Math 8
Curriculum

This curricula and accompanying instructional materials have been developed to align with the NJSLS and in accordance with the NJ Department of Education's guidelines to include: Curriculum designed to meet grade level expectations, integrated accommodations and modifications for students with IEPs, 504s, ELLs, and gifted and talented students, assessments including benchmarks, formative, summative, and alternative assessments, a list of core instructional and supplemental materials, pacing guide, interdisciplinary connections, integration of 21st century skills, integration of technology, and integration of 21st Century Life and Career standards.

About the Standards

In 1996, the New Jersey State Board of Education adopted the state's first set of academic standards called the Core Curriculum Content Standards. The standards described what students should know and be able to do upon completion of a thirteen-year public school education. Over the last twenty years, New Jersey's academic standards have laid the foundation for local district curricula that is used by teachers in their daily lesson plans.

Revised every five years, the standards provide local school districts with clear and specific benchmarks for student achievement in nine content areas. Developed and reviewed by panels of teachers, administrators, parents, students, and representatives from higher education, business, and the community, the standards are influenced by national standards, research-based practice, and student needs. The standards define a "Thorough and Efficient Education" as guaranteed in 1875 by the New Jersey Constitution. Currently the standards are designed to prepare our students for college and careers by emphasizing high-level skills needed for tomorrow's world.

The New Jersey Student Learning Standards include Preschool Teaching and Learning Standards, as well as nine K-12 standards for the following content areas: **21st Century Life and Careers, Comprehensive Health and Physical Education, English Language Arts, Mathematics, Science, Social Studies, Technology, Visual and Performing Arts, World Languages**

The most recent review and revision of the standards occurred in 2014. However, the standards in language arts and math underwent an additional review in 2015 with adoption by the New Jersey State Board of Education in May 2016.

Lower Cape May Regional School District Mathematics Curriculum	
Content Area: Mathematics	
Course Title: Pre Algebra Grade 8	**Grade level: 8**
Unit 1: Number Sense	**33 days**
Unit 2: Expressions and Equations	**38 days**
Unit 3: Functions	**37 days**
Unit 4: Geometry	**30 days**
Unit 5: Probability and Statistics	**22 days**
Date Created:	**Board Approved On:**

Lower Cape May Regional School District Mathematics Curriculum Unit 1 Overview
Content Area: Mathematics

Unit Title: Unit 1 - The Number System

Target Course/Grade Level: Grade 8

Unit Summary:

This unit explores the study of numbers that are rational and irrational. The value of irrational numbers will be approximated using rational numbers. A clear understanding of irrational numbers will be demonstrated using number lines, models, and expressions of approximations and estimations.

The unit also examines integer exponents, exponent rules, and scientific notation.
Very large and very small numbers can be made easier to use and compare using scientific notation which, in turn, uses exponential expressions. Students will also discover different exponent rules and their applications.

Interdisciplinary Connections:

NJ Student Learning Standards in Mathematics
NJ Student Learning Standards in Language Arts Literacy
NJCCCS in Technology
Period of a pendulum
Astronomy
Kinetic energy (in joules)
Engineering
Nautical miles

21st Century Themes, Skills, and Standards:

This unit will integrate the 21st Century Life and Career Standards:

CRP.1 Act as a responsible and contributing citizen and employee.

Students will work in groups to complete various projects and other assignments thus demonstrating and understanding their obligations and responsibilities of being a member of a community. By working together within the classroom community students will observe how their decisions and actions impact others and the environment around them.

CRP.2 Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real -world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP.4 Communicate clearly and effectively and with reason.

Students will communicate thoughts, ideas, and action plans with clarity, using verbal, written, and/or visual methods and maximize use of their own and others' time.

CRP.6 Demonstrate creativity and innovation.

Students will be encouraged to share solutions to problems in new and unconventional ways. They will seek new methods, practices, and ideas from a variety of sources and apply those ideas to real life statistical situations and practices.

CRP.7 Employ valid and reliable research strategies.

Students will be discerning in accepting and using new information to make decisions, change practices, or inform strategies. They will use reliable research methods and evaluate the validity of sources when considering the use and adoption of external information and practices.

CRP.8 Utilize critical thinking to make sense of problems and persevere in solving them.

Students will be able to identify a problem, understand the nature of the problem, and devise effective plans to solve the problem They will investigate the root cause of the problem and then carefully consider the options to solve the problem. Once a solution is agreed upon, they will follow through to ensure the problem is solved, whether through their action or the action of others.

CRP.11 Use technology to enhance productivity.

Students will develop their statistical understanding by maximizing the productive value of existing and new technology, including graphing calculators, statistical software, and ChromeBooks. They will understand the risks, personal and organizational, of technology applications, and take actions to prevent or mitigate these risks.

Learning Targets	
CPI #	**Cumulative Progress Indicators (CPI) for Unit**
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,and convert a decimal expansion which repeats eventually into a rational number.
8.NS.A.2	Use rational approximations of irrational numbers to compare the of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g.π^2).
8.EE.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions.For example, $3^2 \times 3^{-5} = 3^{-3} = (⅓)^3 = 1/27$.
8.EE.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.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.For example,estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9 , and determine that the world population is more than 20 times larger.
8.EE.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.
Unit Essential Questions: ● What strategies can you use to compare and order rational and irrational numbers on a number line? ● How can you distinguish between rational and irrational numbers? ● Can you name a number that is both irrational and rational? Explain why or why not. ● How do perfect squares help you locate the square root of non-perfect squares such as on a number line? ● How are properties of exponents used to simplify numerical expressions? ● How is scientific notation used to represent numbers?	**Unit Enduring Understandings:** ● Numbers can be represented in a variety of forms that do not change the value of the number. ● All numbers belong to the set of complex numbers. Within that set are many subsets that help us describe and characterize numbers by their properties. ● A rational number is a number (value) within the real number system that can be expressed as a fraction, a/b where a and b are integers and b ≠ 0). Rational numbers consist of fractions that either terminate or repeat. ● An irrational number is a number (value) within the real number system that cannot be expressed as a fraction, a/b, where a and b are integers. ● An irrational number is a decimal that never terminates or repeats. ● Rational numbers and irrational numbers together form the set of real numbers. ● nth roots and nth powers are inverse operations. ● Very large and very small numbers are represented using a single digit times an integer power of 10 (scientific notation). ● Operations and properties of exponents are used to determine the value and/or

	compare numbers in both decimal and scientific notation.
Unit Objectives: ***Students will know….*** ● that there are numbers that are not rational and how to approximate them by using rational numbers. ● properties of exponents and how to use them to solve problems. ● how to apply knowledge of rational and irrational numbers to solve real world application problems. ● how to approximate/estimate square roots and cube roots to problem solve. ● how to apply and extend concepts of radical and integer exponents to simplify expressions and solve problems. ● conversion of standard numbers to scientific notation and vice versa. ● how to apply scientific notation to simplify and solve problems.	**Unit Objectives:** ***Students will be able to…...*** ● identify whether a number is rational or irrational by whether its decimal form is exact, repeating, or does not repeat. ● convert repeating decimal numbers into their fraction equivalents. ● estimate rational and irrational numbers in order to compare their relative size and location on a number line. ● describe and apply the properties of integer exponents to expressions. ● solve one-step equations requiring square or cube roots and determine when the solution is rational or irrational. ● evaluate square roots of small perfect squares and cube roots of small perfect cubes. ● explain why all square roots are irrational numbers. ● estimate and compare very large and very small quantities using scientific notation. ● determine how many times bigger one number is than another using scientific notation. ● describe when and where to use scientific notation and choose

		appropriate units for very large and very small numbers. ● compare, interpret and calculate values using scientific notation and decimal equivalents in the same problem.

Lower Cape May Regional School District Mathematics Curriculum **Unit 2 Overview**
Content Area: Mathematics
Unit Title: Unit 2 - Expressions and Equations
Target Course/Grade Level: Grade 8
Unit Summary: In the unit students will expand upon the fundamental rules of simplifying algebraic expressions. Students will build upon prior knowledge of solving one-step linear equations to solve more complex linear equations. Students will also explore and quantify the connections among proportional relationships, lines, and linear equations. Students will use various representations including graphs, tables, and equations.

Interdisciplinary Connections:

NJ Student Learning Standards in Mathematics
NJ Student Learning Standards in Language Arts Literacy
NJCCCS in Technology
Science (melting point of a solid)
Botany (height of a tree after *x* years)
Landscaping Architecture m(formulas for area and perimeter)
Architecture (scale and proportion)
Engineering (scale and proportion)
Cooking (recipe proportions)
Finance (purchasing power and proportions)

21st Century Themes, Skills, and Standards:

CRP.1 Act as a responsible and contributing citizen and employee.

Students will work in groups to complete various projects and other assignments thus demonstrating and understanding their obligations and responsibilities of being a member of a community. By working together within the classroom community students will observe how their decisions and actions impact others and the environment around them.

CRP.2 Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real -world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP.4 Communicate clearly and effectively and with reason.

Students will communicate thoughts, ideas, and action plans with clarity, using verbal, written, and/or visual methods and maximize use of their own and others' time.

CRP.6 Demonstrate creativity and innovation.

Students will be encouraged to share solutions to problems in new and unconventional ways. They will seek new methods, practices, and ideas from a variety of sources and apply those ideas to real life statistical situations and practices.

CRP.7 Employ valid and reliable research strategies.

Students will be discerning in accepting and using new information to make decisions, change practices, or inform strategies. They will use reliable research methods and evaluate the validity of sources when considering the use and adoption of external information and practices.

CRP.8 Utilize critical thinking to make sense of problems and persevere in solving them.

Students will be able to identify a problem, understand the nature of the problem, and devise effective plans to solve the problem They will investigate the root cause of the problem and then carefully consider the options to solve the problem. Once a solution is agreed upon, they will follow through to ensure the problem is solved, whether through their action or the action of others.

CRP.11 Use technology to enhance productivity.

Students will develop their statistical understanding by maximizing the productive value of existing and new technology, including graphing calculators, statistical software, and ChromeBooks. They will understand the risks, personal and organizational, of technology applications, and take actions to prevent or mitigate these risks.

9.1.8.E6. Compare the value of goods or services from different sellers when purchasing large quantities and small quantities.

Learning Targets

CPI #	**Cumulative Progress Indicators (CPI) for Unit**
8.EE.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.*

8.EE.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.
8.EE.7a	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).
8.EE.7b	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
8.EE.8a	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.
8.EE.8b	Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6*
8.EE.8c	Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*

Unit Essential Questions: ● How can you use inductive reasoning to discover rules in mathematics and how can you test that rule? ● What are the various methods that can be used to evaluate and simplify numerical and algebraic expressions? ● What is the purpose of an equations? ● How do we apply mathematical properties and operations to solve equations? ● Why is the order of operation rule important to know when solving equations? ● How can you check the reasonableness of the solution to an equation? ● What does steepness of a line tell us about the magnitude of the rate of change? ● How are graphs, tables, and equations used to represent proportional relationships? ● What is the significance of the slope and the y-intercept in a linear equation?	**Unit Enduring Understandings:** ● Numerical and algebraic expressions can be simplified and evaluated using order of operations and computation of rational numbers. ● Equations are used to model real life situations. ● Inverse operations are used to solve equations. ● The intersection of two linear equations is a solution set that is true for both equations. ● The slope of a line is the constant rate of change and represents the steepness of a line. ● A proportional relationship has a constant rate of change, or unit rate, known as the slope and are linear equations of the form y=mx. ● Linear equations in one variable have one solution, no solutions, or infinitely many solutions.

Unit Objectives: ***Students will know….***	**Unit Objectives:** ***Students will be able to…...***
● that to simplify multi-step numeric and algebraic expressions one must use order of operations, distributive property, combining like terms, and rational number rules. ● how to solve and check multi-step equations with rational coefficients. ● that linear equations have either one, none, or infinitely many solutions. ● that to solve an equation or formula the unknown variable must be isolated and solved for in terms of the other variables.	● compare, contrast, and interpret multiple representations of proportional relationships (graphs, tables, equations, and verbal models). ● graph proportional relationships by using the unit rate as the slope of the graph. ● compare and contrast two different proportional relationships that are represented in different ways, i.e. an equation with a graph. ● write and interpret an equation for a line in slope-intercept form and determine the relationship is linear using similar triangles to show the slope is the same between any two points. ● write, solve, and interpret the solution set of multi-step linear equations in one variable. ● determine when a solution gives one solution, infinitely many solutions, or no solutions. ● apply the distributive property to algebraic expressions. ● combine like terms to simplify expressions and equations. ● write, solve, and interpret the solutions to systems of linear equations with two variables graphically and algebraically. ● recognize and explain the solution to a system of linear equations graphically (as a point of intersection). ● describe instances when a system of equations will yield one solution, no solutions, or infinitely many solutions.

Lower Cape May Regional School District Mathematics Curriculum
Unit 3 Overview

Content Area: Mathematics

Unit Title: Unit 3 - Functions

Target Course/Grade Level: Grade 8

Unit Summary:
The ability to recognize and analyze functions is very useful in real life. In this unit, students will explore and understand the concept of a function as a rule that assigns to each input exactly one output. They will understand that functions describe situations where one quantity determines another. Students will translate among representations and partial representations of functions and describe how aspects of the function are reflected in the different representations. Students will also describe, identify, and graph nonlinear functions.

Interdisciplinary Connections:
NJ Student Learning Standards in Mathematics
NJ Student Learning Standards in Language Arts Literacy
NJCCCS in Technology
Health and Physical Education (number of calories burned depending on activity)
Finances (saving money, simple interest, compound interest)
Science (height vs. time for falling objects)

21st Century Themes, Skills, and Standards:

CRP.1 Act as a responsible and contributing citizen and employee.

Students will work in groups to complete various projects and other assignments thus demonstrating and understanding their obligations and responsibilities of being a member of a community. By working together within the classroom community students will observe how their decisions and actions impact others and the environment around them.

CRP.2 Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real -world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP.4 Communicate clearly and effectively and with reason.

Students will communicate thoughts, ideas, and action plans with clarity, using verbal, written, and/or visual methods and maximize use of their own and others' time.

CRP.6 Demonstrate creativity and innovation.

Students will be encouraged to share solutions to problems in new and unconventional ways. They will seek new methods, practices, and ideas from a variety of sources and apply those ideas to real life statistical situations and practices.

CRP.7 Employ valid and reliable research strategies.

Students will be discerning in accepting and using new information to make decisions, change practices, or inform strategies. They will use reliable research methods and evaluate the validity of sources when considering the use and adoption of external information and practices.

CRP.8 Utilize critical thinking to make sense of problems and persevere in solving them.

Students will be able to identify a problem, understand the nature of the problem, and devise effective plans to solve the problem They will investigate the root cause of the problem and then carefully consider the options to solve the problem. Once a solution is agreed upon, they will follow through to ensure the problem is solved, whether through their action or the action of others.

CRP.11 Use technology to enhance productivity.

Students will develop their statistical understanding by maximizing the productive value of existing and new technology, including graphing calculators, statistical software, and ChromeBooks. They will understand the risks, personal and organizational, of technology applications, and take actions to prevent or mitigate these risks.

9.1.8.D.3 Differentiate among various investment options.

Learning Targets	
CPI #	**Cumulative Progress Indicators (CPI) for Unit**
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.
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, 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.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.

Unit Essential Questions:	**Unit Enduring Understandings:**
● What is a function? ● Why is it important to know if the relationship between two quantities is a function? ● How can you use a mapping diagram to show the relationship between two data sets? ● How can you represent a function in various ways? ● How can you use a function to describe a linear pattern? ● How can you recognize when a pattern in real life is linear or nonlinear? ● How can you use a graph to represent relationships between quantities without using numbers? ● Why aren't all functions linear? When is an equation nonlinear?	● When two quantities represent a function, we can identify the dependent and independent variables and be confident that each input will give a unique output. ● A linear function can be written from a graph or a table of values. ● Understanding the difference between a relation and a function. ● We can represent a function by using an input/output table, graph, rule (equation) or mapping diagram, where each represents the same set of ordered pairs. Comparing linear and nonlinear functions. ● Sketches of graphs can be used to represent the relationship between two quantities. ● Linear functions are used to model, understand, and interpret real life data. ● A linear function has a constant rate of change and can be represented by a straight line. A nonlinear function has a variable rate of change and cannot be represented by a single continuous straight line.

Unit Objectives: ***Students will know….*** ● how to define, evaluate, and compare functions. ● what criteria make a relation a function. ● how to use functions to model relationships between quantities. ● how to compare two functions each represented in a different way, i.e. numerically, verbally, graphically, and algebraically. ● how to draw conclusions about a function's properties (rate of change and intercepts). ● How to classify functions as linear or nonlinear by analyzing equations, graphs, and tables of values. ● how to model a linear relationship by constructing a function from two (x,y) values. ● the meaning of the rate of change and initial value of the linear function in terms of the situation it models, and in terms of its graph or a table of values. ● how to sketch a graph of a function from a qualitative description and give a qualitative description of a graph of a function.	**Unit Objectives:** ***Students will be able to…...*** ● determine if a relation is a function using a table, graph, or set of ordered pairs. ● compare and contrast multiple representations of (tables, graphs, equations, and verbal models) of two functions. ● determine whether the relationship is a function in any type of representation. ● identify the rate of change and y-intercept for a linear function in any type of representation. ● determine if a function is linear or nonlinear from a table, equation, graph, or verbal model. ● write, graph, and interpret linear functions. ● construct a function to model a linear relationship from a table of values, two points, or verbal description. ● determine the rate of change (slope) and initial value (y-intercept) from a table and graph. ● explain the meaning of the rate of change and initial value of a linear function in terms of the situation it models ● describe the relationship between two quantities when given a graph. ● sketch a graph from a verbal description of a function. ● write function rules.

Lower Cape May Regional School District Mathematics Curriculum **Unit 4 Overview**
Content Area: Mathematics
Unit Title: Unit 4 - Geometry
Target Course/Grade Level: Grade 8
Unit Summary: In this geometry unit students will study spatial sense and geometric reasoning with a focus on the study of congruence and similarity of figures. Students will explore distance, angles, and how they behave under translations, rotations, reflections, and dilations. Students will apply ideas about congruence and similarity to describe and analyze two-dimensional and three-dimensional figures and solve real life problems. Students will also focus on understanding and applying the Pythagorean Theorem and its converse. They will apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Finally, students broaden their understanding of volume by solving problems involving cones, cylinders, and spheres.

Interdisciplinary Connections:
NJ Student Learning Standards in Mathematics
NJ Student Learning Standards in Language Arts Literacy
NJCCCS in Technology
Architecture (examine the Victorian architecture of Cape May)
Packing and Storage
Woodwork and Construction
Electronics (orthogonal signals)
Interior Design
Game Development
Science
Engineering

21st Century Themes, Skills, and Standards:

CRP.1 Act as a responsible and contributing citizen and employee.

Students will work in groups to complete various projects and other assignments thus demonstrating and understanding their obligations and responsibilities of being a member of a community. By working together within the classroom community students will observe how their decisions and actions impact others and the environment around them.

CRP.2 Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real -world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP.4 Communicate clearly and effectively and with reason.

Students will communicate thoughts, ideas, and action plans with clarity, using verbal, written, and/or visual methods and maximize use of their own and others' time.

CRP.6 Demonstrate creativity and innovation.

Students will be encouraged to share solutions to problems in new and unconventional ways. They will seek new methods, practices, and ideas from a variety of sources and apply those ideas to real life statistical situations and practices.

CRP.7 Employ valid and reliable research strategies.

Students will be discerning in accepting and using new information to make decisions, change practices, or inform strategies. They will use reliable research methods and evaluate the validity of sources when considering the use and adoption of external information and practices.

CRP.8 Utilize critical thinking to make sense of problems and persevere in solving them.

Students will be able to identify a problem, understand the nature of the problem, and devise effective plans to solve the problem They will investigate the root cause of the problem and then carefully consider the options to solve the problem. Once a solution is agreed upon, they will follow through to ensure the problem is solved, whether through their action or the action of others.

CRP.11 Use technology to enhance productivity.

Students will develop their statistical understanding by maximizing the productive value of existing and new technology, including graphing calculators, statistical software, and ChromeBooks. They will understand the risks, personal and organizational, of technology applications, and take actions to prevent or mitigate these risks.

Learning Targets	
CPI #	**Cumulative Progress Indicators (CPI) for Unit**
8.G.1.a	Verify experimentally the properties of rotations, reflections, and translations: Lines are transformed to lines, and line segments to line segments of the same length.
8.G.1b	Verify experimentally the properties of rotations, reflections, and translations: Angles are transformed to angles of the same measure.
8.G.1c	Verify experimentally the properties of rotations, reflections, and translations: Parallel lines are transformed to parallel lines.

8.G.2	Understand that a two-dimensional figure is congruent to another 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.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates
8.G.4	Understand that a two-dimensional figure is similar to another if 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.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.6	Explain a proof of the Pythagorean Theorem and its converse.
8.G.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.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
8.G.9	Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Unit Essential Questions:	**Unit Enduring Understandings:**
● How can you manipulate an object on a plane? ● How do changes in dimensions of similar geometric figures affect the perimeters and areas of the figures? ● How can you describe angles formed by parallel lines and transversals? ● How can you describe the relationship among the angles of polygons? ● How are the lengths of the sides of a right triangle related? ● How can you find the volume of 3-dimensional figures? ● When the dimensions of a solid increase by a factor of k, how does the surface area change? How does the volume change? ● How can the coordinate plane help me understand properties of reflections, translations, and rotations? ● What is the relationship between reflections, translations, and rotations? ● How do indirect measurement strategies allow for the measurement of items in the real world such as playground structures, flagpoles, and buildings?	● Geometry is the mathematics that we use to describe our physical world. ● Geometry is the mathematics of measurement. ● Standard units of measure enable people to interpret results and data. ● All measurements have some degree of uncertainty. ● Geometry knowledge is used in many different branches of mathematics. ● Geometric figures are ruled by known relationships of measures, often expressed as theorems and/or algebraic formulas.

Unit Objectives: ***Students will know….***	**Unit Objectives:** ***Students will be able to…...***
● congruence and similarity can be understood by using physical models, transparencies, or geometry software. ● the Pythagorean Theorem is used to determine the unknown side lengths of right triangles in two and three dimensions to solve real-world and mathematical problems. ● the Pythagorean theorem is used to determine the distance between two points in the coordinate plane. ● an explanation of a proof of the Pythagorean Theorem and its converse. ● how to solve real-world and mathematical problems involving volume of cylinders, cones and spheres. ● about angle relationships of intersecting and ● parallel/transversal lines. ● the different relationships that exist between similar figures. ● the effects of rotations, reflections, translations, and dilations on one-, two-, and three-dimensional figures.	● know and apply the formulas for volumes of cones, cylinders, and spheres. ● find the heights of cylinders or cones given the volumes. ● find the radii of spheres given the volumes. ● understand the relationship between surface areas of similar solids. ● understand the relationship between volumes of similar solids. ● describe and apply the properties of translations, rotations, and reflections on lines, line segments, angles, parallel lines and geometric figures. ● describe how two figures are congruent if the first figure can be rotated, reflected, and/or translated to create the second figure. ● given two congruent figures, describe the transformations needed to create the second from the first. ● describe and apply dilation, translation, rotation, and reflection to two-dimensional figures in a coordinate plane. ● describe how two figures are similar if the first figure can be rotated, reflected, translated and dilated to create the second figure. ● given two similar figures, describe the transformations needed to create the second from the first. ● informally prove: The angle-sum theorem; The properties of angles when

		parallel lines are cut by a transversal; The angle-angle criterion for similar triangles. ● explain a proof of the Pythagorean Theorem and its converse. ● determine the unknown side lengths in a right triangle problem using the Pythagorean Theorem. ● calculate the distance between two points in a coordinate plane using the Pythagorean Theorem. ● calculate the distance between two points in a 3-dimensional case using the Pythagorean Theorem.

Lower Cape May Regional School District Mathematics Curriculum Unit 5 Overview
Content Area:Mathematics
Unit Title: Unit 5 - Probability and Statistics
Target Course/Grade Level: Grade 8
Unit Summary Statistics is about the collection, analysis, and interpretation of data as well as the effective communication and presentation of results relying on data. In this unit, students will use a line of best fit as a statistical method to make predictions. Students will also examine scatter plots and understand different patterns and lines of best fit within graphs. They will use linear models and two variable data to explain real life situations and examine frequencies and bivariate data.

Interdisciplinary Connections:
NJ Student Learning Standards in Mathematics
NJ Student Learning Standards in Language Arts Literacy
NJCCCS in Technology
Advertising
Science
Biology (studying growth of animals over time)
Botany (studying growth of plants over time)
Medicine
Business (predicted profit)

1st Century Themes, Skills, and Standards:

CRP.1 Act as a responsible and contributing citizen and employee.

Students will work in groups to complete various projects and other assignments thus demonstrating and understanding their obligations and responsibilities of being a member of a community. By working together within the classroom community students will observe how their decisions and actions impact others and the environment around them.

CRP.2 Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real -world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP.4 Communicate clearly and effectively and with reason.

Students will communicate thoughts, ideas, and action plans with clarity, using verbal, written, and/or visual methods and maximize use of their own and others' time.

CRP.6 Demonstrate creativity and innovation.

Students will be encouraged to share solutions to problems in new and unconventional ways. They will seek new methods, practices, and ideas from a variety of sources and apply those ideas to real life statistical situations and practices.

CRP.7 Employ valid and reliable research strategies.

Students will be discerning in accepting and using new information to make decisions, change practices, or inform strategies. They will use reliable research methods and

evaluate the validity of sources when considering the use and adoption of external information and practices.

CRP.8 Utilize critical thinking to make sense of problems and persevere in solving them.

Students will be able to identify a problem, understand the nature of the problem, and devise effective plans to solve the problem They will investigate the root cause of the problem and then carefully consider the options to solve the problem. Once a solution is agreed upon, they will follow through to ensure the problem is solved, whether through their action or the action of others.

CRP.11 Use technology to enhance productivity.

Students will develop their statistical understanding by maximizing the productive value of existing and new technology, including graphing calculators, statistical software, and ChromeBooks. They will understand the risks, personal and organizational, of technology applications, and take actions to prevent or mitigate these risks.

Learning Targets

CPI #	Cumulative Progress Indicators (CPI) for Unit
8.SP.1	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.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.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height

8.SP.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 or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*

Unit Essential Questions: ● How can you use data and a line of best fit to predict an event? ● How does graphing data between two quantities help us determine the relationship, if any, between them? ● What are the advantages of using a graph and a two-way table to organize and interpret data? ● How, why and when is a line of best fit useful? ● How does the linear model help us solve problems in the context of bivariate data? ● How can information from a problem be represented in a way to see a pattern or a frequency? ● Are interpretation and prediction an accurate conclusion for a problem? ● How can you display data in a way that helps you make decisions?· ● How can statistics (data) mislead? How can we avoid being misled?	**Unit Enduring Understandings:** ● Statistics helps us understand data and use it to make decisions. ● Probability helps us understand what is likely to happen and we can use that information to make decisions. ● Scatter plots, line of best fit, and frequencies all help interpret data within a problem. ● Patterns can be modeled using different graphs. ● Straight lines are often used to model relationships.

Unit Objectives: ***Students will know….***	**Unit Objectives:** ***Students will be able to…...***
● that population is the entire group of interest or study. ● that sample is a subset of a larger population that is representative of the population. ● a sample space is a range of values or possible outcomes of a sample. ● a prediction is about inferences that can be made about a population from studying a sample of the population. ● that two data distributions can be compared using visual and numerical representations based upon measures of center and measures of variability to draw conclusions. ● Not all solutions to real -world uses of mathematics are perfect or beyond criticism. Often, we must defend our solutions using both mathematical and non-mathematical evidence and reasoning. ● random sampling can be used to make inferences about a population. ● generalizations about a population are only valid if the sample is representative of that population. ● Random sampling tends to produce representative samples and support valid inferences.	● construct and interpret scatter plots. ● describe the relationships shown in a scatter-plot by identifying patterns such as: clustering; outliers; positive or negative correlation; linear association; nonlinear association. ● sketch a line of best fit on a scatter plot, justify the location of the line; and explain why or why not a given line is a good fit. ● write the equation of a line of best fit and use it to make predictions. ● use the slope and y-intercept to describe the relationship represented in a data set. ● construct two-way frequency and relative frequency tables to summarize categorical data. ● use relative frequencies to describe the possible association between two variables of categorical data. ● make predictions based on data and/or line of best fit. ● conduct an experiment and display their data on a scatterplot ● present findings to the class ● analyze a misleading data display

Lower Cape May Regional School District (Insert Subject/Content Area) Curriculum Evidence of Learning
Specific Formative Assessments Utilized in Daily Lessons: ● Kahoot ● Quizlet ● BrainPOP ● Big Ideas Textbook online assignments ● Exit/Admit Slips ● Student oral presentations ● Quick quizzes ● Peer/self assessments ● Graphic organizers ● Homework practice ● Class participation ● Investigative activities
Summative Assessment Utilized throughout Units: ● Quarterly Benchmark Assessments ● End-of-unit or -chapter tests ● Student presentations ● Projects

Modifications for ELL's, Special Education, 504, and Gifted and Talented Students:
Teacher tutoring
Peer tutoring
Cooperative Learning Groups
Modified Assignments
Differentiated Instruction
Response to Intervention (www.help4teachers.com)
Follow all IEP and 504 modifications

Teacher Notes:

- As required by the NJ Department of Education, teachers in all content areas will integrate the 21st Century Life and Careers Standards. As the NJDOE indicates, "Providing New Jersey students with the life and career skills needed to function optimally within this dynamic context is a critical focus and organizing principle of K-12 public education. New Jersey has both an obligation to prepare its young people to thrive in this environment, and a vested economic interest in grooming an engaged citizenry made up of productive members of a global workforce that rewards innovation, creativity, and adaptation to change." The links below indicate the CPIs for grade ranges and need to be addressed throughout the units of study:

  Life and Career Standards

- As indicated in the NJSLS, standards and interdisciplinary connections will be integrated throughout content area curriculum. Links to relevant content standards can be found below:

  LINK APPROPRIATE INTERDISCIPLINARY CONNECTIONS & RELEVANT NJSLS HERE

Project-based Learning Tasks:

How Much Does A 100×100 In-N-Out Cheeseburger Cost?
Graph of the Week
Cool Shoes: linear
Domino Effect: How much does Domino's charge for pizza?
Buck Institute for Education-Projects

Vocabulary:

- In-text vocabulary should be incorporated into every unit. Word journals, vocabulary walls, and/or various other activities should be utilized by the instructor to teach vocabulary.

Unit 1 - The Number System

Cube root
Integers
Irrational numbers
Natural or counting numbers
Perfect cube
Perfect square
Radical sign
Radicand
Rational numbers
Repeating decimal
Square root
Whole numbers

Unit 2 Expressions and Equations

Absolute value
property of equality
Coefficient
Commutative property of addition
Constant
Distributive property
Division property of equality
Equation

Expression
Formula
Inverse
Like terms
Multiplication property of equality
Opposite
Reciprocal
Simplest form
Solution
Subtraction property of equality
Variable

Unit 3 Functions
Dependent variable
Function
Function rule
Independent variable
Input
Linear function
Mapping diagram
Nonlinear function
Ordered pairs
Output
Relation

Unit 4 Geometry
Cone
Congruent
Converse of Pythagorean Theorem
Corresponding angles
Cylinder
Dilation
Distance formula
Hemisphere
Hypotenuse
Interior angles
Legs of a triangle
Pi

Polygon
Pythagorean Theorem
Reflection
Regular polygon
Rotation
Scale factor
Similar solids
Slant height
Sphere
Transformation
Transversal

Unit 5 Statistics and Probability

Bias
Clusters
Event
Frequency
Joint frequency
Line of best fit
Marginal frequency
Negative correlation
Outcome
Outliers
Population
Positive correlation
Raw data
Sample
Sample space
Scatter Plot
Two-way table

The Research Process:

- The research process must be integrated within each course curriculum. Student will be provided with opportunities to investigate issues from thematic units of study. As the NJSLS indicate, students will develop proficiency with MLA or APA format as applicable.
  - Twelve Assignments Every Middle School Student Should Write
  - A Research Guide for Students and Teachers - SUNY-ESF
  - Purdue Online Writing Lab
  - EBSCOhost

Technology:

Students must engage in technology applications integrated throughout the curriculum. Applicable technology utilized in this curricula are included below:

- Scientific Calculator
- Desmos
- Microsoft EXCEL
- ChromeBook
- Kahoot
- Quizlet
- MathJong
- GeoGebra

Resources:

Ancillary resources and materials used to deliver instruction are included below:

- Dan Meyer's Website
- Math Interactives
- National Library of Virtual Manipulatives
- Math = Love
- Project Based Learning- BIE
- NCTM Illuminations
- BrainPOP
- Big Ideas Resources

Differentiation Strategies

Differentiation strategies can require varied amounts of preparation time. High-prep strategies often require a teacher to both create multiple pathways to process information/demonstrate learning and to assign students to those pathways. Hence, more ongoing monitoring and assessment is often required. In contrast, low-prep strategies might require a teacher to strategically create process and product choices for students, but students are allowed to choose which option to pursue given their learning profile or readiness level. Also, a low-prep strategy might be focused on a discrete skill (such as vocabulary words), so there are fewer details to consider. Most teachers find that integration of one to two new low-prep strategies and one high-prep strategy each quarter is a reasonable goal.

Low Prep Strategies (add to list as needed)	
Varied journal prompts, spelling or vocabulary lists	Students are given a choice of different journal prompts, spelling lists or vocabulary lists depending on level of proficiency/assessment results.

Anchor activities	Anchor activities provide meaningful options for students when they are not actively engaged in classroom activities (e.g., when they finish early, are waiting for further directions, are stumped, first enter class, or when the teacher is working with other students). Anchors should be directly related to the current learning goals.
Choices of books	Different textbooks or novels (often at different levels) that students are allowed to choose from for content study or for literature circles.
Choices of review activities	Different review or extension activities are made available to students during a specific section of the class (such as at the beginning or end of the period).
Homework options	Students are provided with choices about the assignments they complete as homework. Or, students are directed to specific homework based on student needs.
Student-teacher goal setting	The teacher and student work together to develop individual learning goals for the student.
Flexible grouping	Students might be instructed as a whole group, in small groups of various permutations (homogeneous or heterogeneous by skill or interest), in pairs or individual. Any small groups or pairs change over time based on assessment data.
Varied computer programs	The computer is used as an additional center in the classroom, and students are directed to specific websites or software that allows them to work on skills at their level.
Multiple Intelligence or Learning Style options	Students select activities or are assigned an activity that is designed for learning a specific area of content through their strong intelligence (verbal-linguistic, interpersonal, musical, etc.)
Varying scaffolding of same organizer	Provide graphic organizers that require students to complete various amounts of information. Some will be more filled out (by the teacher) than others.

Think-Pair-Share by readiness, interest, and/or learning profile	Students are placed in predetermined pairs, asked to think about a question for a specific amount of time, then are asked to share their answers first with their partner and then with the whole group.
Mini workshops to re-teach or extend skills	A short, specific lesson with a student or group of students that focuses on one area of interest or reinforcement of a specific skill.
Orbitals	Students conduct independent investigations generally lasting 3-6 weeks. The investigations "orbit" or revolve around some facet of the curriculum.
Games to practice mastery of information and skill	Use games as a way to review and reinforce concepts. Include questions and tasks that are on a variety of cognitive levels.
Multiple levels of questions	Teachers vary the sorts of questions posed to different students based on their ability to handle them. Varying questions is an excellent way to build the confidence (and motivation) of students who are reluctant to contribute to class discourse. Note: Most teachers would probably admit that without even thinking about it they tend to address particular types of questions to particular students. In some cases, such tendencies may need to be corrected. (For example, a teacher may be unknowingly addressing all of the more challenging questions to one student, thereby inhibiting other students' learning and fostering class resentment of that student.)
High Prep Strategies (add to list as needed)	
Cubing	Designed to help students think about a topic or idea from many different angles or perspectives. The tasks are placed on the six sides of a cube and use commands that help support thinking (justify, describe, evaluate, connect, etc.). The students complete the task on the side that ends face up, either independently or in homogenous groups.

Tiered assignment/ product	The content and objective are the same, but the process and/or the products that students must create to demonstrate mastery are varied according to the students' readiness level.
Independent studies	Students choose a topic of interest that they are curious about and wants to discover new information on. Research is done from questions developed by the student and/or teacher. The researcher produces a product to share learning with classmates.
4MAT	Teachers plan instruction for each of four learning preferences over the course of several days on a given topic. Some lessons focus on mastery, some on understanding, some on personal involvement, and some on synthesis. Each learner has a chance to approach the topic through preferred modes and to strengthen weaker areas
Jigsaw	Students are grouped based on their reading proficiency and each group is given an appropriate text on a specific aspect of a topic (the economic, political and social impact of the Civil War, for example). Students later get into heterogeneous groups to share their findings with their peers, who have read about different areas of study from source texts on their own reading levels. The jigsaw technique allows you to tackle the same subject with all of your students while discreetly providing them the different tools they need to get there.
Multiple texts	The teacher obtains or creates a variety of texts at different reading levels to assign strategically to students.
Alternative assessments	After completing a learning experience via the same content or process, the student may have a choice of products to show what has been learned. This differentiation creates possibilities for students who excel in different modalities over others (verbal versus visual).

Modified Assessments	Assessments can be modified in a variety of ways – for example by formatting the document differently (e.g. more space between questions) or by using different types of questions (matching vs. open ended) or by asking only the truly essential questions.
Learning contracts or Personal Agendas	A contract is a negotiated agreement between teacher and student that may have a mix of requirements and choice based on skills and understandings considered important by the teacher. A personal agenda could be quite similar, as it would list the tasks the teacher wants each student to accomplish in a given day/lesson/unit. Both Learning contracts and personal agendas will likely vary between students within a classroom.
Compacting	This strategy begins with a student assessment to determine level of knowledge or skill already attained (i.e. pretest). Students who demonstrate proficiency before the unit even begins are given the opportunity to work at a higher level (either independently or in a group).
Literature circles	Flexible grouping of students who engage in different studies of a piece of literature. Groups can be heterogeneous and homogeneous.
Learning Centers	A station (or simply a collection of materials) that students might use independently to explore topics or practice skills. Centers allow individual or groups of students to work at their own pace. Students are constantly reassessed to determine which centers are appropriate for students at a particular time, and to plan activities at those centers to build the most pressing skills.

Tic-Tac-Toe Choice Board (sometimes called "Think-Tac-Toe"	The tic-tac-toe choice board is a strategy that enables students to choose multiple tasks to practice a skill, or demonstrate and extend understanding of a process or concept. From the board, students choose (or teacher assigns) three adjacent or diagonal. To design a tic-tac-toe board: - Identify the outcomes and instructional focus - Design 9 different tasks - Use assessment data to determine student levels - Arrange the tasks on a tic-tac-toe board either randomly, in rows according to level of difficulty, or you may want to select one critical task to place in the center of the board for all students to complete.

Curriculum development Resources/Instructional Materials:

List or Link Ancillary Resources and Curriculum Materials Here:

- Dan Meyer's Website
- Math Interactives
- National Library of Virtual Manipulatives
- Math = Love
- Annenberg Learner
- Texas Instrument Activities

Board of Education Approved Text(s)

Larson, R., Boswell, L., Big Ideas Learning, & LLC. (2017). *Big ideas math: A Common Core curriculum*. Erie, PA.