Algebra II ACC Course Overview

Content Area: **Math**
Course(s): **ALGEBRA II**
Time Period:
Length: **Full Year**
Status: **Published**

Cover

EAST BRUNSWICK PUBLIC SCHOOLS

East Brunswick New Jersey

Superintendent of Schools

Dr. Victor P. Valeski

Mathematics

Agebra II Honors-Course Number: 1162

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Course Adoption: 4/21/1986

Curriculum Adoption:

Date of Last Revision Adoption: 9/5/19

Course Overview

COURSE DESCRIPTION:

Algebra is a symbolic language used to express mathematical relationships. Students need to understand how quantities are related to one another, and how algebra can be used to concisely express and analyze those relationships. Modern technology provides tools for supplementing the traditional focus on algebraic procedures, such as solving equations, with a more visual perspective, with graphs of equations displayed on a screen. Students can then focus on understanding the relationship between the equation and the graph, and on what the graph represents in a real-life situation. This course includes the study of patterns involving whole numbers, rational numbers, and integers using tables, rules, graphs and expressions. Appropriate algebraic methods used to solve linear and quadratic equations and linear inequalities will be studied. The focus of the course will center around the ability to graph functions and understand and describe the general behavior of functions. This is one of three 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 II and Algebra II Honors. The Standards for Mathematical Practices are embedded within the instructional strategies, and not delineated specifically by unit.

Textbooks and other resources

Textbook: Big Ideas Algebra 2 A Common Core Curriculum

Ron Larson and Laurie Boswell 2019

- Teacher's Resource Package and online resources accompanying text
- TI – 84 graphing calculators
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SCOPE AND SEQUENCE

UNIT NAME	LEARNING G
UNIT 1: **Linear Systems of Equations**	**Learning Goal 1:** Solve algebraically and graphically a system of two linear equations. **Learning Goal 2:** Solve algebraically a system of three linear equations.
UNIT 2: **Graphing Quadratic Functions**	**Learning Goal 1:** Transform quadratic functions expressed symbolically, and identify key features of **Learning Goal 2:** Graph quadratic functions expressed symbolically, and show key features of the gra
UNIT 3:	**Learning Goal 3:** Write equations of quadratic functions. **Learning Goal 1:** Solve quadratic equations with real coefficients that have complex solutions by taki

Solving Quadratic Equations and Inequalities

Learning Goal 2:

Add, subtract, multiply, and divide complex numbers using the commutative, assoc

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Learning Goal 3:

Solve simple systems consisting of a linear and quadratic equation in two variables

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Learning Goal 4:

Solve quadratic inequalities.

Learning Goal 1:

Graph absolute value, greatest integer, cubic, piece-wise, and sine and cosine functi

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UNIT 4A: Transformations and Families of Functions

Learning Goal 2:

Identify the effect on the graph of replacing f(x) by f(x)+k, kf(x), f(kx), and f(x+k), cosine functions.

Learning Goal 3:

Graph trigonometric functions (sine and cosine specifically) expressed symbolicall technology for more complicated.

Learning Goal 1:

Use an appropriate factoring technique to factor polynomials. Explain the relations a rough graph of the function defined by the polynomial.

UNIT 4B: Polynomial Functions

Learning Goal 2:

Apply the Remainder Theorem in order to determine the factors of a polynomial.

Learning Goal 3:

Graph polynomial functions from equations; identify zeros when suitable factorizat

Learning Goal 1:

UNIT 5: Rational Exponents, Radical Functions, and Inverse Functions

Use properties of integer exponents to explain and convert between expressions inv

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Learning Goal 2:

For radical functions, interpret key features of graphs and tables in terms of the qua
the relationship.

Learning Goal 3:

Solve radical equations and inequalities in one variable, use them to solve problems

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Learning Goal 4:

Perform operations on functions, including addition, subtraction, multiplication, div

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Learning Goal 5:

Determine the inverse function for a function.

Learning Goal 1:

Graph exponential functions expressed symbolically and show key features of the g

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Learning Goal 2:

Use the properties of exponents to transform expressions for exponential functions,
different properties of the function.

Learning Goal 3:

Express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and th
logarithms and technology.

UNIT 6:

Exponential and Logarithmic Functions

Learning Goal 4:

Graph logarithmic functions expressed symbolically and show key features of the g

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Learning Goal 5:

Use properties of logarithms.

Learning Goal 6:

Solve exponential and logarithmic equations and inequalities using properties of ex

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Learning Goal 1:

Classify and write direct and inverse variation equations.

Learning Goal 2:

For rational functions, interpret key features of graphs, including intercepts and asy of the relationship.

UNIT 7:

Rational Functions

Learning Goal 3:

Perform operations on rational expressions, including addition, subtraction, multipl

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Learning Goal 4:

Solve rational equations and inequalities in one variable, use them to solve problem equations and inequalities in one variable and use them to solve problems.

Learning Goal 1:

Define and use sequences and series.

Learning Goal 2:

Analyze arithmetic sequences and series.

UNIT 8: Sequences and Series

Learning Goal 3:

Analyze geometric sequences and series.

Learning Goal 1:

Identify sample spaces and find theoretical and experimental probabilities.

UNIT 9:

Learning Goal 2:

Probability and Statistics

Analyze independent and dependent events.

Learning Goal 3:

Use two-way tables to calculate probabilities.

Learning Goal 4:

Use the mean and standard deviation of a data set to fit it to a normal distribution, e
estimate areas under the normal curve).

Learning Goal 5:

Explore populations, samples, collecting data, and analyzing hypotheses.

Learning Goal 1:

Derive the equation of a parabola given a focus and directrix; graph a parabola, ide

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Learning Goal 2:

UNIT 10:

Conic Sections

(as time permits)

Derive the equation of a circle given features of the graph; graph a circle, identifyin

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Learning Goal 3:

Derive the equation of an ellipse given features of the graph; graph an ellipse, ident

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Learning Goal 4:

Derive the equation of a hyperbola given features of the graph; graph a hyperbola, i

NJ Student Learning Standards

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.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
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.A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
MA.N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
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.A-SSE.A.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity.
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.A-SSE.B.4	Derive and/or explain the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.
MA.F-IF.C.7b	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
MA.F-IF.C.7c	Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
MA.F-IF.C.7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
MA.S-IC.A.1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
MA.A-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 $p(x)$.
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.A-APR.B.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
MA.S-IC.A.2	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
MA.F-IF.C.8b	Use the properties of exponents to interpret expressions for exponential functions.
MA.S-IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies
MA.N-CN.C.7	Solve quadratic equations with real coefficients that have complex solutions.
MA.F-IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MA.S-IC.B.3	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
MA.S-IC.B.4	Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
MA.A-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.
MA.S-IC.B.5	Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
MA.N-CN.C.9	Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.
MA.S-IC.B.6	Evaluate reports based on data.
MA.A-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.
MA.F-BF.A.1b	Combine standard function types using arithmetic operations.
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
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.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.A-REI.A.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
MA.F-LE.A.4	Understand the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to ab to the ct power = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.
MA.F-TF.A.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
MA.F-TF.C.8	Prove the Pythagorean identity $sin^2(\theta) + cos^2(\theta) = 1$ and use it to find $sin(\theta)$, $cos(\theta)$, or $tan(\theta)$ given $sin(\theta)$, $cos(\theta)$, or $tan(\theta)$ and the quadrant of the angle.

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.

Grading and Evaluation Guidelines

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 Details

SCED

02056 Algebra II Accelerated

Algebra II course topics typically include field properties and theorems; set theory; operations with rational and irrational expressions; factoring of rational expressions; in-depth study of linear equations and inequalities; quadratic equations; solving systems of linear and quadratic equations; graphing of constant, linear, and quadratic equations; properties of higher degree equations; and operations with rational and irrational exponents.