Cliffside Park Public Schools

COURSE OF STUDY UNIT PLANNING GUIDE FOR:
Algebra 1

Grade Level:
8th or 9th

Cliffside Park School District
Cliffside Park, NJ 07010
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Course Overview:

Algebra 1 course looks into the structure of expressions. Student learn how to interpret expressions and write equivalent forms to solve problems. Arithmetic operations are extended to polynomials and rational functions. The understanding of significant values such as the zeros and factors of polynomials is used throughout the course. Students create equations and define functions that model relationships between numbers. Students are expected to explain their reasoning when they obtain a solution or solve an equation or an inequality. Students are introduced to various representations of problems such as graphic, tabular and algebraic.

Overview of Units:

1. Modeling with Linear Equations and Inequalities

2. Modeling with Linear Functions, Linear Systems, & Functions

3. Quadratic Equations, Functions, and Polynomials

4. Modeling with Statistics

Unit 2 Algebra 1		
NJSLS-M Content Standards	**NJSLS-M Standards for Mathematical Practice**	**Critical Knowledge & Skills**
NJSLS-Technology: 8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue. **Career Ready Practices:** CRP2. apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP11. Use technology to enhance productivity	MP.3 Construct viable arguments & critique the reasoning of other MP4 Model with mathematics MP5. Use appropriate tools strategically MP.6 Attend to precision.	Students must learn to collaborate with others to perform specific tasks. Students must defend their answers with reason and communicate effectively. Students must be able to use technology effectively to find the correct answers and justify their claims.
• S.ID.B.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S.ID.B.6a. Fit a function to the data (including the use of technology); 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.	MP.1 Make sense of problems and persevere in solving them. MP 2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	Concept(s): • Scatter plots represent the relationship between two variables. • Scatter plots can be used to determine the nature of the association between the variables. • Linear models may be developed by fitting a linear function to approximately linear data. • The correlation coefficient represents the strength of a linear association. Students are able to: • distinguish linear models representing approximately linear data from linear. equations representing “perfectly” linear relationships.

S.ID.B.6c. Fit a linear function for a scatter plot that suggests a linear association. • S.ID.C.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. • S.ID.C.8. Compute (using technology) and interpret the correlation coefficient of a linear fit. • S.ID.C.9. Distinguish between correlation and causation.		• create a scatter plot and sketch a line of best fit. • fit a linear function to data using technology. • solve problems using prediction equations. • interpret the slope and the intercepts of the linear model in context. • determine the correlation coefficient for the linear model using technology. • determine the direction and strength of the linear association between two variables. Learning Goal 1: Represent data on a scatter plot, describe how the variables are related and use technology to fit a function to data. Learning Goal 2: Interpret the slope, intercept, and correlation coefficient of a data set of a linear model; distinguish between correlation and causation.
• F..BF.A.3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, 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. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	MP.3 Construct viable arguments and critique the reasoning of others. MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concept(s): • Characteristics of even and odd functions in graphs and algebraic expressions • Vertical and horizontal shiftsF.BF Students are able to: • perform transformations on graphs of linear and quadratic functions. • identify the effect on the graph of replacing f(x) by – $f(x) + k$; – $k f(x)$;

		– *f*(*kx*); – *and f*(*x* + *k*) for specific values of *k* (both positive and negative). • identify the effect on the graph of combinations of transformations. • given the graph, find the value of k. • illustrate an explanation of the effects on linear and quadratic graphs using technology. • recognize even and odd functions from their graphs and from algebraic expressions for them. Learning Goal 3: Identify the effects of transformations and combinations of transformations [*f*(*x*) + *k*, *k f*(*x*), *f*(*kx*), and *f*(*x* + *k*)] on a function; find the value of k given the graph.
• F.IF.A.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.A.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. • F.IF.B.5* Relate the domain of a function graph and where applicable, to the quantitative relationship it describes.	MP 2 Reason abstractly and quantitatively. MP.6 Attend to precision. MP 7 Look for and make use of structure.	Concept(s): • F(x) is an element in the range and x is an element in the domain. Students are able to: • use the definition of a function to determine whether a relationship is a function. • use function notation once a relation is determined to be a function. • evaluate functions for given inputs in the domain. • explain statements involving function notation in the context of the problem. • use the domain to identify limits on the functions domain, ex> where x > 0 for f(x) = x

		Learning Goal 4: Explain the definition of a function, including the relationship between the domain and range. Use function notation, evaluate functions and interpret statements in context.
• F.IF.B.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.A.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).	MP 1 Making sense of problems and persevere in solving them. MP 2 Reason abstractly and quantitatively. MP 7 Look for and make use of structure.	Concept(s): • Some functions have a limited domain • Some functions have domains of all real numbers Students are able to: • Graph a solution given a limited domain (a non continuous graph) • Graph a function given domain of all real numbers • Distinguish between the two Learning Goal 5: Understand the concepts of domain being discrete or continuous, graph both solutions and explain the differences.
• A.REI.C.6. Solve systems of linear equations exactly and approximately e.g.,with graphs), focusing on pairs of linear equations in two variables. • A.REI.C.11 Explain why the x-coordinates of the points where the graphs of the equation y=f(x) and y=g(x) intersect are the solutions of the equations *f(x) = g(x)*; find the solutions	MP.1 Make sense of problems and persevere in solving them. MP 2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically.	Concept(s): No new concept(s) introduced Students are able to: • model real world situations by creating a system of linear equations given a context. • interpret the solution(s) in context from graphs and equations

approximately, e.g., using technology to graph the functions, mak 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.CED.A.2. Creating equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales,	MP.6 Attend to precision.	Learning Goal 6: Graph linear equations and systems of linear equations in two variables and explain that the solution to the system is a point. Learning Goal 7: Explain why the solutions of the equation f(x) = g(x) are the x-coordinates of the points where the graphs of the linear equations y=f(x) and y=g(x) intersect. ** *function notation is not introduced here* Learning Goal 8: Understand constraints; represent graphically or by use of equations/inequalities or systems of equations or systems of inequalities
• A.REI.C.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.C.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. • 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. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods*.	MP.1 Make sense of problems and persevere in solving them. MP 2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics.	Concept(s): • Systems of equations can be solved exactly (algebraically) and approximately (graphically). Students are able to: • identify and define variables representing essential features for the model. • model real world situations by creating a system of linear equations. • solve systems of linear equations using the elimination or substitution method. • solve systems of linear equations by graphing. • interpret the solution(s) in context.

		Learning Goal 9: Solve multi step contextual problems by identifying variables, writing equations, and solving systems of linear equations in two variables algebraically and graphically.
• A.REI.D.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. • 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. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods*.	MP.1 Make sense of problems and persevere in solving them. MP 2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	Concept(s): No new concept(s) introduced Students are able to: • model real world situations by creating a system of linear inequalities given a context. • interpret the solution(s) in context. Learning Goal 10: Graph linear inequalities and systems of linear inequalities in two variables and explain that the solution to the system.
• N.RN.A.1 Explain how the definition 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. • N.RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. • A.SSE.B.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Look for and make use of structure. MP.6 Attend to precision. MP.7 Look for and make use of structure	Concept(s): • Rational exponents are used to represent roots • Rational exponents can be used to simplify arithmetic operations on radical expressions. • Rational exponents can represent radical expressions Students will be able to: • evaluate and simplify expressions containing rational exponents • Simplify negative and zero exponents. • Simplify rational expressions • Interchange notation for expressing rational expressions

represented by the expression. A.SSE.B.3c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.* *[Algebra 1: limit to exponential expressions with integer exponents]		• Simplify expressions with rational exponents • Use properties of exponents to simplify expressions • Use the properties of exponents to simplify or expand exponential expressions, recognizing these are equivalent forms. Learning Goal 11: Use properties of exponents to produce equivalent forms of exponential expressions in one variable.

Unit 2 Algebra 1 What This May Look Like	
District/School Formative Assessment Plan	**District/School Summative Assessment Plan**
Homework, IXL practice, do nows, exit tickets, surveys, projects, teacher made chapter tests and quizzes.	Benchmark Assessment for indicated unit. Type of assessment to be unanimously determined by department.

Alternative Assessment

Journaling
Problems worked out partially
Using manipulatives to gauge understanding and develop reasoning skills
Using questioning strategies in TE.
Creating scaffolding questions on test
Online tests
Questions tied to Real-World scenarios
Projects

Focus Mathematical Concepts

Prerequisite skills:

- Represent and solve equations graphically
- Reason quantitatively and use units to solve problems
- Solve [linear] equations and inequalities in one variable
- Understand solving equations as a process of reasoning and explain the reasoning
- Create equations that describe numbers or relationships
- Interpret the structure of expressions
- Summarize, represent, and interpret data on quantitative variables.

Common Misconceptions:

- The notation $f(x)$ does not mean "f multiplied by x."
- The notation $f(x)$ represents the range, or y-values.
- A vertical, not horizontal, line test can help to verify graphically that a relationship is a function of x. The vertical line test should not be the only justification for determining whether a relation is a function.
- Students may have difficulty accurately describing increasing and decreasing behavior, confusing it with when the y-values are positive or negative.
- Students often confuse the x- and y-axes when graphing.

- Students may confuse statements of causation with statements of correlation.
- Students may think that a correlation coefficient close to 1 or -1 guarantees that the linear model is the best fit.
- Students may struggle with the interpretation of the slope and *y*-intercept in the context of the real-world situation.
- It may be difficult for students to understand that a regression model is only a predictor and may not accurately represent the observed data.
- Students may not understand the case in which a system of linear equations has infinitely many solutions, if this is not introduced in a real-world context.
- Algebraically, students arriving at 0=0 may think the solution is at point (0, 0) rather than a system with infinite solutions. Students arriving at -5=0 may think the solution is at point (-5, 0) rather than a system with no solutions.
- Students may have confusion with what the solution set is for a linear inequality or system of linear inequalities.
- Students may not consider points on the boundary lines as potential solutions to inequalities.

District/School Tasks	District/School Primary and Supplementary Resources
District Benchmarks End of Year Projects	Holt McDougal Algebra 1 Common Core Edition 2012 and online website. Big Ideas Algebra 1 (Honors classes) www.IXL.com www.Khanacademy.com www.desmos.com www.illustrativemathematics.org www.GeoGebra.com Graphing Calculator

Interdisciplinary Connections

NJSLS for ELA and Science are introduced, developed, and practiced in the context of learning math content and engaging in mathematical practices.

ELA

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
W.11-12.2.D Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

Science

NJSLS: 21st Century Life and Careers

9.1.12.B.6 Design and utilize a simulated budget to monitor progress of financial needs.
9.1.12.C.2 Compare and compute interest and compound interest and develop an amortization table using business tools.
9.1.12.C.3 Compute and assess the accumulating effect of interest paid over time when using a variety of sources of credit.

Career Ready Practices: Today's students need to develop thinking skills, content knowledge, and social and emotional competencies to navigate complex life and work environments.

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity

NJSLS Technology Standards

Students will participate in activities on Google Classroom and other online resources, Desmos. GeoGebra, IXL

8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
8.1.12.A.4 Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all the worksheets to convey the results.

Integrated Differentiation/Accommodations/Modifications for Math Algebra 1 Unit 2 *(Alternate Modes of Instruction and Support)*		
Modifications to Support Gifted and Talented Students	**Modifications to Support English Language Learners**	**Modifications to Support Our Learners (Students with IEPs/504s and At-Risk Learners)**
Integrate Higher Order Thinking Skills (HOTS) through questioning and extension projects specific to linear equations, inequalities and functions Provide menu of challenge activities for when the child finishes the lesson early (integrate technology when possible). College/Career Readiness skill enhancement - G & T students can research professions related to the Algebra. Have the student teach the lesson - peer tutoring (research-based strategy) Accelerate pace for students who are advanced in concepts. Use inquiry-based, discovery learning approaches that emphasize open-ended problems with multiple solutions or multiple paths to solutions. Allow students to design their own ways to find the answers to complex questions. Leveled Questions assignments for classwork and homework. Challenge Problems	**Concept/Idea Map** - teacher models note-taking on the modeling associated with linear functions, linear systems and functions. **Contextualize language** for the following key vocabulary terms: **Scatter Plot, Correlation, line of best fit,Trend Lines; least-square line, linear regression, correlation coefficient; transformation, absolute-value function, axis of symmetry, vertex; relation, domain, range, function; independent variable;dependent variable; function rule; function notation; system of linear equations; solution of a system of linear equations; consistent system, inconsistent system, independent system;,dependent system;linear inequality, solution of a linear inequality; system of linear inequalities; solutions of a system of linear inequalities; index; rational exponents;** **Visuals and illustrations** to be used for comprehension of lines of best fit, positive correlation, negative correlation,no correlation, trend lines, residual, least-square line, line of best	Review student individual educational plan and/or 504 plan for instructional, assessment, and environmental supports. Allow student to use calculator to solve scatter plots; lines of correlation; absolute value function transformations; systems of linear equations; and systems of linear inequalities. Teach students how to check the accuracy of the solution that was derived from use of the graphing calculator. Provide manipulatives to aid in solving systems of equations (algebra tiles). Utilize manipulatives and/or visuals within instructional presentation of modeling linear functions, linear systems and inequalities ans well as absolute value functions. to support visual learners. Teach students how to check the accuracy of the solution that was derived from use of the calculator or other method. Provide graph paper to aid in aligning system of equations or system of inequalities properly.

	fit, correlation coefficient, solutions of systems of equations and systems of inequalities. Use graphing calculator and Desmos. **Word/picture bank** available for students' reference; as well as Spanish translation through Google or their textbooks. **Wait Time Two** - extend basic "Wait Time" - after the 1st student responds to a question, the teacher waits an additional 5 - 7 seconds before calling on another student to ask a question about scatter plots, correlations and lines of best fit; **Native Language Supports:** Working with peer, online assistive technology, translation device, bilingual dictionary. Teach the text backward - **frontload** the concepts and vocabulary needed for learning the material and activating prior knowledge (about…). Use a **word square** to teach target academic vocabulary for the unit. Reading Strategies Worksheets Reteach Worksheets Leveled Practice Problems	Utilize graphic organizer or partially completed template for students to solve system problems. Provide study guides that are partially completed by teacher, allowing the student to fill in missing information during instruction in order to aid in obtaining information pertaining to modeling linear functions and solving linear systems. Utilize visual aids such as charts or graphs connected to linear functions or systems of equations or system of inequalities and provide explicit instruction in how to analyze or use the data or information. By utilizing individual student assessment results, the teacher will provide small group or remedial instruction to review essential questions/big ideas of linear functions or systems of equations or system of inequalities, to provide additional explanations, more examples, and to model procedures in finding the solutions to particular problems. Provide wait time to allow students to process orally presented information and questions relating to the Unit 2. Access to word/picture banks to develop an understanding and use content-specific vocabulary, such as those listed under **Contextualize language.** Allow for Student Choice: Students should be permitted to demonstrate understanding of content through illustrations, computer projects, oral response, creative presentations or demonstration, etc. Support comprehension of unknown vocabulary, by providing examples of Note-taking, highlighting, underlining, etc. Students should be allowed given copies of grade level material or text so they can highlight or underline pertinent information.

		Text to speech/Oral reading Provide students with flexible seating options while working independently, depending on need or preference. Math-specific vocabulary and literary terms should be pre-taught before teaching relevant concepts. Allow extra time to complete in class written assignments. Provide students with a sample problem or list of steps or procedures for multi-step solutions to problems. Allow student to reference these procedures when solving independently. Reduce the number of assigned problems within Unit 2. Provide models or templates to teach the structure of how to solve problems systematically. If necessary, provide additional set of materials or online access so that students can utilize resources at school and home. Provide study guide for students to review before Unit 2 quizzes and tests. Modify tests to address big ideas/essential questions of Unit 2. Reading Strategies Worksheets Reteach Worksheets Leveled Practice Problems

Edit History:

July 2017 Update CCSS to NJSLS-M

August 2018 Correlation with pacing guide; Include differentiated instruction blueprint for units.