



BOE Approved 8/18

Cliffside Park Public Schools

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COURSE OF STUDY UNIT PLANNING GUIDE FOR: Pre-Algebra Unit 2

Grade Level:
9th

Cliffside Park School District
Cliffside Park, NJ 07010
www.cliffsidepark.edu

Revised on August 2018



Course Overview:

Pre-Algebra is an introductory algebra course designed to prepare students for higher level mathematics. Pre-Algebra will review basic math concepts regarding number sense and the rules regarding math operations and the order of implementation. Students will extend their elementary skills and begin to learn algebra concepts that serve as a transition into formal Algebra and Geometry.

High School Standards listed in conceptual categories:

- ❖ Number and Quantity
- ❖ Algebra
- ❖ Functions
- ❖ Modeling
- ❖ Geometry
- ❖ Statistics and Probability

Overview of Units:

1. Integers, Fractions & Decimals, Exponents, Square Roots, Order of Operations
2. Algebraic Expressions, Solving Equations, Inequalities, Functions, Ratios, Unit Rates & Percents
3. Linear Equations & Slope, Area, Perimeter, Volume, Surface Area, and Pythagorean Theorem
4. More Exponents, Scientific Notation, Polynomials, Probability, and Data Analysis



Unit 2 Pre-Algebra		
Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
<ul style="list-style-type: none"> ● A-CED.A.1. Create equations and inequalities in one variable and use them to solve problems. ● 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 ● A-REI.A.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. ● A-REI.B.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters 	<p>MP. 1 Make sense of problems and persevere in solving them.</p> <p>MP.2 Reason abstractly and quantitatively.</p> <p>MP.3 construct viable arguments & critique the reasoning of others.</p> <p>MP.4 Model with mathematics.</p> <p>MP.5 Use appropriate tools strategically.</p> <p>MP. 6 Attend to precision.</p> <p>MP. 7 Look for and make use of structure.</p> <p>MP. 8 Look for and express regularity in repeated reasoning.</p>	<p>Concept(s):</p> <ul style="list-style-type: none"> ● Solving linear equations and inequalities in one variable ● Linear equations may have an infinite number of solutions. ● Linear equations may have no solution or a single solution. <p>Students are able to:</p> <ul style="list-style-type: none"> ● solve multi-step real-life problems using rational numbers in any form. <ul style="list-style-type: none"> ● solve multi-step mathematical problems using rational numbers in any form. ● convert between decimals and fractions and apply properties of operations when calculating with rational numbers. ● estimate to determine the reasonableness of answers. ● compare an arithmetic solution to a word problem to the algebraic solution of the word problem, identifying the sequence of operations in each solution. ● write an equation of the form $px + q = r$ or $p(x + q) = r$ in order to solve a word problem. ● fluently solve equations of the form $px + q = r$ and $p(x + q) = r$. ● write an inequality of the form $px + q > r$, $px + q < r$, $px + q \geq r$ or $px + q \leq r$ to solve a word problem. ● graph the solution set of the inequality. ● interpret the solution to an inequality in the context of the problem.
	<p>MP.5 Use appropriate tools strategically.</p> <p>MP.6 Attend to precision.</p>	<ul style="list-style-type: none"> ● give examples of linear equations in one variable with one solution ($x = a$), infinitely many solutions ($a = a$), or no solutions ($a = b$.) ● transform a given equation, using the properties of equality, into simpler forms.



		<ul style="list-style-type: none">• transform a given equation until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (<i>a and b are different numbers</i>).<ul style="list-style-type: none">• solve linear equations that have fractional coefficients; include equations requiring use of the distributive property and collecting like terms. <p>Learning Goal :</p> <ul style="list-style-type: none"><input type="checkbox"/> Create equations that describe numbers or relationships<input type="checkbox"/> Understand solving equations as a process of reasoning and explain the reasoning<input type="checkbox"/> Define a function as a rule that assigns one output to each input and determine if data represented as a graph or in a table is a function.<input type="checkbox"/> Functions (quantitative relationships) can be represented in different ways.<input type="checkbox"/> Functions have properties; properties of linear functions. <p>Students are able to:</p> <ul style="list-style-type: none">• analyze functions represented algebraically, as a table of values, and as a graph.• interpret functions represented by a verbal description.• given two functions, each represented in a different way, compare their properties <p>Students are able to:</p> <ul style="list-style-type: none">• compute unit rates with ratios of fractions.• compute unit rates with ratios of fractions representing measurement quantities. in both like and different units of measure. <p>Learning Goal : Calculate and interpret unit rates of various quantities involving ratios of fractions that contain like and different units.</p> <p>Concept(s):</p> <ul style="list-style-type: none">• Proportions represent equality between two ratios.• Constant of proportionality <p>Students are able to:</p>
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		<ul style="list-style-type: none"> • use tables and graphs to determine if two quantities are in a proportional relationship. • identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. • write equations representing proportional relationships. • Interpret the origin and $(1, r)$ on the graph of a proportional relationship in context. • interpret a point on the graph of a proportional relationship in context. <p>Learning Goal : Determine if a proportional relationship exists between two quantities e.g. by testing for equivalent ratios in a table or graph on the coordinate plane and observing whether the graph is a straight line through the origin.</p> <p>Learning Goal : Identify the constant of proportionality (unit rate) from tables, graphs, equations, diagrams, and verbal descriptions.</p> <p>Learning Goal : Write equations to model proportional relationships in real world problems.</p> <p>Learning Goal : Use the graph of a proportional relationship to interpret the meaning of any point (x, y) on the graph in terms of the situation - including the points $(0, 0)$ and $(1, r)$, recognizing that r is the unit rate.</p>
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District/School Formative Assessment Plan	District/School Summative Assessment Plan
<ul style="list-style-type: none"> • Homework • IXL Practice • Daily Do Now • Exit Tickets • Surveys • Projects • Teacher made chapter tests • Quizzes 	Benchmark Assessment (or Project) for indicated unit. Type of assessment to be unanimously determined by department.
Alternative Assessments	



Projects

[MARS Performance Tasks](#)

Modified assignments

Focus Mathematical Concepts

Concepts:

- Solving Two-Step Equations
- Solving Equations Having Like Terms and Parentheses
- Solving Equations with Variables on Both Sides
- Solving Inequalities Using Addition or Subtraction
- Solving Inequalities Using Multiplication or Division
- Solving Multi-Step Inequalities
- Rational Numbers
- Using Multiplicative Inverses to Solve Equations
- Equations and Inequalities with Rational Numbers
- Ratios and Rates
- Writing and Solving Proportions
- Solving Proportions Using Cross Products
- Identifying Functions
- Evaluating Functions
- Solving Simple Radical Functions

Essential Understanding:

- Algebraic expressions can be used to represent and solve problems in real-world contexts.
- Rearranging or combining like terms does not change the value of an expression.
- All like terms must be combined in order for expressions to be simplified.
- Expanded expressions represent an equivalent way to represent the original expression.
- The distributive property and common factors are used to factor expressions.
- Many real-world problem situations can be represented with a mathematical model, but that model may not represent a real-world situation exactly.
- The same rules apply for coefficients and constants when adding expressions.
- Add the inverse when subtracting expressions.
- Understanding mathematical structure is important for solving deeper, unconventional expressions.
- Equations with more than one operation can be used to represent a situation.
- One-and two-step problems are both solved using the properties of equality.
- The distributive property can be used to solve equations in the form $p(x + q) = r$.
- Combining like terms that are on one side of an equation makes it easier to solve for the variable by using inverse operations
- To solve a linear equation that has variable terms on both sides of the equation, first use inverse operations to move all variable terms to one side of the equation and constant terms to the other. Then, isolate the variable.
- The Distributive Property is an important tool for simplifying expressions and combining like terms.



	<ul style="list-style-type: none"> • Equations with one variable can have zero, one, or infinitely many solutions. • A relation is a set of ordered pairs. A function is a relation in which each input, or x-value, has exactly one output, or y-value. Arrow diagrams and tables can be used to determine whether a relation is a function. • Different representations, such as equations, tables, and graphs, can represent a function. The graph of a linear function is a straight line; the graph of a nonlinear function is not a straight line. • Two functions presented in different representations can be compared by looking at their properties: initial value and constant rate of change. • Many real-world problem situations can be represented with a mathematical model, but that model may not represent a real-world situation exactly. • A function that represents a linear relationship between two quantities can be represented by an equation written in the form $y = mx + b$. • The relationship between two quantities can be represented in a qualitative graph that shows the behavior of the function in different intervals. • You can use what you know about the behavior of a function in different intervals to sketch a qualitative graph of a function.
<p>District/School Tasks</p>	<p>District/School Primary and Supplementary Resources</p>
<p>Benchmark Assessment (or Project) for indicated unit. Type of assessment to be determined by department.</p>	<ul style="list-style-type: none"> • Holt-McDougal Larson Pre-Algebra Text and Online Resources • IXL • Manipulatives • Scientific Calculator
<p>Modifications For ELL/IEPs/504s/At-Risk Learners:</p>	<p>Modifications for Gifted And Talented</p>
<p>Translated Notes Shorten assignments to focus on mastery of key concepts Provide visual aids Differentiating the Lesson: Depending on individual IEP or student understanding Allow the student to use a calculator without penalty</p> <ul style="list-style-type: none"> • Group similar problems together • Provide fewer problems on a worksheet (e.g., 4 to 6 problems per page rather than 20 or 30 but the same total number of problems) • Use enlarged graph paper to help the student keep numbers in columns 	<p>Give pre-assessments so that students who already know the material do not have to repeat Use multiple resources. Use inquiry-based, discovery learning approaches that emphasize open-ended problems with multiple solutions or multiple paths to solutions. Provide some activities that can be done independently or in groups based on student choice. Start the Next Section Individualized Projects by Interest</p>



- Provide a table of math facts for reference (unless testing math facts)
- Tape a number line to student's desk
- Read and explain word problems or break problems into smaller steps
- Use pictures or graphics
- Circle math computation signs
- Require the student to solve fewer problems to focus on mastery of concepts

IXL
 Khan Academy in Spanish

Vocabulary

- Two-Step Equations
- Inequalities
- Multi-Step Inequalities
- Rational Numbers
- Multiplicative Inverses
- Ratios
- Rates
- Cross Products
- Functions
- Simple Radical Functions

Interdisciplinary Standards

ELA

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

RST.6-8.4. 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 6-8 texts and topics.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

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NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

WHST.6-8.1. Write arguments focused on discipline-specific content.

- A. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- B. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- C. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
- D. Establish and maintain a formal/academic style, approach, and form.
- E. Provide a concluding statement or section that follows from and supports the argument presented.

WHST.6-8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

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.

NJSLS-Technology:

Students will use Desmos, GeoGebra or the TI-84 calculator to assist in graphing and analyzing these equations. They will discuss their findings with the instructor and their classmates. 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.

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

21st Century Life and Career:



- 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.



Integrated Differentiation/Accommodations/Modifications for Pre-Algebra (High School) (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)
<p>Integrate Higher Order Thinking Skills (HOTS) through questioning and extension projects specific to linear equations, inequalities and functions</p> <p>Provide menu of challenge activities for when the child finishes the lesson early (integrate technology when possible).</p> <p>College/Career Readiness skill enhancement - G & T students can research professions related to the Algebra.</p> <p>Have the student teach the lesson - peer tutoring (research-based strategy) Accelerate pace for students who are advanced in concepts.</p> <p>Use inquiry-based, discovery learning approaches that emphasize open-ended problems with multiple solutions or multiple paths to solutions.</p> <p>Allow students to design their own ways to find the answers to complex questions.</p>	<p>Concept/Idea Map - teacher models note-taking on conceptual and concrete mathematics.</p> <p>Contextualize language See each lesson for specific vocabulary</p> <p>Visuals and illustrations to be used for all concrete terms.</p> <p>Word/picture bank available for students' reference in classroom, online and in their textbooks.</p> <p>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 this unit.</p> <p>Native Language Supports (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 vocabulary, see specific lesson for vocabulary list.</p> <p>Use a word square to teach target academic vocabulary for this unit.</p> <p>Support comprehension of unknown vocabulary, by</p>	<p>Review student individual educational plan and/or 504 plan for instructional, assessment, and environmental supports.</p> <p>Allow student to use calculator to solve problems without penalty depending on 504,</p> <p>Teach students how to check the accuracy of the solution that was derived from use of the graphing calculator.</p> <p>Utilize manipulatives and/or visuals within instructional presentation of functions and their changes.</p> <p>Teach students how to check the accuracy of the solution that was derived from use of the calculator or other method.</p> <p>Provide graph paper to aid in aligning calculations and graphing or sketching functions.</p> <p>Provide a table of math facts for reference (unless testing math facts)</p> <ul style="list-style-type: none"> • Tape a number line to student's desk • Read and explain word problems or break problems into smaller steps



<p>Provide some activities that can be done independently or in groups based on student choice.</p> <p>Start the Next Section</p> <p>Individualized Projects by Interest</p>	<p>providing examples of Note-taking, highlighting, underlining, etc.</p> <p>Students should be given copies of grade level material or text so they can highlight or underline pertinent information.</p> <p>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.</p> <p>Modifications For ELL/IEPs/504s/At-Risk Learners: Modifications for Gifted And Talented</p> <p>Translated Notes Shorten assignments to focus on mastery of key concepts</p> <p>Provide visual aids</p> <p>Differentiating the Lesson:</p> <ul style="list-style-type: none"> • Group similar problems together • Provide fewer problems on a worksheet (e.g., 4 to 6 problems per page rather than 20 or 30 but the same total number of problems) • Use enlarged graph paper to help the student keep numbers in columns • Provide a table of math facts for reference (unless testing math facts) • Tape a number line to student's desk • Read and explain word problems or break problems into smaller steps • Use pictures or graphics • Circle math computation signs 	<ul style="list-style-type: none"> • Use pictures or graphics • Circle math computation signs • Require the student to solve fewer problems to focus on mastery of concepts <p>Utilize graphic organizer or partially completed template for students to solve word problems and other complex problems in the unit.</p> <p>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.</p> <p>Utilize visual aids such as charts or graphs connected to graphing and transformations and provide explicit instruction in how to analyze this data.</p> <p>By utilizing individual student assessment results, the teacher will provide small group or remedial instruction to review essential questions/big ideas, key concepts and provide additional explanations, more examples, and to model procedures in finding the solutions to particular problems.</p> <p>Provide wait time to allow students to process orally unit.</p> <p>Access to word/picture banks to develop an understanding and use content-specific vocabulary.</p> <p>Allow for Student Choice: Students should be permitted to demonstrate understanding of content through illustrations, computer projects,</p>
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	<ul style="list-style-type: none"> • Require the student to solve fewer problems to focus on mastery of concepts <p>IXL Khan Academy in Spanish</p> <p>Give pre-assessments so that students who already know the material do not have to repeat Use multiple resources.</p>	<p>oral response, creative presentations or demonstration, etc.</p> <p>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.</p> <p>Text to speech/Oral reading if necessary.</p> <p>Provide students with flexible seating options while working independently, depending on need or preference.</p> <p>Math-specific vocabulary and literary terms should be pre-taught before teaching relevant concepts.</p> <p>Allow extra time to complete in class written assignments.</p> <p>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.</p> <p>Reduce the number of assigned problems within a unit.</p> <p>Provide models or templates to teach the structure of how to solve problems systematically.</p> <p>If necessary, provide additional set of materials or online access so that students can utilize resources at school and home.</p> <p>Provide study guide for students to review before Unit quizzes or tests.</p>
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		<p>Provide models or templates to teach the structure of how to solve problems systematically.</p> <p>If necessary, provide additional set of materials or online access so that students can utilize resources at school and home.</p> <p>Modify tests to address big ideas/essential questions of the unit.</p>
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