

# Pequannock Township School District

## Curriculum Syllabus

### Prealgebra / Grade 7

#### Course Description:

In Grade 7, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

1. Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.

2. Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

3. Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in Grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical

problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

4. Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

In preparation for Algebra students in Pre-algebra will also be addressing the 8<sup>th</sup> grade mathematics topics, such as irrational numbers, connections between proportional relationships, lines, and linear equations, the Pythagorean Theorem, and geometric transformations.

## **Course Standards:**

The following is a list of proficiencies that describe what students are expected to know and be able to do as a result of successfully completing this course. The following proficiencies are the basis of the assessment of student achievement. The learner will demonstrate mastery of:

### **The Number System**

1. Apply and extend previous understandings of operations with fractions.  
*7.NS.A.1a-d, 7.NS.A.2a-d, 7.NS.A.3*
2. Know that there are numbers that are not rational, and approximate them by rational numbers.  
*8.NS.A.1, 8.NS.A.2*

### **Expressions and Equations**

3. Use properties of operations to generate equivalent expressions.  
*7.EE.A.1, 7.EE.A.2*
4. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.  
*7.EE.B.3, 7.EE.B.4a-b*
5. Expressions and Equations Work with radicals and integer exponents.  
*8.EE.A.1, 8.EE.A.2, 8.EE.A.3, 8.EE.A.4*
6. Understand the connections between proportional relationships, lines, and linear equations.  
*8.EE.B.5, 8.EE.B.6*
7. Analyze and solve linear equations and pairs of simultaneous linear equations.  
*8.EE.C.7a-b*

### **Ratios and Proportional Reasoning**

8. Analyze proportional relationships and use them to solve real-world and mathematical problems.  
*7.RP.A.1, 7.RP.A.2a-d, 7.RP.A.3*

### **Statistics**

9. Use random sampling to draw inferences about a population.  
*7.SP.A.1, 7.SP.A.2*
10. Draw informal comparative inferences about two populations. 7.  
*SP.B.3, 7.SP.B.4*
11. Draw informal comparative inferences about two populations. 7.  
*SP.B.5, 7.SP.B.6, 7.SP.7a-b, 7.SP.8a-c*

### **Geometry**

12. Draw construct, and describe geometrical figures and describe the relationships between them.  
*7.G.A.1, 7.G.A.2, 7.G.A.3*
13. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.  
*7.G.B.4, 7.G.B.5, 7.G.B.6*
14. Understand congruence and similarity using physical models, transparencies, or geometry software.  
*8.G.A.1, 8.G.A.2, 8.G.A.3, 8.G.A.4, 8.G.A.5*
15. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.  
*8.G.C.9*

### **Standards for Mathematical Practice**

1. Make sense of problems and persevere in solving them. *SMP1*
2. Reason abstractly and quantitatively. *SMP2*
3. Construct viable arguments and critique the reasoning of others. *SMP3*
4. Model with mathematics. *SMP4*
5. Use appropriate tools strategically. *SMP5*
6. Attend to precision. *SMP6*
7. Look for and make use of structure. *SMP7*
8. Look for and express regularity in repeated reasoning. *SMP8*

## **Scope and Sequence**

## **Unit 1: The Number System (Trimester 1)**

Students build the number sense necessary for problem solving through an instructional pathway that involves modeling and representing types of number including rational and irrational numbers. The students also consolidate number sense through practice and activities. They also apply number sense in real-world and mathematical contexts. The students will extend previous understanding of the operations for fractions to rational numbers. The use of definitions, terminology, symbols, and properties associated with rational numbers will help students develop algorithms for operations with rational numbers. It will also help them represent and solve real-world problems using rational numbers. Students will be able to compare, approximate, locate, and identify rational and irrational numbers. Students will be able to evaluate expressions with integer exponents and use scientific notation to write very large or very small numbers. Students will be able to perform operations expressed in scientific notation. Students will be able to choose appropriate size measurements for quantities in real-world problem solving situations.

Students in Prealgebra need to extend their knowledge of numbers (whole number, integers, fractions, and decimals) to irrational numbers. They have to be able to identify the numbers that make up the set of rational numbers and those that make up the set of real numbers. The students need to be able to locate numbers from both sets on a number line. Seventh grade students have to learn how to convert rational numbers into fractions and decimals and approximate irrational numbers. These students must be able to compute with integers through the operations of addition, subtraction, multiplication, and division. The students will extend their operations skills to rational numbers, including decimals and percents, and they use their new skills to solve real-world problems. Students in Prealgebra need to understand these properties in order to be prepared for Algebra 1.

Students in Prealgebra need to be able to communicate clearly and accurately about real numbers. Students will use definitions, terminology, symbols, and properties associated with real numbers to identify and locate rational and irrational numbers on a number line, use exponential notation to generate equivalent numerical expressions, and use square root and cube roots symbols to evaluate expressions. Students in Prealgebra will use scientific notation in problem solving by learning how to represent real-world situations using scientific notation, computing with very small and very large measurements and quantities, and by applying scientific notation in real-world and mathematical contexts. Students in Prealgebra need to understand these properties in order to be prepared for Algebra 1 and Geometry.

## **Unit 2: Equations and Expressions (Trimesters 1 and 2)**

In this unit a visual-symbolic-algebraic progression allows all students to understand that algebraic expressions are single objects composed of several objects. Students use words, bar models, and symbols to represent and generate equivalent algebraic expressions. Students are able to simplify algebraic expressions by adding and subtracting like terms. They will have the ability to use properties of operations to simplify, expand, and factor expressions. They will also be able to use algebraic reasoning to solve problems using expressions. Students will be able to solve real-life and mathematical problems using equations and inequalities. Students will be able to make sense of quantities and their relationships by using variables and symbols to represent and reason. They will be able to apply the properties of operations in solving algebraic equations and inequalities. Students will be able to establish proportion relationships and interpret unit rates. Students will be able to identify the slope or rate of change and graph and interpret the relationship between two variables. Students will be able to identify the parts of the slope-intercept formula and graph the linear equation.

From this graph students will be able to use similar triangles to explain how slope is similar between two points of a non-vertical line. Students will be able to evaluate these linear equations with rational number coefficients that may require expressions using the distributive property and/or combining like terms yielding one solution, infinite solutions, or no solution.

Students in Prealgebra need to take the skills they learned with numerical expressions and apply them to basic and more complex algebraic expressions. In this unit students will learn how to write, simplify, expand and factor algebraic expressions to represent many different types of problems. The types of problems also include real world situations. Prealgebra students need to be able to identify equivalent equations. They will be able to solve multi-step equations with variables on both sides, including problems with parenthesis. Students will also be able to solve real-world problems with algebraically. After solving equations, students will learn how to solve inequalities. They will have the capability to graph the solution to the inequalities on a number line and apply inequalities to solve real-world problems. Students in Prealgebra need to understand these properties in order to be prepared for Algebra 1. Students in Prealgebra need to be able to solve problems by reasoning about algebraic linear equations. Students will make sense of quantities and relationships by using properties, such as the distributive property, to solve linear equations. Students will also identify the number of solutions to an equation and use tables and multi-variable equations to represent relationships. Students will be able to understand that direct proportional relationships are really linear relationships. Students are expected to extend the models and processes associated with ratios and rates to transform linear equations to slope-intercept form ( $y = mx + b$ ) to determine intercepts and find the slope of a line. Students will use slope and intercepts to graph linear equations and explain the slopes and y-intercept in the context of real-world problems.

### **Unit 3: Ratios and Proportional Reasoning (Trimester 2)**

The visual-symbolic-algebraic progression continues in this unit to allow students to better understand the abstract concepts associated with proportional relationships. Students solve direct and inverse proportion problems through an assortment of representations that include verbal descriptions, numerical and algebraic expressions, coordinate graphs, tables, and equations. Students study scale drawings and learn to identify scale factors.

Seventh grade students need to extend their knowledge of ratios and rates to the concepts of direct and inverse proportions. They need to be able to identify both direct and inverse proportions and recognize that a constant of proportionality can be a constant rate. These students should be able to solve real-world proportional problems by describing the proportional relationship and using cross products. The students in seventh grade will be able to use visual bar models to interpret and solve direct and inverse proportion problems. Graphs of direct proportion relationships will be created by students to show their understanding of proportionality. Students use scale factors to relate actual lengths and areas to lengths and areas on scale drawings. Students in seventh grade need to understand these skills in order to be prepared for Algebra 1.

### **Unit 4: Statistics and Probability (Trimester 3)**

This unit focuses on students using random sampling to draw inferences about a population. The students learn to construct arguments, reason inductively, and communicate statistical conclusions throughout this unit. Students create data displays and analyze simulations. They also acquire the ability to generalize characteristics of a population. Students investigate chance processes and develop and interpret probability models. They learn to use multiple representations for probability problems in a variety of methods. The students are

able to generate data and organize it in lists, tables, Venn Diagrams, and graphs. Students gain the capability to compare and explain probability distributions using verbal descriptions. Students in seventh grade need to understand the concepts of measures of variation, quartiles and interquartile range. They need to be able to represent data in a stem-and-leaf plot. As well as, make conclusions and solve word problems involving stem-and-leaf-plots. These students need to be able to draw and interpret box and whisker plots. Students will complete this unit so they understand the concept of population and samples and can simulate a random sampling. These students are expected to be able to make and use inferences about a population to estimate its population mean. They also need to be able to make comparative inferences between two populations. The students in seventh grade need to understand the concepts of outcomes, events and sample space in order to apply them to everyday life. The seventh grade students need to be able to find the probability of events and use Venn Diagrams to illustrate their relationship. These students are expected to find relative frequencies, interpret them as probabilities, and use them to make predictions. They need to be able to compare experimental probability with theoretical probability. Students in seventh grade need to understand these concepts in order to be prepared for Math 8.

### **Unit 5: Geometry (Trimester 3)**

The beginning of this unit provides students with the opportunity to review prior skills learned in the Expression and Equations unit. Students will be able to solve real-life and mathematical problems using equations and inequalities. Students will be able to make sense of quantities and their relationships by using variables and symbols to represent and reason. They will be able to apply the properties of operations in solving algebraic equations and inequalities. After the students revisit equations and inequalities, they move on to geometry. The students apply the formulas of area, volume, and surface area to solve real-world mathematical problems. They also use algebraic equations to find angle measures in supplementary, complementary, vertical, and adjacent angles. The students will also explore circles and how the circumference of a circle relates to the area of the circle. Students will be able to describe and identify what 2-dimensional figure is created when a 3-dimensional figure is sliced from multiple different angles.

Students build comprehension of transformation in the coordinate plane through dilations, translations, rotations, and reflections. Students will also be able to recognize the proportionality of objects and establish if angles and side lengths of polygons are congruent or similar. Students will also understand the relationship between corresponding angles. Prealgebra students need to be able to identify equivalent equations. They will be able to solve multi-step equations with variables on both sides, including problems with parenthesis. Students will also be able to solve real-world problems with algebraically. After solving equations, students will learn how to solve inequalities. They will have the capability to graph the solution to the inequalities on a number line and apply inequalities to solve real-world problems. Prealgebra students need to know and apply the formulas for area, volume and surface area to two and three-dimensional figures. These students need to be familiar with a variety of pairs of angles including, complementary, supplementary, vertical, and adjacent angles. Once familiar with the pairs of angles, the students will be able to write and solve equations for find angle measures. Prealgebra students need to be able to identify three-

dimensional figures and the cross sections of solids. Students in Prealgebra need to be able to select appropriate geometric tools to establish facts about geometric transformations on two-dimensional figures. Students in Prealgebra are expected to understand and model geometric transformations by using coordinates to describe the effect of dilations, translations, rotations, and reflections and drawing images of two-dimensional figures after geometric transformations. Students in Prealgebra will complete this unit so they can reason inductively and communicate conclusions about congruence, similarity, and transformations. Students in Prealgebra need to understand these properties in order to be prepared for Algebra 1.

## Assessments

Evaluation of student achievement in this course will be based on the following:

- a. Observational data collected by teachers as students are learning
- b. Formative assessments given by teachers to gauge progress toward each standard

## Curriculum Resources

### Instructional Resources:

*enVision Accelerated Math Grade 7 Common Core*

### Additional Technology Resources:

Illustrative Mathematics: [www.illustrativemathematics.org](http://www.illustrativemathematics.org)

Open-Up Resources: <https://im.openupresources.org/7/teachers/index.html>  
<https://im.openupresources.org/8/teachers/index.html>

NC Lessons for Learning: <http://tools4ncteachers.com/seventh-grade/>  
<http://tools4ncteachers.com/eighth-grade/>

Georgia Lessons for Grades 7 and 8: <https://www.georgiastandards.org/Georgia-Standards/Pages/Math-6-8.aspx>

## Home and School Connection

The following are suggestions and/or resources that will help parents support their children:

- Tutorials
  - <https://www.khanacademy.org/>
- Learn Zillion
  - <https://learnzillion.com/resources/75114-math/>
- IXL Math
  - <https://www.ixl.com/math/grade-7>
  - <https://www.ixl.com/math/grade-8>
- EnVision Math series
  - [www.pearsonrealize.com](http://www.pearsonrealize.com)
    - Educational games
    - Online tutorials for each lesson (Virtual Nerd videos)

