| Algebra 1 Geometry 8th Grade Standards | | |
|---|---|---|
| **Pacing: 45 days** | | |
| **Unit Title** | **NJSLS** | **Unit Focus** |
| <u>Unit 1A</u><br><br>**Geometry: Pythagorean Theorem, Congruence and Similarity Transformations** | ▪8.EE.A.2<br>◎8.G.C.9<br>▪8.G.B.6<br>▪8.G.B.7 | ● **Work with radicals and integer exponents**<br>● **Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres**<br>● **Understand and apply the Pythagorean Theorem**<br>● **Understand congruence and similarity using physical models, transparencies, or geometry software** |
| **Content Standards** | **Suggested Mathematical Practices** | **Critical Knowledge & Skills** |
| 8.EE.A.2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where $p$ is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that Ö2 is irrational.<br><br>8.G.C.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. | MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br>MP.5 Use appropriate tools strategically.<br>MP.6 Attend to precision.<br>MP.7 Look for and make use of structure.<br>MP.8 Look for and express regularity in repeated reasoning. | Concept(s):<br>● Square root and cube roots; perfect squares and perfect cubes<br>● Inverse relationship between powers and square roots<br><br>Students are able to:<br>● give the value of square roots of small perfect squares.<br>● solve equations of the form $x^2 = p$, where $p$ is a positive rational number.<br>● use the square root symbol to represent solutions to equations of the form $x^2 = p$.<br>● give the value of cube roots of small perfect cubes.<br>● solve equations of the form $x^3 = p$, where $p$ is a positive rational number.<br>● use the cube root symbol to represent solutions to equations of the form $x^3 = p$.<br>● show or explain that Ö2 is an irrational number.<br>● use volume formulas to find a single unknown dimension of cones, cylinders and spheres when solving real world problems.<br><br>Learning Goal 1: Evaluate square roots and cubic roots of small perfect squares and cubes respectively and use square and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$ where $p$ is a positive rational number; identify $\sqrt{2}$ as irrational.<br><br>Learning Goal 2: Apply the formula for the volume of a cone, a cylinder, or a sphere to find a single unknown dimension when solving real-world and mathematical problems. |

Key:   ▪Major Content   ●Supporting Content   ◎Additional Content

| 8.G.B.6. Explain a proof of the Pythagorean Theorem and its converse. | MP.2 Reason abstractly and quantitatively. | Concept(s): <br> • Pythagorean Theorem <br> • If the square of one side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle (Pythagorean theorem converse). <br><br> Students are able to: <br> • given a proof of the Pythagorean theorem, explain the proof. <br> • given a proof of the converse of the Pythagorean theorem, explain the proof. <br><br> Learning Goal 3: Explain a proof of the Pythagorean Theorem and its converse. |
|---|---|---|
| 8.G.B.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. | MP.2 Reason abstractly and quantitatively. <br> MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced <br><br> Students are able to: <br> • determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving two dimensional spaces. <br> • determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving three dimensional spaces. <br><br> Learning Goal 4: Apply the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensional cases when solving real-world and mathematical problems. |

| Unit 1 Eighth Grade | |
|---|---|
| Formative, Alternate, Benchmark and Summative Assessments <br> Study Island CPM checkups   Quizzes   Math Fluency Assessments <br> Tests      Pair and Share   Benchmarks      Performance Assessments <br> Bridges Post Assessments   Observations   Exit and Entrance Tickets <br> Self  Evaluations | |
| **Accommodations & modifications for special education, ELL,G&T, 504 plans and At Risk Learners** | **Integration of NJSLS 21ˢᵗ Century Skills, Life and Career Standards 9.1 CRP, 9.2 Financial Literacy, and 9.3 Career Awareness** |
| **https://docs.google.com/document/d/1QOotX2EIuJaPydBBcm-l6_Jo6n-j0uEqI3YX0q3MDVM/edit?usp=sharing** | iPads <br> Google Classroom |

| | https://docs.google.com/document/d/1sBiARk7yaPV_NQhMh5cJJ_wJb0Rj9nEUvxJKsE-8xvw/edit?usp=sharing |
|---|---|
| **Interdisciplinary Connections**<br>ELA, STEM, Science, Visual and Performing Arts<br><br>NJSLS Technology<br>https://docs.google.com/document/d/1GHL_TdtZh2bmZbeyCW5BPMWOvY-2o5P7NLU_3bDo1qE/edit?usp=sharing | **Core instructional and supplemental materials**<br>CPM Mathematics<br>Study Island by Edmentum<br>8.G.B.6 Converse of the Pythagorean Theorem<br>8.G.B.7 Running on the Football Field |

| Unit 1 Eighth Grade Algebra 1 | | |
|---|---|---|
| **Pacing: 45 days** | | |
| ** note grade 8 expectations | | |
| **Unit Title** | **NJSLS** | **Unit Focus** |
| **Unit 1**<br><br>**Modeling with Linear Equations and Inequalities** | ⬤N.Q.A.1<br>⬤N.Q.A.2<br>⬤N.Q.A.3<br>◼A.REI.B.3<br>◼A.REI.A.1<br>◼A.CED.A.4<br>◼A.SSE.A.1<br>◼A.CED.A.1<br>◼A.CED.A.2<br>◼A.REI.D.10<br>⬤S.ID.B.6<br>◼S.ID.C.7<br>◼S.ID.C.8<br>◼S.ID.C.9<br>◼A.REI.D.11<br>◼8.EE.C.8a.b.c<br>◼8.F.A.1<br>◼8.F.A.2<br>◼8.F.A.3 | ● Reason quantitatively and use units to solve problems<br>● Solve [linear] equations and inequalities in one variable<br>● Understand solving equations as a process of reasoning and explain the reasoning<br>● Create equations that describe numbers or relationships<br>● Interpret the structure of expressions<br>● Represent and solve equations graphically<br>● Summarize, represent, and interpret data on quantitative variables.<br>● Interpret linear models |
| **Content Standards** | **Suggested Mathematical Practices** | **Critical Knowledge & Skills** |

Key:  ◼ Major Content   ⬤ Supporting Content   ◎ Additional Content

| | | |
|---|---|---|
| 8.EE.C.8. Analyze and solve pairs of simultaneous linear equations.<br><br>8.EE.C.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<br><br>8.EE.C.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.*<br><br>8.EE.C.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.* | MP.1 Make sense of problems and persevere in solving them.<br>MP.2 Reason abstractly and quantitatively.<br>MP.6 Attend to precision.<br>MP.7 Look for and make use of structure. | Concept(s):<br><ul><li>Simultaneous linear equations may have an infinite number of solutions.</li><li>Simultaneous linear equations may have no solution or a single solution.</li><li>Solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs.</li></ul><br>Students will be able to:<br><ul><li>solve systems of two linear equations in two variables algebraically.</li><li>estimate solutions of a linear system of two equations by graphing.</li><li>solve simple cases of a linear system of two equations by inspection.</li><li>solve real-world and mathematical problems leading to two linear equations in two variables.</li></ul><br>Learning Goal 1a: Solve systems of linear equations in two variables algebraically and by inspection. Estimate solutions by graphing, explain that points of intersection satisfy both equations simultaneously, and interpret solutions in context. |
| 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. | MP.2 Reason abstractly and quantitatively.<br>MP.5 Use appropriate tools strategically. | Concept(s):<br><ul><li>A function is a rule.</li><li>If a rule is a function, then for each input there is exactly one output.</li></ul><br>Students are able to: |

Key:  ■ Major Content   ● Supporting Content   ◎ Additional Content

|  |  |  |
|---|---|---|
|  |  | <ul><li>use function language.</li><li>describe a function as providing a single output for each input.</li><li>determine whether non-numerical relationships are functions.</li><li>describe a function as a set of ordered pairs.</li><li>read inputs and outputs from a graph.</li><li>describe the ordered pairs as containing an input, and the corresponding output.</li></ul><br>Learning Goal 1: Define a function as a rule that assigns one output to each input and determine if data represented as a graph or in a table is a function. |
| 8.F.A.2. Compare properties <span style="color:red">(e.g. rate of change, intercepts, domain and range)</span> of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For 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.* | MP.5 Use appropriate tools strategically.<br>MP.8 Look for and express regularity in repeated reasoning. | Concept(s):<ul><li>Functions (quantitative relationships) can be represented in different ways.</li><li>Functions have properties; properties of linear functions.</li></ul>Students are able to:<ul><li>analyze functions represented algebraically, as a table of values, and as a graph.</li><li>interpret functions represented by a verbal description.</li><li>given two functions, each represented in a different way, compare their properties.</li></ul>Learning Goal 2: Compare two functions each represented in a different way (numerically, verbally, graphically, and algebraically) and draw conclusions about their properties (rate of change and intercepts). |
| 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. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.* | MP.2 Reason abstractly and quantitatively.<br>MP.3 Construct viable arguments and critique the reasoning of others.<br>MP.5 Use appropriate tools strategically. | Concept(s):<ul><li>A linear function is defined by the equation $y = mx + b$.</li><li>The graph of a linear function is a straight line.</li></ul>Students are able to:<ul><li>analyze tables of values, graphs, and equations in order to classify a function as linear or non-linear.</li><li>determine if equations presented in forms other than y $= mx + b$ (for example 3y – 2x = 7) define a linear function.</li></ul> |

Key:  ■ Major Content   ● Supporting Content   ◎ Additional Content

|  |  | ● give examples of equations that are non-linear functions.<br>● show that a function is not linear using pairs of points.<br><br>Learning Goal 3: Classify functions as linear or non-linear by analyzing equations, graphs, and tables of values; interpret the equation $y = mx + b$ as defining a linear function. |
|---|---|---|
| N.Q.A.1. Use units as a way to understand problems and to guide the solution of multi-step problems; Choose and interpret units consistently in formulas; Choose and interpret the scale and the origin in graphs and data displays.<br><br>N.Q.A.2. Define appropriate quantities for the purpose of descriptive modeling.<br><br>N.Q.A.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP 2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically. | Concept(s):<br>● Units are associated with variables in expressions and equations in context.<br>● Quantities may be used to model attributes of real world situations.<br>● Measurement tools have an inherent amount of uncertainty in measurement.<br><br>Students are able to:<br>● use units to understand real world problems.<br>● use units to guide the solution of multi-step real world problems (e.g. dimensional analysis).<br>● choose and interpret units while using formulas to solve problems.<br>● identify and define appropriate quantities for descriptive modeling.<br>● choose a level of accuracy when reporting measurement quantities.<br><br>Learning Goal 4: Solve multi-step problems, using units to guide the solution, interpreting units consistently in formulas and choosing an appropriate level of accuracy on measurement quantities. Develop descriptive models by defining appropriate quantities. |
| A.REI.B.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.<br><br>A.REI.A.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. | MP 2 Reason abstractly and quantitatively.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s).<br>● Literal equations can be rearranged using the properties of equality.<br><br>Students are able to.<br>● solve linear equations with coefficients represented by letters in one variable.<br>● use the properties of equality to justify steps in solving linear equations.<br>● solve linear inequalities in one variable.<br>● rearrange linear formulas and literal equations, isolating a specific variable.<br><br>Learning Goal 5. Solve linear equations and inequalities in one variable (including literal equations); justify each step in the process. |

Key:  ▪ Major Content  ● Supporting Content  ⊚ Additional Content

| | | |
|---|---|---|
| A.CED.A.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$. | | |
| A.SSE.A.1. Interpret expressions that represent a quantity in terms of its context.<br><br>A.SSE.A.1a. Interpret parts of an expression, such as terms, factors, and coefficients. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP 2 Reason abstractly and quantitatively. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br>● identify different parts of an expression, including terms, factors and constants.<br>● explain the meaning of parts of an expression in context.<br><br>Learning Goal 6: Interpret terms, factors, coefficients, and other parts of expressions in terms of a context . |
| A.CED.A.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear functions and quadratic functions, and simple rational and exponential functions.<br><br>A.REI.A.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. | MP 2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>● Equations and inequalities describe relationships.<br>● Equations can represent real-world and mathematical problems.<br><br>Students are able to:<br>● identify and describe relationships between quantities in word problems.<br>● create linear equations in one variable.<br>● create linear inequalities in one variable.<br>● use equations and inequalities to solve real world problems.<br>● explain each step in the solution process.<br><br>Learning Goal 7: Create linear equations and inequalities in one variable and use them in contextual situations to solve problems. Justify each step in the process and the solution. |
| A.CED.A.2. Create equations in two or more variables to represent relationships between quantities; Graph equations on coordinate axes with labels and scales.<br><br>N.Q.A.1. Use units as a way to understand problems and to guide the solution of multi-step problems; | MP 2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>● Equations represent quantitative relationships.<br><br>Students are able to:<br>● create linear equations in two variables, including those from a context.<br>● select appropriate scales for constructing a graph.<br>● interpret the origin in graphs.<br>● graph equations on coordinate axes, including labels and scales. |

Key:  ■ Major Content  ● Supporting Content  ⊚ Additional Content

| | | |
|---|---|---|
| Choose and interpret units consistently in formulas; Choose and interpret the scale and the origin in graphs and data displays.<br><br>A.REI.D.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). [Focus on linear equations.] | | ● identify and describe the solutions in the graph of an equation.<br><br>Learning Goal 8: Create linear equations in two variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. |
| S.ID.B.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.<br><br>S.ID.B.6a. Fit a function to the data (including the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.<br><br>S.ID.B.6c. Fit a linear function for a scatter plot that suggests a linear association.<br><br>S.ID.C.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.<br><br>S.ID.C.8. Compute (using technology) and interpret the correlation coefficient of a linear fit. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP 2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | Concept(s):<br>● Scatter plots represent the relationship between two variables.<br>● Scatter plots can be used to determine the nature of the association between the variables.<br>● Linear models may be developed by fitting a linear function to approximately linear data.<br>● The correlation coefficient represents the strength of a linear association.<br><br>Students are able to:<br>● distinguish linear models representing approximately linear data from linear equations representing "perfectly" linear relationships.<br>● create a scatter plot and sketch a line of best fit.<br>● fit a linear function to data using technology.<br>● solve problems using prediction equations.<br>● interpret the slope and the intercepts of the linear model in context.<br>● determine the correlation coefficient for the linear model using technology.<br>● determine the direction and strength of the linear association between two variables.<br><br>Learning Goal 9: Represent data on a scatter plot, describe how the variables are related and use technology to fit a function to data.<br><br>Learning Goal 10: Interpret the slope, intercept, and correlation coefficient of a data set of a linear model; distinguish between correlation and causation. |

Key:  ■Major Content  ●Supporting Content  ◉Additional Content

| | | |
|---|---|---|
| S.ID.C.9. Distinguish between correlation and causation. | | |
| A.REI.D.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* [Focus on linear equations.] | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.3 Construct viable arguments and critique the reasoning of others.<br><br>MP.5 Use appropriate tools strategically. | Concept(s):<br>● y = f(x), y=g(x) represent a system of equations.<br>● Systems of equations can be solved graphically (8.EE.C.8).<br><br>Students are able to:<br>● explain the relationship between the x-coordinate of a point of intersection and the solution to the equation f(x) = g(x) for linear equations y = f(x) and y = g(x).<br>● find approximate solutions to the system by making a table of values, graphing, and finding successive approximations.<br><br>Learning Goal 11: Explain why the solutions of the equation f(x) = g(x) are the x-coordinates of the points where the graphs of the linear equations y=f(x) and y=g(x) intersect. ** function notation is not introduced here<br><br>Learning Goal 12: Find approximate solutions of f(x) = g(x), where f(x) and g(x) are linear functions, by making a table of values, using technology to graph and finding successive approximations. |

| Unit 1 Eighth Grade Algebra 1 | |
|---|---|
| Formative, Alternate, Benchmark and Summative Assessments<br>Study Island CPM checkups   Quizzes   Math Fluency Assessments<br>Tests       Pair and Share   Benchmarks     Performance Assessments<br>Bridges Post Assessments   Observations   Exit and Entrance Tickets<br>Self Evaluations | |
| **Accommodations & modifications for special education, ELL,G&T, 504 plans and At Risk Learners** | **Integration of NJSLS 21st Century Skills, Life and Career Standards 9.1 CRP, 9.2 Financial Literacy, and 9.3 Career Awareness** |
| **https://docs.google.com/document/d/1QOotX2EIuJaPydBBcm-l6_Jo6n-j0uEqI3YX0q3MDVM/edit?usp=sharing** | iPads<br>Google Classroom<br>https://docs.google.com/document/d/1sBiARk7yaPV_NQhMh5cJJ_wJb0Rj9nEUvxJKsE-8xvw/edit?usp=sharing |
| **Interdisciplinary Connections** | **Core instructional and supplemental materials** |

Key:   ■ Major Content   ● Supporting Content   ◎ Additional Content

| ELA, STEM, Science, Visual and Performing Arts | Study Island CPM Mathematics |
|---|---|
| NSLS Technology: https://docs.google.com/document/d/1GHL_TdtZh2bmZbeyCW5BPMWOvY-2o5P7NLU_3bDo1qE/edit?usp=sharing | Study Island by Edmentum |
| | N.Q.A.1 Runners' World |
| | N.Q.A.2 Giving Raises |
| | N.Q.A.3 Calories in a Sports Drink |
| | A.REI.B.3, A.REI.A.1 Reasoning with linear inequalities |
| | A.CED.A.4 Equations and Formulas |
| | A.SSE.A.1 Kitchen Floor Tiles |
| | A.CED.A.1 Planes and wheat |
| | A-CED.A.1 Paying the rent |
| | A.REI.A.1 Zero Product Property 1 |
| | A.CED.A.2 Clea on an Escalator |
| | S.ID.B.6,S.ID.C.7-9 Coffee and Crime |
| | 8.F.A.1 Function Rules |
| | 8.F.A.2 Battery Charging |
| | 8.F.A.3 Introduction to Linear Functions |

Key: ■ Major Content  ● Supporting Content  ◎ Additional Content

| Unit 2 Eighth Grade Algebra 1 |
| --- |
| Pacing: 45 days |
| ** note grade 8 expectations |

| Unit Title | NJSLS | Unit Focus |
| --- | --- | --- |
| **Unit 2**<br><br>**Modeling with Linear Functions, Linear Systems, & Exponential Functions** | ◎A.REI.C.6<br>▪A.CED.A.3<br>◎A.REI.C.5<br>▪A.REI.D.12<br>▪F.IF.A.1<br>▪F.IF.A.2<br>●F.LE.A.1<br>●F.LE.A.2<br>▪F.IF.A.3<br>●F.BF.A.1<br>▪A.SSE.A.1<br>●A.SSE.B.3<br>▪F.IF.B.4<br>●F.LE.B.5<br>▪F.IF.B.5<br>▪F.IF.B.6<br>●F.IF.C.9<br>●F.IF.C.7<br>▪8.F..B.4<br>▪8.F.B.5 | • Solve linear systems of equations<br>• Create equations that describe numbers or relationships<br>• Interpret the structure of expressions<br>• Represent and solve equations and inequalities graphically<br>• Construct & compare linear & exponential models<br>• Interpret expressions for functions in terms of the situation<br>• Build a function that models a relationship between two quantities<br>• Understand the concept of a function and use function notation<br>• Interpret functions that arise in applications in terms of the context<br>• Analyze functions using different representations |
| **Content Standards** | **Suggested Mathematical Practices** | **Critical Knowledge & Skills** |
| 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 | MP.6 Attend to precision.<br>MP.2 Reason abstractly and quantitatively.<br>MP.7 Look for and make use of structure. | Concept(s):<br>• As with equations, two (x,y) values can be used to construct a function.<br><br>Students are able to:<br>• determine the rate of change and initial value of a function from a description of a relationship. |

Key: ▪Major Content  ●Supporting Content  ◎Additional Content

| 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. | | <ul><li>determine the rate of change and initial value of a function from two $(x, y)$ values by reading from a table of values.</li><li>determine the rate of change and initial value of a function from two $(x, y)$ values by reading these from a graph.</li><li>construct a function in order to model a linear relationship.</li><li>interpret the rate of change and initial value of a linear function in context.</li></ul><br>Learning Goal 1: Model a linear relationship by constructing a function from two (x,y) values. Interpret 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. |
|---|---|---|
| 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. | MP.1 Make sense of problems and persevere in solving them.<br>MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br>MP.5 Use appropriate tools strategically. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<ul><li>analyze a graph.</li><li>provide qualitative descriptions of graphs (e.g. where increasing or decreasing, linear or non-linear).</li><li>given a verbal description, sketch a graph of a function based on the qualitative features described.</li></ul><br>Learning Goal 2: Sketch a graph of a function from a qualitative description and give a qualitative description of a graph of a function. |
| A.REI.C.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.<br><br>A.CED.A.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* | MP.1 Make sense of problems and persevere in solving them.<br><br>MP 2 Reason abstractly and quantitatively.<br><br>MP.3 Construct viable arguments and critique the reasoning of others.<br>MP.4 Model with mathematics. | Concept(s):<ul><li>Systems of equations can be solved exactly (algebraically) and approximately (graphically).</li></ul><br>Students are able to:<ul><li>identify and define variables representing essential features for the model.</li><li>model real world situations by creating a system of linear equations.</li><li>solve systems of linear equations using the elimination or substitution method.</li><li>solve systems of linear equations by graphing.</li><li>interpret the solution(s) in context.</li></ul> |

Key:  ■ Major Content   ● Supporting Content   ◎Additional Content

| | | |
|---|---|---|
| A.REI.C.5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. | | Leaning Goal 3: Solve multistep contextual problems by identifying variables, writing equations, and solving systems of linear equations in two variables algebraically and graphically. |
| A.REI.D.12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.<br><br>A.CED.A.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* | MP.1 Make sense of problems and persevere in solving them.<br><br>MP 2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br>● model real world situations by creating a system of linear inequalities given a context.<br>● interpret the solution(s) in context.<br><br><br>Learning Goal 4: Graph linear inequalities and systems of linear inequalities in two variables and explain that the solution to the system. |
| F.IF.A.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).<br><br>F.IF.A.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. | MP 2 Reason abstractly and quantitatively.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>● F(x) is an element in the range and x is an element in the domain.<br><br>Students are able to:<br>● use the definition of a function to determine whether a relationship is a function.<br>● use function notation once a relation is determined to be a function.<br>● evaluate functions for given inputs in the domain.<br>● explain statements involving function notation in the context of the problem.<br><br><br>Learning Goal 5: Explain the definition of a function, including the relationship between the domain and range. Use function notation, evaluate functions and interpret statements in context. |

Key: ■ Major Content   ● Supporting Content   ◎ Additional Content

| | | |
|---|---|---|
| F.LE.A.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.<br><br>F.LE.A.1a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.<br><br>F.LE.A.1b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.<br><br>F.LE.A.1c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. | MP.3 Construct viable arguments and critique the reasoning of others.<br>MP.6 Attend to precision. | Concept(s):<br>● Linear functions grow by equal differences over equal intervals.<br>● Exponential functions grow by equal factors over equal intervals.<br><br>Students are able to:<br>● identify and describe situations in which one quantity changes at a constant rate.<br>● identify and describe situations in which a quantity grows or decays by a constant percent.<br>● show that linear functions grow by equal differences over equal intervals.<br>● show that exponential functions grow by equal factors over equal intervals.<br><br>Learning Goal 6: Distinguish between and explain situations modeled with linear functions and with exponential functions. |
| F.LE.A.2. Construct linear and exponential functions - including arithmetic and geometric sequences - given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). *[Algebra 1 limitation: exponential expressions with integer exponents]<br><br>F.IF.A.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.* | MP 2 Reason abstractly and quantitatively.<br><br>MP 4. Model with mathematics<br><br>MP.1 Make sense of problems and persevere in solving them.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>● Sequences are functions, sometimes defined and represented recursively.<br>● Sequences are functions whose domain is a subset of integers.<br><br>Students are able to:<br>● create arithmetic and geometric sequences from verbal descriptions.<br>● create arithmetic sequences from linear functions.<br>● create geometric sequences from exponential functions.<br>● identify recursively defined sequences as functions.<br>● create linear and exponential functions given<br>  − a graph;<br>  − a description of a relationship;<br>  − a table of values.<br><br>Learning Goal 7: Write linear and exponential functions given a graph, table of values, or written description; construct arithmetic and geometric sequences. |
| F.BF.A.1. Write a function that describes a relationship between two quantities. | MP 2 Reason abstractly and quantitatively. | Concept(s): No new concept(s) introduced<br><br>Students are able to: |

Key:    ■ Major Content    ● Supporting Content    ⊚ Additional Content

| | | |
|---|---|---|
| 1a. Determine an explicit expression, a recursive process, or steps for calculation from a context.<br><br>A.SSE.A.1.  Interpret expressions that represent a quantity in terms of its context<br><br>A.SSE.A.1a: Interpret parts of an expression, such as terms, factors, and coefficients.<br><br>A.SSE.A.1b: Interpret complicated expressions by viewing one or more of their parts as a single entity.  *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.*<br>*[Algebra 1 limitation: exponential expressions with integer exponents] | MP.4 Model with mathematics | ● given a context, write an explicit expressions, a recursive process or steps for calculation for linear and exponential relationships.<br>● interpret parts of linear and exponential functions in context.<br><br><br>Learning Goal 8: Write explicit expressions, recursive processes and steps for calculation from a context that describes a linear or exponential relationship between two quantities. |
| A.SSE.B.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.<br><br>A.SSE.B.3c. Use the properties of exponents to transform expressions for exponential functions.  *For example the expression $1.15^t$ can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*<br>*[Algebra 1: limit to exponential expressions with integer exponents] | MP.1 Make sense of problems and persevere in solving them.<br><br>MP 2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.7 Look for and make use of structure | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br>● use the properties of exponents to simplify or expand exponential expressions, recognizing these are equivalent forms.<br><br><br>Learning Goal 9: Use properties of exponents to produce equivalent forms of exponential expressions in one variable. |
| F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and | MP 2 Reason abstractly and quantitatively. | Concept(s): No new concept(s) introduced<br><br>Students are able to: |

Key:  ■ Major Content   ● Supporting Content   ◎ Additional Content

| | | |
|---|---|---|
| tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* *[Focus on exponential functions] <br><br> F.LE.B.5. Interpret the parameters in a linear or exponential function in terms of a context. <br><br> F.IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function* | MP.4 Model with mathematics. <br><br> MP.6 Attend to precision. | ● given a verbal description of a relationship, sketch linear and exponential functions. <br> ● identify intercepts and intervals where the function is positive/negative. <br> ● interpret parameters in context. <br> ● determine the *practical* domain of a function. <br><br><br> Learning Goal 10: Sketch graphs of linear and exponential functions expressed symbolically or from a verbal description. Show key features and interpret parameters in context. |
| F.IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <br> *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* *[Limit to linear and exponential] <br><br> F.IF.B.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) | MP.1 Make sense of problems and persevere in solving them. <br><br> MP.3 Construct viable arguments and critique the reasoning of others. <br><br> MP.5 Use appropriate tools strategically. <br><br> MP.6 Attend to precision. <br><br> MP.8 Look for and express regularity in repeated reasoning. | Concept(s): <br> ● Rate of change of non-linear functions varies. <br><br> *Students are able to:* <br> ● compare key features of two linear functions represented in different ways. <br> ● compare key features of two exponential functions represented in different ways. <br> ● calculate the rate of change from a table of values or from a function presented symbolically. <br> ● estimate the rate of change from a graph. <br><br> Learning Goal 11: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). |

Key:  ■ Major Content   ● Supporting Content   ◎ Additional Content

| over a specified interval. Estimate the rate of change from a graph. | | Learning Goal 12: Calculate and interpret the average rate of change of a function presented symbolically or as a table; estimate the rate of change from a graph. |
|---|---|---|
| F.IF.C.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.<br><br>F.IF.C.7a. Graph linear and quadratic functions and show intercepts, maxima, and minima.<br><br>F.IF.C.7b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | Concept(s):<br>● Piecewise-defined functions may contain discontinuities.<br>● Absolute value functions are piecewise functions.<br><br>Students are able to:<br>● graph linear, square root, cube root, and piecewise-defined functions.<br>● graph more complicated cases of functions using technology.<br>● identify and describe key features of the graphs of square root, cube root, and piecewise-defined functions .<br><br>Learning Goal 13: Graph linear, square root, cube root, and piecewise-defined functions (including step and absolute value functions) expressed symbolically. Graph by hand in simple cases and using technology in more complex cases, showing key features of the graph. |

| **Unit 2 Eighth Grade Algebra 1** | |
|---|---|
| Formative, Alternate, Benchmark and Summative Assessments<br>    Study Island CPM checkups   Quizzes   Math Fluency Assessments<br>Tests      Pair and Share    Benchmarks     Performance Assessments<br>Bridges Post Assessments   Observations   Exit and Entrance Tickets<br>Self Evaluations | |
| **Accommodations & modifications for special education, ELL,G&T, 504 plans and At Risk Learners** | **Integration of NJSLS 21st Century Skills, Life and Career Standards 9.1 CRP, 9.2 Financial Literacy, and 9.3 Career Awareness** |
| **https://docs.google.com/document/d/1QOotX2EIuJaPydBBcm-l6_Jo6n-j0uEqI3Y X0q3MDVM/edit?usp=sharing** | iPads<br>Google Classroom<br>https://docs.google.com/document/d/1sBiARk7yaPV_NQhMh5cJJ_wJb0Rj9nEUvxJKsE-8xvw/edit?usp=sharing |
| **Interdisciplinary Connections**<br>ELA, STEM, Science, Visual and Performing Arts | **Core instructional and supplemental materials** |

Key:     ■ Major Content     ● Supporting Content     ◎ Additional Content

| NSLS Technology: | Study Island CPM Mathematics |
|---|---|
| https://docs.google.com/document/d/1GHL_TdtZh2bmZbeyCW5BPMWOvY-2o5P7NLU_3bDo1qE/edit?usp=sharing | Study Island  by Edmentum |
| | A.REI.C.6 Cash Box |
| | A.CED.A.3 Dimes and Quarters |
| | A.REI.C.5 Solving Two Equations in Two Unknowns |
| | A.REI.D.12 Fishing Adventures 3 |
| | F.IF.A.1 The Parking Lot |
| | F.IF.A.2 Yam in the Oven |
| | F.LE.A.1 Finding Linear and Exponential Models |
| | F.LE.A.2 Interesting Interest Rates |
| | F.BF.A.1a Skeleton Tower |
| | A.SSE.A.1 Mixing Candies |
| | F.IF.B.4 Warming and Cooling |
| | F.IF.B.4, F.IF.B.5 Average Cost |
| | F.LE.B.5 US Population 1982-1988 |
| | F.IF.B.6 Temperature Change |
| | F.IF.C.7b Bank Account Balance |

Key:  ■ Major Content   ● Supporting Content   ◎ Additional Content

| Unit 3 Eighth Grade Algebra 1 | | |
|---|---|---|
| Pacing: 45 days | | |
| **Unit Title** | **NJSLS** | **Unit Focus** |
| **Unit 3**<br><br>**Quadratic Equations, Functions & Polynomials** | ▦A.APR.A.1<br>▦A.SSE.A.2<br>▦A.REI.B.4<br>▦A.CED.A.1<br>▦F.IF.B.4<br>▦F.IF.B.5<br>⬤A.SSE.B.3<br>▦F.BF.A.1<br>⬤F.IF.C.7<br>⬤F.IF.C.8<br>⬤F.IF.C.9<br>▦F.IF.B.6<br>⬤F.LE.A.3<br>◎F.BF.B.3<br>▦A.REI.D.11<br>⬤A.APR.B.3<br>◎N.RN.B.3 | ● Perform arithmetic operations on polynomials<br>● Understand the relationship between zeros and factors<br>● Interpret the structure of expressions<br>● Solve equations and inequalities in one variable<br>● Create equations that describe numbers or relationships<br>● Interpret functions that arise in applications in terms of the context<br>● Represent and solve equations and inequalities graphically<br>● Build a function that models a relationship between two quantities<br>● Construct & compare linear, quadratic, & exponential models<br>● Build new functions from existing functions<br>● Analyze functions using different representations<br>● Use properties of rational and irrational numbers |
| **Content Standards** | **Suggested Mathematical Practices** | **Critical Knowledge & Skills** |
| A.APR.A.1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.<br><br>A.SSE.A.2. Use the structure of an expression to identify ways to rewrite it.<br><br>*For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.* | MP.2 Reason abstractly and quantitatively.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>● Polynomials form a system analogous to the integers.<br>● Polynomials are closed under the operations of addition, subtraction, and multiplication.<br><br>Students are able to:<br>● add and subtract polynomials.<br>● multiply polynomials.<br>● recognize numerical expressions as a difference of squares and rewrite the expression as the product of sums/differences.<br>● recognize polynomial expressions in one variable as a difference of squares and rewrite the expression as the product of sums/differences. |

Key:  ▦ Major Content  ⬤ Supporting Content  ◎ Additional Content

| | | Learning Goal 1: Add, subtract, and multiply polynomials, relating these to arithmetic operations with integers.  Factor to produce equivalent forms of quadratic expressions in one variable. |
|---|---|---|
| A.REI.B.4. Solve quadratic equations in one variable.<br><br>A.REI.B.4a. Use the method of completing the square to transform any quadratic equation in $x$ into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.<br><br>A.REI.B.4b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers $a$ and $b$. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.3 Construct viable arguments and critique the reasoning of others.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>● Multiple methods for solving quadratic equations.<br>● Transforming a quadratic equation into the form $(x - p)^2 = q$ yields an equation having the same solutions.<br><br>Students are able to:<br>● use the method of completing the square to transform a quadratic equation in $x$ into an equation of the form $(x - p)^2 = q$.<br>● derive the quadratic formula from $(x - p)^2 = q$.<br>● solve a quadratic equations in one variable by inspection.<br>● solve quadratic equations in one variable by taking square roots.<br>● solve a quadratic equations in one variable by completing the square.<br>● solve a quadratic equations in one variable using the quadratic formula.<br>● solve a quadratic equations in one variable by factoring.<br>● strategically select, as appropriate to the initial form of the equation, a method for solving a quadratic equation in one variable.<br>● write complex solutions of the quadratic formula in $a \pm bi$ form.<br>● analyze the quadratic formula, recognizing the conditions leading to complex solutions (discriminant).<br><br><br>Learning Goal 2: Derive the quadratic formula by completing the square and recognize when there are no real solutions.<br><br>Learning Goal 3: Solve quadratic equations in one variable using a variety of methods (including inspection, taking square roots, factoring, completing the square, and the quadratic formula) and write complex solutions in $a \pm bi$ form. |
| A.CED.A.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear functions and quadratic functions, and simple rational and exponential functions. | MP 2 Reason abstractly and quantitatively.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br>● create quadratic equations in one variable.<br>● use quadratic equations to solve real world problems. |

Key: ■Major Content  ● Supporting Content  ◎Additional Content

| | | |
|---|---|---|
| | | Learning Goal 4: Create quadratic equations in one variable and use them to solve problems. |
| F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*<br><br>F.IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.<br><br>*For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function* | MP.4 Model with mathematics.<br><br>MP.6 Attend to precision. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br>● interpret maximum/minimum and intercepts of quadratic functions from graphs and tables in the context of the problem.<br>● sketch graphs of quadratic functions given a verbal description of the relationship between the quantities.<br>● identify intercepts and intervals where function is increasing/decreasing<br>● determine the practical domain of a function.<br><br>Learning Goal 5: Interpret key features of quadratic functions from graphs and tables.   Given a verbal description of the relationship, sketch the graph of a quadratic function, showing key features and relating the domain of the function to its graph. |
| A.SSE.B.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.<br><br>A.SSE.B.3a. Factor a quadratic expression to reveal the zeros of the function it defines.<br><br>A.SSE.B.3b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>● Alternate, equivalent forms of a quadratic expression may reveal specific attributes of the function that it defines.<br><br>Students are able to:<br>● factor a quadratic expression for the purpose of revealing the zeros of a function.<br>● complete the square for the purpose of revealing the maximum or minimum of a function.<br><br>Learning Goal 6: Use factoring and completing the square to produce equivalent forms of quadratic expressions in one variable that highlight particular properties such as the zeros or the maximum or minimum value of the function. |

Key:   ■Major Content   ●Supporting Content   ◎Additional Content

| | | |
|---|---|---|
| F.BF.A.1. Write a function that describes a relationship between two quantities.<br><br>F.BF.A.1a: Determine an explicit expression, a recursive process, or steps for calculation from a context. | MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><ul><li>given a context, write explicit expressions, a recursive process or steps for calculation for quadratic relationships.</li></ul><br>Learning Goal 7: Given a context, write an explicit expression, a recursive process or steps for calculation for quadratic relationships. |
| F.IF.C.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.<br><br>F.IF.C.7a. Graph linear and quadratic functions and show intercepts, maxima, and minima. *[emphasize quadratic functions]<br><br>F.IF.C.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.<br><br>F.IF.C.8a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.<br><br>F.IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.3 Construct viable arguments and critique the reasoning of others.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.8 Look for and express regularity in repeated reasoning. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><ul><li>graph quadratic functions expressed symbolically.</li><li>graph more complicated cases of quadratic functions using technology.</li><li>identify and describe key features of the graphs of quadratic functions.</li><li>given two quadratic functions, each represented in a different way, compare the properties of the functions.</li></ul><br>Learning Goal 8: Graph quadratic functions by hand in simple cases and with technology in complex cases, showing intercepts, extreme values and symmetry of the graph. Compare properties of two quadratic functions, each represented in a different way. |

Key: ■ Major Content ● Supporting Content ◎ Additional Content

| | | |
|---|---|---|
| *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* | | |
| F.IF.B.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.<br><br>F.LE.A.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. | MP.1 Make sense of problems and persevere in solving them.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>● A quantity increasing exponentially eventually exceeds a quantity increasing quadratically.<br><br>Students are able to:<br>● calculate the rate of change of a quadratic function from a table of values or from a function presented symbolically.<br>● estimate the rate of change from a graph of a quadratic function.<br>● analyze graphs and tables to compare rates of change of exponential and quadratic functions.<br><br>Learning Goal 9: Calculate and interpret the average rate of change of a quadratic function presented symbolically or as a table. Estimate and compare the rates of change from graphs of quadratic and exponential functions. |
| F.BF.B.3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. | MP.3 Construct viable arguments and critique the reasoning of others.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>● Characteristics of even and odd functions in graphs and algebraic expressions<br>● Vertical and horizontal shifts<br><br>Students are able to:<br>● perform transformations on graphs of linear and quadratic functions.<br>● identify the effect on the graph of replacing f(x) by<br>  − $f(x) + k$;<br>  − $k\,f(x)$;<br>  − $f(kx)$;<br>  − and $f(x + k)$ for specific values of $k$ (both positive and negative).<br>● identify the effect on the graph of combinations of transformations.<br>● given the graph, find the value of k.<br>● illustrate an explanation of the effects on linear and quadratic graphs using technology.<br>● recognize even and odd functions from their graphs and from algebraic expressions for them. |

Key: ■ Major Content ● Supporting Content ◉ Additional Content

| | | Learning Goal 10: Identify the effects of transformations and combinations of transformations [$f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$] on a function; find the value of k given the graph. |
|---|---|---|
| A.REI.D.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.5 Use appropriate tools strategically. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br>● approximate the solution(x) to a system of equations comprised of a linear and a quadratic function by using technology to graph the functions, by making a table of values and/or by finding successive approximations.<br><br>Learning Goal 11: Find approximate solutions of f(x) = g(x), where f(x) is a linear function and g(x) is a quadratic function by making a table of values, using technology to graph and finding successive approximations. |
| A.APR.B.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.<br>  *[Algebra 1: limit to quadratic and cubic functions in which linear and quadratic factors are available] | MP.7 Look for and make use of structure. | Concept(s):<br>● General shape(s) and end behavior of cubic functions<br><br>Students are able to:<br>● find the zeros of a polynomial (quadratic and cubic).<br>● test domain intervals to determine where f(x) is greater than or less than zero.<br>● use zeros of a function to sketch a graph.<br><br>Learning Goal 12: Identify zeros of cubic functions when suitable factorizations are available and use the zeros to construct a rough graph of the function. (*cubic functions are presented as the product of a linear and a quadratic factor) |
| N.RN.B.3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. | MP.3 Construct viable arguments and critique the reasoning of others.<br><br>MP.6 Attend to precision. | Concept(s):<br>● The sum or product of two rational numbers is rational.<br>● The sum of a rational number and an irrational number is irrational.<br>● The product of a nonzero rational number and an irrational number is irrational.<br><br>Students are able to:<br>● explain and justify conclusions regarding sums and products of two rational numbers..<br>● explain and justify conclusions regarding the sum of a rational and irrational number.<br>● explain and justify conclusions regarding the product of a nonzero rational and irrational number. |

Key:  ■ Major Content     ● Supporting Content     ◎ Additional Content

|  |  | Learning Goal 13: Explain and justify conclusions about sums and products of rational and irrational numbers. |
| --- | --- | --- |

| Unit 3 Eighth Grade Algebra 1 |
| --- |

| Formative, Alternate, Benchmark and Summative Assessments<br>    Study Island CPM checkups   Quizzes   Math Fluency Assessments<br>Tests       Pair and Share    Benchmarks     Performance Assessments<br>Bridges Post Assessments    Observations    Exit and Entrance Tickets<br>Self  Evaluations |
| --- |

| Accommodations & modifications for special education, ELL,G&T, 504 plans and At Risk Learners | Integration of NJSLS 21st Century Skills, Life and Career Standards 9.1 CRP, 9.2 Financial Literacy, and 9.3 Career Awareness |
| --- | --- |
| **https://docs.google.com/document/d/1QOotX2EIuJaPydBBcm-l6_Jo6n-j0uEqI3YX0q3MDVM/edit?usp=sharing** | iPads<br>Google Classroom<br>https://docs.google.com/document/d/1sBiARk7yaPV_NQhMh5cJJ_wJb0Rj9nEUvxJKsE-8xvw/edit?usp=sharing |

| Interdisciplinary Connections<br>ELA, STEM, Science, Visual and Performing Arts | Core instructional and supplemental materials |
| --- | --- |
| NSLS Technology:<br>https://docs.google.com/document/d/1GHL_TdtZh2bmZbeyCW5BPMWOvY-2o5P7NLU_3bDo1qE/edit?usp=sharing | Study Island CPM Mathematics<br>Study Island  by Edmentum<br>A.APR.A.1 Powers of 11<br>A.SSE.A.2 Equivalent Expressions<br>A.REI.B.4 Visualizing Completing the Square<br>A.REI.B.4 Braking Distance<br>A.REI.B.4 Two Squares are Equal<br>F.IF.B.4 Words – Tables - Graphs<br>F.IF.B.5 The restaurant<br>A.SSE.B.3 Profit of a company<br>A.SSE.B.3 Rewriting a Quadratic Expression<br>F.IF.C.7a Graphs of Quadratic Functions<br>F.IF.C.8a Springboard Dive<br>F.IF.C.8a Which Function? |

Key:     ■ Major Content     ● Supporting Content     ◎Additional Content

| | |
|---|---|
| | [F.IF.B.9 Throwing Baseballs](#)<br>[F.IF.B.6 Mathemafish Population](#)<br>[F.LE.A.3 Population and Food Supply](#)<br>[F.BF.B.3 Identifying Even and Odd Functions](#)<br>[F.BF.B.3 Transforming the graph of a function](#)<br>[A.REI.D.11 Introduction to Polynomials – College Fund](#)<br>[A.APR.B.3 Graphing from Factors 1](#)<br>[N.RN.B.3 Operations with Rational and Irrational Numbers](#) |

Key:     ■ Major Content     ● Supporting Content     ◎ Additional Content

| Unit 4 Eighth Grade Algebra 1 | | |
|---|---|---|
| Pacing: 45 days | | |
| **Unit Title** | **NJSLS** | **Unit Focus** |
| **Unit 4**<br><br>**Modeling with Statistics** | ◉S.ID.A.1<br>◉S.ID.A.2<br>◉S.ID.A.3<br>⬤ S.ID.B.5<br>⬤ S.ID.B.6<br>◼F.IF.B.4<br>◼F.IF.B.5<br>⬤8.SP.A.1<br>⬤8.SP.A.2<br>⬤8.SP.A.3<br>⬤8.SP.A.4 | ● Summarize, represent, and interpret data on a single count or measurement variable<br>● Summarize, represent, and interpret data on two categorical and quantitative variables<br>● Interpret functions that arise in applications in terms of the context |
| **Content Standards** | **Suggested Mathematical Practices** | **Critical Knowledge & Skills** |
| 8.SP.A.1.  Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. | MP.3 Construct viable arguments and critique the reasoning. of others.<br>MP.5 Use appropriate tools strategically.<br>MP.7 Look for and make use of structure. | Concept(s):<br>● Association in data (bivariate measurement data)<br><br>Students are able to:<br>● construct and interpret scatter plots.<br>● analyze patterns of association between the two quantities represented in a scatter plot.<br>● describe clustering, outliers, positive or negative association, linear or non-linear association when explaining patterns of association in a scatter plot.<br><br>Learning Goal 1: Construct and interpret scatter plots for bivariate measurement data and describe visual patterns of association (clusters, outliers, positive or negative association, linear association and nonlinear association, strong, weak, and no association). |
| 8.SP.A.2.  Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit | MP.2 Reason abstractly and quantitatively.<br>MP.5 Use appropriate tools strategically.<br>MP.7 Look for and make use of structure. | Concept(s):<br>● Straight lines are used to model *approximately* linear relationships between quantitative variables.<br><br>Students are able to:<br>● informally fit a line (of best fit) to a scatter plot that suggests a linear association. |

Key:  ◼Major Content     ⬤ Supporting Content     ◉Additional Content

| | | |
|---|---|---|
| (e.g. line of best fit) by judging the closeness of the data points to the line. | | ● informally assess the model's fit by judging the closeness of the data points to the line (line of best fit).<br><br>Learning Goal 2: For scatter plots that suggest a linear association, informally fit a straight line and informally assess the model's fit. |
| 8.SP.A.3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *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.* | MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br>MP.6 Attend to precision.<br>MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br>● given the equation for a linear model (line of best fit), interpret the slope and intercept.<br>● given the equation for a linear model, solve problems in the context of measurement data.<br><br>Learning Goal 3: Use a linear model (equation) representing measurement data to solve problems, interpreting the slope and intercept in the context of the situation. |
| 8.SP.A.4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.<br><br>*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* | MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br>MP.5 Use appropriate tools strategically.<br>MP.7 Look for and make use of structure. | Concept(s):<br>● Categorical data: patterns of association can also be observed in bivariate categorical data through analyzing two-way tables containing frequencies or relative frequencies.<br><br>Students are able to:<br>● construct and interpret a two-way frequency table containing data on two categorical variables.<br>● construct and interpret a two-way relative frequency table containing data on two categorical variables.<br>● describe any association between the two categorical variables using relative frequencies calculated for rows or columns.<br><br>Learning Goal 4: Construct two-way frequency tables and two-way relative frequency tables, and describe possible associations between two variables. |

Key:    ■ Major Content    ● Supporting Content    ◎ Additional Content

| | | |
|---|---|---|
| *evidence that those who have a curfew also tend to have chores?* | | |
| S.ID.A.1. Represent data with plots on the real number line (dot plots, histograms, and box plots). | MP.1 Make sense of problems and persevere in solving them.<br><br>MP 2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br>● represent data with dot plots on the real number line.<br>● represent data with histograms on the real number line.<br>● represent data with box plots on the real number line.<br><br><br>Learning Goal 5: Represent data with plots (dot plots, histograms, and box plots) on the real number line. |
| S.ID.A.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.<br><br>S.ID.A.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). | MP.1 Make sense of problems and persevere in solving them.<br><br>MP 2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | Concept(s):<br>● Appropriate use of a statistic depends on the shape of the data distribution.<br>● Standard deviation<br><br>Students are able to:<br>● represent two or more data sets with plots and use appropriate statistics to compare their center and spread.<br>● interpret differences in shape, center, and spread in context.<br>● explain possible effects of extreme data points (outliers) when summarizing data and interpreting shape, center and spread.<br><br><br>Learning Goal 6: Compare center and spread of two or more data sets, interpreting differences in shape, center, and spread in the context of the data, taking into account the effects of outliers. |
| S.ID.B.5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.5 Use appropriate tools strategically. | Concept(s):<br>● Categorical variables represent types of data which may be divided into groups.<br><br>Students are able to:<br>● construct two-way frequency tables for categorical data.<br>● interpret joint, marginal and conditional relative frequencies in context.<br>● explain possible associations between categorical data in two-way tables.<br>● identify and describe trends in the data. |

Key:  ■ Major Content  ● Supporting Content  ◉ Additional Content

| | MP.7 Look for and make use of structure. | Learning Goal 7: Summarize and interpret categorical data for two categories in two-way frequency tables; explain possible associations and trends in the data. |
|---|---|---|
| S.ID.B.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.<br><br>S.ID.B.6a. Fit a function to the data (including the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.<br><br>S.ID.B.6b. Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP 2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br>● fit a function to data using technology.<br>● solve problems using functions fitted to data (prediction equations).<br>● interpret the intercepts of models in context.<br>● plot residuals of linear and non-linear functions.<br>● analyze residuals in order to informally evaluate the fit of linear and non-linear functions.<br><br>Learning Goal 8: Fit functions to data using technology, plot residuals and informally assess the fit of linear and non-linear functions by analyzing residuals. |
| F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.<br><br>*Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* | MP.4 Model with mathematics.<br><br>MP.6 Attend to precision. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br>● interpret maximum/minimum and intercepts of functions from graphs and tables in the context of the problem.<br>● sketch graphs of functions given a verbal description of the relationship between the quantities.<br>● identify intercepts and intervals where function is increasing/decreasing.<br>● determine the practical domain of a function . |

Key: ▓ Major Content  ⬤ Supporting Content  ◎ Additional Content

| F.IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.<br><br>*For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* | | Learning Goal 9: Interpret key features of functions from graphs and tables. Given a verbal description of the relationship, sketch the graph of a function, showing key features and relating the domain of the function to its graph. |
| --- | --- | --- |

| Unit 4  Eighth Grade Algebra 1 | |
| --- | --- |
| Formative, Alternate, Benchmark and Summative Assessments<br>Study Island CPM checkups   Quizzes   Math Fluency Assessments<br>Tests        Pair and Share    Benchmarks        Performance Assessments<br>Bridges Post Assessments    Observations    Exit and Entrance Tickets<br>Self  Evaluations | |
| **Accommodations & modifications for special education, ELL,G&T, 504 plans and At Risk Learners** | **Integration of NJSLS 21ˢᵗ Century Skills, Life and Career Standards 9.1 CRP, 9.2 Financial Literacy, and 9.3 Career Awareness** |
| **https://docs.google.com/document/d/1QOotX2EIuJaPydBBcm-l6_Jo6n-j0uEqI3Y X0q3MDVM/edit?usp=sharing** | iPads<br>Google Classroom<br>https://docs.google.com/document/d/1sBiARk7yaPV_NQhMh5cJJ_wJb0Rj9nEUvxJKsE-8xvw/edit?usp=sharing |
| **Interdisciplinary Connections**<br>ELA, STEM, Science, Visual and Performing Arts | **Core instructional and supplemental materials** |
| NSLS Technology:<br>https://docs.google.com/document/d/1GHL_TdtZh2bmZbeyCW5BPMWOvY-2o5P7 NLU_3bDo1qE/edit?usp=sharing | Study Island CPM Mathematics<br>Study Island  by Edmentum<br>S.ID.A.1-3 Haircut Costs<br>S.ID.A.1-3 Speed Trap<br>S.ID.A.2-3 Measuring Variability in a Data Set<br>S.ID.A.3 Identifying Outliers<br>S.ID.B.5 Support for a Longer School Day? |

Key:  ■ Major Content     ● Supporting Content     ◎ Additional Content

| | |
|---|---|
| | S.ID.B.6 Laptop Battery Charge 2<br>F.IF.B.4 The Aquarium<br>F.IF.B.4 Containers<br>F.IF.B.4-5 The Canoe Trip, Variation 2<br>8.SP.A.1 Texting and Grades 1<br>8.SP.A.2 Animal Brains<br>8.SP.A.3 US Airports<br>8.SP.A.4 What's Your Favorite Subject<br>8.SP.A.4 Music and Sports |

Key:   ■ Major Content   ● Supporting Content   ◎ Additional Content