12.F-IF.4, 7a, b, 8a)

62. Find square roots of perfect squares and estimate square roots of non perfect squares. (12.A-REI.4a)

63. Solve quadratic equations using square roots, factoring, graphing, and the quadratic formula. (12.A-SSE.3, 12.A-REI.4b)

64. Choose an appropriate method for solving a quadratic equation. (12.A-SSE.3a, b)

65. Simplify radicals involving products and quotients. (12.A-REI.4a; 12.N-RN.3)

66. Solve problems using the Pythagorean Theorem and identify right triangles. (8.G.7, 8; 12.G-SRT.8)

67. Find the distance between two points on a coordinate plane. (6.GPE.6)

68. Find the coordinates of the midpoint of a line segment. (6.GPE.6)

69. Simplify sums, differences, products, and quotients of radical expressions. (12.A-REI.4a)

70. Solve equations containing radicals. (12.N-RN.2; 12.A-CED.2)

71. Identify extraneous solutions of radical equations. (12.N-RN.2; 12.A-CED.2)

72. Evaluate factorials. ()

75. Use basic counting principles and simple combinations and permutations to count possibilities for certain events without applying formulas. (9.1/12A.1)

METHODS OF EVALUATION

1. Homework and class work.
2. Class participation.
3. Tests and quizzes.
4. Projects.
5. Notebooks.
6. Cooperative learning assignments.
7. Mid-term and final examinations.

SCOPE AND SEQUENCE
COURSE OUTLINE/STUDENT OBJECTIVES

The student will be able to:

CCSS category domain	Standard	Course Outline/Student Objectives
7.NS 12.A-SSE 12.A-CED 12.A-REI 12.F-IF 12.N-RN 12.N-VM 12.S-ID	1, 2 1a, b, 2 1, 4 1,3 8b 1 8 6a, c, 8	I. Tools Of Algebra (3 Weeks) A. Using Variables 1. Model relationships with variables 2. Translate English phrases into algebraic expressions B. Exponents and Order of Operations 1. Evaluate expressions using exponents 2. Evaluate expressions using grouping symbols 3. Simplify formulas C. Exploring Real Numbers 1. Classify and compare numbers 2. Add, subtract, multiply, and divide real numbers 3. Find opposites and absolute value D. Adding, Subtracting, Multiplying, and Dividing Real Numbers 1. Perform operations with real numbers 2. Add matrices E. The Distributive Property 1. Simplify algebraic expressions F. Properties of Real Numbers 1. Identify and use properties of real numbers 2. Use deductive reasoning G. Graphing Data on The Coordinate Plane 1. Graph points on the coordinate plane 2. Analyze data using scatter plots
12.A-REI 12.A-CED 6.SP 9.1/12A	1, 3 4 5c 1	II. Solving Equations (3 Weeks) A. Solving One and Multi-Step Equations 1. Solve equations using addition, subtraction, multiplication, and division 2. Solve equations with multiple operations B. Solving Equations With Variables on Both Sides 1. Identify equations that are identities 2. Identify equations that have no solution C. Equations and Problem Solving 1. Define a variable in terms of another variable 2. Model real world situations with equations. D. Solving a Formula for a Variable E. Using Measures of Central Tendency (3 Types)

		II. Solving Equations (continued) 2. Make and use visual representations of data
12.A-CED 12.A-REI 9.1/12A	1 1, 3 1	III. Solving Inequalities (2 Weeks) A. Inequalities and Their Graphs 1. Identify solutions of inequalities 2. Graph and write inequalities B. Solve Inequalities Using Addition, Subtraction, Multiplication, and Division C. Solve Multi-Step Inequalities 1. With variables on one side 2. With variables on both sides D. [Solve Compound Inequalities] 1. Solve inequalities containing "and" and "or" 2. Graph inequalities containing "and" and "or" E. Solve Absolute Value Equations and Inequalities 1. Recognize more than one solution exists to absolute value equations 2. Apply the rules for solving absolute value inequalities
12.A-REI 12.N-Q 7.SP 9.1/12A	1, 3 1 7,8 1	IV. Solve And Apply Proportions (2 Weeks) A. Ratio and Proportion 1. Find ratios and rates and distinguish between the two 2. Solve proportions B. Use Proportions to Work with Similar Figures 1. Find missing measures of similar figures 2. Use similar figures when measuring indirectly C. Proportion and Percent Equations 1. Use proportions when solving percent equations 2. Write and solve percent equations D. Percent of Change 1. Find percent of change 2. Find percent error E. Apply Ratios to Probability of Simple and Compound Events 1. Find theoretical probability 2. Find experimental probability 3. Find probability of independent and dependent events
12.A-REI 12.F-IF 12.F-BF 12.F-LE	10 1, 2, 3 1a, 2 2	V. Graphs And Functions (3 Weeks) A. Relate Graphs to Events 1. Interpret and sketch graphs that depict situations 2. Analyze graphs to solve problems B. Relations and Functions 1. Identify and distinguish between relations and functions 2. Evaluate functions C. Model Functions Using Rules, Tables, and Graphs

		V. Graphs and Functions (continued) 1. Graph functions given the rule 2. Create a table of values to graph D. Write a Function Rule Given a Table 1. Use real life situations to create a function 2. Write a function given a table E. Describe Number Patterns 1. Use inductive reasoning in continuing number patterns 2. Write rules for arithmetic sequences 3. Define "first term", "nth term", and "common difference"
12.F-IF 12.F-LE 12.F-BF 12.S-ID 12.A-REI	4, 6, 7a 1a, 2 1 6a, c, 7, 8 10	VI. Linear Equations And Their Graphs (2 Weeks) A. Rate of Change and Slope 1. Find rates of change from tables and graphs 2. Find slope 3. Equate rate of change with slope 4. Use graphing calculator to compare steepness of lines with various slopes B. Slope Intercept Form 1. Write a linear equation in slope intercept form 2. Graph linear equations using slope intercept form 3. Use slope intercept form to model real life situations C. Standard Form 1. Graph equations using x and y intercepts 2. Write an equation in standard form 3. Use standard form to model real life situations D. Parallel and Perpendicular Lines 1. Use slope to determine parallel or perpendicular lines E. Scatter Plots and Equations of Lines 1. Write an equation for a trend line and use it to make predictions 2. Write the equation for a line of best fit and use it to make predictions 3. [Compare individual's line of best fit with that of the graphing calculators linear regression line]
12.A-CED 12.A-REI 12.F-LE 9.1/12A	2, 3 5, 6, 12 5 1	VII. Systems Of Equations And Inequalities (2 Weeks) A. Solve systems using graphs 1. Find the point of intersection as the solution to a system 2. Determine the number of solutions to a system by referring to the graph 3. Verify graphs using the graphing calculator B. Solve Systems Using Substitution 1. Use graphs to estimate solutions 2. Use algebra to find the exact solution

		VII. Systems Of Equations And Inequalities (continued) C. Solve Systems Using Elimination 1. Solve systems by adding or subtracting 2. Multiply first when solving systems D. Applications of Linear Systems 1. Write systems of linear equations based on real life situations 2. Solve linear system using appropriate method E. [Graph Linear Inequalities] 1. Write linear inequalities to model real world situations 2. Solve problem by analyzing linear inequality
12.A-SSE 12.F-IF 12.LE 8.EE	2 7e, 8b 1a, 3, 5 4	VIII. Exponents And Exponential Functions (2 Weeks) A. Zero and Negative Exponents 1. Simplify expressions with zero and negative exponents 2. Evaluate exponential expressions B. Scientific Notation 1. Write numbers in scientific and standard notation 2. Use scientific notation to write very large and very small numbers C. Multiplication Properties of Exponents 1. Multiply powers 2. Work with scientific notation 3. Raise a power to a power 4. Raise a product to a power D. Division properties of exponents 1. Divide powers with the same base 2. Raise a quotient to a power
12.A-APR 12.SSE	1 2	IX. Polynomials And Factoring (3-4 Weeks) A. Add and Subtract Polynomials 1. Describe polynomials according to the degree and the number of terms 2. Add and subtract polynomials by combining like terms 3. Write a polynomial in standard form B. Multiply and Factor Polynomials 1. Multiply a polynomial by a monomial 2. Factor a monomial from a polynomial C. Multiply Binomials 1. Multiply binomials using FOIL 2. Multiply trinomials by binomials 3. Model polynomial multiplication using algebra tiles 4. Solve problems using polynomial multiplication and addition D. Multiply Special Cases 1. Find the square of a binomial 2. Find the difference of squares E. Factor Trinomials

		1. Factor trinomials with leading coefficient of 1 IX. Polynomials and Factoring (continued) 2. Factor trinomials with leading coefficient other than 1 3. Factor perfect square trinomials 4. Factor difference of squares F. [Factor by Grouping] 1. Factor polynomials with four terms 2. Factor trinomials by grouping
12.A-REI 12.N-RN 12.G-SRT 12.G-GPE 12.A-CED	4a 2, 3 8 6 1, 2	X. Quadratic Equations And Functions (3-4 Weeks) A. Explore Quadratic Graphs 1. Graph quadratic equations by creating a table of values 2. [Identify maximum, minimum, and vertex of a parabola] 3. Verify sketches using the graph created on graphing calculator B. Find and Estimate Square Roots 1. Find square roots of perfect squares 2. Estimate square roots of non-perfect squares 3. Discuss positive and negative square roots C. Solve Quadratic Equations 1. Solve quadratic equations by graphing on the graphing calculator 2. Solve quadratic equations using square roots 3. Solve quadratic equations using factoring 4. Solve quadratic equations using the quadratic formula 5. Choose an appropriate method for solving quadratic equations
12.A-REI 12.N-RN 12.G-SRT 12.G-GPE 12.A-CED	4a 2, 3 8 6 1, 2	XI. Radical Expressions And Equations (3 Weeks) A. Simplify Radicals 1. Simplify radicals involving products and quotients 2. Rationalize the denominator of quotients 3. Simplify radicals involving variables raised to odd or even powers B. Apply The Pythagorean Theorem 1. Solve problems using the Pythagorean Theorem 2. Identify right triangles C. The Distance and Midpoint Formulas 1. Find the distance between two points on a coordinate plane 2. Find the coordinates of the midpoint of a line segment D. Operate with Radical Expressions 1. Simplify sums, differences, products, and quotients of radical expressions 2. [Apply knowledge of factoring, multiplying binomials, and adding like terms to simplify radicals]

		E. [Solve Radical Equations] XI. Radical Expressions And Equations (continued) 1. Solve equations containing radicals 2. Identify extraneous solutions

Note: The Common Core Curriculum Standards for Mathematics can be accessed at www.state.nj.us

Topics in brackets throughout the scope and sequence should be omitted from the Algebra Concepts course requirements.

RESOURCES/ACTIVITIES GUIDE

Text:

Bellman, Allan E., et. al. Algebra 1. Upper Saddle River, NJ: Prentice Hall, 2004.

Prentice Hall Teacher Online Access Pack
- Featuring Interactive Textbook

Prentice Hall Algebra I Workbooks
- Practice Workbook
- Hands-On Activities
- Technology Activities

Teaching Resources Kit
- Grab & Go Chapter Support Files
- Cumulative Assessment
- Solution Key
- Teacher Express CD-ROM

Prentice Hall Assessment System
- Computer Test Generator-Workbook and CD-ROM
- Assessment Resources
- Content Diagnostic Tests
- Skills and Concepts Review
- Test Preparation
- Test-Taking Strategies with Transparencies

Presentation Assistant Plus!
- Prentice Hall Presentation Pro, CD-ROM
- Daily Skills Check and Lesson Quiz transparencies

Resource Pro with Planning Express, CD-ROM

SUGGESTED AUDIO VISUAL/COMPUTER AIDS

Texas Instruments 84 Graphing Calculator

Graphing Calculator View Screen for Overhead Projector

TI-Smartview Graphing Software

Internet Access to:

www.PHSchool.com

www.algebrahelp.com

http://mathforum.org/dr.math

www.terragon.com/tkobrien/algebra/

www.pearsonsuccessnet.com

Students can access a help desk, graph functions, and chat with others regarding Algebra 1 topics.

Manipulatives

Overhead Projector and transparencies

Presentation Plus software

SUGGESTED MATERIALS

Resources for Students

Bellman, Allan E., et. al. Algebra 1. Upper Saddle River, NJ: Prentice Hall, 2004.

Prentice Hall Algebra I Practice Workbook

Prentice Hall Algebra I Hands-On Activities

phschool.com

Resources for Teacher

Bellman, Allen E. et. al. Algebra 1. Upper Saddle River, NJ: Prentice Hall, 2004.

Transparencies

Manipulatives

Teacher's Guide, Test Preparation