



BOE Approved 8/18

**Cliffside Park Public Schools**

# **Cliffside Park Public Schools**

## **COURSE OF STUDY UNIT PLANNING GUIDE FOR: Pre-Algebra**

Grade Level:  
9th

Cliffside Park School District  
Cliffside Park, NJ 07010  
[www.cliffsidepark.edu](http://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



**SUBJECT: MATHEMATICS HIGH SCHOOL**  
**BOE APPROVAL: August 2018**

# Cliffside Park Public Schools

**GRADE: 9**



Unit 1 Pre-Algebra		
Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
<ul style="list-style-type: none"> <li>● <b>8.NS.A.1.</b> Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.</li> <li>● <b>8.NS.A.2.</b> Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., <math>\pi^2</math>).</li> <li>● <b>N.RN.B.3.</b> Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.</li> </ul>	<p>MP.2 Reason abstractly and quantitatively.</p> <p>MP.3 Construct viable arguments &amp; critique the reasoning of others.</p> <p>MP.5 Use appropriate tools strategically.</p> <p>MP.7 Look for and make use of structure.</p>	<p>Concept(s):</p> <ul style="list-style-type: none"> <li>● Classifying rational and irrational numbers</li> <li>● The process for multiplying and dividing fractions extends to multiplying and dividing rational numbers.</li> </ul> <p>Students are able to:</p> <ul style="list-style-type: none"> <li>● Distinguish between numbers that are rational and irrational</li> <li>● Approximate rational numbers in decimal expansions               <ul style="list-style-type: none"> <li>➤ For example, by truncating the decimal expansion of <math>\sqrt{2}</math>, show that <math>\sqrt{2}</math> is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.</li> </ul> </li> <li>● Show that the distance between two rational numbers on the number line is the absolute value of their difference.</li> <li>● State various examples of rational and irrational numbers               <ul style="list-style-type: none"> <li>➤ For example, rational: <math>\frac{2}{3}</math>, <math>\frac{4}{1}</math>, <math>\sqrt{16}</math> vs irrational: <math>\pi</math>, <math>\sqrt{3}</math>, <math>\sqrt{2}</math></li> </ul> </li> <li>● Perform operations between these numbers and determine whether the solutions rational are always/never/sometimes rational or irrational</li> </ul> <p>Learning Goals :</p> <ul style="list-style-type: none"> <li>❑ Describe real-world situations in which (positive and negative) rational numbers are combined, emphasizing rational numbers that combine to make 0.</li> <li>❑ Apply properties of operations as strategies to add, subtract, multiply, and divide rational numbers.</li> <li>❑ Solve mathematical and real-world problems involving addition, subtraction, multiplication, and division of signed rational numbers.</li> <li>❑ Apply the convention of order of operations to add, subtract, multiply and divide rational numbers.</li> </ul>



<ul style="list-style-type: none"> <li>● <b>8.EE.A.1.</b> Know and apply the properties of integer exponents to generate equivalent numerical expressions.</li> <li>● <b>8.EE.A.2.</b> Use square root and cube root symbols to represent solutions to equations of the form <math>x^2 = p</math> and <math>x^3 = p</math>, where <math>p</math> is a positive rational number.</li> </ul>		<p>Concept(s):</p> <ul style="list-style-type: none"> <li>● Working with radicals and integer exponents</li> </ul> <p>Students are able to:</p> <ul style="list-style-type: none"> <li>● Apply properties of exponents to generate equivalent expressions. <ul style="list-style-type: none"> <li>➤ For example, <math>3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27</math>.</li> </ul> </li> <li>● Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that <math>\sqrt{2}</math> is irrational.</li> </ul>
<ul style="list-style-type: none"> <li>● <b>A.SSE.A.1a</b> Interpret parts of an expression, such as terms, factors, and coefficients</li> </ul>	<p>MP.1 Make sense of problems and persevere in solving them.</p> <p>MP. 2 Reason abstractly and quantitatively.</p> <p>MP.7 Look for and make use of structure.</p>	<p>Concepts (s):</p> <ul style="list-style-type: none"> <li>● Rewriting expressions that represent a quantity in terms of its context.</li> </ul> <p>Students are able to:</p> <ul style="list-style-type: none"> <li>● Interpret parts of an expression, such as terms, factors, and coefficients</li> <li>● Add and subtract linear expressions having rational coefficients, using properties of operations.</li> <li>● Write expressions in equivalent forms to shed light on the problem and interpret the relationship between the quantities in the context of the problem.</li> </ul> <p>Learning Goals:</p> <ul style="list-style-type: none"> <li>❑ Apply the properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</li> <li>❑ Rewrite algebraic expressions in equivalent forms to highlight how the quantities in it are related.</li> </ul>



District/School Formative Assessment Plan	District/School Summative Assessment Plan
<ul style="list-style-type: none"> <li>● Homework</li> <li>● IXL Practice</li> <li>● Daily Do Now</li> <li>● Exit Tickets</li> <li>● Surveys</li> <li>● Projects</li> <li>● Teacher made chapter tests</li> <li>● Quizzes</li> </ul>	<p>Benchmark Assessment (or Project) for indicated unit. Type of assessment to be determined by department.</p>
<b>Alternative Assessments</b>	
<p>Projects  <a href="#">MARS Performance Tasks</a>            Modified assignments</p>	
<b>Vocabulary</b>	
<ul style="list-style-type: none"> <li>● Expressions and Variables</li> <li>● Powers and Exponents</li> <li>● Order of Operations</li> <li>● Comparing and Ordering Integers</li> <li>● Adding Integers</li> <li>● Subtracting Integers</li> <li>● Multiplying and Dividing Integers</li> <li>● Properties and Operations</li> <li>● The Distributive Property</li> <li>● Simplifying Variable Expressions</li> <li>● Variables and Equations</li> <li>● Solving Equations Using Addition or Subtraction</li> <li>● Decimal Operations and Equations</li> <li>● Rules of Exponents</li> <li>● Negative and Zero Exponents</li> </ul>	



**Focus Mathematical Concepts**

**Concepts:**

- Expressions and Variables
- Powers and Exponents
- Order of Operations
- Comparing and Ordering Integers
- Adding Integers
- Subtracting Integers
- Multiplying and Dividing Integers
- Properties and Operations
- The Distributive Property
- Simplifying Variable Expressions
- Variables and Equations
- Solving Equations Using Addition or Subtraction
- Decimal Operations and Equations
- Rules of Exponents
- Negative and Zero Exponents

**Essential Understanding:**

- An integer and its opposite are the same distance from 0 on a number line and have a sum of 0.
- Adding integers required adding or subtracting their absolute values and understanding the sign of the sum.
- Subtracting a number is the same as adding that number's additive inverse.
- Adding and subtracting integers is related to adding and subtracting other rational numbers.
- The sign of the product is determined by the signs of the factors in a multiplication expression.
- The same properties used to multiply integers also apply when multiplying rational numbers.
- The relationship between multiplication and division can be useful when dividing positive and negative integers.
- Dividing rational numbers is similar to dividing integers. The sign of the quotient depends on the signs of the dividend and the divisor.
- To find the square root of a number, find the factor whose square is equal to that number. To find a cube root, find the factor whose cube is equal to that number.
- The properties of exponents are used to simplify expressions by adding, subtracting, multiplying, or dividing either the base or the exponent.
- Any nonzero number raised to the power of zero is equal to 1. Any nonzero number raised to a negative power is equal to its multiplicative reciprocal.
- An estimate of a very small or very large quantity can be written as a single digit times a power of ten.
- The Distributive Property is an important tool for simplifying expressions and combining like terms.
- Every real number is either a rational number or an irrational number.
- Rational and Irrational numbers can be compared and ordered using decimal approximations.
- Equivalent ratios and unit rates can be used to compare ratios and solve problems.



	<ul style="list-style-type: none"> <li>• A unit rate can be easier to use to solve problems than a ratio of fractions.</li> <li>• Quantities in a proportional relationship can be described by equivalent ratios.</li> <li>• Equations in the form <math>y=kx</math>, where <math>k</math> is the constant of proportionality, can be used to represent proportional relationships and solve problems.</li> <li>• Many real-world problem situations can be represented with a mathematical model, but that model may not represent a real-world situation exactly.</li> <li>• The graph of a proportional relationship is straight line through the origin.</li> <li>• By recognizing proportional quantities, you can use what you know about proportional relationships to solve problems.</li> </ul>
<b>District/School Tasks</b>	<b>District/School Primary and Supplementary Resources</b>
Benchmark Assessments	<ul style="list-style-type: none"> <li>• Holt-McDougal Larson Pre-Algebra Text and Online Resources</li> <li>• IXL</li> <li>• Manipulatives</li> <li>• Scientific Calculator</li> </ul>
<b>Cross-Curricular Standards</b>	
<p><b>ELA</b></p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p><b>NJSLS-Technology</b></p>	





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.

**Career Ready Practices:**

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.

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



<b>Integrated Differentiation/Accommodations/Modifications for Pre-Algebra (High School)</b> <b>(Alternate Modes of Instruction and Support)</b>		
<b>Modifications to Support Gifted and Talented Students</b>	<b>Modifications to Support English Language Learners</b>	<b>Modifications to Support Our Learners (Students with IEPs/504s and At-Risk Learners)</b>
<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 &amp; 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</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</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</p>



<p>the answers to complex questions.</p> <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>vocabulary for this unit.</p> <p>Support comprehension of unknown vocabulary, by 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"> <li>• Group similar problems together</li> <li>• 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)</li> <li>• Use enlarged graph paper to help the student keep numbers in columns</li> <li>• Provide a table of math facts for reference (unless testing math facts)</li> </ul>	<p>testing math facts)</p> <ul style="list-style-type: none"> <li>• Tape a number line to student's desk</li> <li>• Read and explain word problems or break problems into smaller steps</li> <li>• Use pictures or graphics</li> <li>• Circle math computation signs</li> <li>• Require the student to solve fewer problems to focus on mastery of concepts</li> </ul> <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>
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	<ul style="list-style-type: none"> <li>• Tape a number line to student’s desk</li> <li>• Read and explain word problems or break problems into smaller steps</li> <li>• Use pictures or graphics</li> <li>• Circle math computation signs</li> <li>• Require the student to solve fewer problems to focus on mastery of concepts</li> </ul> <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>Allow for Student Choice: Students should be permitted to demonstrate understanding of content through illustrations, computer projects, 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>
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		<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> <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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