MATHEMATICS
GRADE 8

THE EWING PUBLIC SCHOOLS
2099 Pennington Road
Ewing, NJ 08618

Board Approval Date: November 25, 2019
Revised by: District Math Staff

Michael Nitti
Superintendent

In accordance with The Ewing Public Schools' Policy 2230, Course Guides, this curriculum has been reviewed and found to be in compliance with all policies and all affirmative action criteria.

Table of Contents

Course Description and Rationale

In Grade 8, mathematics instructional time will focus on four critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

While students will utilize a constructivist approach to investigate relationships in math, this approach will be balanced with a level of practice needed to attain skill mastery. Throughout the course, students will be actively engaged in problem solving through reasoning. Students will be expected to communicate their reasoning and problem solving on a daily basis through written and verbal formats.

In the end, the goal of this course is to develop young mathematicians with the habits of mind enabling them to meet the vision shared above, enabling their future success in mathematics.

The Ewing Public Schools' Math Vision

The Ewing Public Schools will deliver an instructional program in mathematics where students are actively engaged in the discovery of math concepts and are applying these concepts in ways that they find meaningful and relevant.

Ewing students will be mathematical thinkers who can reason, communicate and solve problems.

Ultimately, Ewing students will master and will be able to utilize these math concepts and skills throughout their lives.

21st Century Skills - During this course, students will work on developing, to an age appropriate level, the following 21st century skills:

Career Readiness Pathways:

- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP12. Work productively in teams while using cultural global competence.

Learning and Innovation Skills

Creativity and Innovation

Think Creatively

- Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts

Work Creatively with Others

- View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

CRITICAL THINKING AND PROBLEM SOLVING

Reason Effectively

- Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Use Systems Thinking

- Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

Make Judgments and Decisions

- Effectively analyze and evaluate evidence, arguments, claims and beliefs
- Synthesize and make connections between information and arguments
- Interpret information and draw conclusions based on the best analysis

Solve Problems

- Identify and ask significant questions that clarify various points of view and lead to better solutions

COMMUNICATION AND COLLABORATION

Communicate Clearly

- Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
- Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions
- Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
- Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
- Communicate effectively in diverse environments (including multi-lingual)

Collaborate with Others

- Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

Information, Media, and Technology Skills

Informational Literacy

Access and Evaluate Information

- Evaluate information critically and competently

Use and Manage Information

- Use information accurately and creatively for the issue or problem at hand

Life and Career Skills

Social and Cross-Cultural Skills

Interact Effectively with Others

- Know when it is appropriate to listen and when to speak

Work Effectively in Diverse Teams

- Respond open-mindedly to different ideas and values

Be Responsible to Others

- Act responsibly with the interests of the larger community in mind

Technology Integration

8.1 Educational Technology
All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

ELA Integration:

RI.8.1. Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

RI.8.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.

RI.8.8. Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.

SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

A. Come to discussions prepared having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
B. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
C. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
D. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

SL.8.3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

SL.8.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Unit 1: Geometry (30 Days)

Why Is This Unit Important?

Geometry is the study of size, shape and position of two and three dimensional figures. In geometry, one explores spatial sense and geometric reasoning. Geometry is found everywhere; in art, architecture, engineering, robotics, etc. When taking geometry, spatial reasoning and problem-solving skills will be developed. As students move through this unit, their abstract thinking will be developed through analysis and reasoning. The big ideas in this unit are:

- Understand congruence and similarity using models, transparencies or geometry software.

Enduring Understandings:

- Verify experimentally the properties of rotations, reflections and translations. Lines are taken to lines and line segments to line segments of the same length. Angles are taken to angles of the same measure. Parallel lines are taken to parallel.
- 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.
- Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.
- 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.
- 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.

Essential Questions:

- What is difference between congruence and similarity?
- What is the effect of a scale factor less than one and greater than one on an object?
- Why is the sum of the interior angles of a triangle 180^{o}?
- What are ways to differentiate the 4 different types of geometric transformations are taking place?
- Can students identify geometric transformations in a real-life setting?
- What strategies can be used to find unknown angles?
- What properties apply to the angles of two parallel lines cut by a transversal?

Acquired Knowledge:

- Understand the properties of symmetry and congruence.
- Understand how coordinates are affected by transformations on the coordinate plane.
- Examine and describe the symmetries of a design made from a figure and its image(s) under a symmetry transformation.
- Give precise mathematical directions for performing reflections, rotations and translations in terms of the effect of the transformation on points of the original figure.
- Draw conclusions about a figure in terms of the effect of the transformation on points of the original figure based on what symmetry or symmetries the figure has.
- Understand that figures with the same shape and size are congruent.
- Understand the properties of supplemental angles to prove the interior angles of a triangle sum to 180^{o}.

Acquired Skills:

- Use integer operations to measure distance in the x and y direction.
- Plot coordinates on the coordinate grid.
- Use the coordinate plane to examine symmetries and transformations.
- Use symmetry transformations to explore whether two figures are congruent.
- Make figures with specified symmetries.
- Write coordinate rules for specifying the image of a point under geometric transformations.
- Perform symmetry transformations of figures, including reflections, translations, rotations and dilations.
- Write and solve equations to find an unknown angle value in the context of supplemental angles, parallel lines cut with transversals and interior/exterior angles of triangles.
- Perform compound transformations.

Differentiation:

Enrichment:

- Working with Percents and Transformations

Supplement:

- Special Needs Handbook Activities

Assessments:

Formative Assessments:

- Assessment Checklist for Transformation Symmetry
- Assessment Checklist for Congruence
- Assessment Checklist for Pythagorean Theorem
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Chapter Assessments

Benchmarks

- Unit 1 Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

NJSLS.8.G.A.1
NJSLS.8.G.A.2
NJSLS.8.G.A.3
NJSLS.8.G.A.4
NJSLS.8.G.A.5
NJSLS.MP.1-8

Suggested Learning Experiences and Instructional Activities:

- Three Types of Symmetry
- Symmetry Transformations
- Exploring Congruence
- Applying Congruence and Symmetry
- Coordinate Grids
- The Pythagorean Theorem
- Using the Pythagorean Theorem

Technology:

- http://calculationnation.nctm.org/
- www.ixl.com/math
- https://www.hoodamath.com/games/eighth-grade.html

Unit 2: The Number System (40 Days)

Why Is This Unit Important?

In the middle grades, students are introduced to fractions and decimals. The next major hurdle is building a greater understanding of rational numbers; i.e., integers, fractions and terminating and non-terminating decimals. Students have experienced these kinds of numbers informally in their everyday world. For example, temperatures drop below zero in the winter or soar above 90 degrees in the summer and sports teams are said to be ahead or behind by so much. Students have intuitively used operations on rational numbers to make sense of these situations. This unit explores situations that require representation with rational and irrational numbers. Students will formalize algorithms for operating using rational and irrational numbers. The big ideas in this unit are:

- Know that there are numbers that are not rational and approximate them by rational numbers.
- Work with radicals and integer exponents.

Enduring Understandings:

- 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.
- 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.
- Know and apply the properties of integer exponents to generate equivalent numerical expressions.
- 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.
- 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. Interpret scientific notation that has been generated by technology.

Essential Questions:

- What is the difference between rational and irrational numbers?
- What is the impact of a positive or negative exponent on a number?
- What is the effect of multiplying or dividing by a power of ten on a number?
- How can we use exponents to perform unit conversions in the metric system?
- When do we use scientific notation in real world applications?
- What is side of the square when given the area?
- How do you determine if two numerical expressions are equivalent?

Acquired Knowledge:

- Students recognize that the decimal equivalent of a fraction will either terminate or repeat.
- Understand irrational numbers are non-terminating and non-repeating decimals.
- Students should connect multiplying and dividing by powers of ten to decimal movement.
- Understand the exponent rules for multiplying and dividing numbers with like bases.
- Differentiate between terminating, repeating and non-repeating and non-terminating decimals.
- Understand the relationship between a square of a number and its square root.
- Understand the different units in the metric system.

Acquired Skills:

- Estimate square roots and cube roots of numbers.
- Convert any rational or irrational number to decimal form.
- Plot rational and irrational numbers on the number line.
- Write equivalent numerical expressions for numbers with integer exponents.
- Perform metric conversions.
- Simplify numerical expressions.
- Apply the rules for numbers with the same base.
- Write numerical expressions with negative exponents in positive exponent form.
- Convert numbers from standard form to scientific notation and vice versa.
- Use technology to apply scientific notation conversions and apply roots.

Differentiation:

Enrichment:

- Exponential Decay

Supplement:

- Special Needs Handbook Activities

Assessments:

Formative Assessments:

- Assessment Checklist for Rational Approximations
- Assessment Checklist for Scientific Notation
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Chapter Assessments

Benchmarks

- Unit 2 Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

NJSLS.8.NS.A.1
NJSLS.8.NS.A.2
NJSLS.8.EE.A.1
NJSLS.8.EE.A.3
NJSLS.8.EE.A.4
NJSLS.MP.1-8

Suggested Learning Experiences and Instructional Activities:

- Rational Numbers and Their Applications
- Irrational Numbers and Their Applications
- Exponential Growth
- Examining Growth Patterns
- Growth Factors and Growth Rates
- Patterns with Exponents

Technology:

- http://calculationnation.nctm.org/
- www.ixl.com/math
- https://www.hoodamath.com/games/eighth-grade.html

Unit 3: Functions (40 Days)

Why Is This Unit Important?

Functions and the equations that represent them are invaluable tools for quantitative reasoning throughout the physical, biological, social and management sciences. In applying algebra to problem-solving tasks, a critical step is representing relationships in symbolic form so that the tools of algebra can be applied effectively. In some situations, the stated problem conditions can be used to write algebraic equations for functions directly and precisely. In other cases, relationships between key variables are only suggested by data patterns. Such relationships can be approximated by mathematical functions, but cannot be precisely described by them. When algebraic equations are used to represent patterns in data from experiments or surveys, the resulting functions are called mathematical models of the underlying relationships. The models can be used to make calculations and to estimate answers to questions about the relationships. One of the central goals is to develop student understanding of and skill with elementary aspects of the modeling process. The big ideas in this unit are:

- Define, evaluate and compare functions.
- Investigate patterns of association in bi-variant data.

Enduring Understandings:

- Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
- Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- 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.
- Construct and interpret scatter plots for bi-variant measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association and nonlinear association.
- Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line and informally assess the model fit by judging the closeness of the data points to the line.
- Use the equation of a linear model to solve problems in the context of bi-variant measurement data, interpreting the slope and intercept.
- Understand that patterns of association can also be seen in bi-variant 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.

Essential Questions:

- How do determine if a relationship is linear based on a table, graph, equation or verbal expression?
- What is the difference between a function and an equation?
- What is slope-intercept form and what does each variable represent?
- What is approximately linear?
- What affect does an outlier have on data that is approximately linear?
- How are lines used to determine comparative rate of change?
- Why is the constant of proportionality the slope of the line?

Acquired Knowledge:

- Recognize linear and non-linear patterns from verbal descriptions, tables and graphs and describe those patterns using words and equations.
- Write equations to express linear patterns appearing in tables, graphs and verbal contexts.
- Write a linear equation when given specific information, such as the slope and y-intercept.
- Approximate linear data patterns with graph and equation models.
- Use linear equations to solve problems and to make predictions and decisions.
- Explain the meaning the meaning of slope and y-intercept.

Acquired Skills:

- Construct and interpret scatter plots of bi-variant data.
- Find the slope and y-intercept given a graph, table, or equation.
- Write an equation in slope-intercept form.
- Solve two variable equations for a given variable.
- Change equations from standard form to slope-intercept form.
- Graph a linear equation using table of values or the slope and y-intercept.
- Find the line of best fit.
- Use the vertical the line test to assess if a graph is a function.
- Construct a relative frequency table.

Differentiation:

Enrichment:

- Equations for Circles and Polygons

Supplement:

- Special Needs Handbook Activities

Assessments:

Formative Assessments:

- Assessment Checklist for Linear Equations
- Assessment Checklist for Bi-Variant Data Analysis
- Assessment Checklist for Pythagorean Theorem
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Chapter Assessments

Benchmarks

- Unit 3 Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

NJSLS.8.F.A.1
NJSLS.8.F.A.2
NJSLS.8.F.A.3
NJSLS.8.SP.A.1
NJSLS.8.SP.A.2
NJSLS.8.SP.A.3
NJSLS.8.SP.A.4
NJSLS.MP.1-8

Suggested Learning Experiences and Instructional Activities:

- Exploring Data Patterns
- Linear Models and Equations
- Inverse Variation
- Looking Back at Functions
- Reasoning with Symbols
- Comparing data Sets
- Choosing a Sample From a Population
- Solving Real World Problems
- Relating Two Variables

Technology:

- http://calculationnation.nctm.org/
- www.ixl.com/math
- https://www.hoodamath.com/games/eighth-grade.html

Unit 4: Equations (40 Days)

Why Is This Unit Important?

In this unit the application of algebraic equations will be applied to practical real-life scenarios and the beginning of the application of functions will be developed. The big ideas in this unit are:

- Understand the connections between proportional relationships, lines and linear equations.
- Analyze and solve linear equations and pairs of simultaneous linear equations.

Enduring Understandings:

- Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
- 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 intercepting the vertical axis at b.
- Solve linear equations in one variable.
- 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).
- Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
- Analyze and solve pairs of simultaneous linear equations.
- 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.
- Solve systems of two linear equations in two variables algebraically and estimate solutions by graphing the equations.
- Solve real-world and mathematical problems leading to two linear equations in two variables.
- 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 table of values.
- Describe qualitatively 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.

Essential Questions:

- What makes two triangles similar?
- What are the key variables in this situation?
- What is the pattern relating the variables?
- What kind of equation will express the relationship?

- How can I use the equation to answer questions about the relationship?
- Does the problem call for writing and/or solving a system of equations? If so, what method would be useful for solving the system?
- What patterns relate the points whose coordinates satisfy linear equations?
- Are there systematic methods that can be used to solve any systems of linear equations?

Acquired Knowledge:

- Understand that the solution to an equation is a point on the graph.
- Identify whether the slope of the graph will be positive, negative, zero, or undefined.
- Understand that systems of linear equations can be solved by graphing, by substituting and by combining equations.
- Explain the significance of points of intersection for systems of linear equations.
- Understand the slope is the unit rate of change or the constant of proportionality.
- Understand that equations can have a single solution, multiple solutions, infinite solutions, or no solutions.

Acquired Skills:

- Use linear and equations to solve problems and to make predictions and decisions.
- Solve linear equations in one variable.
- Write equations to express linear patterns appearing in tables, graphs and verbal contexts.
- Write a linear equation when given specific information, such as two points or a point and the slope.
- Find the slope given the coordinates of two points.
- Find the slope of a graph associated with data.
- Write equations describing proportional relationships in terms of unit rate.
- Simplify expressions using the distributive property and combining like terms.
- Graph a function given a description of the graph and vice versa.
- Use systems of linear equations to solve problems.
- Solve systems of equations using algebra or graphs.

Differentiation:

Enrichment:

- Quadratic Equations

Supplement:

- Special Needs Handbook Activities

Assessments:

Formative Assessments:

- Assessment Checklist for Slope
- Assessment Checklist for Solving Linear Equations
- Assessment Checklist for System of Equations
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Chapter Assessments

Benchmarks

- Unit 4 Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

NJSLS.8.F.B.4
NJSLS.8.F.B.5
NJSLS.8.EE.B.5
NJSLS.8.EE.B.6
NJSLS.8.EE.C.7
NJSLS.8.EE.C.8
NJSLS.MP.1-8

Suggested Learning Experiences and Instructional Activities:

- Equivalent Expressions
- Combining Expressions
- Solving Equations 3
- Linear Equations and Inequalities
- Equations with Two or More Variables
- Solving Systems of Linear equations Symbolically
- Linear Inequalities

Technology:

- http://calculationnation.nctm.org/
- www.ixl.com/math
- https://www.hoodamath.com/games/eighth-grade.html

Unit 5: Geometry II (30 Days)

Why Is This Unit Important?

Geometry is the study of size, shape and position of two and three dimensional figures. In geometry, one explores spatial sense and geometric reasoning. Geometry is found everywhere; in art, architecture, engineering, robotics, etc. When taking geometry, spatial reasoning and problem-solving skills will be developed. As students move through this unit, their abstract thinking will be developed through analysis and reasoning. The big ideas in this unit are:

- Work with radical and integer exponents.
- Understand and apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

Enduring Understandings:

- 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 √2 is irrational.
- Explain a proof of the Pythagorean Theorem and its converse.
- Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
- Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
- Know the formulas for the volumes of cones, cylinders and spheres and use them to solve real-world and mathematical problems.

Essential Questions:

- How can I find the length of something without directly measuring it?
- Is it appropriate and useful to use the Pythagorean Theorem in this situation? How do I know this?
- How can I find the distance between two points?
- What is the √2?
- When is it appropriate to have a radical in a solution?
- How is finding area related to finding volume?
- What is the inverse of a square root?

Acquired Knowledge:

- Prove, understand and apply the Pythagorean Theorem.
- Develop strategies for finding the distance between two points on a coordinate grid.
- Understand that square root solutions are positive and negative.
- Recognize that square roots of negative numbers result in complex numbers.

Acquired Skills:

- Evaluate squares and cubes.
- Evaluate square roots and cube roots.
- Use the Pythagorean Theorem.
- Simplify problems with radicals using appropriate methods. (Radicals cannot be in the denominator)
- Use the Pythagorean Theorem to solve everyday problems.
- Use the Pythagorean Theorem to determine if a triangle is right.
- Find the distance between two points.
- Find the volume of a cone, cylinder, or sphere.
- Find the radius or diameter of a cone, cylinder or sphere given the volume.
- Write solutions in terms of π.

Differentiation:

Enrichment:

- 3-Dimensional Transformations

Supplement:

- Special Needs Handbook Activities

Assessments:

Formative Assessments:

- Assessment Checklist for Pythagorean Theorem
- Assessment Checklist for Volume
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Chapter Assessments

Benchmarks

- Unit 5 Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

NJSLS.8.EE.A.2
NJSLS.8.G.B.6
NJSLS.8.G.B.7
NJSLS.8.G.B.8
NJSLS.8.G.C.9
NJSLS.MP.1-8

Suggested Learning Experiences and Instructional Activities:

- Squares, Cubes and Roots
- Coordinate Grids
- The Pythagorean Theorem
- Using the Pythagorean Theorem
- Exploring, Analyzing and Describing 3-Dimensional Models

Technology:

- http://calculationnation.nctm.org/
- www.ixl.com/math
- https://www.hoodamath.com/games/eighth-grade.html

Sample Standards Integration

21st Century Skills & Career Readiness Practices

CRP4. Communicate clearly and effectively and with reason.

For example, in Unit 2 students will justify their reasoning in their choice of solution pathways involving exponential growth scenarios

CRP6. Demonstrate creativity and innovation.

For example, in Unit 5 students will use geometric techniques to solve real world complex volume problems.

CRP7. Employ valid and reliable research strategies.

For example, in Unit 3 students will analyze and interpret data plots for b-variant measurement data.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

For example, in Unit 4 students will work to solve and understand real world applications utilizing their understanding of functions, graphical analysis, and proportional relationships.

CRP12. Work productively in teams while using cultural global competence.

For example, in Unit 1 students will work in small teams to develop informal arguments for their solutions to unknown geometric scenarios.

8.1 Educational Technology
All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

For example, in Unit 5 students will access, manage, evaluate, and synthesize information to develop models for geometric manipulations in 3 dimensions.

Interdisciplinary Connections

RI.8.1. Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

RI.8.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.

RI.8.8. Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.

These standards are met throughout the course. For example, in Unit 3 students will read use written sources to gather bi-variant data for analysis.

SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

A. Come to discussions prepared having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
B. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
C. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
D. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

SL.8.3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

SL.8.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation

These standards are met throughout the course. For example, in Unit 4 students will discuss their solutions to a variety of real world scenarios involving functions and proportional relationships.