A comprehensive document for the High School Algebra 1 scope and sequence.

# ALGEBRA 1

## SAUGERTIES CENTRAL SCHOOL DISTRICT

A comprehensive document for the High School Algebra 1 scope and sequence.

# Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and prophecies with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

## 1. Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

## 2. Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

### 3. Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

### 4. Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

### 5. Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

## 6. Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

## 7. Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see $7 \times 8$ equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as $2 \times 7$ and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

## 8. Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

School Year – 168 class days – 6 snow days – 15 review days = **148 lesson days**

| **Introduction Days** | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 1. Greeting Day | | | | | | |
| 2. Course Expectations | | | | | | |
| 3. Pre-Test | | | | | | |
| 4. Calculator Scavenger Hunt | | | | | | |

| **Unit 10a: Statistics Mini-Unit – Data Analysis** | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 5. Graphical Displays of Data | N-Q.1, S-ID.1, S-ID.3 | x | x | x | | |
| 6. Quartiles and Box Plots | N-Q.1, S-ID.1, S-ID.2, S-ID.3 | x | x | x | | |
| 7. Measures of Central Tendency | N-Q.2, S-ID.2, S-ID.3 | x | x | x | | |

| **Unit 1: The Building Blocks of Algebra** | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 8. Rates, Patterns, and Problem Solving | N-Q.1, A-CED.2 | x | x | x | | |
| 9. Variables and Expressions | N/A | x | x | x | | |
| 10. Mathematical Properties Day 1 | A-REI.1 | x | x | x | | |
| 11. Mathematical Properties Day 2 | A-REI.1 | x | x | x | | |
| 12. Equivalent Expressions | A-REI.1 | x | Modified | x | | |
| 13. Seeing Structure in Expressions | A-SSE.1b, A-SSE.2 | x | Modified | x | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 14. Exponents as Repeated Multiplication | A-SSE.3c | x | x | | x | |
| 15. More Complex Equivalency | N/A | x | If Time allows | | x | |
| 16. More Structure Work | A-SSE.1b, A-SSE.2 | x | If Time allows | | | x |
| 17. Translating Algebraic Expressions | A-CED.1 | x | x | x | | |
| 18. Algebra Puzzles | A-SSE.1b | | | | | x |
| 19. Unit Review | | | | | | |
| 20. Unit Assessment | | | | | | |

| **Unit 2: Linear Expressions, Equations, and Inequalities** | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 21. Equations and Their Solutions | A-REI.3 | | | | | |
| 22. Seeing Structure in Equations | A-SSE.1b<br>A-REI.3 | | | | | |
| 23. Solving Linear Equations | A-CED.3, A-REI.3 | x | x | x | | |
| 24. Solving Linear Equations Practice | A-CED.3, A-REI.3 | x | x | x | | |
| 25. Justify Steps in Solving Linear Equations | A-REI.1, A-REI.3 | x | x | | | |
| 26. Linear Word Problems | A-CED.1<br>A-REI.3 | x | x | x | | |
| 27. Consecutive Integer Problems | A-CED.1<br>A-REI.3 | x | x | x | | |
| 28. Solving Linear Equations with Unspecified Constants – day 1 | A.CED.4, A-REI.3 | x | x | x | | |
| 29. Solving Linear Equations with Unspecified Constants – day 2 | A.CED.4, A-REI.3 | x | x | x | | |
| 30. Inequalities | A-CED.1, A-CED.3, A-REI.3 | x | x | x | | |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| | | | | | | |
|---|---|---|---|---|---|---|
| 31. Compound Inequalities (time permitting) | A- REI.3 | x | x | x | | |
| 32. More Work with Compound Inequalities (time permitting) | A- REI.3 | x | x | x | | |
| 33. Interval Notation | A.REI.3 | x | x | x | | |
| 34. Modeling with Inequalities | A.CED.1<br>A.REI.3 | x | x | x | | |
| 35. Exploration Activity | | | | | | |
| 36. Unit Review | | | | | | |
| 37. Unit Assessment | | | | | | |

| **Unit 3: Functions** | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 38. Introduction to Functions | F.IF.1 | x | x | x | | |
| 39. Function Notation | F.IF.1, F.IF.2 | x | x | x | | |
| 40. Graphs of Functions | F.IF.1, F.IF.2, F.IF.7a | x | x | x | | |
| 41. (Function Practice) | F.IF.1, F.IF.2, F.IF.7a | x | x | x | | |
| 42. Graphical Features and Terminology | F.IF.1, F.IF.2, F.IF.4, F.IF.7b | x | x | x | | |
| 43. Functions on the Graphing Calculator | F.IF.1, F.IF.2, F.IF.4 | x | x | x | | |
| 44. Average Rate of Change | N-Q.1, F-IF.1, F-IF.2, F-IF.6 | x | x | x | | |
| 45. Domain and Range | F-IF.1, F-IF.2, F-If.5, F-IF.6 | x | x | x | | |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| | | | | | | |
|---|---|---|---|---|---|---|
| 46. Domain and Range Exploration Activity | F-IF.1, F-IF.2, F-If.5, F-IF.6 | x | x | x | | |
| 47. Unit Review | | | | | | |
| 48. Unit Assessment | | | | | | |

| **Unit 4a: Linear Functions** | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 49. Proportional Relationships | A.CED.2, F-IF.7a | x | x | x | | |
| 50. Unit Conversions | N-Q.1 | x | x | | x | |
| 51. Non-proportional Linear Relationships | A.CED.2, F-IF.6, F-IF.7a, F-LE.1a | x | x | x | | |
| 52. More Work with Graphing | F.IF.7a, F-LE.1a | x | x | x | | |
| 53. Write Equations in Slope-Intercept Form | A.CED.2, F-LE.2 | x | x | x | | |
| 54. (Writing Equations Practice) | A.CED.2, F-LE.2 | x | x | x | | |
| 55. Modeling | N-Q.2, A-CED.2, F-IF.5, F-IF.7a, F-BF.1a, F-LE.1b, F-LE.2, F-LE.5 | x | x | x | | |
| 56. (Modeling Practice) | N-Q.2, A-CED.2, F-IF.5, F-IF.7a, F-BF.1a, F-LE.1b, F-LE.2, F-LE.5 | x | x | x | | |
| 57. Vertical and Horizontal Lines | A-CED.3, F-IF.7 | x | x | x | | |
| 58. Absolute Value and Step Functions | F-IF.4, F-IF.7b | x | x | | x | |
| 59. Exploration Activity | | | | | | |
| 60. Unit Review 1 | | | | | | |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

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|---|---|---|---|---|---|---|
| 61. Unit Assessment 1 | | | | | | |

| Unit 10b: Statistics Mini-Unit – Linear Regression Topics | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 62. Variation within Data | N-Q.2, S-ID.2, S-ID.3 | | | x | | |
| 63. 2-way Frequency tables | S-ID.5 | x | | x | | |
| 64. Bivariate Data Analysis | S-ID.6a, S-ID.6c, S-ID.9 | x | x | | x | |
| 65. Linear Regression | S-ID.6a, S-ID.6c, S-ID.7, S-ID.9 | x | x | | x | |
| 66. Mini-Assessment | | | | | | |

| Unit 4b: Linear Functions – Inequalities | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 67. The Truth About Graphs | A.REI.10 | x | x | x | | |
| 68. Graphs of Linear Inequalities | A.REI.12 | x | x | x | | |
| 69. (Graphs of Linear Inequalities Practice) | A.REI.12 | x | x | x | | |
| 70. Mini-Assessment | | | | | | |

| Unit 5: Systems of Linear Equations and Inequalities | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 71. Solve Systems by Graphing | A.CED.2, A.REI.6, A.REI.10 | x | x | | | x |
| 72. Solve Systems Using Substitution | A.REI.6 | x | x | | | x |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| | | | | | | |
|---|---|---|---|---|---|---|
| 73. (Solve Systems Using Substitution – Practice) | A.REI.6 | x | x | | | x |
| 74. Solve Systems Using Elimination | A.REI.5, A.REI.6 | x | x | | | x |
| 75. (Solve Systems Using Elimination – Practice) | A.REI.5, A.REI.6 | x | x | | | x |
| 76. Solve Systems Practice | A.REI.5, A.REI.6 | x | x | | | x |
| 77. Modeling Systems | A.CED.3, A.REI.6 | x | x | | | x |
| 78. (Modeling Systems Practice) | A.CED.3, A.REI.6 | x | x | | | x |
| 79. Systems of Inequalities | A.REI.12 | x | x | x | | |
| 80. Modeling Systems of Inequalities | A.CED.3, A.REI.12 | x | x | x | | |
| 81. Exploration Activity | | | | | | |
| 82. Unit Review | | | | | | |
| 83. Unit Assessment | | | | | | |

| **Unit pre-6: Laws of Exponents Review** | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 84. Laws of Exponents | A-SSE.3c | x | x | | x | |
| 85. Law of Exponents continued | A-SSE.3c | x | x | | x | |
| 86. Law of Exponents continued | A-SSE.3c | x | x | | x | |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| Unit 6: Exponents | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 87. Simplify Expressions with Exponents | A-SSE.3c | x | x | x | | |
| 88. Zero and Negative Exponents | A-SSE.3c | x | x | | x | |
| 89. Exponential Functions | F-IF.6, F-LE.1 | x | x | | x | |
| 90. Percent Review | A.CED.1, F-LE.1c, F-LE.2, F-LE.5 | x | x | x | | |
| 91. Percent Increase / Decrease | F-LE.2, F-LE.3, F-LE.5 | x | x | x | | |
| 92. Exponential Models | N-Q.2, A-SSE.1a, A-CED.1, A-CED.2, F-IF.6, F-LE.1a, F-LE.1c, F-LE.2, F-LE.5 | x | x | | x | |
| 93. Linear versus Exponential | A-CED.2, F-IF.6, F-BF.1a, F-LE.1a-c, F-LE.2 | x | x | | x | |
| 94. Exponential Growth and Decay Exploration Activity | A-CED.3, F-IF.5, F-BF.1a, F-LE.1c, F-LE.2 | x | x | | x | |
| 95. Unit Review | | | | | | |
| 96. Unit Assessment | | | | | | |

| Unit 6: Arithmetic and Geometric Sequences | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 97. Introduction to Sequences | F.IF.3, F.BF.1a | x | x | x | | |
| 98. Arithmetic Sequences | F.IF.3, F.BF.1a, F.LE.2 | x | x | x | | |
| 99. Geometric Sequences | A-CED.3, F-IF.3, F-BF.1a, F-LE.2 | x | x | x | | |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| | | | | | | |
|---|---|---|---|---|---|---|
| 100. Sequences Practice | A-CED.3, F.IF.3, F.BF.1a, F.LE.2 | x | x | x | | |
| 101. Sequences Mini-Assessment | | | | | | |

| **Unit 10c: Statistics Mini-Unit – Other Types of Regression** | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 102. Other Types of Regression | [S-ID.6a] | x | x | | x | |
| 103. Quantifying Predictability | [S-ID.6a], [S-ID.6c], [S-ID.8] | x | x | | x | |
| 104. Residuals | [S-ID.6a-c], S-ID.8 | x | | | x | |

| **Unit 7: Polynomials** | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 105. Introduction to Polynomials | A-APR.1 | x | x | x | | |
| 106. Adding and Subtracting Polynomials | A-APR.1 | x | x | x | | |
| 107. Multiply Polynomials | A-APR.1 | x | x | x | | |
| 108. Operations with Polynomials Practice | A-APR.1 | x | x | x | | |
| 109. Operations with Polynomials Practice continued | A-APR.1 | x | x | x | | |
| 110. Factoring Using the GCF | A-SSE.1a-b, A-SSE.2 | x | x | | x | |
| 111. Factoring Using the GCF continued | A-SSE.1a-b, A-SSE.2 | x | x | | x | |
| 112. Factoring Using Difference of Perfect Squares | A-SSE.2 | x | x | | x | |
| 113. Factoring Trinomials | A-SSE.2 | x | x | | x | |
| 114. Factoring Trinomials with Grouping | A-SSE.2 | x | x | | x | |
| 115. Factoring Trinomials Practice | A-SSE.2 | x | x | | x | |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| | | | | | | |
|---|---|---|---|---|---|---|
| 116. Factoring Practice | A-SSE.2 | x | x | | x | |
| 117. Factoring Practice | A-SSE.2 | x | x | | x | |
| 118. Unit Review 1 | | | | | | |
| 119. Unit Assessment 1 | | | | | | |
| 120. Unit Review 2 | | | | | | |
| 121. Unit Assessment 2 | | | | | | |

| **Unit 8: Quadratic Functions** | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 122. Introduction to Quadratic Functions | A-CED.3, F-IF.4, [F-IF.7a] | x | x | x | | |
| 123. More Work with Parabolas | [F-IF.7a] | x | x | x | | |
| 124. The Shifted Form of a Parabola | [F-IF.7a], F-BF.3 | x | If time allows | | x | |
| 125. Completing the Square | A-SSE.3b, F-IF.8a, F-IF.9, F-BF.3 | x | If time allows | | x | |
| 126. Completing the Square Practice | A-SSE.3b, F-IF.8a, F-IF.9, F-BF.3 | x | If time allows | | x | |
| 127. Stretching Parabolas and More Completing the Square | A-SSE.3b, F-IF.8a, F-BF.3 | x | If time allows | | x | |
| 128. Zeroes of a Quadratic | A-SSE.3a, A-APR.3, A-REI.4b, F-IF.8a | x | x | x | | |
| 129. More Zero Product Work | A-SSE.3a, A-APR.3, A-REI.4b | x | x | x | | |
| 130. Quadratic Word Problems | A-SSE.3a, A-CED.1, A-REI.4b | x | x | x | | |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| | | | | | | |
|---|---|---|---|---|---|---|
| 131. Unit Review | | | | | | |
| 132. Unit Assessment | | | | | | |

| Unit 9: Roots and Irrational Numbers | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 133. Square Roots: Evaluate and Simplify | N-RN.3, I-IF.7b | x | x | x | | |
| 134. Simplify Square Roots Practice | N-RN.3, I-IF.7b | x | x | x | | |
| 135. Irrational Numbers | N-RN.3 | x | x | x | | |
| 136. Square Root Functions and Shifting | F-IF.1, F-IF.7b, F-BF.3 | x | | | x | |
| 137. Solve Quadratics Using Inverse Operations | A-SSE.1b, A-REI.4b | x | x | | x | |
| 138. Solve Quadratics Using Completing the Square and Inverse Operations | N-RN.3, A-SSE.1b, A-REI.4a, A-REI.4b | x | x | | x | |
| 139. Solve Quadratics Using The Quadratic Formula | A-REI.4a, A-REI.4b | x | x | | x | |
| 140. Solve Quadratics Using The Quadratic Formula Practice | A-REI.4a, A-REI.4b | x | x | | x | |
| 141. Solve Quadratics Practice | A-SSE3a, A-REI.4a-b | x | x | | x | |
| 142. Solve Quadratics Practice continued | A-SSE3a, A-REI.4a-b | x | x | | x | |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| | | | | | | |
|---|---|---|---|---|---|---|
| 143. Cube Roots | F-IF.1, F-IF.6, F-IF.7b, F-BF.3 | x | x | | x | |
| 144. Unit Review | | | | | | |
| 145. Unit Assessment | | | | | | |

| Unit 11: A Final Look at Functions and Modeling | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **CCSS Addressed** | **R+** | **R** | **70%** | **20%** | **10%** |
| 146. Function Transformations | F-IF.1, [F-BF.3] | x | x | | x | |
| 147. Horizontal Stretching | [F-BF.3] | x | x | | x | |
| 148. Discrete Functions | A-CED.3, F-IF.5 | | | | x | |
| 149. Linear versus Exponential Functions | F-LE.1a-c, F-LE.5, S-ID.6a-c | x | | | x | |
| 150. Step Functions | F-IF.7b | | | | x | |
| 151. Piecewise Functions | A-CED.3, F-IF.6, F-IF.7b | | | | x | |
| 152. Quadratic Modeling | N-Q.2 | x | x | x | | |
| 153. Functions Practice | N-Q.3 | | | | | |
| 154. Unit Review | | | | | | |
| 155. Unit Assessment | | | | | | |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| Unit 1<br><br>The Building Blocks of Algebra | Algebra R+/R | Approx. 15 days | SCD Math 12/21/15 |
|---|---|---|---|

**Domain(s):** N – Number and Quantity

A – Algebra

**Essential Question(s):**

**How are properties related to algebra?**

**Can equations that appear to be different be equivalent?**

**Cluster(s):**

**N-Q Quantities**

- **N- Reason quantitatively and use units to solve problems.**
  - *Q.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.*
  - *Q.2 Define appropriate quantities for the purpose of descriptive modeling.*

**A-CED Creating Equations**

- **A- Create equations that describe numbers or relationships.**
  - *CED.1 Create equations and inequalities in one variable and use them to solve problems.*
  - *CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

- *CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.*
- *CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.*

**A-REI Reasoning with Equations and Inequalities**

- **A- Understand solving equations as a process of reasoning and explain the reasoning.**
  - *REI.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.*

**A-SSE Seeing Structure in Expressions**

- **A- Interpret the structure of expressions.**
  - *SSE.1 Interpret expressions that represent a quantity in terms of its context.*
    - *1.a Interpret parts of an expression, such as terms, factors, and coefficients.*
    - *1.b Interpret complicated expressions by viewing one or more of their parts as a single entity.*
  - *SSE.2 Use the structure of an expression to identify ways to rewrite it.*
  - *SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression*
    - *3.c Use the properties of exponents to transform expressions for exponential functions. Tasks are limited to exponential expressions with integer coefficients.*

| Essential Skills | Vocabulary | District Resources |
|---|---|---|
| • Connect proportional reasoning to algebraic structure<br>• Interpret rates of varying quantities<br>• Use mathematical properties such as associative, commutative, distributive, and identity to create equivalent expressions<br>• Translate algebraic expressions from words<br>• Use the laws of exponents to simplify expressions<br>• Evaluate calculations using the order of operations | • Associative Property<br>• Binomial<br>• Coefficient<br>• Commutative Property<br>• Consecutive Integers<br>• Distributive Property<br>• Equivalent<br>• Evaluate | District Instructional Packets<br><br>EMath Instruction Online Text CCSS version |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| | | |
|---|---|---|
| • Explain the mathematical reasoning needed to solve a word problem<br>• Identify errors in mathematical calculations<br>• Represent a real life situation with an algebraic expression | • Exponent<br>• Identity<br>• Inverse<br>• Monomial<br>• Polynomial<br>• Power<br>• Simplify<br>• Variable | **Engage NY –Algebra 1**<br>**Module 1**<br>**Topic B**<br><br>**Math Bits Algebra** |

| | | | |
|---|---|---|---|
| Unit 2<br><br>**Linear Expressions, Equations, and Inequalities** | Algebra R+/R | Approx. 20 days | SCD Math 12/21/15 |

**Domain(s):**

- Algebra

N- Number and Quantity

**Essential Question(s):**

**Is there a solution for every problem?**

**Does different reasoning result in the same outcome?**

**Why is it important to explain how a result is derived?**

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

## Cluster(s):

**A-CED Creating Equations**

- **A- Create equations that describe numbers or relationships.**
  - *CED.1 Create equations and inequalities in one variable and use them to solve problems.*
  - *CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*
  - *CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.*
  - *CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.*

**A-REI Reasoning with Equations and Inequalities**

- **A- Understand solving equations as a process of reasoning and explain the reasoning.**
  - *REI.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.*
- **A- Solve equations and inequalities in one variable.**
  - *REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.*

**A-SSE Seeing Structure in Expressions**

- **A- Interpret the structure of expressions.**
  - *SSE.1 Interpret expressions that represent a quantity in terms of its context.*
    - *1.a Interpret parts of an expression, such as terms, factors, and coefficients.*
    - *1.b Interpret complicated expressions by viewing one or more of their parts as a single entity.*

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

**N-Q Quantities**

- **N- Reason quantitatively and use units to solve problems.**
  - *Q.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.*
  - *Q.2 Define appropriate quantities for the purpose of descriptive modeling.*

| Essential Skills | Vocabulary | District Resources |
|---|---|---|
| • Solve multi-step equations using the properties<br>• Recognize equivalences in expression structure<br>• Be able to predict whether an equation has one, none, or infinitely many solutions<br>• Be able to model an algebraic solution for a word problem<br>• Justify multiple steps of the equation solving process in words<br>• Manipulate a literal equation to solve for one variable<br>• Be able to represent a set of numbers as an interval<br>• Translate a compound inequality into interval notation and vice versa<br>• Solve multi-step inequalities and graph the solution on a number line<br>• Be able to model an algebraic word problem as an inequality and find the solution set<br>• Solve a compound inequality | • Literal equations<br>• Equivalence<br>• Rational<br>• Inequality<br>• Solution set<br>• Compound inequality<br>• Interval notation<br>• Open Interval<br>• Closed Interval<br>• Greater Than<br>• Less Than | District Instructional Packets<br><br>Emathinstruction online text CCSS version<br><br>**Engage NY –Algebra 1 Module 1 Topics C and D** |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| Unit 3<br><br>Functions | Algebra R+/R | Approx. 12 days | SCD Math 12/21/15 |
|---|---|---|---|

**Domain(s):**

F – Functions

N – Number and Quantity

**Essential Question(s):**

**Can a relationship be represented different ways?**

**What are the benefits of studying bivariate data?**

**What values should be used when evaluating different relationships?**

**Cluster(s):**

F-BF Building Functions

- **F- Build a function that models a relationship between two quantities.**
  - *BF.1 Write a function that describes a relationship between two quantities.*
    - *1.a Determine an explicit expression, a recursive process, or steps for calculation from a context.*
    - *1.b Combine standard function types using arithmetic operations.*
    - *1.c Compose functions.*

**F- Build new functions from existing functions.**

- *BF.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.*

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

**F-IF Interpreting Functions**

- **F- Understand the concept of a function and use function notation.**
  - *IF.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).*
  - *IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.*
  - *IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.*
- **F- Interpret functions that arise in applications in terms of the context.**
  - *IF.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.*
  - *IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.*
  - *IF.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.*
- **F- Analyze functions using different representations.**
  - *IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
    - *7.a Graph linear and quadratic functions and show intercepts, maxima, and minima.*
    - *7.b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*
    - *7.d Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.*
    - *7.e Graph exponential functions, showing intercepts and end behavior.*

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

**N-Q Quantities**

- **N- Reason quantitatively and use units to solve problems.**
  - *Q.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.*
  - *Q.2 Define appropriate quantities for the purpose of descriptive modeling.*

| Essential Skills | Vocabulary | District Resources |
|---|---|---|
| • Interpret the domain and range of a given function<br>• Be able to justify if a relation is a function<br>• Find the output value of a function for a given input value<br>• Calculate the average rate of change of a given bivariate relationship in table or graphical form<br>• Describe the relative minima and maxima of a given function<br>• Identify the x and y intercepts of a function from a graph<br>• Be able to interpret the meaning of the average rate of change of a given function | • Function<br>• Relation<br>• Domain<br>• Range<br>• Input<br>• Output<br>• Bivariate<br>• Univariate<br>• Proportional<br>• Direct Variation<br>• Rate of Change<br>• Piecewise Function<br>• Relative maximum<br>• Relative minimum<br>• Turning Point<br>• X-intercept<br>• Y-intercept<br>• Average Rate of Change | District Instructional Packets<br><br>Emathinstruction online text<br>CCSS version<br><br>**Engage NY –Algebra 1**<br>**Module 3**<br>**Topic B** |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| Unit 4<br><br>Linear Functions | Algebra R+/R | Approx. 15 days | SCD Math 8/01/14 |
|---|---|---|---|

**Domain(s):**

A -- Algebra

F – Functions

N – Number and Quantity

**Essential Question(s):**

**Why do units and scales matter when depicting relationships?**

**What role does the rate of change have in a real life scenario?**

## Cluster(s):

A-CED Creating Equations

- **A- Create equations that describe numbers or relationships.**
  - *CED.1 Create equations and inequalities in one variable and use them to solve problems.*
  - *CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*
  - *CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.*

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

**F-BF Building Functions**

- **F- Build a function that models a relationship between two quantities.**
  - *BF.1 Write a function that describes a relationship between two quantities.* 🟦
    - *1.a Determine an explicit expression, a recursive process, or steps for calculation from a context.*
    - *1.b Combine standard function types using arithmetic operations.*
    - *1.c Compose functions.*
- **F- Build new functions from existing functions.**
  - *BF.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.* 🟨

**F-LE Linear, Quadratic, and Exponential Models**

- **F- Construct and compare linear, quadratic, and exponential models and solve problems.**
  - *LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.* 🟩
    - *1.a Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.*
    - *1.b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.*
    - *1.c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.*
  - *LE.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).* 🟩
  - *LE.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.* 🟩

**F- Interpret expressions for functions in terms of the situation they model.**

- *LE.5 Interpret the parameters in a linear or exponential function in terms of a context.* 🟦

🟩 Major Clusters (70%) 🟦 Supporting Clusters (20%) 🟨 Additional Clusters (10%) 🟪 Honors Clusters (enrichment)

**F-IF Interpreting Functions**

- **F- Interpret functions that arise in applications in terms of the context.**
  - *IF.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.*
  - *IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.*
  - *IF.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.*

**Analyze functions using different representations.**

  - *IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
    - *7.a Graph linear and quadratic functions and show intercepts, maxima, and minima.*
    - *7.b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*
    - *7.d Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.*
    - *7.e Graph exponential functions, showing intercepts and end behavior.*
- *IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.*
  - *8.a 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.*
  - *8.b Use the properties of exponents to interpret expressions for exponential functions.*

- IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

**N-Q Quantities**

**Reason quantitatively and use units to solve problems.**

- *Q.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.* 🟦
- *Q.2 Define appropriate quantities for the purpose of descriptive modeling.* 🟦
- *Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.* 🟦

**A-REI Reasoning with Equations and Inequalities**

**Represent and solve equations and inequalities graphically.**

- *REI.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).* 🟩
- *REI.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.* 🟩

| Essential Skills | Vocabulary | | District Resources |
|---|---|---|---|
| • Determine the proportional relationship of a given real life scenario<br>• Perform unit conversions for practicality<br>• Calculate the average rate of change to determine proportionality<br>• Represent a linear function in slope-intercept form<br>• Graph a linear function from slope-intercept form<br>• Identify the slope and y-intercept of a graphed function<br>• Determine the slope of a line from 2 points | • Absolute Value<br>• Absolute Value Function<br>• Arithmetic Sequence<br>• Average Rate of Change<br>• Constant<br>• Coordinate Plan<br>• Curve<br>• Dashed Line<br>• Discrete Linear Function<br>• Domain<br>• Element | • Output<br>• Output<br>• Parabola<br>• Parameters<br>• Plane<br>• Properties of Inequality<br>• Proportional Relationship<br>• Proportional to One Another<br>• Recursive Definition<br>• Recursive Formula<br>• Recursively<br>• Recursively Defined | District Instructional Packets<br><br>Emathinstruction online text CCSS version<br><br>**Engage NY –High School Module 3 Topics A , C and D** |

🟩 Major Clusters (70%) 🟦 Supporting Clusters (20%) 🟨 Additional Clusters (10%) 🟪 Honors Clusters (enrichment)

| | | | |
|---|---|---|---|
| • Model an equation for a linear function from a table<br>• Algebraically find the output of a linear function given an input<br>• Algebraically find the input of a linear function given an output<br>• Recognize the equations of horizontal and vertical lines<br>• Be able to determine the equation of a vertical or horizontal line<br>• Graph an absolute value function by creating the table<br>• Determine the minimum value or maximum value of an absolute value function<br>• Graph a step function<br>• Determine outputs of a step function<br>• Determine if a coordinate pair is a solution to an equation or an inequality<br>• Determine if a point is a solution to a system of equations or inequalities<br>• Graph an inequality of two variables | • Equation<br>• Exact Relationship<br>• Fibonacci Sequence<br>• Fluency<br>• Graphing Inequalities<br>• Horizontal Line<br>• Index<br>• Input<br>• Integer<br>• Linear Function<br>• Linear Functions<br>• Linear Models<br>• Linear Relationships<br>• List<br>• Magnitude<br>• Model | • Sequence<br>• Slope<br>• Slope-Intercept Form<br>• Solid Line<br>• Solution Set<br>• Step Function<br>• System of Equations<br>• System of Inequalities<br>• Term<br>• Truth Value<br>• Two Parameters<br>• Unit Conversion<br>• Vertical Line<br>• y-intercept | |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| Unit 5<br>Systems of Equations and Inequalities | Algebra R+/R | Approx. 15 days | SCD Math 12/21/15 |
|---|---|---|---|

**Domain(s):**

**A - Algebra**

**Essential Question(s):**

**Where are systems modeled in the real world?**

**How do models help interpret conclusions to posed problems?**

**Cluster(s):**

**A-CED Creating Equations**

- **Create equations that describe numbers or relationships.**
  - *CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*
  - *CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.*

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

**A-REI Reasoning with Equations and Inequalities**

- **A- Solve systems of equations.**
  - *REI.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.* 🟨
  - *REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.* 🟨
- **A- Represent and solve equations and inequalities graphically.**
  - *REI.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).* 🟩
  - *REI.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.* 🟩

| Essential Skills | Vocabulary | | District Resources |
|---|---|---|---|
| • Determine if a point is the solution of a system of equations or inequalities algebraically and from a graph<br>• Graph a system of linear equations<br>• Model a linear system of equations or inequalities graphically<br>• Draw conclusions from a modeled linear system of equations or inequalities<br>• Solve a system of equations in two variables algebraically(substitution and elimination)<br>• Model and solve a system of equations algebraically from a word problem | • Algebraic<br>• Discrete Versions<br>• Elimination<br>• Graphically<br>• Integer Values<br>• Modeling Systems of Equations<br>• Modeling Systems of Inequalities<br>• Multiple Conditions<br>• Multiple Variables | • Region<br>• Solution<br>• Solution Set<br>• Substitution<br>• System of Equations<br>• System of Inequalities<br>• Unknowns<br>• Viable Solutions<br>• xy- Plane | District Instructional Packets<br><br>Emathinstruction online text<br>*CCSS version*<br><br>**Engage NY- Algebra 1**<br>**Module 1**<br>**Topic C (lessons 20-25)and D** |

🟩 Major Clusters (70%) 🟦 Supporting Clusters (20%) 🟨 Additional Clusters (10%) 🟪 Honors Clusters (enrichment)

| Unit 6<br>Exponents and Sequences | Algebra R+/R | Approx. 20 days | SCD Math 12/21/15 |
|---|---|---|---|

**Domain(s):**

N- Number and Quantity

A- Algebra

F- Functions

**Essential Question(s):**

**How can real world scenarios be modeled using exponential growth and decay?**

**Cluster(s):**

**A-CED Creating Equations**

- **A- Create equations that describe numbers or relationships.**
  - *CED.1 Create equations and inequalities in one variable and use them to solve problems.*
  - *CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*
  - *CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.*

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

**A-SSE Seeing Structure in Expressions**

- **A- Interpret the structure of expressions.**
  - *SSE.1 Interpret expressions that represent a quantity in terms of its context.* 🟦
    - *1.a Interpret parts of an expression, such as terms, factors, and coefficients.*
  - *SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression*
    - *3.c Use the properties of exponents to transform expressions for exponential functions. Tasks are limited to exponential expressions with integer coefficients.* 🟦

**F-BF Building Functions**

- **F- Build a function that models a relationship between two quantities.**
  - *BF.1 Write a function that describes a relationship between two quantities.* 🟦
    - *1.a Determine an explicit expression, a recursive process, or steps for calculation from a context.*

**F-IF Interpreting Functions**

- **F- Understand the concept of a function and use function notation.**
  - *IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.* 🟩
- **F- Interpret functions that arise in applications in terms of the context.**
  - *IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.* 🟦
  - *IF.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.* 🟦

**F-LE Linear, Quadratic, and Exponential Models**

- **F- Construct and compare linear, quadratic, and exponential models and solve problems.**
  - *LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.* ■
    - *1.a Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.*
    - *1.b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.*
    - *1.c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.*
  - *LE.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).* ■
  - *LE.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.* ■
- **F- Interpret expressions for functions in terms of the situation they model.**
  - *LE.5 Interpret the parameters in a linear or exponential function in terms of a context.* ■

**N-Q Quantities**

**Reason quantitatively and use units to solve problems.**

- *Q.2 Define appropriate quantities for the purpose of descriptive modeling.* ■

■ Major Clusters (70%) ■ Supporting Clusters (20%) ■ Additional Clusters (10%) ■ Honors Clusters (enrichment)

| Essential Skills | Vocabulary | | District Resources |
|---|---|---|---|
| • Represent exponents as an expanded product<br>• Use the laws of exponents to rewrite an exponential expression in simplest form<br>• Apply the properties of zero and negative exponents to simplify exponential expressions<br>• Model real world exponential growth and decay functions from a word problem<br>• Interpret a graph of exponential growth or decay<br>• Draw conclusions from a modeled graph of exponential growth or decay<br>• Represent rate of change as a percent increase or decrease<br>• Use $y = a(b)^x$ to model exponential growth and decay word problems<br>• Be able to differentiate between a linear and exponential function with regards to the table or graph<br>• Write a recursive definition for an arithmetic or geometric sequence<br>• Differentiate between an arithmetic or a geometric sequence<br>• Find the nth term of a given sequence<br>• Understand generating elements of a given sequence<br>• Derive an explicit formula for an arithmetic sequence | • Arithmetic Sequence<br>• Average Rate of change<br>• Base<br>• Common Ratio<br>• Constant Percent Rate<br>• Constant Rate of Change<br>• Decreasing<br>• Discrete<br>• Discrete Exponential Function<br>• Discrete Linear Function<br>• Equivalent Expressions<br>• Exponents<br>• Exponential Function<br>• Exponential Decay<br>• Exponential Growth<br>• Exponent Law / Rule<br>• Fluent<br>• Fraction Equivalent<br>• Geometric Sequence<br>• Growth Factor<br>• Increasing<br>• Intersect Command<br>• Linear Functions<br>• List | • Multiplication<br>• Multiplying Factor<br>• Negative Exponent<br>• Percent<br>• Positive Exponent<br>• Recursive<br>• Recursive Rule<br>• Repeated Addition<br>• Repeated Division<br>• Repeated Multiplication<br>• Sequences<br>• Slope<br>• Subtraction Rule for Exponents<br>• Term<br>• "Unmultiplication" of Fractions<br>• Window<br>• y-intercept | District Instructional Packets<br><br>Emathinstruction online text<br><br>*CCSS version*<br><br>**Engage NY- Algebra 1**<br>**Module 1**<br>**Topic A**<br>**Module 3**<br>**Topics A,C,D** |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| Unit 7<br>Polynomials | Algebra R+/R | Approx. 20 days | SCD Math 12/21/15 |
|---|---|---|---|

**Domain(s):**

A- Algebra

**Essential Question(s):**

**Can operations be performed on mathematical elements other than numbers?**

**Is there only one way to factor?**

**Cluster(s):**

**A-CED Creating Equations**

- **A - Create equations that describe numbers or relationships.**
  - *CED.1 Create equations and inequalities in one variable and use them to solve problems.* ■
  - *CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.* ■
  - *CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.* ■

**A-SSE Seeing Structure in Expressions**

- **A - Interpret the structure of expressions.**
  - *SSE.1 Interpret expressions that represent a quantity in terms of its context.* ■
    - *1.a Interpret parts of an expression, such as terms, factors, and coefficients.*
    - *1.b Interpret complicated expressions by viewing one or more of their parts as a single entity.*
  - *SSE.2 Use the structure of an expression to identify ways to rewrite it.* ■

■ Major Clusters (70%) ■ Supporting Clusters (20%) ■ Additional Clusters (10%) ■ Honors Clusters (enrichment)

**A- APR Arithmetic with Polynomials and Rational Expressions**

- **A -Perform Arithmetic Operations on Polynomials.**
  - *APR.1 Understand that polynomials form a system that is analogous to the integers, namely they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.* ■

| Essential Skills | Vocabulary | | District Resources |
|---|---|---|---|
| • Write polynomials in their standard form<br>• Find the sum and difference of polynomials<br>• Multiply polynomials using distributive property<br>• Model the multiplication of polynomials using the distributive property to determine equality<br>• Find the Greatest Common Factor to rewrite polynomials as a equivalent product<br>• Factor a polynomial expression using many methods(ie conjugate pairs, greatest common factor, trinomial, grouping)<br>• Be able to interpret and find errors in the factoring process of a modeled problem | • Binomial Polynomial<br>• Coefficient<br>• Completely Factored Form<br>• Complete Factoring<br>• Conjugate Binomial<br>• Conjugate Pair<br>• Critical Skill<br>• Cubic Trinomial<br>• Descend<br>• Difference of Perfect Squares<br>• Distributive Property<br>• Equivalent Expression<br>• Equivalent Polynomial<br>• Equivalent Product<br>• Factor<br>• Factorization<br>• Fluent<br>• Gateway Skill | • Greatest Common Factor (GCF)<br>• Integer<br>• Monomial<br>• Multiply<br>• Polynomial<br>• Powers of 10<br>• Practical Applications<br>• Product<br>• Properties of Equality<br>• Repeated Distribution<br>• Standard Form<br>• Term<br>• Trinomial Polynomial | **Emath instruction unit 7** *CCSS version*<br><br>*Math bits*<br><br>**Engage NY- Algebra 1**<br>**Module 4**<br>**Topic A** |

■ Major Clusters (70%) ■ Supporting Clusters (20%) ■ Additional Clusters (10%) ■ Honors Clusters (enrichment)

| Unit 8<br>Quadratic Functions | Algebra R+/R | Approx. 20 days | SCD Math 12/21/15 |
|---|---|---|---|

**Domain(s):**

A - Algebra

F - Functions

**Essential Question(s):**

**Where are quadratics used in the real world?**

**How does the model of a function explain the situation represented?**

**Why would one choose to draw a graph rather than solve a posed problem algebraically?**

**Cluster(s):**

**A-CED Creating Equations**

- **A - Create equations that describe numbers or relationships.**
  - *CED.1 Create equations and inequalities in one variable and use them to solve problems.*
  - *CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.*

**A-SSE Seeing Structure in Expressions**

- **A - Write expressions in equivalent forms to solve problems.**
  - *SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*
    - *3.a Factor a quadratic expression to reveal the zeros of the function it defines.*
    - *3.b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.*

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

**A-APR Arithmetic with Polynomials & Rational Expressions**

- **A - Understand the relationship between zeros and factors of polynomials.**
  - *APR.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.*

**A – REI Reasoning with Equations and Inequalities**

- **A - Solve equations and inequalities in one variable.**
- *REI.4 Solve quadratic equations in one variable.*
  - *4.b 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.*

**IF – Interpreting Functions**

- **F - Interpret functions that arise in applications in terms of the context.**
  - *IF. 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.*

- **F - Analyze functions using different representations.**

  - *IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
    - *7a Graph linear and quadratic functions and show intercepts, maxima, and minima.*
    - *7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*

  - *IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.*
    - *8.a 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.*

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

- *IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* 🟦

**BF - Building Functions**

- **F - Build new functions from existing functions.**
  - *BF.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.* 🟨

| Essential Skills | Vocabulary | | District Resources |
|---|---|---|---|
| ○ Recognize the difference between a quadratic and linear graph<br>○ Be able to identify axis of symmetry, vertex point, intercepts, roots, maxima, and minima of parabolas<br>○ Solve a quadratic equation using various strategies<br>○ Understand and apply the method of completing the square<br>○ Draw conclusions from a graph and/or an equation of a projectile using your knowledge of the parts of a parabola<br>○ Be able to represent a quadratic function by its equation in vertex and standard form<br>○ Justify and calculate the solution to a quadratic equation | ○ Algorithm<br>○ Always Decreasing<br>○ Always Increasing<br>○ Axis of Symmetry<br>○ Completing the Square<br>○ Consecutive Integers<br>○ Constant<br>○ Cubic<br>○ Cubic Polynomial<br>○ Domain<br>○ Domain Interval<br>○ Equivalent Expression<br>○ Exponential<br>○ Factorable<br>○ Higher-Order Polynomials<br>○ Increasing | ○ Open Downwards<br>○ Open Upwards<br>○ Origin<br>○ Output<br>○ Parabola<br>○ Parameter<br>○ Polynomial Function<br>○ Quadratic Function<br>○ Range<br>○ Repeat<br>○ Rational Numbers<br>○ Shifted Form<br>○ Solve by Factoring<br>○ Standard Form<br>○ Turning Point<br>○ Vertex Form<br>○ Viable | District Instructional Packets<br><br>Emathinstruction online text<br><br>*CCSS version*<br><br>**Engage NY- Algebra 1**<br>**Module 4**<br>**Topic B** |

🟩 Major Clusters (70%) 🟦 Supporting Clusters (20%) 🟨 Additional Clusters (10%) 🟪 Honors Clusters (enrichment)

| | | | |
|---|---|---|---|
| ○ Model and communicate the strategy involved for solving a real life quadratic word problem<br>○ Identify the zeros of a quadratic equation using multiple strategies | ○ Leading Coefficient<br>○ Linear<br>○ Maximum<br>○ Maximum y-value<br>○ Minimum<br>○ Minimum y-value | ○ Zero Product Law<br>○ Zeroes<br>○ Zeroes of the Function<br>○ Zeroes of a Quadratic | |

| Unit 9<br><br>Roots and Irrational Numbers | Algebra R+/R | Approx. 20 days | SCD Math 12/21/15 |
|---|---|---|---|

**Domain(s):**

N – Numbers and Quantity

A – Algebra

F – Functions

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

**Essential Question(s):**

**What is the difference between a rational and an irrational number?**

**What the relationship between a solution to an equation and its graph?**

**When is it appropriate to use various strategies when solving a quadratic equation?**

**Cluster(s):**

**A-SSE Seeing Structure in Expressions**

- **A - Interpret the structure of expressions.**
  - *SSE.1 Interpret expressions that represent a quantity in terms of its context.* 🟦
    - *1.b Interpret complicated expressions by viewing one or more of their parts as a single entity.*
  - *SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* 🟦
    - *3.a Factor a quadratic expression to reveal the zeros of the function it defines.*

**A – REI Reasoning with Equations and Inequalities**

- **A - Solve equations and inequalities in one variable.**
  - **REI.4 Solve quadratic equations in one variable.** 🟦
    - *4.a 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.*
    - *4.b 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.*

🟩 Major Clusters (70%) 🟦 Supporting Clusters (20%) 🟨 Additional Clusters (10%) 🟪 Honors Clusters (enrichment)

**F - IF Interpreting Functions**

**Understand the concept of a function and use function notation.**

- *F-IF.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).* ■

- **F - Analyze functions using different representations.**
  - *F-IF.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.* ■
  - *F- IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* ■
    - *7.b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*

**F - BF Building Functions**

- **F - Build new functions from existing functions.**
  - *F- BF.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.* ■

**N – RN The Real Number System**

- **N - Use properties of rational and irrational numbers.**
  - *RN.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.* ■

| Essential Skills | Vocabulary | | District Resources |
|---|---|---|---|
| • Estimate the value of imperfect squares | • Algorithm<br>• Algorithmic | • Negative Number<br>• Non-Perfect Square | District Instructional Packets Summer 2013 |

■ Major Clusters (70%) ■ Supporting Clusters (20%) ■ Additional Clusters (10%) ■ Honors Clusters (enrichment)

| | | | |
|---|---|---|---|
| • Substitute a given value into a square root function<br>• Simplify a radical expression by using the multiplication and division properties of square roots<br>• Find equivalent numerical expressions to demonstrate understanding of the properties of square roots<br>• Recognize the difference between rational and irrational numbers<br>• Draw conclusions calculations involving both rational and irrational numbers<br>• Graph a square root and a cubic function<br>• Apply previous knowledge of quadratic behavior to deduce the characteristics of a square root and a cubic function.<br>• Make predictions and conclusions from problems posed involving models of square root functions<br>• Explore solving quadratic and cubic equations by inverse operations<br>• Solve a quadratic equation by applying the quadratic formula<br>• Calculate cube roots and estimate the cubed root of a non- perfect cube<br>• Recognize the characteristics of a cubic function and be able to communicate the differences between a square root and cubic function<br>• Model a cubic function on a graph and with a table<br>• Choose a method (completing the square, quadratic formula, or factoring) to find the roots of a quadratic | • Approximate<br>• Common Denominator<br>• Completing the Square<br>• Cube Root<br>• Cube Root Function<br>• Cubing<br>• Cubing a Number<br>• Equivalent Function<br>• Equivalent Numerical Expression<br>• Factoring<br>• Imaginary Solution<br>• Integer<br>• Inverse Operations<br>• Irrational Number<br>• Largest Perfect Square<br>• Multiplication Property of Square Roots<br>• Subdividing<br>• Standard Form<br>• Standard Viewing Window<br>• Terminating Decimal<br>• Turning Points<br>• Transformed<br>• Whole Number<br>• Zeroes Algebraically<br>• Zero Product Law<br>• Zeroes | • Non-Rational<br>• Non-Repeating Decimal<br>• Non-Reversible<br>• Non-Terminating Decimal<br>• Non-Zero Rational Number<br>• Positive Number<br>• Principal Square Roots<br>• Product<br>• Quadratic Formula<br>• Quadratic Function<br>• Ratio<br>• Radicand<br>• Rational Number<br>• Real Number<br>• Real Solution<br>• Repeating Decimal<br>• Shifting Pattern<br>• Simplest Radical Form<br>• Simplifying Square Root<br>• Squaring<br>• Square Root | Emathinstruction online text<br><br>*CCSS version*<br><br>**Engage NY—Algebra 1**<br>**Module 4**<br>**Topic B and C** |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| | | | |
|---|---|---|---|
| • Understand and be able to communicate the methods of completing the square, factoring, and quadratic formula | | | |

| Unit 10<br>Statistics | Algebra R+/R | Broken down into 3 mini units<br>Approx. 18 days | SCD Math 12/21/15 |
|---|---|---|---|

**Domain(s):**

**N – Numbers and Quantity**

**S – Statistics**

**Essential Question(s):**

**How does data vary from one distribution to another?**

**Why does data support the need to be used to justify trends?**

**When is a data set best represented by a graph?**

**Cluster(s):**

**N–Q Quantities**

- **N - Reason quantitatively and use units to solve problems.**

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

- *Q.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.*
- *Q.2 Define appropriate quantities for the purpose of descriptive modeling.*

**S-ID Interpreting Categorical and Quantitative Data**

- **S - Summarize, represent, and interpret data on a single count or measurement variable.**
  - *ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).*
  - *ID.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.*
  - *ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).*
  - *ID.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.*
  - *ID.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.*
- **S - Summarize, represent, and interpret data on two categorical and quantitative variables.**
  - *ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.*
    - *6.a Fit a function to the data; use functions fitted to data to solve problems in the context of the data.*
    - *6.b Informally assess the fit of a function by plotting and analyzing residuals.*
    - *6.c Fit a linear function for a scatter plot that suggests a linear association.*
- **S - Interpret linear models.**
  - *ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.*

- *ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.*
- *ID.9 Distinguish between correlation and causation.*

| Essential Skills | Vocabulary | | District Resources |
|---|---|---|---|
| • Interpret and make conclusions about data represented in several graphical constructs<br>• Create dot plots, histograms, box and whisker plots from given data sets<br>• Make conjecture about choosing the appropriate measures of center and variability with respect to two or more different data sets.<br>• Calculate the mean,median, mode, range and interquartile range of a given data set<br>• Be able to find standard deviation<br>• Be able to support findings in shape, center, and spread in the context of data sets, accounting for possible effects of extreme data points (outliers).<br>• Create a summary of two data sets in the form of a two way data table.<br>• Be able to justify trend and analyze calulations with regard to relative, joint, marginal, and conditional relative frequencies of two way tables<br>• Recognize and be able to describe possible associations and trends in data.<br>• Create the representation of data of two quantitative variables on a scatter plot.<br>• Describe using pertinent statistical vocabulary how variables are related given in a table or graphical form.<br>• Choose the appropriate function for a set of data<br>• Draw conclusions from data generated from functions to support problems posed about the particular functions | • Survey<br>• Dot plot<br>• Histogram<br>• Distribution<br>• Mean<br>• Median<br>• Mode<br>• Range<br>• Data<br>• Central tendency<br>• First quartile<br>• Third quartile<br>• Box and Whisker Plot<br>• Sample<br>• Fairness<br>• Bias<br>• Outlier<br>• Maximum<br>• Minimum<br>• Two-Way Table<br>• Marginal Frequency<br>• Relative Frequency<br>• Interquartile Range<br>• Standard Deviation | • Population<br>• Trend<br>• Ascending<br>• Line of Best Fit<br>• Scatterplot<br>• Correlation Coefficient<br>• Residual<br>• Correlation<br>• Causation | **District Instructional Packets**<br>**Summer 2013**<br><br>**Emathinstruction online text**<br>*CCSS version*<br><br>**Engage NY- Algebra 1**<br>**Module 2**<br>**Topics A,B, and C** |

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

| | | | |
|---|---|---|---|
| • Assess the appropriateness of the fit of a function by plotting and analyzing residuals.<br>• Calculate the line of best fit for a scatterplot<br>• Interpret the slope and intercept of a linear model in the context of data.<br>• Use appropriate technology to compute and interpret the correlation coefficient of a linear fit.<br>• Be able to explain constructs developed with correlation vs. causation. | | | |

| Unit 11<br>Applications of Functions | Algebra R+/R | Approx. 15 days | SCD Math 12/21/15 |
|---|---|---|---|
| **Domain(s):** N – Number and Quantity<br>A – Algebra<br>F - Functions | | | |
| **Essential Question(s):**<br>**What is the best way to represent data in the real world?**<br>**How do we draw correct conclusions from a function's illustration?** | | | |

## Cluster(s):

**N-Q Quantities**

- **N - Reason quantitatively and use units to solve problems.**
  - *Q.2 Define appropriate quantities for the purpose of descriptive modeling.*
  - *Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*

**A-CED Creating Equations**

- **A - Create equations that describe numbers or relationships.**
  - *CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.*

***F- Functions***

- **F - Build new functions from existing functions.**
  - *BF.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.*
- **F - Interpret functions that arise in applications in terms of the context.**
  - *IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.*
  - *IF.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.*
- **F - Analyze functions using different representations.**
  - *IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
    - *7.a Graph linear and quadratic functions and show intercepts, maxima, and minima.*
    - *7.b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*

**F-LE Linear, Quadratic, and Exponential Models**

Major Clusters (70%) Supporting Clusters (20%) Additional Clusters (10%) Honors Clusters (enrichment)

- **F- Construct and compare linear, quadratic, and exponential models and solve problems.**
  - *LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.* ■
    - *1.a Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.*
    - *1.b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.*
    - *1.c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.*
  - *LE.5 Interpret the parameters in a linear or exponential function in terms of a context.* ■

**S –Interpret Models Statistically**

- **S-ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.** ■
  - 6.a Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
  - 6.b Informally assess the fit of a function by plotting and analyzing residuals.
  - 6.c Fit a linear function for a scatter plot that suggests a linear association.

| Essential Skills | Vocabulary | District Resources |
|---|---|---|
| • Calculate the new range for a function transformation<br>• Plot the image and pre-image of a function undergoing a transformation<br>• Interpret the function rule containing composed functions<br>• Identify a function and its transformation on a graph or when given function notation<br>• Recognize a continuous or discrete function from a table of values or from a graph<br>• Create an equation for a continuous or discrete function when presented with output values<br>• Interpret the output value or a given input for a continuous or discrete function<br>• Be able to explain a step functions behavior based on a given function rule | • Accuracy<br>• Continuous<br>• Discrete<br>• Domain<br>• Exponential Function<br>• Horizontal Stretch<br>• Linear Function<br>• Prediction<br>• Quadratic Function<br>• Range<br>• Real World Phenomena<br>• Reflection<br>• Residual | District Instructional Packets<br><br>EMath Instruction – Unit 11 CCSS version<br><br>**Engage NY—Algebra 1**<br>**Module 2**<br>**Topic D( Lessons 16 – 20)**<br>**Module 5**<br>**All**<br><br>**Math Bits Algebra** |

■ Major Clusters (70%) ■ Supporting Clusters (20%) ■ Additional Clusters (10%) ■ Honors Clusters (enrichment)

| | | |
|---|---|---|
| • Graph a step function<br>• Represent a real life situation with an algebraic function<br>• Develop conjecture for a scenario that would result in a piecewise function<br>• Graph a piecewise function<br>• Identify a function as linear exponential or quadratic<br>• Interpret the graphs of functions for specific outputs<br>• Predict the outcomes of a given scenario<br>• Make predictions in data when presented with residuals<br>• Be able to create the residual of a function using technology | • Transformation<br>• Vertical Stretch<br>• Viable | |