Thomaston Public Schools - Curriculum Overview and Pacing Guide

Course Title: Mathematics		
School: Thomaston High School	**Grade:** 8	**Curriculum Pacing: 36 Weeks**

Unit One: Rigid Transformations and Congruence	**Unit Two: Dilations, Similarity, and Introducing Slope**
Unit Pacing: 5 Weeks	**Unit Pacing: 4 Weeks**
Unit Overview: Students begin the unit by looking at pairs of cartoons, each of which illustrates a translation, rotation, or reflection. Students describe in their own words how to move one cartoon figure onto another. As the unit progresses, they solidify their understanding of these transformations, increase the precision of their descriptions (MP6), and begin to use associated terminology, recognizing what determines each type of transformation, e.g., two points determine a translation.	**Unit Overview:** Through activities designed and sequenced to allow students to make sense of problems and persevere in solving them (MP1), students use and extend their knowledge of geometry and geometric measurement. Students encounter the term “scale factor” and the new terms “dilation” and “center of dilation.” Students draw images of figures under dilations on and off square grids and the coordinate plane. In describing correspondences between a figure and its dilation, they use the terms “corresponding points,” “corresponding sides,” and “image.” Students learn that angle measures are preserved under a dilation, but lengths in the image are multiplied by the scale factor. They learn the definition of “similar”: two figures are said to be similar if there is a sequence of translations, rotations, reflections, and dilations that takes one figure to the other. They use the definition of “similar” and properties of similar figures to justify claims of similarity or non-similarity and to reason about similar figures. Using these properties, students conclude that if two triangles have two angles in common, then the triangles must be similar. Students also conclude that the quotient of a pair of side lengths in a triangle is equal to the quotient of the corresponding side lengths in a similar triangle. This conclusion is used in the lesson that follows: students learn the terms “slope” and “slope triangle,” and use the similarity of slope triangles on the same line to understand that any two distinct points on a line determine the same slope.
Compelling Questions: **How do I give specific instructions/directions to a peer on how to move one figure in a plane to another area in the plane?**	**Compelling Questions:** **How do I prove that angles measures remain the same under dilation?**

Priority Learning Targets ● **Verify experimentally the properties of rotations, reflections, and translations. 8ga1** ● **Describe the effect of dilations, translations, rotations, and reflections on two dimensional figures using coordinates .8ga3** ● **Understand that a two dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. 8ga2**	**Priority Learning Targets** ● **Understand that a two-dimensional figure is similar to another if the second con be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. 8ga4** ● **Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y=mx+b for a line intersecting the vertical axis at b. 8eeb6** ● **Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. 8ga5**
Unit Three: Linear Relationships	**Unit Four: Linear Equations and Linear Systems**
Unit Pacing: 4 Weeks	**Unit Pacing: 4 Weeks**
Unit Overview: Students analyze a relationship that is linear but not proportional. They are not asked to solve this problem in a specific way, giving them an opportunity to choose and use strategic representations. Students are introduced to “rate of change” as a way to describe the rate per 1 in a linear relationship and note that its numerical value is the same as that of the slope of the line that represents the relationship. Students analyze another linear relationship (height of water in a cylinder vs number of cubes in the cylinder) and establish a way to compute the slope of a line from any two distinct	**Unit Overview**: Students write and solve equations, abstracting from contexts to represent a problem situation, stating the meanings of symbols that represent unknowns, identifying assumptions such as constant rate, selecting methods and representations to use in obtaining a solution, reasoning to obtain a solution, interpreting solutions in the contexts from which they arose and writing them with appropriate units, communicating their reasoning to others, and identifying correspondences between verbal descriptions, tables, diagrams, equations, and graphs, and between different solution approaches.

points on the line via repeated reasoning (MP8). They learn a third way to obtain an equation for a linear relationship by viewing the graph of a line in the coordinate plane as the vertical translation of a proportional relationship.	Students focus on linear equations in one variable. Students analyze “hanger diagrams” that depict two collections of shapes that balance each other. Students will focus on systems of linear equations in two variables.
Compelling Questions: • **How can linear functions be used to model real world situations?**	**Compelling Questions:** • **How can equations and systems of equations help me make informed decisions in my life?**
Priority Learning Targets • **Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. 8eeb5** • **Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relation or from two (x,y) values, including reading those from a table or from a graph. 8fb4** • **Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. 8fb4**	**Priority Learning Targets** • **Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. 8eec7b** • **Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. 8eec8b** • **Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solution. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x=a, a=a, or a=b results. 8eec7a**

Unit Five: Functions and Volume	Unit Six: Associations in Data
Unit Pacing: 6 Weeks	**Unit Pacing: 3 Weeks**
Unit Overview: Students are introduced to the concept of a function as a relationship between “inputs” and “outputs” in which each allowable input determines exactly one output.Students work with relationships that are familiar from previous grades or units (perimeter formulas, proportional relationships, linear relationships), expressing them as functions. Students connect the terms “independent variable” and “dependent variable” with the inputs and outputs of a function. Students use linear and piecewise linear functions to model relationships between quantities in real-world situations, interpreting information from graphs and other representations in terms of the situations.Students work with volume, using abilities developed in earlier work with geometry and geometric measurement.	**Unit Overview:** Students analyze bivariate data—using scatter plots and fitted lines to analyze numerical data, and using two-way tables, bar graphs, and segmented bar graphs to analyze categorical data. Students manipulate data to look for patterns in the table, then examine a scatter plot of the same data. This motivates the need to use different representations of the same data to find and analyze any patterns. Students focus on using scatter plots and fitted lines to analyze numerical data. Students make and examine scatter plots, interpreting points in terms of the quantities represented and identifying scatter plots that could represent verbal descriptions of associations between two numerical variables. Students focus on using two-way tables to analyze categorical data. Students collect and analyze numerical data using a scatter plot, then categorize the data based on a threshold and analyze the categories based on a two-way table.
Compelling Questions: **How can I use linear functions to model relationships between quantities in real-world situations, interpreting information from graphs and other representations in terms of the situations?**	**Compelling Questions:** **What would motivate me to need to use different representations of the same data to find and analyze any patterns?**
Priority Learning Targets • **Interpret the equation y=mx+b as defining a linear function, whose graph is a straight line;give examples of functions that are not linear. 8fa3**	**Priority Learning Targets** • **Construct and interpret scatter plots for bivariate measurements data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, and**

• **Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a tale of values. 8fb4** • **Describe quantitatively the functional relationship between two quantities by analyzing a graph. Sketch a graph that exhibits the qualitative features of a function that has been described verbally. 8fb5**	**nonlinear association. 8spa1** • **Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. 8spa3** • **Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. 8spa4**
Unit Seven: Exponents and Scientific Notation	**Unit Eight: Pythagorean Theorem and Irrational Numbers**
Unit Pacing: 5 Weeks	**Unit Pacing: 5 Weeks**
Unit Overview: Students examine powers of 10, formulating the rules 10n · 10m=10n+m, 10nm=10nm, and, for n^{m}, 10n · 10m=10n−m where n and m are positive integers. After working with these powers of 10, they consider what the value of 100 should be and define 100 to be 1. Students write estimates of quantities in terms of integer or non-integer multiples of powers of 10 and use their knowledge of exponential expressions to solve problems, e.g., How many meter sticks does it take to equal the mass of the Moon? They are introduced to the term "scientific notation," practice distinguishing scientific from other notation, and use scientific notation (with no more than three significant figures) in order to make additive and multiplicative comparisons of pairs of quantities.	**Unit Overview**: Work in this unit is designed to build on and connect students' understanding of geometry and numerical expressions. The unit begins by foreshadowing algebraic and geometric aspects of the Pythagorean Theorem and strategies for proving it. Students are shown three squares and asked to compare the area of the largest square with the sum of the areas of the other two squares. The comparison can be done by counting grid squares and comparing the counts—when the three squares are on a grid with their sides on grid lines and vertices on intersections of grid lines—using the understanding of area measurement established in grade 3. The comparison can also be done by showing that there is a shape that can be decomposed and rearranged to form the largest square or the two smallest squares. Students are provided with opportunities to use and discuss both strategies. In the second section, students work with

	figures shown on grids, using the grids to estimate lengths and areas in terms of grid units, e.g., estimating the side lengths of a square, squaring their estimates, and comparing them with estimates made by counting grid squares. In the third section, students work with edge lengths and volumes of cubes and other rectangular prisms. In the fourth and last section, students work with decimal representations of rational numbers and decimal approximations of irrational numbers.
Compelling Questions: **Can I use scientific notation to determine distances that are extremely far away and extremely close by?**	**Compelling Questions:** **Can I prove that a triangle is a right triangle using the Pythagorean Theorem?**
Priority Learning Targets ● **Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. 8eea2** ● **Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is that the other. 8eea3** ● **Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. 8eea4**	**Priority Learning Targets** ● **Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. 8gb7** ● **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. 8nsa1** ● **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. 8nsa2**