



BOE Approved 8/18

Cliffside Park Public Schools

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COURSE OF STUDY UNIT PLANNING GUIDE FOR:
Pre-Algebra Unit 3

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 3 Pre-Algebra		
Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
<ul style="list-style-type: none"> ● 8.EE.B.5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. ● G.GMD.A.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. ● G.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ● 8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. 	<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.6 Attend to precision.</p> <p>MP.7 Look for and make use of structure.</p>	<p>Concept(s):</p> <ul style="list-style-type: none"> ● Circumference <p>Students are able to:</p> <ul style="list-style-type: none"> ● solve problems by finding the area and circumference of circles. ● show that the area of a circle can be derived from the circumference. <p>Learning Goal : Know the formulas for the area and circumference of a circle and use them to solve problems. Give an informal derivation of the relationship between the circumference and area of a circle.</p> <p>Students are able to:</p> <ul style="list-style-type: none"> ● use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations. ● solve mathematical problems by writing and solving simple algebraic equations based on the relationships between and properties of angles (supplementary, complementary, vertical, and adjacent). <p>Learning Goal : Write and solve <i>simple</i> multi-step algebraic equations involving supplementary, complementary, vertical, and adjacent angles</p> <p>Students are able to:</p>



		<ul style="list-style-type: none"> ● solve real-world and mathematical problems involving area of two dimensional objects composed of triangles, quadrilaterals, and polygons. ● solve real-world and mathematical problems involving volume of three dimensional objects composed of cubes and right prisms. ● solve real-world and mathematical problems involving surface area of three-dimensional objects composed of cubes and right prisms. <p>Concept(s):</p> <ul style="list-style-type: none"> ● Categorical data: patterns of association can also be observed in bivariate categorical data through analyzing two-way tables containing frequencies or relative frequencies. <p>Students are able to:</p> <ul style="list-style-type: none"> ● construct and interpret a two-way frequency table containing data on two categorical variables. ● construct and interpret a two-way relative frequency table containing data on two categorical variables. ● describe any association between the two categorical variables using relative frequencies calculated for rows or columns. <p>Learning Goal : Construct two-way frequency tables and two-way relative frequency tables, and describe possible associations between two variables.</p> <p>Learning Goal : Solve real-world and mathematical problems involving area, volume and surface area of two- and</p>
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		<p>three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms</p> <p>Concept(s):</p> <ul style="list-style-type: none"> • Pythagorean Theorem • If the square of one side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle (Pythagorean theorem converse). <p>Students are able to:</p> <ul style="list-style-type: none"> • given a proof of the Pythagorean theorem, explain the proof. • given a proof of the converse of the Pythagorean theorem, explain the proof. <p>Learning Goal : Explain a proof of the Pythagorean Theorem and its converse.</p> <p>Concept(s): No new concept(s) introduced</p> <p>Students are able to:</p> <ul style="list-style-type: none"> • determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving two dimensional spaces. • determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving three dimensional spaces. <p>Learning Goal : Apply the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensional cases when solving real-world and mathematical problems.</p> <p>Concept(s): No new concept(s) introduced</p>
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		<p>Students are able to:</p> <ul style="list-style-type: none"> determine the distance between two points in a coordinate plane by drawing a right triangle and applying the Pythagorean Theorem. <p>Learning Goal : Use the Pythagorean Theorem to determine the distance between two points in the coordinate plane.</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 	<p>Benchmark Assessment (or Project) for indicated unit. Type of assessment to be unanimously determined by department.</p>
Alternative Assessments	
<p>Projects MARS Performance Tasks Modified assignments</p>	
Vocabulary	
<ul style="list-style-type: none"> Similar Figures Congruent Figures Scale Drawings The Percent Equation Percent Change Percent Application Square Roots The Pythagorean Theorem 	



- Real Numbers
- Distance Formula
- Midpoint Formulas
- Translations
- Reflections
- Symmetry
- Triangles
- Polygons
- Quadrilaterals
- Parallelograms
- Trapezoids
- Circumference
- Area of a Circle
- Surface Area
- Prisms
- Cylinders
- Pyramids
- Cones

Focus Mathematical Concepts

Concepts:

- Similar and Congruent Figures
- Similarity and Measurements
- Scale Drawings
- Percents and Fractions
- Percents and Proportions
- Percents and Decimals
- The Percent Equation
- Percent Change
- Percent Application
- Square Roots
- Simplifying Square Roots
- The Pythagorean Theorem
- Real Numbers

Enduring Understandings:

- The measure of angles that are formed by intersecting lines and rays can be determined when the relationships between different types of angles are known.
- The circumference and diameter of a circle, regardless of size, have a unique and constant ratio that is an irrational number symbolized by π .
- The formula for the area of a circle, $A = \pi r^2$, can be used to solve problems by substituting the known values for area (A) and/or radius (r) to solve for the unknown value.
- Many real-world problem situations can be represented with a mathematical model, but that model may not represent a real-world situation exactly.
- A cross section is a two-dimensional figure that is exposed when a three-dimensional figure that is exposed when a three-dimensional



- Distance and Midpoint Formulas
- Angle Relationships
- Angles and Parallel Lines
- Angles and Polygons
- Translations
- Reflections and Symmetry
- Rotations and Symmetry
- Triangles
- Polygons and Quadrilaterals
- Areas of Parallelograms and Trapezoids
- Circumference and Area of a Circle
- Surface Areas of Prisms and Cylinders
- Surface Areas of Pyramids and Cones
- Volumes of Prisms and Cylinders
- Volumes of Pyramids and Cones

figure is sliced by a plane.

- The surface area of a composite figure is the sum of the areas of its surfaces. The surface area of a 3-dimensional figure is the combined surface area of all the faces of the figure.
- To find the volume of a prism, find the area of the base (B) and multiply it by its height.
- If parallel lines are intersected by a transversal, then corresponding and alternate interior angles are congruent, and same-side interior angles are supplementary.
- The measure of an exterior angle of a triangle is equal to the sum of the measures of its remote interior angles.
- If two angles in one triangle are congruent to two angles in another triangle, the triangles are similar triangles.
- Formulas for finding the areas of polygons, such as rectangles, squares, triangles and circles, can be used to find the surface areas of cylinders, cones, and spheres.
- Finding the volume of a cylinder is an extension of finding the volume of a rectangular prism. The volume of a rectangular prism is the product of the area of its base and its height. Similarly, the volume of a cylinder is equal to the product of the area of its circular base and its height.
- The volume of a cone is $\frac{1}{3}$ the volume of a cylinder given that the bases have the same radius and the heights are the same. The formula for the volume of a cone is $V = \frac{1}{3}Bh$, where B is the area of its circular base and h is the height of the cone.
- The volume of a sphere and cone are proportionally related. The volume of a sphere is twice the volume of a cone that has the same circular base and height. The formula for the volume of a sphere is $V = \frac{4}{3}$
- πr^3 where r is the radius of the sphere.
- Many real-world problem situations can be represented with a mathematical model, but that model may not represent a real-world situation exactly.



District/School Tasks	District/School Primary and Supplementary Resources
<ul style="list-style-type: none"> ● Pythagorean Theorem Pennant ● Converse of the Pythagorean Theorem Maze 	<ul style="list-style-type: none"> ● Holt-McDougal Larson Pre-Algebra Text and Online Resources ● IXL ● Manipulatives ● Scientific Calculator

Interdisciplinary Standards
<p>ELA</p> <p>RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.</p> <p>WHST.6-8.1. Write arguments focused on discipline-specific content.</p> <p>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.</p> <p>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.</p> <p>C. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.</p> <p>D. Establish and maintain a formal/academic style, approach, and form.</p> <p>E. Provide a concluding statement or section that follows from and supports the argument presented.</p> <p>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.</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>



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>Provide some activities that can be done independently or in groups based on student</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 providing examples of Note-taking, highlighting,</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>choice.</p> <p>Start the Next Section</p> <p>Individualized Projects by Interest</p>	<p>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 • Require the student to solve fewer problems to 	<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, oral response, creative presentations or demonstration, etc.</p>
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	<p>focus on mastery of concepts</p> <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>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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