Bermudian Springs Pennsylvania Core Math Framework
Grade 8 – Math and Algebra I

Introduction

Bermudian Springs School District, in partnership with all stakeholders, recognizes the importance of our students being able to use mathematics in everyday life and in the workplace. New knowledge, tools, and ways of solving math problems will significantly enhance opportunities for shaping our students future. Math competencies open doors to productive futures. All students should have the opportunity and support necessary to learn significant math with depth and understanding. Common Core has provided critical areas designed to bring focus to the standards at each grade by describing key concepts in order to guide instruction. The critical areas for instructional focus for eighth grade math outlined by the *Common Core* include the following three areas:

1. **Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations.** Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($y/x = m$ or $y = mx$) as special linear equations ($y = mx + b$), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount $m \cdot A$. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation. Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

2. **Grasping the concept of a function and using functions to describe quantitative relationships. S**tudents grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.

3. **Analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.** Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

Adapted from: PARCC 2013 http://www.parcconline.org PDE/SAS 2014

Standards for Mathematical Practice in Eighth Grade

Bermudian Springs School District incorporated the following Mathematical Practices which are expected to be integrated into every mathematics lesson for all students as outlined in the Pennsylvania Common Core Standards. Below are a few examples of how these mathematical practices may be integrated into some tasks that Bermudian students will apply in eighth grade.

Standards for Mathematical Practice	**Explanations and Examples**
1. Make sense of problems and persevere in solving them.	In Grade 8, Students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and Can I solve the problem in a different way?"
2. Reason abstractly and quantitatively.	In grade 8, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.
3. Construct viable arguments and critique the reasoning of others.	In grade 8, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like "How did you get that?", "Why is that true?" "Does that always work?" They explain their thinking to others and respond to others' thinking.
4. Model with mathematics.	In grade 8, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students solve systems of linear equations and compare properties of functions provided in different forms. Students use scatter plots to represent data and describe associations between variables. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.
5. Use appropriate tools strategically.	Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 8 may translate a set of data given in tabular form to a graphical representation to compare it to another data set. Students might draw pictures, use applets, or write equations to show the relationships between the angles created by a transversal.

6. Attend to precision.	In grade 8, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays.
7. Look for and make use of structure.	Students routinely seek patterns or structures to model and solve problems. In grade 8, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity
8. Look for and express regularity in repeated reasoning.	In grade 8, students use repeated reasoning to understand algorithms and make generalizations about patterns. Students use iterative processes to determine more precise rational approximations for irrational numbers. They analyze patterns of reappearing decimals to identify the corresponding fraction. During multiple opportunities to solve model problems, they notice that the slope of a line and rate of change are the same value. Students flexibly make connections between covariance, rates, and representations showing the relationships between quantities.

Mathematical Standards: Development and Progression											
	Pre K	K	1	2	3	4	5	6	7	8	HS
2.1 Numbers and Operations	(A) Counting & Cardinality										
		(B) Number and Operations in Base Ten						(D) Ratios and Proportional Relationships			(F) Number and Quantity
					(C) Number and Operations - Fractions			(E) The Number System			
2.2 Algebraic Concepts	(A) Operations and Algebraic Thinking							(B) Expressions and Equations			(D) Algebra
										(C) Functions	
2.3 Geometry	(A) Geometry										
2.4 Measurement, Data and Probability	(A) Measurement and Data							(B) Statistics and Probability			

Standard Taxonomy

CC 2.1 . 8. B . 1

- CC: PA Common Core
- 2.1: Math Numbers and Operations
- 8: Grade Level 8th
- B: Domain
- 1: Standard 1

Anchor and Eligible Content

M08. C-G.1.1.1

- M08: Math Grade Level 7
- C-G: Reporting Categories (different by grade)
- 1: Assessment Anchor
- 1: 1.1 Anchor Descriptor
- 1: Eligible Content .1

Reporting Categories (different by grade)

- A-N = The Number System (A – Numbers and
- B-E = Expressions and Equations
- B-F = Functions
- **C-G = Geometry**
- D-S = Statistics and Probability

2.1 Number and Operations

Domain: (E) The Number System

Standard: CC.2.1.8.E.1 Distinguish between rational and irrational numbers using their properties.

Anchor Descriptor: M08.A-N.1.1 Apply concepts of rational and irrational numbers.

- **M08.A-N.1.1.1** Determine whether a number is rational or irrational. For rational numbers, show that the decimal expansion terminates or repeats (limit repeating decimals to thousandths).
- **M08.A-N.1.1.2** Convert a terminating or repeating decimal into a rational number (limit repeating decimals to thousandths).

Standard: CC.2.1.8.E.4 Estimate irrational numbers by comparing them to rational numbers.

Anchor Descriptor: M08.A-N.1.1 Apply concepts of rational and irrational numbers.

- **M08.A-N.1.1.3** Estimate the value of irrational numbers without a calculator (limit whole number radicand to less than 144). *Example: √5 is between 2 and 3 but closer to 2.*
- **M08.A-N.1.1.4** Use rational approximations of irrational numbers to compare and order irrational numbers.
- **M08.A-N.1.1.5** Locate/identify rational and irrational numbers at their approximate locations on a number line.

Key Concepts	**Key Vocabulary**
• Real Numbers	numerical expression, number set, equivalent expression, rational numbers, irrational numbers, whole numbers, natural numbers, integers, real numbers, opposites, absolute value, reciprocal, radical, radicand, perfect square, inequality

Competencies

Describe what students should be able to do (key skills) as a result of this instruction

- Understand and apply properties of real numbers to simplify a complex algebraic expression into an equivalent expression
- Estimate, compare, and order values of irrational numbers
- Determine to which sub sets of numbers an element belongs (ie; the number 4 belongs to the natural/counting, whole, integer, rational, and real number sets – the number 0.25 belong to the rational and real number sets)

2.1 Number and Operations

Domain: (F) Number and Quantity

Standards: CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.
CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

Anchor Description: A1.1.1.1 Represent and/or use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, square roots, and exponents).

- **A1.1.1.1.1**: Compare and/or order any real numbers. Note: Rational and irrational may be mixed.
- **A1.1.1.1.2**: Simplify square roots (e.g., $\sqrt{24} = 2\sqrt{6}$)

Anchor Description: A1.1.1.3 Use exponents, roots, and/or absolute values to solve problems.

- **A1.1.1.3.1**: Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems. Note: Exponents should be integers from -10 to 10

Standard: CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Anchor Description: A1.1.2.2 Write, solve, and/or graph systems of linear equations using various methods.

- **A1.1.2.2.1** Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination. Note: Limit systems to two linear equations.
- **A1.1.2.2.2** Interpret solutions to problems in the context of the problem situation. Note: Limit systems to two linear equations.

Anchor Description: A1.1.3.2 Write, solve, and/or graph systems of linear inequalities using various methods.

- **A1.1.3.2.1** Write and/or solve a system of linear inequalities using graphing. Note: Limit systems to two linear inequalities.
- **A1.1.3.2.2** Interpret solutions to problems in the context of the problem situation. Note: Limit systems to two linear inequalities.

Key Concepts	**Key Vocabulary**
• Real numbers • Solving equations • Solving inequalities • Systems of Equations and Inequalities	radical, radicand, perfect square, rational numbers, irrational numbers, whole numbers, natural numbers, integers, real numbers, inequality, substitution, elimination, graphing, no solution, infinitely many solutions

Competencies

Describe what students should be able to do (key skills) as a result of this instruction

- Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems
- Solve and graph systems of equations and inequalities

2.2 Algebraic Concepts

Domain: (B) Expressions and Equations

Standard: CC.2.2.8.B.1 Apply concepts of radicals and integer exponents to generate equivalent expressions.

Assessment Anchor: M08.B-E.1.1 Represent and use expressions and equations to solve problems involving radicals and integer exponents.

- **M08.B-E.1.1.1** Apply one or more properties of integer exponents to generate equivalent numerical expressions without a calculator (with final answers expressed in exponential form with positive exponents). **Properties will be provided.** *Example: 312 × 3 015 = 3 03 = 1/(33)*
- **M08.B-E.1.1.2** 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 perfect squares (up to and including 122) and cube roots of perfect cubes (up to and including 53) without a calculator. *Example: If x2 = 25 then x = ±√25.*
- **M08.B-E.1.1.3** Estimate very large or very small quantities by using numbers expressed in the form of a single digit times an integer power of 10, and express how many times larger or smaller one number is than another. *Example: Estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109, and determine that the world population is more than 20 times larger than the United States population.*
- **M08.B-E.1.1.4** Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Express answers in 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 (e.g., interpret 4.7EE9 displayed on a calculator as 4.7 × 109).

Standard: CC.2.2.8.B.2 Understand the connections between proportional relationships, lines, and linear equations.

Assessment Anchor: M08.B-E.2.1 Analyze and describe linear relationships between two variables, using slope.

- **M08.B-E.2.1.1** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *Example: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*
- **M08.B-E.2.1.2** Use similar right triangles to show and explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane.
- **M08.B-E.2.1.3** 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.

Standard: CC.2.2.8.B.3 Analyze and solve linear equations and pairs of simultaneous linear equations.

Assessment Anchor: M08.B-E.3.1 Write, solve, graph, and interpret linear equations in one or two variables, using various methods.

- **M08.B-E.3.1.1** Write and identify 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).
- **M08.B-E.3.1.2** Solve linear equations that have rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
- **M08.B-E.3.1.3** Interpret solutions to a system of two linear equations in two variables as points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
- **M08.B-E.3.1.4** Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *Example: 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.*
- **M08.B-E.3.1.5** Solve real-world and mathematical problems leading to two linear equations in two variables. *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.*

Key Concepts	**Key Vocabulary**
• Simplifying algebraic expressions • Solving equations • Solving inequalities • Properties of exponents • Solving systems of equations	distributive property, equation, solution, inverse operations, one-, two-, multi-step, inequality, one-, two-, multi-step, exponent, properties – multiply/divide same base, power to a power, negative/zero exponents, scientific/standard notation, system, solution of a system, substitution, elimination, graphing

Competencies

Describe what students should be able to do (key skills) as a result of this instruction

- Apply properties of real numbers to simplify a complex algebraic expression into an equivalent expression (ie; distributive property, combining like terms, etc.)
- Solve real-world situations described by equations and inequalities using the four operations and inverse operations.
- Understand and apply properties of exponents to simplify algebraic expressions
- Solve real-world scenarios by writing a system of equations and solving algebraically (graphing, substitution, or elimination)
- Develop a logical argument/explanation as to which method of solving a system of equations is 'best' to use when given a specific system

2.2 Algebraic Concepts

Domain: (C) Functions

Standard: CC.2.2.8.C.1 Define, evaluate, and compare functions.

Assessment Anchor: M08.B-F.1.1 Define, evaluate, and compare functions displayed algebraically, graphically, numerically in tables, or by verbal descriptions.

- **M08.B-F.1.1.1** Determine whether a relation is a function.
- **M08.B-F.1.1.2** Compare properties of two functions each represented in a different way (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions). *Example: Given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*
- **M08.B-F.1.1.3** 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.

Standard: CC.2.2.8.C.2 Use concepts of functions to model relationships between quantities.

Assessment Anchor: M08.B-F.2.1 Represent or interpret functional relationships between quantities using tables, graphs, and descriptions.

- **M08.B-F.2.1.1** 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.
- **M08.B-F.2.1.2** 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 or determine a graph that exhibits the qualitative features of a function that has been described verbally.

Key Concepts	**Key Vocabulary**
• Relations • Functions	function, relation, vertical line test, function notation, domain, range, input, output, dependent variable, independent variable, linear function, nonlinear function

Competencies
Describe what students should be able to do (key skills) as a result of this instruction

- Solve real-world problems using function notation
- Describe a logical argument to describe if different representations of relations are or are not functions (ie; mapping, ordered pairs, table of values, graphical illustration, etc.)
- Find a function's output/range when given the input/domain values

2.2 Algebraic Concepts

Domain: (C) Functions

Standard: **CC.2.2.HS.D.1** Interpret the structure of expressions to represent a quantity in terms of its context.
CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.5 Use polynomial identities to solve problems.
CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.

Anchor Description: A1.1.1.5 Simplify expressions involving polynomials.

- **A1.1.1.5.1** Add, subtract, and/or multiply polynomial expressions (express answers in simplest form). Note: Nothing larger than a binomial multiplied by a trinomial.
- **A1.1.1.5.2** Factor algebraic expressions, including difference of squares and trinomials. Note: Trinomials are limited to the form $ax2+bx+c$ where a is equal to 1 after factoring out all monomial factors.
- **A1.1.1.5.3** Simplify/reduce a rational algebraic expression.

Standard: **CC.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method.
CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

Anchor Description: A1.1.1.4 Use estimation strategies in problem-solving situations.

- **A1.1.1.4.1** Use estimation to solve problems.

Anchor Description: A1.1.2.1 Write, solve, and/or graph linear equations using various methods.

- **A1.1.2.1.1** Write, solve, and/or apply a linear equation (including problem situations).
- **A1.1.2.1.2** Use and/or identify an algebraic property to justify any step in an equation-solving process. Note: Linear equations only.
- **A1.1.2.1.3** Interpret solutions to problems in the context of the problem situation. Note: Linear equations only.

Anchor Description: A1.1.2.2 Write, solve, and/or graph systems of linear equations using various methods.

- **A1.1.2.2.1** Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination. Note: Limit systems to two linear equations.
- **A1.1.2.2.2** Interpret solutions to problems in the context of the problem situation. Note: Limit systems to two linear equations.

Anchor Description: A1.1.3.1 Write, solve, and/or graph linear inequalities using various methods.

- **A1.1.3.1.1** Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).
- **A1.1.3.1.2** Identify or graph the solution set to a linear inequality on a number line.
- **A1.1.3.1.3** Interpret solutions to problems in the context of the problem situation. Note: Limit to linear inequalities.

Standard: CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

Anchor Description: A1.1.3.2 Write, solve, and/or graph systems of linear inequalities using various methods.

- **A1.1.3.2.1** Write and/or solve a system of linear inequalities using graphing. Note: Limit systems to two linear inequalities.
- **A1.1.3.2.2** Interpret solutions to problems in the context of the problem situation. Note: Limit systems to two linear inequalities.

Key Concepts	**Key Vocabulary**
• Polynomials • Factoring polynomials • Solving systems of equations and inequalities	polynomial, monomial, binomial, trinomial, degree, standard form, operations with polynomials, factoring trinomials, factoring by grouping, perfect-square trinomial, difference of two squares, substitution, elimination, graphing, no solution, infinitely many solutions

Competencies

Describe what students should be able to do (key skills) as a result of this instruction

- Solve problems using the four operations with polynomials
- Solve real-world situations described by systems of equations and inequalities using the four operations and inverse operations.

2.3 Geometry

Domain: (A) Geometry

Standard: CC.2.3.8.A.1 Apply the concepts of volume of cylinders, cones, and spheres to solve real- world and mathematical problems.

Assessment Anchor: M08.C-G.3.1 Apply volume formulas of cones, cylinders, and spheres.

- **M08.C-G.3.1.1** Apply formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems. **Formulas will be provided.**

Standard: CC.2.3.8.A.2 Understand and apply congruence, similarity, and geometric transformations using various tools.

Assessment Anchor: M08.C-G.1.1 Apply properties of geometric transformations to verify congruence or similarity.

- **M08.C-G.1.1.1** Identify and apply properties of rotations, reflections, and translations. *Example: Angle measures are preserved in rotations, reflections, and translations.*
- **M08.C-G.1.1.2** Given two congruent figures, describe a sequence of transformations that exhibits the congruence between them.
- **M08.C-G.1.1.3** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures, using coordinates.
- **M08.C-G.1.1.4** Given two similar two-dimensional figures, describe a sequence of transformations that exhibits the similarity between them.

Standard: CC.2.3.8.A.3Understand and apply the Pythagorean Theorem to solve problems.

Assessment Anchor: M08.C-G.2.1 Solve problems involving right triangles by applying the Pythagorean theorem.

- **M08.C-G.2.1.1** Apply the converse of the Pythagorean theorem to show a triangle is a right triangle.
- **M08.C-G.2.1.2** Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (Figures provided for problems in three dimensions will be consistent with Eligible Content in grade 8 and below.)
- **M08.C-G.2.1.3** Apply the Pythagorean theorem to find the distance between two points in a coordinate system.

Key Concepts	**Key Vocabulary**
• Two- and three- dimensional objects • Triangles • Coordinate plane	volume, cones, cylinders, spheres, properties, Pythagorean theorem, converse of Pythagorean theorem, reflections, rotations, translations, dilations, similarity and congruence properties

Competencies

Describe what students should be able to do (key skills) as a result of this instruction

- Solve real-world problems using the Pythagorean Theorem and Converse of the Pythagorean Theorem (ie; diagonal distance problems, finding the missing side length of a right triangle, etc.)
- Solve real-world problems on 3-dimensional objects using volume
- Apply geometrical transformations to shapes on a coordinate plane (ie; rotate the triangle at a 45 degree angle)
- Determine what properties (similarity/congruence) were preserved as a result of a geometric transformation

2.4 Measurement, Data and Probability

Domain: (B) Statistics and Probability

Standard: CC.2.4.8.B.1 Analyze and/or interpret bivariate data displayed in multiple representations.

Assessment Anchor: M08.D-S.1.1 Analyze and interpret bivariate data displayed in multiple representations.

- **M08.D-S.1.1.1** 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 correlation, linear association, and nonlinear association.
- **M08.D-S.1.1.2** For scatter plots that suggest a linear association, identify a line of best fit by judging the closeness of the data points to the line.
- **M08.D-S.1.1.3** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *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.*

Standard: CC.2.4.8.B.2 Understand that patterns of association can be seen in bivariate data utilizing frequencies.

Assessment Anchor: M08.D-S.1.2 Understand that patterns of association can be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table.

- **M08.D-S.1.2.1** 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 associations between the two variables. *Example: Given data on whether students have a curfew on school nights and whether they have assigned chores at home, is there evidence that those who have a curfew also tend to have chores?*

Key Concepts	**Key Vocabulary**
• Displaying and representing data	multiple line/bar graphs, line plot, scatter plot, line of best fit, trend line, outliers, positive/negative/no correlation

Competencies
Describe what students should be able to do (key skills) as a result of this instruction

- Interpret and analyze data given in different graphical representations
- Given data, determine the equation for the line of best fit