

Blue and Purple Room Math Curriculum

Math instruction, in both content and pace, is as individualized as possible, with Middle School students working in small groups based on skills. Students learn by practicing mathematical computation and by solving word problems based on real-world applications. Those students who seek further challenges will have opportunities to complete math projects related to the current topic of study, which extend their thinking. Students will be taught with a hands-on approach whenever possible. Proof of or explanations of why a given formula works will reinforce students' understanding. **Math instructors include Pre-Algebra Prep: Bina Bentley, Pre-Algebra, part 1: Julia Hall, Pre-Algebra, part 2: Jared Bond, Pre-Algebra, part 3: Ann Heaslip, HS Algebra: Molly Lucier, HS Algebra, HS Geometry: Seema Dalal.**

Pre-Algebra Prep Curriculum

The Pre-Algebra Prep (5th-grade Math) curriculum is based on common core standards and references the Virginia SOLs. It utilizes several resources, including but not limited to *Fifth-Grade Simplified Math*, *Eureka Math*, *Prodigy*, *Frax*, and *Reflex*. Pre-Algebra Prep's objectives are to develop whole-number, fraction, and decimal arithmetic fluency, along with reasoning, multi-step problem solving, and other skills to help students complete Pre-Algebra in later years. The following skills are covered in Pre-Algebra Prep:

- Place value:
 - Writing numbers in words
 - Writing numbers in expanded form
 - Comparing numbers using $<$, $>$, $=$
 - Rounding
 - Moving whole numbers and decimals by powers of ten
- Decimal arithmetic:
 - Comparing and ordering decimals
 - Rounding decimals
 - Adding and subtracting decimals
 - Single, double, and then multi-digit multiplication and division with whole numbers and decimals
- Fraction arithmetic:
 - Equivalent fractions
 - Comparing fractions and mixed numbers
 - Converting mixed numbers into improper fractions and vice versa
 - Adding and subtracting fractions with like and unlike denominators
 - Adding and subtracting mixed numbers with like and unlike denominators
 - Interpreting fractions as division problems
 - Multiplying fractions
 - Dividing fractions
 - Convert fractions to decimals and decimals to fractions
- Unit conversion and measurement
 - Introduction to metric and customary unit conversions
 - Measuring using different units
 - Solving word problems that require unit conversions
 - Representing data with units on a line plot
- Volume

- Introduction to diagramming and calculating the volume of rectangular prisms
- Diagramming and calculating the volume of complex figures made of several rectangular prisms
- Introduction to coordinate planes
 - Locating points and graphing on a coordinate plane using ordered pairs
 - Extending number patterns of linear functions using coordinate planes
 - Analyzing the relationship between two sets of numbers using a function table
 - Using coordinate planes to solve word problems
- Multi-step problem-solving and logic
 - Introduction to the order of operations and using parentheses or brackets to solve multi-step problems
 - Introduction to exponents
 - Practice solving word problems
 - Using estimation and math logic to test if an answer is reasonable
 - Using models and illustrations to visualize and solve complex word problems

The other math courses use Prentice Hall's math curriculum and supplemental materials to study various levels of **Pre-Algebra, High School Algebra 1, and Geometry**, depending on each student's current skills. The basic pre-algebra curriculum addresses and goes beyond the state's 6th, 7th, and 8th grade SOLs.

The middle school math curriculum follows the National Council of Teachers of Mathematics (NCTM) "Principles and Standards for School Mathematics" by teaching the following major math content areas and skills:

- *Number and Operations*: Understanding numbers, ways of representing numbers, relations among numbers, and number systems; understand meanings of operations and how they relate to one another; compute fluently and make reasonable estimates.
- *Data Analysis*: Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them; select and use appropriate statistical methods to analyze data; develop and evaluate inferences and predictions that are based on data; understand and apply basic concepts of probability.
- *Algebra*: Understanding patterns, relations, and functions; represent and analyze mathematical situations and structures using Algebraic symbols; use mathematical models to represent and understand quantitative relationships; analyze change in various contexts.
- *Geometry*: Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships; specify locations and describe spatial relationships using coordinate geometry and other representational systems; apply transformations and use symmetry to analyze mathematical situations; use visualization, spatial reasoning, and geometric modeling to solve problems.
- *Measurement*: Understanding measurable attributes of objects and the units, systems, and processes of measurement; apply appropriate techniques, tools, and formulas to determine measurements.
- *Problem Solving*: Build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts; apply and adapt a variety of appropriate strategies to solve problems; monitor and reflect on the process of mathematical problem solving.
- *Reasoning and Proof*: Recognize reasoning and proof as fundamental aspects of mathematics; make and investigate mathematical conjectures; develop and evaluate mathematical arguments and proofs; select and use various types of reasoning and methods of proof.
- *Communication*: Organize and consolidate their mathematical thinking through communication; communicate their mathematical thinking coherently and clearly to peers, teachers, and others; analyze and evaluate the mathematical thinking and strategies of others; use the language of mathematics to express mathematical ideas precisely;

- *Connections:* Recognize and use connections among mathematical ideas; understand how mathematical ideas interconnect and build on one another to produce a coherent whole; recognize and apply mathematics in contexts outside of mathematics.
- *Representation:* Create and use representations to organize, record, and communicate mathematical ideas; select, apply, and translate among mathematical representations to solve problems; use representations to model and interpret physical, social, and mathematical phenomena.

The specific Pre-Algebra topics covered follow:

Pre-Algebra, part 1:

- Estimation strategies
- Understanding decimals
- Adding, subtracting, multiplying and dividing decimals
- Understanding the customary system
- Understanding the metric system
- Adding, subtracting, multiplying and dividing integers
- Mean, median and mode
- Understanding variables and Algebraic expressions
- Solving one and two-step equations
- Graphing and solving one-step inequalities
- Exponents
- Prime factorization
- Simplifying fractions
- Equivalent and comparative fractions
- Mixed numbers and improper fractions
- Ratios
- Unit rates and proportional reasoning
- Maps and scale drawings
- Understanding percents and solving percent problems
- Points, lines, segments, rays, and planes
- Quadrilaterals and other polygons
- Areas of rectangles, parallelograms, and triangles
- Circumference and area of circles
- Square roots and irrational numbers
- Introduction of the Pythagorean Theorem
- Surface area and volume of three-dimensional figures
- Interpreting graphs
- Graphing in the coordinate plane
- Symmetry and transformations
- Spreadsheets and data display
- Making a table using logical reasoning
- Exploring scatter plots
- Probability
- Planning a budget and using a check book.
- Using scientific and graphing calculators

Pre-Algebra, part 2:

- Estimation strategies
- Adding, subtracting, multiplying and dividing decimals
- Measuring in metric units
- Adding, subtracting, multiplying and dividing integers
- Mean, median and mode
- Evaluating Algebraic expressions
- Unit rates and proportional reasoning
- Maps and scale drawings
- Understanding percents and solving percent problems
- Lines and planes
- Constructing bisectors
- Quadrilaterals and other polygons
- Areas of parallelograms and triangles
- Square roots and irrational numbers

- Solving two-step equations
- Graphing and solving inequalities
- Exponents
- Order of operations
- Scientific notation
- Prime factorization
- Simplifying fractions
- Mixed numbers and improper fractions
- Rational numbers
- Ratios
- Three-dimensional figures
- Interpreting graphs
- Graphing points and linear equations
- Exploring non-linear relationships
- Symmetry and reflections
- Spreadsheets and data display
- Making a table using logical reasoning
- Exploring scatter plots
- Probability

Pre-Algebra, part 3:

- Order of operations
- Using a problem-solving plan
- Integers and absolute value
- Measuring in metric units
- Mean, median and mode
- Powers and exponents
- Solving one- and two-step Algebraic equations
- Solving and graphing inequalities
- Understanding slope
- Solving linear systems by graphing
- Comparing, ordering, addition, subtracting, multiplying and dividing rational numbers
- Scale models and maps
- Sine and cosine ratios
- Exploring square roots and irrational numbers
- The Pythagorean Theorem
- Ratios and rates
- Solving proportions
- Percents
- Probability
- Scientific notation
- Angles and parallel lines
- Congruent polygons
- Surface areas and volumes of solids
- Planning a budget
- Learning to use a check book.
- Using scientific and graphing calculators

The High School Algebra group will use Prentice Hall Algebra 1. The curriculum includes 7th and 8th grade SOLs as well as high school level Algebra topics. Students successfully completing Algebra 1 course will receive high school credit for Algebra 1. The specific topics covered follow:

Algebra 1:

- Using variables
- Exponents and order of operations
- Using real numbers
- The distributive property
- Graphing on the coordinate plane
- Slope-intercept form
- Point-slope form and writing linear equations
- Parallel and perpendicular lines
- Scatter plots and equations of lines
- Graphing absolute value equations
- Systems of equations and inequalities

- Solving multi-step equations
- Using measures of central tendency
- Using inequalities
- Absolute value equations
- Ratio and proportion
- Percent equations
- Applying ratios of probability
- Probability of compound events
- Graphs and functions
- Direct variation
- Describing number patterns
- Rate of change and slope
- Exponents and exponential functions
- Geometric sequences
- Polynomials and factoring
- Quadratic equations and functions
- Choosing a model for data and statistics
- Radical expressions and equations
- Pythagorean theorem
- Trigonometric ratios
- Radical expressions and functions
- Counting methods and permutations

The High School Geometry group will use Prentice Hall Geometry. The curriculum includes high school level Geometry topics and state S.O.L. standards. Students successfully completing this one year High School Geometry course will receive high school credit for Geometry. This is a proof oriented course. The specific topics covered follow:

High School Geometry:

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| • Points, lines, planes | • Angle-sum theorems | • Trigonometry: sine, cosine, tangent |
| • Constructions | • Congruent triangles | • Transformations |
| • Perimeter and circumference, Reasoning and proofs | • Relationships within triangles | • Area |
| • Parallel and Perpendicular Lines | • Quadrilaterals | • Surface area |
| | • Similarity | • Volume |
| | • Right triangles and the Pythagorean theorem | • Circles |