



Totowa Public Schools

Mathematics

Grade 8

Aligned to NJSLS 2020 Standards

BOE Adopted: 8/31/2022

Revised 12/14/2022

Units of Study & Pacing Guide

<u>Unit of Study</u>	<u>Timeline</u>	<u>Notes</u>
Unit 1: Number System	8 Weeks	
Unit 2: Proportional/Nonproportional Relationships & Functions	8 Weeks	
Unit 3: Equations	8 Weeks	
Unit 4: Transformational Geometry	8 Weeks	
Unit 5: Measurement Geometry	4 Weeks	

Title	The Number System
Unit Duration	8 Weeks
Unit Summary & Rationale	In this unit the definition of irrational numbers is introduced. Students will learn how to give rational approximations for irrational numbers and will be able to understand that every number has a decimal expansion. The students will be able to conclude that all rational numbers will eventually repeat and/or terminate. Students will also work on radical values and applying properties with integer exponents. The students will use these properties of integer exponents to generate equivalent expressions and apply these concepts to scientific notation.
Unit Goals	
Essential Questions	<ul style="list-style-type: none"> • What is the difference between rational and irrational numbers? • When can you apply integer exponents to real world situations? • Why is it useful to use scientific notation? • What is the result of a base having a positive, a negative or a zero exponent?
Enduring Understandings	<ul style="list-style-type: none"> • Rational numbers can be written as a ratio, whereas irrational numbers cannot be written as a ratio. • Rational numbers can be used to approximate the value of irrational numbers. • Integer exponents can be used to represent very small or very large numerical values. • Extremely small and large numbers can be displayed using integer exponents or conceptually scientific notation.
Learning Outcomes	<ul style="list-style-type: none"> • Be able to compare rational and irrational numbers. • Be able to use rational numbers to approximate and locate irrational numbers on a number line. • Be able to apply properties of integer exponents to simplify and write equivalent numerical expressions. • Be able to use scientific notation to estimate and express the values of very large or very small numbers and compare their values. • Be able to perform operations with numbers written in scientific notation.

Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Digital Personal Math Trainer, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments, Interactive Notebooks
Summative	LinkIt Benchmark Assessments, Tests, Pre-Assessments, Quizzes, Written Responses
Alternative and Benchmark	LinkIt Benchmark Assessments, Totowa TPA Alternative – Reteaching, One on One Conferencing, Learning Centers, Levels Homework, Higher Order Thinking Problems, Additional leveled practice Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, iPads, websites and digital interactives/models, Multi-media presentations, video streaming, Brain Pop, Microsoft 365, Primary and Secondary Source Documents, Go Math! Resources, Assorted Manipulatives, Khan Academy, Crosswalk Coach for the Common Core Standards, Ready Common Core Mathematics Instruction and Practice, Common Core Coach, Calculators, Whiteboards Approved Class Resource List
Content & Interdisciplinary Standards	
NJ 2020 SLS: Mathematics	
NJSLS	Activity
8.NS.A.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	<ul style="list-style-type: none"> • Show examples of rational and irrational numbers and let students make generalizations and write examples of each. • Partner activity- Give students numbers represented in different forms and work together to plot these numbers on a number line.

<p>and convert a decimal expansion which repeats eventually into a rational number.</p> <p>8.NS.A.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 (e.g., π^2)</p>	
<p>8.EE.A.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions.</p> <p>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.</p> <p>8.EE.A.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 (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.</p>	<ul style="list-style-type: none"> • Class activity- Expand each exponent form and simplify in order to draw conclusions of integer properties. • Students will be given real world examples where they must calculate and compare values. • Students will use pencil and paper to find the product or quotient of numbers expressed in scientific notation, and then check their answer their calculator. Draw conclusions about how their answer may or may not differ. • Partner work-Choose an appropriate measurement for objects and explore why precision of measurement is essential.
<p>Mathematical Practices</p>	

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

NJ: 2016 SLS: English Language Arts

- RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.
- RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
- RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
- W.8.4. Produce clear and coherent writing in which the development, organization, voice and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
- W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
- L.8.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking
- L.8.4. Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

- 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
- 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values.

2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the

- Act as a responsible and contributing community members and employee.
- Attend to financial well-being.

<p>mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.</p>	<ul style="list-style-type: none"> • Consider the environmental, social and economic impacts of decisions • Demonstrate creativity and innovation. • Utilize critical thinking to make sense of problems and persevere in solving them. • Model integrity, ethical leadership and effective management. • Plan education and career paths aligned to personal goals. • Use technology to enhance productivity increase collaboration and communicate effectively. • Work productively in teams while using cultural/global competence
<ul style="list-style-type: none"> • 9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest. • 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 	
Interdisciplinary/21st Century Connections	
Science	<ul style="list-style-type: none"> • MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
21st Century Connections	<ul style="list-style-type: none"> • Creativity and Innovation • Information and Media Literacy • Critical Thinking and Problem Solving • Technology Literacy

Title	Proportional/Nonproportional Relationships & Functions
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Unit Duration	8 Weeks
Unit Summary & Rationale	In this unit, students will distinguish between proportional and nonproportional relationships. Students will be able to use the concept of unit rate and define it as the slope or constant of proportionality of a linear function. Students will be able to identify the parts of the slope-intercept formula and graph the linear equation $y=mx+b$. Students will learn to analyze, solve and graph linear equations, as well as identify and describe functions.
Unit Goals	
Essential Questions	<ul style="list-style-type: none"> • What do the variables m and b in the linear equation $y=mx + b$ represent? • How can the unit rate of a proportional relationship be identified from the graph of the equation? • Why do we graph linear equations, and what does the line represent? • What is a real-life situation you can apply using the slope-intercept formula? • What is a linear function?
Enduring Understandings	<ul style="list-style-type: none"> • Slope intercept form ($y = mx + b$) is a standard linear form of an equation, where the m stands for the slope of the linear equation and the b stands for the y-intercept. • Linear equations can be solved graphically or algebraically to yield the same solutions. • Students will be able to write a function to model linear relationships between two variables to examine the rate of change and initial value of the real-world data. • A linear function is a rule that assigns one output to each input and, when graphed, creates a line. Data from functions can be represented as a graph or in table format and can be summarized as an equation.
Learning Outcomes	<ul style="list-style-type: none"> • Be able to define linear functions as a rule that assigns one output to each input and determine if data represented in a graph or in a table is a function. • Be able to compare two functions each represented in a different way (numerically, verbally, graphically, and algebraically) and draw conclusions about their properties (rate of change and intercepts).

- Be able to utilize equations, graphs, and tables to classify functions as linear or non-linear, recognizing that $y = mx + b$ is linear with a constant rate of change.
- Be able to graph proportional relationships, interpreting the unit rate as the slope of a graph, and compare two different proportional relationships represented in different ways.
- Be able to derive the equation ($y = mx$) of a line for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b and use similar triangles to explain why the slope (m) is the same between any two points on a non-vertical line in the coordinate plane.
- Be able to create a linear equation to model and solve real life problems as to interpret the meaning of the slope and the intercept.

Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Digital Personal Math Trainer, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments, Interactive Notebooks
Summative	LinkIt Benchmark Assessments, Tests, Pre-Assessments, Quizzes, Written Responses
Alternative and Benchmark	LinkIt Benchmark Assessments, Totowa TPA Alternative – Reteaching, One on One Conferencing, Learning Centers, Levels Homework, Higher Order Thinking Problems, Additional leveled practice Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, iPads, websites and digital interactives/models, Multi-media presentations, video streaming, Brain Pop, Microsoft 365, Primary and Secondary Source Documents, Go Math! Resources, Assorted Manipulatives, Khan Academy, Crosswalk Coach for the Common Core Standards, Ready Common

Core Mathematics Instruction and Practice, Common Core Coach, Calculators, Whiteboards
[Approved Class Resource List](#)

Content & Interdisciplinary Standards

NJ 2020 SLS: Mathematics

NJSLs	Activity
<p>8.EE.B.5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</p> <p>8.EE.B.6. 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.</p>	<ul style="list-style-type: none"> • Class discussion of comparing a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. • Group work- Looking for patterns. • Students will create a table of values of linear equations. Students will graph equations and use patterns to derive that the slope is m and the y-intercept is b in the equation $y = mx + b$.
<p>8.F.A.1. 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.</p> <p>8.F.A.2. Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically,</p>	<ul style="list-style-type: none"> • What's the Rule? - Given data, students will determine the rule that assigns each input to each output. • Class activity- Determine rate of change using linear functions in various forms. • Linear or Nonlinear- Teacher directed activity where students will need to classify and compare and contrast functions in various forms. • Graphing -Running Out of Gas- Provide students with a table of values representing the amount of gas in a leaking tank over time. Calculate the rate of change and determine what the intercepts represent.

numerically in tables, or by verbal descriptions).

8.F.A.3. 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.

8.F.B. Use functions to model relationships between quantities.,

8.F.B.4. 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.

8.F.B.5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

- Class ‘Story Telling’ activity, where students must sketch a graph based on a story told by the teacher. Analyze what each part of the graph represents in the context of the story.

Mathematical Practices	
<ul style="list-style-type: none"> • MP.1. Make sense of problems and persevere in solving them. • MP.2. Reason abstractly and quantitatively. • MP.3. Construct viable arguments and critique the reasoning of others. • MP.4. Model with mathematics. • MP.5. Use appropriate tools strategically. • MP.6. Attend to precision. • MP.7. Look for and make use of structure. • MP.8. Look for and express regularity in repeated reasoning. 	
NJ: 2016 SLS: English Language Arts	
<ul style="list-style-type: none"> • RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts. • RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics • RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. • W.8.4. Produce clear and coherent writing in which the development, organization, voice and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.) • W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others. • L.8.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking • L.8.4. Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies. 	
2020 SLS: Computer Science & Design Thinking	
NJSLS Performance Expectations (By the end of 8th Grade)	
<ul style="list-style-type: none"> • 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. • 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values. 	

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Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.

- Act as a responsible and contributing community members and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence

- 9.1.8.CDM.1: Compare and contrast the use of credit cards and debit cards for specific purchases and the advantages and disadvantages of using each.
- 9.1.8.E.6 Compare the value of goods or services from different sellers when purchasing large quantities and small quantities.

Interdisciplinary/21st Century Connections

Science

- MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

21st Century Connections

- Critical thinking
- Collaboration and Teamwork
- Problem Solving

Title	Equations
Unit Duration	8 Weeks

Unit Summary & Rationale	<p>In this unit students will work on defining, evaluating, and comparing functions. Students will discuss linear functions as defined in the form $y = mx + b$, as well as non-linear functions. Functions will be compared when displayed in different forms (algebraically, graphically, numerically in tables, or by verbal descriptions). In this unit students will begin to extend their descriptions and understanding of variation to the graphical displays of bivariate data. Students will create and interpret scatterplots. Using scatterplots, students will need to determine positive or negative trends, identify outliers, and determine the line of best fit.</p>
Unit Goals	
Essential Questions	<ul style="list-style-type: none"> • What is bivariate data and how can displaying this type of data be useful? • How can an equation with variables on both sides be used to solve real world problems? • How do we use the graph of systems of equations to determine the solution(s)? • How real-world problems be solved by using a system of equations? • How can scatter plots and two-way tables be used to describe the relationship between bivariate data?
Enduring Understandings	<ul style="list-style-type: none"> • Tables and graphs of functions allow for conclusions to be drawn about their rate of change, intercepts, etc. • Model real-world problems using algebraic equations and use various methods of inverse operations to find a solution. • Systems of linear equations can have one solution, many solutions, or no solution. • An ordered pair, where two variables are the same quantities, can be used to solve system of equations. • Bivariate data has two variables, and graphs such as scatter plots can be useful for displaying and analyzing this type of data. The conclusions made from the data depend on how it is represented and summarized.
Learning Outcomes	<ul style="list-style-type: none"> • Be able to solve linear equations in one variable with rational number coefficients that might require expanding expressions using the distributive property and/or combining like terms, including examples with one solution, infinite solutions, or no solution.

- Be able to solve systems of linear equations in two variables by inspection (in simple cases), algebraically, and/or graphically (estimate solutions).
- Be able to use models to explain why the solutions to a system of two linear equations in two variables correspond to a point of intersection of their graphs, parallel lines or coinciding lines.
- Be able to construct scatter plots for bivariate data and identify and interpret data patterns (clustering, outliers, positive or negative association, possible lines of best fit, and nonlinear association).
- Be able to construct frequency/relative frequency tables to analyze and describe possible associations between two variables.

Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Digital Personal Math Trainer, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments, Interactive Notebooks
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Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, iPads, websites and digital interactives/models, Multi-media presentations, video streaming, Brain Pop, Microsoft 365, Primary and Secondary Source Documents, Go Math! Resources, Assorted Manipulatives, Khan Academy, Crosswalk Coach for the Common Core Standards, Ready Common Core Mathematics Instruction and Practice, Common Core Coach, Calculators, Whiteboards

Content & Interdisciplinary Standards

NJ 2020 SLS: Mathematics

NJSLS

Activity

8.SP.A.1. Construct and interpret scatter plots for bivariate 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.

8.SP.A.2. 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 (e.g. line of best fit) by judging the closeness of the data points to the line.

8.SP.A.3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

8.SP.A.4. 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

- Teacher directed activity- Graphing cost of cell phone usage.
- Take a class poll of height vs. foot size- Collect data from entire class on height vs. foot size (in inches) and plot data in scatterplot. Analyze graph and make conclusions.
- Class data collection of looking for a relationship between two variables-Do you have a curfew on school nights and do you have chores assigned to you at home?

<p>or columns to describe possible association between the two variables.</p>	
<p>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.</p> <p>8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.</p>	<ul style="list-style-type: none"> • Teacher driven instruction-What is the solution? Solve linear equations in one variable by using all number properties and inverse operations. Discussion of possible outcomes: one solution, a false statement (no solution) and a true statement (infinite solutions). • Class activity- Graphing equations of using expense and income variables to find the solution to the system (which is the breakeven point). Analyze graph to determine where store is working at a loss or making a profit.
Mathematical Practices	
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2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

- 8.2.8.ED.1: Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
- 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.
- 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).

2020 SLS: Career Readiness, Life Literacies, and Key Skills

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Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.

- Act as a responsible and contributing community members and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence

- 9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.

- 9.1.8.EG.5: Interpret how changing economic and societal needs influence employment trends and future education.

Interdisciplinary/21st Century Connections

Science	<ul style="list-style-type: none"> • MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
21st Century Connections	<ul style="list-style-type: none"> • Critical thinking • Collaboration and Teamwork • Problem Solving

Title	Transformational Geometry
Unit Duration	8 Weeks
Unit Summary & Rationale	In this unit, students will be given an understanding of congruence and similarity using models. Students will experiment with the properties and effects of transformations such as dilations, rotations, translations, and reflections. Students will be able to analyze effects of various transformations using their understanding of similarity and congruency. This unit also incorporates the relationships of the angle sum and exterior angles of triangles, as well as the angle relationships formed when a transversal cuts through a set of parallel lines.
Unit Goals	
Essential Questions	<ul style="list-style-type: none"> • If a figure is transformed on the coordinate plane, will the resulting figure always be congruent to the original? • What relationships are formed when a set of parallel lines is cut by a transversal? • What properties do the angles of a triangle possess?
Enduring Understandings	<ul style="list-style-type: none"> • Geometric images that are reflected, rotated or translated will always result in a congruent image, however images that have been dilated result in a similar image.

	<ul style="list-style-type: none"> • When a set of parallel lines is cut by a transversal, relationships that are formed include supplementary angles, vertical angles, alternate interior/exterior angles, and corresponding angles. • Triangles have an interior angle sum of 180 degrees, and the exterior angles and interior angles have a supplementary relationship. • Relationships formed by angles can be used to find unknown angle measurements.
Learning Outcomes	<ul style="list-style-type: none"> • Be able to utilize the properties of rotation, reflection and translation to model and relate pre-images to their resultant image through physical representations. • Be able to apply effective sequence of transformations to prove that two figures are congruent. • Be able to recognize a dilation as the reduction or an enlargement of a figure and determine the scale factor. • Be able to apply a sequence of transformations to determine that figures are similar when corresponding parts are proportional. • Be able to justify facts about angles created by a set of parallel lines cut by a transversal. • Be able to justify facts about the interior and exterior angles of a triangle, and the angle-angle relationship used to identify similar triangles.
Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Digital Personal Math Trainer, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments, Interactive Notebooks
Summative	LinkIt Benchmark Assessments, Tests, Pre-Assessments, Quizzes, Written Responses
Alternative and Benchmark	LinkIt Benchmark Assessments, Totowa TPA

	<p>Alternative – Reteaching, One on One Conferencing, Learning Centers, Levels Homework, Higher Order Thinking Problems, Additional leveled practice</p> <p>Formative, Summative, Alternative and Benchmark Assessments</p>
Resources to Promote Learning	
Resources & Equipment Needed	<p>Smartboard, Computers, iPads, websites and digital interactives/models, Multi-media presentations, video streaming, Brain Pop, Microsoft 365, Primary and Secondary Source Documents, Go Math! Resources, Assorted Manipulatives, Khan Academy, Crosswalk Coach for the Common Core Standards, Ready Common Core Mathematics Instruction and Practice, Common Core Coach, Calculators, Whiteboards</p> <p>Approved Class Resource List</p>
Content & Interdisciplinary Standards	
NJ 2020 SLS: Mathematics	
NJSLS	Activity
<p>8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations:</p> <p>8.G.A.1a. Lines are transformed to lines, and line segments to line segments of the same length.</p> <p>8.G.A.1b. Angles are transformed to angles of the same measure.</p> <p>8.G.A.1c. Parallel lines are transformed to parallel lines.</p> <p>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.</p>	<ul style="list-style-type: none"> • Apply transformations to real world examples and give direct instruction of how to apply each transformation to a given pre-image. • Partner work of applying multiple transformations to a given pre-image. • Cooperative learning on applying a sequence of transformations in order to find the pre-image or resultant image. • Class discussion of how the scale factor affects the pre-image. • Class activity of applying multiple transformations to an image in order to find corresponding parts of the figure. • Class discussion on which angles look congruent when parallel lines are cut by a transversal. Give direct instruction on names of angle relationships. • Class will draw conclusions of the relationship between the exterior and interior of a triangle, and apply these conclusions to multiple examples.

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.

Mathematical Practices

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

NJ: 2016 SLS: English Language Arts

- RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

- RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
- RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
- W.8.4. Produce clear and coherent writing in which the development, organization, voice and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
- W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
- L.8.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking
- L.8.4. Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

- 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
- 8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies.

2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.

- Act as a responsible and contributing community members and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence

- 9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest

- 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.

Interdisciplinary/21st Century Connections

Science	<ul style="list-style-type: none"> • MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
21st Century Connections	<ul style="list-style-type: none"> • Critical thinking • Collaboration and Teamwork • Problem Solving

Title	Measurement Geometry
Unit Duration	4 Weeks
Unit Summary & Rationale	In this unit, students will continue to work on the following concepts: square roots, cube roots, and integer exponents. They will use these concepts in order to explain a proof of the Pythagorean Theorem and its converse, problem solving with the Pythagorean Theorem, and using the Pythagorean Theorem to determine the distance between two points in the coordinate plane. Students will also be able to solve real-world and mathematical problems involving volume of cylinders, cones, and spheres
Unit Goals	
Essential Questions	<ul style="list-style-type: none"> • How do square/cube roots relate to rational and irrational numbers? • Where and when can the Pythagorean Theorem be applied? • Why is it important to know and be able to • apply formulas for the volume of a cone, cylinder, and sphere?
Enduring Understandings	<ul style="list-style-type: none"> • Calculating square roots of perfect squares and identifying them as rational.

	<ul style="list-style-type: none"> • Estimating square roots of non-perfect squares and identifying them as irrational. • The Pythagorean Theorem is a formula that can determine a missing side of a right triangle if the other two side measurements are known. • Volume formulas calculate the amount of space enclosed by three-dimensional figures, and can be applied to many real life situations.
Learning Outcomes	<ul style="list-style-type: none"> • Be able to evaluate square roots and cubic roots of small perfect squares and cubes respectively and use square and cube root symbols to represent solutions to equations. • Be able to identify $\sqrt{2}$ as irrational. • Be able to explain a proof of the Pythagorean Theorem and its converse. • Be able to utilize the Pythagorean Theorem to determine unknown side lengths of right triangles. • Be able to use the Pythagorean Theorem to determine the distance between two points in the coordinate plane. • Be able to identify and apply the appropriate formula for the volume of a cone, a cylinder, or a sphere to solve real-world and mathematical problems.

Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Digital Personal Math Trainer, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments, Interactive Notebooks
Summative	LinkIt Benchmark Assessments, Tests, Pre-Assessments, Quizzes, Written Responses
Alternative and Benchmark	<p>LinkIt Benchmark Assessments, Totowa TPA</p> <p>Alternative – Reteaching, One on One Conferencing, Learning Centers, Levels Homework, Higher Order Thinking Problems, Additional leveled practice</p> <p>Formative, Summative, Alternative and Benchmark Assessments</p>

Resources to Promote Learning

Resources & Equipment Needed

Smartboard, Computers, iPads, websites and digital interactives/models, Multi-media presentations, video streaming, Brain Pop, Microsoft 365, Primary and Secondary Source Documents, Go Math! Resources, Assorted Manipulatives, Khan Academy, Crosswalk Coach for the Common Core Standards, Ready Common Core Mathematics Instruction and Practice, Common Core Coach, Calculators, Whiteboards

[Approved Class Resource List](#)

Content & Interdisciplinary Standards

NJ 2020 SLS: Mathematics

NJSLs	Activity
<p>8.G.B.6. Explain a proof of the Pythagorean Theorem and its converse.</p> <p>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.</p> <p>8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.</p>	<ul style="list-style-type: none"> • Teacher modeling- Using the Smartboard, teacher will use pictures of right triangles to build squares to derive Pythagorean Theorem. • Partner work- Using real life examples, students will problem solve using the Pythagorean Theorem to determine missing measurements. • Teacher directed activity. Using a coordinate plane on the SmartBoard, put an example of a line segment drawn diagonally. Students predict length. Then using string and the square tiles on the floor we will recreate image from board. Have students relate segment to hypotenuse by building a right triangle and using Pythagorean Theorem to solve.
<p>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.</p>	<ul style="list-style-type: none"> • Class discussion- Discuss slicing three dimensional solids to derive formulas for volume,
<p>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</p>	<ul style="list-style-type: none"> • Teacher modeling-What is meant by squaring and cubing? How do we represent the inverse of these operations symbolically? • Class activity- Too High, Too Low- Using Guess and Test with increased precision, students will determine that they will never arrive at exact answer for the square root of 2. Therefore, its square root is irrational.

roots of small perfect cubes. Know that is irrational.

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- RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
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2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

- 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
- 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
- 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values.

2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.

- Act as a responsible and contributing community members and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence

- 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest.
- 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.

Interdisciplinary/21st Century Connections

21st Century Connections

- Critical thinking
- Collaboration and Teamwork
- Problem Solving

Accommodations & Modifications

Special Education Students, 504 students, English Language Learners, Students at-Risk Based on Students' Individual Needs

<p style="text-align: center;">Time/General</p> <ul style="list-style-type: none"> • Allow extra time • Repeat and clarify directions • Provide breaks in between tasks • Have student verbalize directions • Provide timelines/due dates for reports and projects 	<p style="text-align: center;">Processing</p> <ul style="list-style-type: none"> • Provide extra response time • Have student verbalize steps • Repeat directions • Provide small group instruction • Include partner work 	<p style="text-align: center;">Comprehension</p> <ul style="list-style-type: none"> • Provide reading material on student's level • Have student underline important points • Assist student on how to use context clues to identify words/phrases • Ensure short manageable tasks
<p style="text-align: center;">Tests/Quizzes/Grading</p> <ul style="list-style-type: none"> • Provide extended time • Provide study guides • Limit number of responses 	<p style="text-align: center;">Behavior/Attention</p> <ul style="list-style-type: none"> • Establish classroom rules • Write a contract with the student specifying expected behaviors • Provide preferential seating • Re-focus student as needed • Reinforce student for staying on task 	<p style="text-align: center;">Organization</p> <ul style="list-style-type: none"> • Monitor the student and provide reinforcement of directions • Verify the accurateness of homework assignments • Display a written agenda

ELL, Enrichment, Gifted & Talented Strategies

Accommodations Based on Students' Individual Needs

ELL Strategies

- Provide explicit, systematic instruction in vocabulary.
- Ensure that ELLs have ample opportunities to talk with both adults and peers and provide ongoing feedback and encouragement.
- Expose ELLs to rich language input.
- Scaffolding for ELLs language learning.

- Encourage continued L1 language development.
- Alphabet knowledge
- Phonological awareness
- Print awareness
- Design instruction that focuses on all of the foundational literacy skills.
- Recognize that many literacy skills can transfer across languages.
- English literacy development by helping ELLs make the connection between what they know in their first language and what they need to know in English.
- Graphic organizers
- Modified texts
- Modified assessments
- Written/audio instruction
- Shorter paragraph/essay length
- Homogeneously grouped by level

Accommodations Based on Students' Individual Needs:

Enrichment Strategies

- Evaluate vocabulary
- Elevate Text Complexity
- Incorporate inquiry based assignments and projects
- Extend curriculum
- Balance individual, small group and whole group instruction
- Provide tiered/multi-level activities
- Include purposeful learning centers
- Provide open-ended activities and projects
- Offer opportunities for heterogeneous grouping to work with age and social peers as well as homogeneous grouping to provide time to work with individual peers
- Provide pupils with experiences outside the 'regular' curriculum

- Alter the pace the student uses to cover regular curriculum in order to explore topics of interest in greater depth/breadth within their own grade level
- Require a higher quality of work than the norm for the given age group
- Promote higher level of thinking and making connections.
- Focus on process learning skills such as brainstorming, decision making and social skills
- Use supplementary materials in addition to the normal range of resources.
- Encourage peer to peer mentoring
- Integrate cross-curricular lessons
- Incorporate real-world problem solving activities
- Facilitate student-led questioning and discussions

Gifted & Talented Strategies

- More elaborate, complex, and in-depth study of major ideas, problems, and themes that integrate knowledge within and across systems of thought.
- Development and application of productive thinking skills to enable students to reconceptualize existing knowledge and/or generate new knowledge.
- Explore constantly changing knowledge and information and develop the attitude that knowledge is worth pursuing in an open world.
- Encourage exposure to, selection, and use of appropriate and specialized resources.
- Promote self-initiated and self-directed learning and growth.
- Provide for the development of self-understanding and the understanding of one's relationship to persons, societal institutions, nature, and culture.
- Flexible pacing
- Use of more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace. If they master a particular unit, they need to be provided with more advanced learning activities, not more of the same activity.
- Questions that require a higher level of response and/or open-ended questions that stimulate inquiry, active exploration, and discovery.
- Encourage students to think about subjects in more abstract and complex ways

- Activity selection based on student interests, that encourage self-directed learning
- Group interaction and simulations
- Guided self-management
- Encourage students to demonstrate what they have learned in a wide variety of forms that reflect both knowledge and the ability to manipulate ideas.
- Engage students in active problem-finding and problem-solving activities and research.
- Provide students opportunities for making connections within and across systems of knowledge by focusing on issues, themes, and ideas.