Algebra I Honors Course Overview

Content Area: **Math**
Course(s): **ALG. I-H, ALGEBRA I H**
Time Period:
Length: **Full Year**
Status: **Published**

Cover

EAST BRUNSWICK PUBLIC SCHOOLS

East Brunswick New Jersey

Superintendent of Schools

Dr. Victor P. Valeski

Mathematics

Algebra I Honors-Course Number: 2170

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Course Adoption: 4/21/1986

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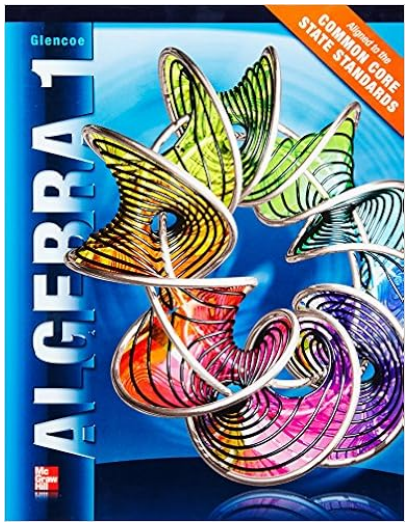
Course Overview

COURSE DESCRIPTION:

This is a first course in elementary algebra which uses inductive approaches to develop the basic algebraic operations. Topics studied include integers and operations, solving linear equations and inequalities, polynomials, graphing linear and non-linear functions, factoring, fractional equations, irrational numbers, data analysis and verbal/word problems. Problem solving will also be a major component of this course as will the infusion of graphing calculator lessons and activities. This is one of two courses in which students are enabled and expected to demonstrate mastery of some of the algebraic standards for mathematical content, the other course being Algebra I Honors. The Standards for Mathematical Practices are embedded within the instructional strategies, and not delineated specifically by unit.

Materials and Resources

Textbook: Glencoe Algebra by Carter (2012)



- Teacher's Resource Package and online resources accompanying text
- TI-84 Graphing Calculator
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Content Specific Standards

MA.F-IF	Interpreting Functions
MA.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
MA.S-ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).

MA.N-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.
MA.F-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.
MA.A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
MA.S-ID.A.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
MA.N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
MA.A-SSE.A.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity.
MA.F-IF.A.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
MA.S-ID.A.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
MA.S-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.
MA.A-SSE.A.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 $(x^2 - y^2)(x^2 + y^2)$.
MA.F-IF.B.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
MA.N-Q.A.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.
MA.A-SSE.B.3a	Factor a quadratic expression to reveal the zeros of the function it defines.
MA.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.A-SSE.B.3b	Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
MA.F-IF.B.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.
MA.A-SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions.
MA.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
MA.F-IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
MA.F-IF.C.7b	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
MA.A-APR.A	Perform arithmetic operations on polynomials
MA.A-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.
MA.F-IF.C.7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

MA.F-IF.C.8a	Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
MA.F-IF.C.8b	Use the properties of exponents to interpret expressions for exponential functions.
MA.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
MA.F-BF.A.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
MA.A-CED.A.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.
MA.F-BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.
MA.A-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
MA.F-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.
MA.F-BF.B.4b	Verify by composition that one function is the inverse of another.
MA.A-REI.A.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.
MA.F-BF.B.4c	Read values of an inverse function from a graph or a table, given that the function has an inverse.
MA.F-BF.B.4d	Produce an invertible function from a non-invertible function by restricting the domain.
MA.A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
MA.F-LE.A.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.
MA.A-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.
MA.A-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.
MA.F-LE.A.1a	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
MA.F-LE.A.1b	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
MA.F-LE.A.1c	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
MA.F-LE.A.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
MA.A-REI.D.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.

Standards for Mathematical Practices

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.

Interdisciplinary Standards

	Explanation
	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems tha engineering.
	Develop and use a model based on evidence to illustrate the relationships between systems or between component
	Use a model based on evidence to illustrate the relationships between systems or between components of a system

	Explanation
	Determine if the reasoning and evidence in a text support the author's claim or a recommendation for solving a scien problem.
	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attendi explanations or descriptions
	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative da in order to address a question or solve a problem.
	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possib challenging conclusions with other sources of information.
	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding phenomenon, or concept, resolving conflicting information when possible.
	Write arguments focused on discipline-specific content
	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments,
	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusin most significant for a specific purpose and audience.
	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating underst under investigation.
	Draw evidence from informational texts to support analysis, reflection, and research.

	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, de are appropriate to task, purpose, and audience.
	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations t understanding of findings, reasoning, and evidence and to add interest

NJSLS-Career Readiness, Life Literacies, and Key Skills

20 New Jersey Student Learning Standards – Career Readiness, Life L Key Skills 9.4 Life Literacies and Key Skills by the End of Grade 12

Creativity and Innovation	
Core Ideas	**Performance Expectations**
t, failure is an important part of	• 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use crea (e.g., 1.1.12prof.CR3a).

Critical Thinking and Problem-solving	
Core Ideas	**Performance Expectations**
viduals with diverse experiences can ing process, particularly for global lutions are needed.	• 9.4.12.CT.1: Identify problem-solving strategies used in the develo product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3). • 9.4.12.CT.2: Explain the potential benefits of collaborating to enha and problem solving (e.g., 1.3E.12profCR3.a). • 9.4.12.CT.3: Enlist input from a variety of stakeholders (e.g., comn experts in the field) to design a service learning activity that addres issue (e.g., environmental justice). • 9.4.12.CT.4: Participate in online strategy and planning sessions fo based, or other project and determine the strategies that contribute t

Global and Cultural Awareness	
Core Ideas	**Performance Expectations**
ns faced by a global society require viduals with different points of view	• 9.4.12.GCA.1: Collaborate with individuals to analyze a variety of climate change effects and determine why some solutions (e.g., pol cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1- ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.E

Technology Literacy	
Core Ideas	**Performance Expectations**
eatures, capacities, and styles. digital tools is helpful in selecting a task.	• 9.4.12.TL.1: Assess digital tools based on features such as accessib capacities, and utility for accomplishing a specified task (e.g., W.11 • 9.4.12.TL.2: Generate data using formula-based calculations in a sp

	conclusions about the data.
ols can be used to access, record and nts and to collect and tabulate the ple.	• 9.4.12.TL.3: Analyze the effectiveness of the process and quality o environments. • 9.4.12.TL.4: Collaborate in online learning communities or social n worlds to analyze and propose a resolution to a real-world problem 7.1.AL.IPERS.6).

Pacing Guide

	LEARNING GOALS
	Learning Goal 1: Explain the definition of a function, including the relationship between the domain and range. Use function n evaluate functions and interpret statements in context. **Learning Goal 2:** Solve Linear equations and inequalities in one variable (including literal equations); justify each step in the p **Learning Goal 3:** Create linear equations and inequalities in one variable and use them in contextual situations to solve problen each step in the process and the solution. **Learning Goal 4:** **Determine the inverse function for a simple function.**
	Learning Goal 1: Sketch graphs of linear and exponential functions expressed symbolically or from a verbal description. Show features and interpret parameters in context. **Learning Goal 2:** Create linear equations in two variables to represent relationships between quantities; graph equations on coo axes with lables and scales. **Learning Goal 3:** Graph linear, square root, cube root, and piecewise-defined functions (including step and absolute value func expressed symbolically. Graph by hand in simple cases and using technology in more complex cases, showin features of the graph. **Learning Goal 4:**

Calculate and interpret the average rate of change of a function presented symbolically or as a table; estimate of change from a graph.

Learning Goal 5:

Write linear and exponential functions given a graph, table of values, or written description; construct arithm geometric sequences.

Learning Goal 6:

Graph linear inequalities and systems of linear inequalities in two variables and explain that the solution to th system.

Learning Goal 1:

Explain why the solutions of the equation f(x) = g(x) are the x-coordinates of the points where the graphs of t equations y=f(x) and y=g(x) intersect. ** function notation is not introduced here.

Learning Goal 2:

Find approximate solutions of f(x) = g(x), where f(x) and g(x) are linear functions, by making a table of valu technology to graph and finding successive approximations.

Learning Goal 3:

Solve multistep contextual problems by identifying variables, writing equations, and solving systems of linea equations in two variables algebraically and graphically**.**

Learning Goal 4:

Write linear and exponential functions given a graph, table of values, or written description; construct arithm geometric sequences.

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Learning Goal 1:

Use properties of exponents to produce equivalent forms of exponential expressions in one variable.

Learning Goal 1:

Interpret terms, factors, coefficients, and other parts of expressions in terms of a context.

Learning Goal 2:

Add, subtract, and multiply polynomials, relating these to arithmetic operations with integers. Factor to prod equivalent forms of quadratic expressions in one variable.

Learning Goal 1:

Derive the quadratic formula by completing the square and recognize when there are no real solutions.

Learning Goal 2:

Solve quadratic equations in one variable using a variety of methods (including inspection, taking square roo
factoring, completing the square, and the quadratic formula) and write complex solutions in $a \pm bi$ form.

Learning Goal 3:

Interpret key features of quadratic functions from graphs and tables. Given a verbal description of the relatio
sketch the graph of a quadratic function, showing key features and relating the domain of the function to its g

Learning Goal 4:

Use factoring and completing the square to produce equivalent forms of quadratic expressions in one variable
highlight particular properties such as the zeros or the maximum or minimum value of the function.

Learning Goal 5:

Graph quadratic functions by hand in simple cases and with technology in complex cases, showing intercepts
values and symmetry of the graph. Compare properties of two quadratic functions, each represented in a diff
way.

Learning Goal 1:

Calculate and interpret the average rate of change of a quadratic function presented symbolically or as a table
Estimate and compare the rates of change from graphs of quadratic and exponential functions.

Learning Goal 2:

Identify the effects of transformations and combinations of transformations [$f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$
function; find the value of k given the graph.

Learning Goal 3:

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Distinguish between and explain situations modeled with linear functions and with exponential functions.

Learning Goal 4:

Interpret key features of functions from graphs and tables. Given a verbal description of the relationship, ske
graph of a function, showing key features and relating the domain of the function to its graph.

Learning Goal 5:

Find approximate solutions of f(x) = g(x), where f(x) is a linear function and g(x) is a quadratic function by n
table of values, using technology to graph and finding successive approximations.

Learning Goal 6:

Graph linear, square root, cube root, and piecewise-defined functions (including step and absolute value func

expressed symbolically. Graph by hand in simple cases and using technology in more complex cases, showin features of the graph.

Learning Goal 1:

Summarize and interpret categorical data for two categories in two-way frequency tables; explain possible associations and trends in the data.

Learning Goal 2:

Fit functions to data using technology, plot residuals and informally assess the fit of linear and non-linear fun analyzing residuals.

Learning Goal 3:

Represent data on a scatter plot, describe how the variables are related and use technology to fit a function to

Learning Goal 4:

Interpret the slope, intercept, and correlation coefficient of a data set of a linear model; distinguish between c and causation**.**

Materials and Resources

Formative and Summative Assessments

nt incorporates a variety of methods for assessment including:					
Common Unit Test and Quizzes	**Minor Assessments & Classwork**	**Projects**	**Homework**	**Midterm Exam**	**Fi**
Student assessments based on specific or general content knowledge	Any cooperative work primarily completed in class, Entrance/ Exit cards, Performance assessments etc.	Some of the courses may utilize content specific projects.	Work assigned to be completed outside of classroom	Common Comprehensive Assessment given after semester 1.	C A co ac

Grading Procedures and Evaluation

GRADING GUIDELINES:

As per Math Department Policy, grades will be determined by a variety of assessment strategies, including Major Assessments, Minor Assessments, and Performance Assessments. In addition to tests and quizzes, students will be evaluated on a combination of performance assessment instruments, including homework completions, cooperative group participation, note-taking, open ended question responses, lab reports and/or supplemental projects.

GRADING PROCEDURES:

Grading procedures must be described in sufficient detail so that a pupil will understand, the minimal to advanced proficiency, expected of him/her as the outcome of each unit, for the marking period and for the course as a whole. Benchmark level assessments associated with the course also need to be identified. While assessments of proficiency levels must be valid and reliable they do not need be the same for all students. Other criteria to be considered in grading must be identified and the degree to which such criteria will be considered in a grade. Each pupil must receive a copy of the grading procedures, proficiencies and criteria for each unit and/or marking period.

COURSE EVALUATION:

Course achievement will be evaluated as the percent of all pupils who achieve the minimum level of proficiency (final average grade) in the course. Student achievement levels above minimum proficiency will also be reported. Final grades, and where relevant mid-term and final exams, will be analyzed by staff for the total cohort and for sub-groups of students to determine course areas requiring greater support or modification.

In terms of proficiency the East Brunswick grades are as follows:

A	**Excellent**	**Advanced Proficient**
B	**Good**	**Above Average Proficient**
C	**Fair**	**Proficient**
D	**Poor**	**Minimally Proficient**
F	**Failing**	**Partially Proficient**

In this course the goal is that a minimum of 95% of the pupil's will meet at least the minimum proficiency level (D or better) set for the course. The department will analyze the achievement of students on Unit Assessments, Mid-term and Final Exams and Final Course Grades, and for Final Course Grades the achievement of sub-groups identified by the state to determine if modifications in the curriculum and instructional methods are needed.

Course evaluation requires the answering of the following questions:
1. Are course content, instruction and assessments aligned with the required NJSLS? 2. Is instruction sufficient for students to achieve the Standards? 3. Do all students achieve the set proficiencies/benchmarks set for the course?

Other Information

SCED

02052 Algebra I Honors

The focus of Algebra I is the progression of the concepts that were started in middle school with the content presented in this course intended to extend and deepen the previous understandings. Topics covered include expressions and equations, linear and exponential relationships along with quadratic and exponential functions. Additional areas will include the conceptual understandings of expressions and equations with procedural fluency and problem solving, rational exponents and descriptive statistics/linear modeling.