

Verona Public School District Curriculum Overview

8th Grade Math



Curriculum Committee Members:
Danielle Kelly

Supervisor:
Glen Stevenson

Curriculum Developed:
February 2013
Summer 2015
May 2016

Board Approval Date:
March 12, 2013
June 14, 2016

Verona Public Schools
121 Fairview Ave., Verona, NJ 07044
www.veronaschools.org

Verona Public Schools Mission Statement:

The mission of the Verona Public Schools, the center of an engaged and supportive community, is to empower students to achieve their potential as active learners and productive citizens through rigorous curricula and meaningful, enriching experiences.

Course Description:

A new concept for the 8th grade level is the idea of a function. Students define what a function is and evaluate and compare different types of functions. They describe functions mathematically as relationships between quantities. Students apply their experience with proportional relationships to understand lines and linear equations, specifically with slope and the Pythagorean Theorem. They solve single and simultaneous pairs of linear equations and interpret the meaning of those equations. Students use their experience comparing features of geometrical figures in earlier grades to explore congruence and similarity with physical and digital models.

Prerequisite(s):

7th Grade Math

Standard 8: Technology Standards

8.1: Educational Technology: <i>All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.</i>	8.2: Technology Education, Engineering, Design, and Computational Thinking - Programming: <i>All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.</i>
A. Technology Operations and Concepts B. Creativity and Innovation X C. Communication and Collaboration D. Digital Citizenship E. Research and Information Fluency X F. Critical thinking, problem solving, and decision making	A. The Nature of Technology: Creativity and Innovation B. Technology and Society C. Design D. Abilities for a Technological World X E. Computational Thinking: Programming

SEL Competencies and Career Ready Practices

Social and Emotional Learning Core Competencies: <i>These competencies are identified as five interrelated sets of cognitive, affective, and behavioral capabilities</i>	Career Ready Practices: <i>These practices outline the skills that all individuals need to have to truly be adaptable, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.</i>
Self-awareness: The ability to accurately recognize one's emotions and thoughts and their influence on behavior. This includes accurately assessing one's strengths and limitations and possessing a well-grounded sense of confidence and optimism.	X CRP2. Apply appropriate academic and technical skills. CRP9. Model integrity, ethical leadership, and effective management. CRP10. Plan education and career paths aligned to personal goals.
Self-management: The ability to regulate one's emotions, thoughts, and behaviors effectively in different situations. This includes managing stress, controlling impulses, motivating oneself, and setting and working toward achieving personal and academic goals.	CRP3. Attend to personal health and financial well-being. CRP6. Demonstrate creativity and innovation. X CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP11. Use technology to enhance productivity.
Social awareness: The ability to take the perspective of and empathize with others from diverse backgrounds and cultures, to understand social and ethical norms for behavior, and to recognize family, school, and community resources and supports.	X CRP1. Act as a responsible and contributing citizen and employee. CRP9. Model integrity, ethical leadership, and effective management.
Relationship skills: The ability to establish and maintain healthy and rewarding relationships with diverse individuals and groups. This includes communicating clearly, listening actively, cooperating, resisting inappropriate social pressure, negotiating conflict constructively, and seeking and offering help when needed.	X CRP4. Communicate clearly and effectively and with reason. CRP9. Model integrity, ethical leadership, and effective management. CRP12. Work productively in teams while using cultural global competence.
Responsible decision making: The ability to make constructive and respectful choices about personal behavior and social interactions based on consideration of ethical standards, safety concerns, social norms, the realistic evaluation of consequences of various actions, and the well-being of self and others.	CRP5. Consider the environmental, social, and economic impact of decisions. CRP7. Employ valid and reliable research strategies. X CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership, and effective management.

Standard 9: 21st Century Life and Careers

9.1: Personal Financial Literacy: <i>This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.</i>	9.2: Career Awareness, Exploration & Preparation: <i>This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.</i>	9.3: Career and Technical Education: <i>This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.</i>
X A. Income and Careers B. Money Management C. Credit and Debt Management D. Planning, Saving, and Investing X E. Becoming a Critical Consumer F. Civic Financial Responsibility G. Insuring and Protecting	X A. Career Awareness (K-4) B. Career Exploration (5-8) C. Career Preparation (9-12)	A. Agriculture, Food & Natural Res. B. Architecture & Construction C. Arts, AV Technology & Comm. D. Business Management & Admin. E. Education & Training F. Finance G. Government & Public Admin. H. Health Science I. Hospital & Tourism J. Human Services K. Information Technology L. Law, Public, Safety, Corrections & Security M. Manufacturing N. Marketing X O. Science, Technology, Engineering & Math P. Transportation, Distribution & Log.

Course Materials

Core Instructional Materials: <i>These are the board adopted and approved materials to support the curriculum, instruction, and assessment of this course.</i>	Differentiated Resources: <i>These are teacher and department found materials, and also approved support materials that facilitate differentiation of curriculum, instruction, and assessment of this course.</i>
<ul style="list-style-type: none"> Big Ideas Math 8th Grade 	<ul style="list-style-type: none"> Common Core State Standards http://www.corestandards.org/Math/Content/4/introduction/ Howard County MD Mathematics 8 https://hcpss.instructure.com/courses/161 Khan Academy 8th Grade Math https://www.khanacademy.org/math/cc-eighth-grade-math Math Assessment Project Resources http://map.mathshell.org/ Promoting Inquiry in Mathematics and Science Education Across Europe http://www.primas-project.eu/en/index.do



Unit Title / Topic: Geometry	Unit Duration:
-------------------------------------	-----------------------

Stage 1: Desired Results

Established Goals:

- 8.G.A.1** Verify experimentally the properties of rotations, reflections, and translations:
 - a. Lines are taken to lines, and line segments to line segments of the same length.
 - b. Angles are taken to angles of the same measure.
 - c. Parallel lines are taken to parallel lines.
- 8.G.A.2** 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.
- 8.G.A.3** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
- 8.G.A.4** Understand that a two-dimensional figure is similar to another if the second can 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.
- 8.G.A.5** 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. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.
- 8.G.C.9** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Transfer Goal:

Students will be able to independently use their learning to accurately describe and model transformations.

Students will be able to independently use their learning of volume to find the capacity of any standard three- dimensional figure

Students will understand that:

- Transformations of the plane (2D) lead to transformations of space (3D), which are crucial to understanding how modern computer graphics systems work.
- A clear classification system of transformations enables identification of symmetric patterns.

Essential Questions:

- How do transformations play a part in your life?
- How does volume and surface area relate to profitability?

Students will know:

- | | |
|---|---------------------|
| Line | Congruent Segments |
| Plane | Congruent Angles |
| Line Segment | Corresponding Parts |
| Ray | Side-Side-Side |
| Collinear | Side-Angle-Side |
| Coplanar | Angle-Side-Angle |
| Perpendicular Lines | Coordinate Plane |
| Parallel Lines | Ordered Pair |
| Skew Lines | Line Symmetry |
| Angle (Acute, Right, Obtuse, Straight) | Transformation |
| Adjacent Angles | Pre-image |
| Vertical Angles | Image |
| Supplementary Angles | Reflection |
| Complementary Angles | Translation |
| Transversal | Rotation |
| Alternate Interior Angles | Similar Figures |
| Alternate Exterior Angles | Dilations |
| Corresponding Angles | Scale Factor |
| Triangles (Acute, Obtuse, Right, Equilateral, Isosceles, Scalene) | |

Students will be able to:

- prove triangle are congruent using SSS, SAS, and ASA
- perform translation, rotations, reflections, and dilations of different shapes
- find volume of 3-D figures using the formulas
- Classify triangles
- Identify and name congruent polygons.
- Identify and plot points in a coordinate plane.
- Reflect figures
- Identify lines of symmetry
- Translate figures in a coordinate plane.
- Rotate figures in a coordinate plane.
- Use similar polygons to find missing measures.
- Dilate figures in a coordinate plane

Stage 2: Acceptable Evidence

Transfer Task

Department Developed Performance Task and Unit Assessment

Reference Materials

- Big Ideas Math Support Materials
- Common Core State Standards <http://www.corestandards.org/Math/Content/4/introduction/>
- Howard County MD Mathematics 8 <https://hcpss.instructure.com/courses/161>
- Khan Academy 8th Grade Math <https://www.khanacademy.org/math/cc-eighth-grade-math>
- Math Assessment Project Resources <http://map.mathshell.org/>



Unit Title / Topic: Exponents and Real Numbers

Unit Duration:

Stage 1: Desired Results

Established Goals:

- 8.NS.1**-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.
- 8.NS.2**-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
- 8.EE.A.1** Know and apply the properties of integer exponents to generate equivalent numerical expressions.
- 8.EE.A.2**-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.
- 8.EE.A.3**-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 than the other.
- 8.EE.B.4**-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
- 8.G.B.6**- Explain a proof of the Pythagorean Theorem and its converse.
- 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.
- 8.G.B.8**- Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Transfer Goal:

Students will be able to independently use their learning to...

Students will understand that:

- Students will understand the number system by constructing meanings for the following:
 - o Exponents
 - o Roots
 - o Numbers represented in scientific notation
- The student will use and explain procedures for performing calculations involving addition, subtraction, multiplication, division, and exponentiation with integers and all
- Computational fluency includes understanding not only the meaning, but also the appropriate use of numerical operations.
- The magnitude of numbers affects the outcome of operations on them.
- Exponents represent repeated multiplication.
- “Laws of exponents” are consistent set of rules (addition, subtraction, multiplication, and division) used to solve equations.
- Decimals and scientific notation are exercises with exponents.

Essential Questions:

- What makes a computational strategy both effective and efficient?
- How do operations affect numbers?
- How do mathematical representations reflect the needs of society across cultures?
- Why do we need to represent numbers using exponents
- What is special about the “Laws of Exponents”?

Students will know:

- Square root,
- Difference between rational and irrational numbers,
- Pythagorean theorem,
- radical expression,
- scientific notation

Students will be able to:

- Students will be able to: multiply and divide expressions with negative exponents.
- Read and write numbers in scientific notation.
- Solve problems using square roots and the Pythagorean theorem. Students will know what exponents are.
- Divide using whole numbers,
- Evaluate and simplify expressions by combining like terms.

Stage 2: Acceptable Evidence

Transfer Task

Department Developed Performance Task and Unit Assessment

Reference Materials

- Big Ideas Math Support Materials
- Common Core State Standards <http://www.corestandards.org/Math/Content/4/introduction/>
- Howard County MD Mathematics 8 <https://hcpss.instructure.com/courses/161>
- Khan Academy 8th Grade Math <https://www.khanacademy.org/math/cc-eighth-grade-math>
- Math Assessment Project Resources <http://map.mathshell.org/>



Unit Title / Topic: Solving Equations & Inequalities	Unit Duration:
--	----------------

Stage 1: Desired Results

Established Goals:

8.EE.C.7 Solve linear equations in one variable.

a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. 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 (where a and b are different numbers)

b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Transfer Goal:

Students will be able to independently use their learning of number properties to write and/or solve any linear equation or inequality regardless of the form or the number of steps.

Students will be able to independently solve real world problems by using inequalities.

Students will understand that:

- Students will understand that complex problems and expressions are easier to solve when simplified.
- With the development of mathematical reasoning, comes the recognition that many real life situations can be quantified
- Inequalities can simplify real world situations involving limitations

Essential Questions:

- Why do we simplify algebraic expressions?
- In what scenarios can algebra be utilized to solve problems in your life?
- How can you model and represent real world situations involving inequalities?

Students will know:

- Distributive property and combining like terms.
- Solving 1 and 2-step equations.
- Solving multi-step equations
- Solving equations with variables on both sides
- Solving fraction and decimal equations
- Writing equations for word problems
- Solving 1 and 2-step inequalities
- Solving multi-step inequalities
- Writing inequalities for word problems

Students will be able to:

- Use the Distributive Property to simplify expressions.
- Identify and combine like terms.
- Solve addition, subtraction, multiplication, and division equations.
- Solve 2-step equations.
- Write and solve two-step equations.
- Write and solve equations to find the cost of different pizzas.
- Solve multi-step equations.
- Solve equations with variables on both sides.
- Identify equations that are identities and have no solution.
- Solve equations with fractions and decimals.
- Use addition, subtraction, multiplication and division to solve inequalities.
- Solve multi-step inequalities
- Write and solve multi-step inequalities.

Stage 2: Acceptable Evidence

Transfer Task

Department Developed Performance Task and Unit Assessment

Reference Materials

Big Ideas Math Support Materials
 Common Core State Standards <http://www.corestandards.org/Math/Content/4/introduction/>
 Howard County MD Mathematics 8 <https://hcpss.instructure.com/courses/161>
 Khan Academy 8th Grade Math <https://www.khanacademy.org/math/cc-eighth-grade-math>
 Math Assessment Project Resources <http://map.mathshell.org/>



Unit Title / Topic: Functions

Unit Duration:

Stage 1: Desired Results

Established Goals:

- 8.F.1- Understand that a function is rule that assigns to each input exactly one output.
- 8.F.2- Compare properties of two functions each represented in a different way (algebraically, graphically, and numerically, in table or by verbal descriptions).
- 8.F.3- Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line.
- 8.F.4- Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value from a description of a relationship of from two (x,y) values.
- 8.F.5- Describe qualitatively the functional relationship between two quantities by analyzing a graph.
- 8.SP.1-Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.
- 8.SP.2 –Know that straight lines are widely used to model relationships between two quantitative variable.
- 8.SP.3- Use the equation of a linear model to solve problems in the context of bivariate measurements data, interpreting slope and intercept
- 8.SP.4- Understand patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two –way table

Transfer Goal:

Students will be able to independently use their learning to make sense of the relationship between 2 variables.

Students will understand that:

- Functional relationships can be expressed in real contexts, graphs, algebraic equations, tables, and words; each representation of a given function is simply a different way of expressing the same idea.
- A function can be used to express a cause and effect relationship between two variables.

Essential Questions:

- How do you know when a pattern is linear or nonlinear?
- How can you use a linear function to describe a linear pattern?
- What does the rate of change mean in terms of a given situation?

Students will know:

- The connection between linear equations and patterns
How to make decisions about linear relationships using information given in tables and graphs to solve problems
- Recognize problem situations in which two or more variables have a linear relationship
- function,
- domain,
- range,
- slope,
- linear,
- x-intercept,
- y-intercept,
- scatterplot,
- correlation,
- slope-intercept form

Students will be able to:

- Construct tables, graphs, and equations to express linear relationships.
- Translate information about linear relations given in a table, a graph, or an equation to one of the other forms
- To solve problems and make decisions about linear relationships using information given in tables and graphs.
- Construct tables, graphs, and equations to express linear relationships.
- Recognize problem situations in which two or more variables have a linear relationship to each other

Stage 2: Acceptable Evidence

Transfer Task

Department Developed Performance Task and Unit Assessment

Reference Materials

- Big Ideas Math Support Materials
- Common Core State Standards <http://www.corestandards.org/Math/Content/4/introduction/>
- Howard County MD Mathematics 8 <https://hcpss.instructure.com/courses/161>
- Khan Academy 8th Grade Math <https://www.khanacademy.org/math/cc-eighth-grade-math>
- Math Assessment Project Resources <http://map.mathshell.org/>



Unit Title / Topic: Solving Systems of Equations

Unit Duration:

Stage 1: Desired Results

Established Goals:

8.EE.C.8 Analyze and solve pairs of simultaneous linear equations.

- a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
- b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspections.
- c. Solve Real-world and mathematical problems leading to two linear equations in two variables.

Transfer Goal:

Students will be able to solve a system of equations using two different methods: graphing, and substitution. They will learn how to set up systems of equations to solve problems in the real world and they will be able to choose the best method depending on the system of the equations.

Students will understand that:

- Different problem solving scenarios demand different problem solving techniques
- A linear equation in two variables can represent relationships between quantities
- Some real-world situations can be translated into a system of equations
- The solution of a system of equations is the ordered pair that satisfies both equations.
- Some equations must be transformed before the system can be solved
- Some systems have no solution; some have infinite solutions

Essential Questions:

- Which is the best method to solve a system of equations?
- How do you set up a system of equations to solve a real life problem?
- How do you solve a system of equations?
- What are the advantages and disadvantages of the two methods used to solve a system of equations?
- How can variables and equations be used to represent the relationship between quantities?

Students will know:

- systems of linear equations,
- consistent independent system,
- inconsistent system,
- consistent dependent system.

Students will be able to:

- Solve a system of equations by using the graphing and the substitution methods. They will understand the advantages, and disadvantages of these methods.
- Read and interpret a real-world situation and develop a system of equations that accurately reflects the situation.

Stage 2: Acceptable Evidence

Transfer Task

Department Developed Performance Task and Unit Assessment

Reference Materials

Big Ideas Math Support Materials
 Common Core State Standards <http://www.corestandards.org/Math/Content/4/introduction/>
 Howard County MD Mathematics 8 <https://hcpss.instructure.com/courses/161>
 Khan Academy 8th Grade Math <https://www.khanacademy.org/math/cc-eighth-grade-math>
 Math Assessment Project Resources <http://map.mathshell.org/>