South Orange & Maplewood School District
Mathematics Curriculum Grade 8
The Foundations of Algebra
Algebra I Advanced Honors

South Orange Maplewood School District
Department of Curriculum & Instruction
December 2013

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GRADE 8 MATHEMATICS CURRICULUM: THE FOUNDATIONS OF ALGEBRA

Course Title: The Foundations of Algebra

Levels: 2, 3, 4

Grade: 8

Description:

Over a three-year sequence, students build the foundation for and develop the concepts and skills of Algebra. This conceptually-based eight grade curriculum is the second course, and continues the deliberate connection between arithmetic and algebra, while combining informal and intuitive experiences with symbolic notation. As it did in Prealgebra, mathematical development is focused on big ideas, such as equivalence, operational reasoning, and properties. Grade 8 Developing Algebra adds linearity to the big ideas, and develops it through variation, recursive routines, and slope. Algebraic activities include representational and transformational tasks, as well as generalizing and justifying activities. Appropriate for the developmental level of eighth graders, concepts and skills are initially presented through models, and real and familiar situations, followed by activities that enable students to determine, develop and articulate categorical distinctions.

This course is designed to provide students with an appropriate balance between the development of key concepts and the mastery of skills. With that in mind, this curriculum guide clearly defines the learning objectives and content outline that drives the choice of instructional activity and assessment.

Evaluation:

Student performance will be measured using a variety of tools, including quizzes and tests, class work and homework. All eighth graders will take common departmental assessments, including common tests on all objectives, as well as Midterm and Final Exams. Similar to high stakes State assessments, district assessments will reflect a balance between concepts, skills, and applications.

New Jersey Curriculum Content Standards:

The delineation of objectives and content outline reflects not only complete coverage of the *Common Core State Standards* for 8th grade (coded under objectives and detailed in Appendix A), this blueprint for instruction also draws from all the current empirical research and professional literature available at the time of its development.

Textbook: Discovering Algebra (Key Curriculum)

GRADE 8 MATHEMATICS CURRICULUM: THE FOUNDATIONS OF ALGEBRA

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Standards for Mathematical Practice
1a. Represent and connect equivalent forms of exponential expressions. 1b.Represent situations and solve problems using scientific notation. 1c. Distinguish rational from irrational numbers.	Level 4 10 days Level 3 15 days Level 2 18 days	Work with radicals and integer exponents. 1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. 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. 3. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. 4. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. 5. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. 6. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities 7. Interpret scientific notation that has been generated by technology.	**Textbook***:* *Discovering Algebra*: 7.3 Multiplication and Exponents - page 382 7.4 Scientific Notation for Large Numbers - page 388 7.5 Division Property of Exponents - page 393 7.6 Zero and Negative Exponents - page 399 10.8 Cubic Functions - page 572 - Example A only	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math

CCSS: 8EE1-4 8NS 1-2 Central ideas: Equivalence Doing and undoing		Work with irrational numbers 8. Approximate irrational numbers using rational numbers. 9. For rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. 10. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).	**Technology:** *regentsprep.org* **District Supplementsl**	5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: THE FOUNDATIONS OF ALGEBRA

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Standards for Mathematical Practice
2. Solve linear equations in one variable. CCSS: 8EE7 Central ideas: Equivalence Doing and undoing Substitution	Level 4 5 days Level 3 8-12 days Level 2 14-19 days	1. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. 2. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). 3. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	**Textbook:** *Discovering Algebra*: 4.1 Distributive Property - page 182 (L2/3) 4.2 Undoing Operations - page 190 (L2/3) 4.8 Solving Equations Balancing Method - page 233 **Technology:** *regentsprep.org* **District Supplements**	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically

				6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: THE FOUNDATIONS OF ALGEBRA

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Standards for Mathematical Practice
3. Use rates and variation to solve real world problems. Identify how quantities vary directly and inversely. CCSS: EE 5 Central ideas: Proportionality	Level 4 5-8 days Level 3 9-14 days Level 2 9-14 days	1. Constant of variation 2. Connect the concept of rate and unit conversions to direct variation 3. Graph direct variation and read direct variation graphs to find missing values 4. Distinguish between quantities that vary directly and inversely	**Textbook:** *Discovering Algebra:* 2.3 Proportions and Measurement Systems - page 105 3.1 Using Rates - page 139 3.2 Direct Variation - page 146 3.4 Inverse Variation - page 163 (L3/4) **Technology:** *regentsprep.org* TI83+ **District Supplements**	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically

				6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: THE FOUNDATIONS OF ALGEBRA

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Standards for Mathematical Practice
4. Recognize that the primary characteristic of linearity is a constant rate of change. CCSS: EE5	Level 4 4-6 days Level 3 6-9 days Level 2 8-14 days	1. Approaches to linearity a. constant rate of change b. equations that relate variables c. graphs 2. Recursive routines 3. Equations for lines 3. Representations and connections in form a. equations and tables b. tables and graphs c. graphs and equations	**Textbook:** *Discovering Algebra:* 4.3 Recursive Sequences - page 199 4.4 Linear Plots - page 206 4.6 Linear Equations and Intercept Form - page 216 4.7 Linear Equations and Rates of Change – page 225 **Technology:** *regentsprep.org:* TI83+ **District Supplements**	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically

Central ideas: Linearity Rate of change				6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: THE FOUNDATIONS OF ALGEBRA

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Standards for Mathematical Practice
5. Define and calculate slope. CCSS: 8EE 5&6 Central ideas: Slope	Level 4 9-14 days Level 3 11-17 days Level 2 21-24 days	1. Investigate slope 2. Recognize visually rise/run 3. Positive/falling(negative)/zero slope (horizontal)/undefined slope (vertical) 4. Equations all in intercept form. 5. Connect recursive routine to intercept form 6. Determine the equation given using tables, graphs, and situations. 7. Graph using two points, a point and the slope, and points from a table. 8. Identify an equation from its graph 9. Use similar triangles to explain why the slope ***m*** is the same between any two distinct points on a non-vertical line in the coordinate plane (slope triangles).	**Textbook:** *Discovering Algebra:* 5.1 A Formula for Slope - page 251 5.2 Writing a Linear Equation to Fit Data - page 261 5.3 Point slope form of a Linear Equation - page 270 11.1 Parallel and Perpendicular – page 583 **Technology:** Green Globs *regentsprep.org:* TI83+	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically

Forms of an equation related to characteristics of the graph			**District Supplements**	6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: THE FOUNDATIONS OF ALGEBRA

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Standards for Mathematical Practice
6. Investigate, analyze, and articulate patterns of association in bivariate data. CCSS: 8SP1-4 <u>Central idea</u>: Variability	<u>Level 4</u> 4-6 days <u>Level 3</u> 8-10 days <u>Level 2</u> 11-15 days	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. 2. Recognize 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 by judging the closeness of the data points to the line. 3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.	**Textbook:** *Discovering Algebra* 1.7 Estimating - page 74 5.2 Writing a Linear Equation to Fit Data – page 261 5.6 More on Modeling (L4) – page 288 5.7 Application of Modeling - page 296 **Technology:** Green Globs *regentsprep.org:* TI83+	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. <u>Construct viable arguments and critique the reasoning of others.</u> 4. <u>Model with math.</u> 5. Use appropriate tools strategically

		4. Represent and interpret patterns of association seen in bivariate categorical data and displayed as 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.	**District Supplements**	6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: THE FOUNDATIONS OF ALGEBRA

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Standards for Mathematical Practice
7. Model and solve systems of linear equations. CCSS: 8EE8a,b,c <u>Central ideas</u>: Equivalence Doing and undoing Substitution	<u>Level 4</u> 11-18 days <u>Level 3</u> 22-27 days <u>Level 2</u> 27-30 days	A. Develop Standard Form of an equation 1. Introduce through situations. 2. Determine and write the form of the equation based on the structure of the situation B. Analyze and solve pairs of simultaneous linear equations. 1. 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. 2. 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.	**Textbook:** *Discovering Algebra:* 5.4 Equivalent Algebraic Expressions - page 276 6.1 Solving Systems of equations - page 308 6.2 Solving Systems of Equations Using Substitution - page 316 6.3 Solving Systems of Equations Using Elimination - page 324 **Technology:** *regentsprep.org:* TI83+	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. <u>Construct viable arguments and critique the reasoning of others.</u> 4. <u>Model with math.</u> 5. Use appropriate tools strategically

		3. 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.	**District Supplements**	6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Standards for Mathematical Practice
8. Represent and solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. CCSS: 8G 9 Central ideas: Unit iteration Invariance Substitution	Level 4 3-4 days Level 3 4-6 days Level 2 6-9 days Level 4 3-5 days Level 3 4-7 days Level 2 6-9 days	1. Generate and model formulas, develop automaticity and flexibility in using the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. 2. Transform equations/formulas to solve for one variable in terms of the others. 1. Explore and explain a proof of the Pythagorean Theorem and its converse. 2. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. 3. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	**Textbook:** *Discovering Algebra*: **Technology:** *regentsprep.org:* **District Supplements**	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically

9.Develop and apply the Pythagorean Theorem. CCSS: 8G 6-8			**Textbook:** *Discovering Algebra*: 11.4 The Pythagorean Theorem - page 598 11.5 Operations with Roots - page 604 11.6 A Distance Formula - page 611 **Technology:** *regentsprep.org:* **District Supplements**	6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Standards for Mathematical Practice
10. Solve and explain or justify solutions for congruence and similarity problems using physical models, transparencies or geometry software. CCSS: 8G1-5	Level 4 7-10 days Level 3 10-18 days Level 2 9-16 days	1. Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines. 2. Model and explain that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. 3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	**Textbook:** *Discovering Algebra:* 9.1 Translating Points - page 476 **Technology:** *regentsprep.org:* **District Supplements**	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically

Central ideas: Congruence Similarity Transformations		4. Model and explain that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar 2-dimensional figures, describe a sequence that exhibits the similarity between them. 5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.		6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Standards for Mathematical Practice
11. Develop, represent, explain, and apply the concept of function. CCSS: 8F 1-5 Central idea: Function	Level 4 7-10 days Level 3 10-18 days Level 2 9-16 days	**Identify, evaluate, and compare functions** 6. Recognize that a function is a rule that assigns to each input exactly one output. 7. Identify the graph of a function as the set of ordered pairs consisting of an input and the corresponding output. 8. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). 9. Interpret the equation $y = mx + b$ as defining a linear function. 10. Give examples of functions that are not linear. **Use functions to model relationships between quantities.** 1. Construct a function to model a linear relationship between two quantities. 2. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph.	**Textbook:** *Discovering Algebra:* 8.2 Functions and Graphs - page 432 8.3 Graphs of Real World Situations - page 440 8.4Function Notation - page 446 8.5 Interpreting Graphs - page 452 8.6 Defining the Absolute Value Function –page 460 8.7 Squares, Squaring, and Parabolas - page 466 (L4)	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically

		3. 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. 4. Describe qualitatively the functional relationship between two quantities by analyzing a graph 5. Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	**Technology:** *regentsprep.org:* *TI83+* **District Supplements**	6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: THE FOUNDATIONS OF ALGEBRA

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Standards for Mathematical Practice
12. Use quadratic functions to model and solve equations based on real world data. CCSS:8F 5 CCSS (9-12) A-SSE 3, A-REI 4, 7	Level 4 only 23-35 days	1. Model applications w/quadratic functions 2. Compare features of parabolas to their quadratic equation 3. Find the x-intercepts and vertex of a parabola graph & symbolic methods 4. Convert & analyze quadratic equations- 5. Vertex, factored, and general forms 6. Determine form to use based on info. 7. Solve quadratic equations w/ graphs, and tables 8. Solve quadratic equations a. In factored form by finding the roots b. In general form by completing the square c. By applying the quadratic formula	**Materials:** *Discovering Algebra:* 10.1 Solving Quadratic Equations - page 532 10.2 Finding the Roots and the Vertex - page 538 10.3 From Vertex to General Form - page 544 10.4 Factored Form - page 551 10.6 Completing the Square - page 560 10.7 The Quadratic Formula - page 566	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically

Central idea: Vertex Intercepts Roots			**Technology:** *Green Globs* *regentsprep.org:* *TI83+* **District Supplements**	6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GENERAL INSTRUCTIONAL CONSIDERATIONS AND PRIORITIES FOR ALGEBRA AND INTRO TO ALGEBRA

Strategies for shifting attention to number and operational sense

- Approach all things with this perspective: Math is a puzzle not a recipe.
- Design questions to frame out task selection and presentation. What mathematics are we aiming to develop?
- What questions can we ask to have students reflect on or analyze the particular aspects of mathematical concept, structure, or property?

Consider and prepare:

(1) Task selection begins with the mathematics, and offers variation and range of content and contexts

(2) Initial question should be open-ended, often encouraging conjecturing

(3) Prompts should enable connections to prior learning and draw out evidence of existing knowledge or understanding

(4) Follow-up questions should encourage generalization and evidence of critical thinking

(5) Pedagogical reflection and notes for reframing and discussion

Lesson design

Learning objectives provide focus for tasks by the nature of the verb
e.g., Examine the relationship between number and operations in arithmetic expressions.

Display rather than say directions. The written statement articulates purpose that can be (and should be encouraged to be) reviewed as needed.

Make student communication of mathematical ideas central, essential, and purposeful. Communication is not language for the sake of language. It is purposeful and not incidental.

Teacher Notes

Eighth Grade Curriculum Meeting Notes

- Give a quiz every 5 to 7 days
- Common assessments within 2 days within a building and within a week across both middle schools.
- To adapt to each different class, and to initiate new assessment items, develop similar class starters to judge how much time the students need to complete these.
- Emphasize number sense and operational sense and estimation throughout the year. E.g., expect mastery of Newton's Method for approximating square roots.
- Whenever possible, develop visual models of the mathematics.
- Enable students to recognize the value of equivalent forms of a number and the ubiquitous use of the Distributive Property.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Course Title: Algebra 1 Advanced Honors

Level: 5

Grade: 8

Description:

This conceptually-based eight grade Algebra 1 Advanced Honors curriculum begins with informal and intuitive experiences and moves to generalization and abstraction. As it did in Prealgebra Honors, mathematical development is focused on big ideas, such as equivalence, operational reasoning, and properties. Grade 8 Algebra1 Advanced Honors adds linearity to the big ideas, and develops linearity through variation, recursive routines, and slope. Additionally, this course lays a solid foundation for Advanced Honors Algebra 2, with the development of quadratic equations. Algebraic activities include representational and transformational tasks, as well as generalizing and justifying activities. Appropriate for the developmental level of eighth graders, concepts and skills are initially presented through representation, and familiar situations, followed by activities that enable students to determine, develop and articulate categorical distinctions.

This course is designed to provide students with an appropriate balance between the acquisition of key concepts and the mastery of skills. With that in mind, this curriculum guide clearly defines the learning objectives and content outline that frames the choice of instructional activity and assessment.

Evaluation:

Student performance will be measured using a variety of tools, including quizzes and tests, class work and homework. All eighth graders will take common departmental assessments, including common tests on all objectives, as well as Midterm and Final Exams. Similar to high stakes State assessments, district assessments will reflect a balance between concepts, skills, and applications.

New Jersey Curriculum Content Standards:

The delineation of objectives and content outline reflects not only complete coverage of the *Common Core State Standards* for 8th grade and those standards designated for high school Algebra (coded under objectives and detailed in Appendix A), this blueprint for instruction also draws from all the current empirical research and professional literature available at the time of its development.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Textbook: Discovering Algebra (Key Curriculum) and Algebra (Mc Dougal) 2011

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

THIS OBJECTIVE WILL BE DEVELOPED THROUGH STUDY PACKETS, CLASS WARM-UPS, AND ISOLATED LESSONS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
0. Understand congruence and similarity using physical models, transparencies or geometry software. CCSS: 8G1-5 Central ideas: Congruence Similarity Transformations	Introduced in Quarter 1 Study Packets introduced and reviewed in class. Warm-ups provide review and extensions #5 will be developed after midterms in a 2-3 day lesson.	6. Verify experimentally the properties of rotations, reflections, and translations: d. Lines are taken to lines, and line segments to line segments of the same length. e. Angles are taken to angles of the same measure. f. Parallel lines are taken to parallel lines. 7. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. 8. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 9. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar 2-dimensional figures, describe a sequence that exhibits the similarity between them. 10. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.	**Textbooks** Discovering Algebra - 9.1 Translating Points (p 476) Larson - Extension 4.1 Perform Transformations (p 213) **Technology** *Class zone. com* *regentsprep. org* *Geometer Sketchpad* *TI83+* **District Supple-ments**	A common assessment administered at the end of the unit. Formative assess-ments Writing tasks Selections from Packets to be graded as a project (equivalent to the weight of a test)	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model w/ math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
1a. Solve single-variable linear equations with rational coefficients. 1b.Construct viable arguments to justify solution methods. 1c. Recognize, express and solve problems that can be modeled using single-variable linear equation CCSS: N-Q-1,2,3; A-SSE-1,2; A-CED-1,2,3; A-REI-1,3	September 10 days	1. Approach solving equations as a process of reasoning and explaining the reasoning. 2. Write and solve equations that model real life situations 3. Solve multi-step equations using the distributive property, combining like terms, variables on both sides, infinite and no solutions. The final answer will be in the form x = a, a = a, or a = b. 4. Explain solutions in the context of the problem. 5. Use the structure of the equation to predict the features of its solution. Ex: 9x = -3, explain whether the solution is positive or negative, and explain whether x is an Integer or a Fraction.	**Textbooks** *Discovering Algebra*: 4.2 4.8. *Larson Algebra:* 3.4 **Technology** *Classzone.com* *regentsprep.org* **District Supplements**	Teacher selected or constructed quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
2. Solve equations involving several variables for one variable in terms of the others. CCSS: 8EE7 N-Q-1,2,3 A-CED-4	September-October 10 days	1. Transform equations a. Identify appropriate quantities for the purpose of descriptive modeling 2. Work with formulas a. Use units as a way to understand problems and to guide the solution of multi-step problems b. Interpret units consistently in a formula c. Choose a level of accuracy appropriate to the limitations of measurement when reporting quantities.	**Textbooks** *Discovering Algebra:* 11.4; 11.6 The Distance Formula (p611) *Larson Algebra:* 3.8, Skill Review page 925 **Technology** *Classzone.com* *regentsprep.org:* for literal equations **District Supplements**	Teacher selected or constructed quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction. Writing tasks	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
3a. Investigate linearity through various models and recursive routines. 3b. Identify and calculate slope. CCSS: none Central ideas: Proportionality	October 10 days	Approaches to linearity a. constant rate of change b. equations that relate variables c. recursive routines developed through situations and visual models (graphs) d. translations between models 1. Generate recursive routines 2. Connect the rule of a recursive routine to slope. 3. Based on a variety of situations, relate recursive routines to equations for lines 4. Represent, relate, and record changes in linear representation: a. equations and tables b. graphs and equations c. tables and graph d. situations to all of the above 5. Investigate and generalize direct variation relationships.	**Textbooks** *Discovering Algebra:* 3.2, 4.3, 4.4, 4.6, 4.7 Take another look –page 179 *Larson Algebra:* 4.6, Extension on arithmetic sequences p. 309 **Technology** *Classzone.com* *regentsprep.org:* for scatter plots TI83+ **District Supplements**	Teacher selected or constructed quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
4a. Identify, describe, represent, and determine slope using recursive routines, tables, numerical patterns, graphs, and equations. 4b. Translate among representations. 4c. Interpret and compare linear models for data that exhibit a linear trend including contextual problems. CCSS: none Central ideas: Linearity Rate of change	November 16 days	Slope 1. Introduce through investigations using Green Globs (approximate slope). 2. Connect recursive routines to intercept form. 3. Determine equation given a. point and slope b. two points 4. Identify an equation from its graph 5. Write linear equations in slope-intercept form, point-slope form and standard form, and use these equations to solve problems. 6. Write equations for parallel and perpendicular lines, interpret in context. 7. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point) Scatterplots 1. Plot bivariate data with a scatterplot and describe the nature of any possible linear trends: positive or negative, weak or strong. 2. Approximate a trend line by drawing on the scatterplot through the cloud of points. Give the equation for this line. 3. Use these trend lines to predict values. 4. Compute (using technology) and interpret the correlation coefficient of a linear fit.	**Textbooks** *Discovering Algebra:* 5.1, 5.2, 5.3 *Larson Algebra:* 4.1-4.5, 5.1-5.7 **Technology** Green Globs *Classzone.com* *regentsprep.org:* TI83+ **District Supplements**	Teacher selected or constructed quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
5a. Represent and solve one variable inequalities and graph solutions on a number line. 5b.Model real world situations with inequalities and explain solutions in the context of the problem. CCSS A-CED-1, 3 A-REI-3	December 6 days	1. Represent real world situations with linear inequalities 2. Explain solutions in the context of the problem. 3. Solve simple linear inequalities 4. Solve inequalities using combining like terms and distributive law. 5. Solve inequalities with rational coefficients. 6. Solve inequalities with variables on both sides, including those with no and infinite solutions. 7. Solve compound inequalities	**Textbooks** *Discovering Algebra:* 6.5 *Larson Algebra:* 6.1-6.4, **Technology** *Classzone.com* *regentsprep.org:* **District Supplements**	Teacher selected or constructed quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction. Writing tasks	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
6. Represent and solve equations involving the absolute value of a linear expression. CCSS A-REI-1; F-IF-1	December 6 days	1. Solve absolute value equations. a. one solution b. two solutions c. no solutions 2. Graph Absolute value equations a. Determine how the change in the equation transforms the graph.	**Textbooks** *Discovering Algebra:* 8.6 *Larson Algebra:* 6.5, 6.6, Extension Graph Absolute Value Function page 396 **Technology** *Classzone.com* *regentsprep.org:* TI83+ **District Supplements**	Teacher selected or constructed quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction. Writing tasks	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
7. Graph and analyze the graph of the solution set of a two-variable linear inequality. CCSS F-IF-1,5	December – January 3 days	1. Demonstrate how any point in the shaded region satisfies the equation. 2. Model a real world situation with a two-variable linear inequality and explain the solution set in the context of the problem. 3. Graph a linear equality with correct shading and dotted/dashed lines.	**Textbooks** *Discovering Algebra:* 6.6 *Larson Algebra:* 6.7 **Technology** *Classzone.com* *regentsprep.org:* TI83+ **District Supplements**	Teacher selected or constructed quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction. Writing tasks	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
8a. Represent and solve systems of linear equations in two variables using algebraic and graphic procedures. 8b. Recognize, express and solve problems that involve systems of inequalities. 8c. Interpret their solutions in terms of the context of the problem. CCSS A-REI-6	January 12 days	1. Represent situations using standard form or slope-intercept form of an equation. Find pairs of values for the linear relationship 2. Interpret x and y intercept in the context of the problem. Use these values to graph equations in standard form. 3. Demonstrate that the solution to a system of linear equations is the ordered pair that satisfies both equations. 4. Use tables to confirm the solution to a system. 5. Solve systems graphically by finding the point of intersection, both with technology and by hand. 6. Confirm that a solution satisfies both equations algebraically. 7. Solve systems using algebraic techniques. 8. Decide which method is best to solve a given system.	**Textbooks** *Discovering Algebra:* 6.1, 6.2, 6.3, 6.7 *Larson Algebra:* 7.1-7.6 **Technology** *Classzone.com* *regentsprep.org:* TI83+ **District Supplements**	Teacher selected or constructed quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction. Writing tasks	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision.

		9. Given an algebraic representation, represent the solution set to a system of linear inequalities graphically. 10. Model real world situations using systems of linear equations and inequalities.			7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
9a. Represent and connect equivalent forms of exponential expressions. 9b. Model and solve problems involving exponential growth and decay. CCSS N-RN-2	February 17 days	1. Use product and quotient properties to rewrite exponential expressions 2. Rewrite expressions so that all exponents are positive (Equivalent forms) 3. Solve problems using exponents 4. Convert between standard form and scientific notation 5. Model exponential function in the form $y = a(1 + r)^x$ or $y = ab^x$ 6. Graph exponential functions as continuous and positive 7. Model and solve real world problems	**Textbooks** *Discovering Algebra:* 7.1, 7.3, 7.4, 7.5, 7.6 *Larson Algebra:* 8.1, 8.2, 8.3, 8.4, 8.6 **Technology** *Classzone.com* *regentsprep.org:* TI83+ **District Supple-ments**	Teacher selected or constructed quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction. Writing tasks	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
10a. Develop, represent, explain and apply the concept of a function using various models. 10b. Interpret functions presented in various contexts. 10c. Analyze functions using different representations. CCSS: F-IF 1 - 6, 9 A-REI-10	March 10 days	Demonstrate understanding, apply and explain the concept of a function A. Use function notation and consider/identify domain and range 1. Evaluate functions with given input or output values 2. Interpret statements that use function notation in terms of a context 3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. B. Interpret, connect and analyze different representations for functions. 1. Graph linear functions using a table. 2. Distinguish between examples and non-example of functions using graphs, including horizontal and vertical lines. C. 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 it describes. 1. Key features include a. intercepts; b. intervals where the function is increasing/decreasing, positive/ negative; c. slope 2. Relate the domain of a function to its graph and, where possible, to the functional relationship it describes. 3. Investigate graphs of non-linear functions.	**Textbooks** *Discovering Algebra:* 8.2-8.5, 8.7 *Larson Algebra*: 1.6, 1.7, 1.7 Extension 4.7 **Technology** *Classzone.com* *regentsprep.org:* *TI83+* **District Supplements**	Teacher selected or created quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assess-ments are integrated during instruction. Writing tasks	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
11a. Generate a definition of polynomials. 11b. Add, subtract and multiply polynomial expressions with or without a context. CCSS	March 10 days	1. Investigate examples and non-examples of polynomials to generate a definition of polynomials. 2. Distinguish between equivalent and non-equivalent polynomial expressions. 3. Classify, add, subtract, and multiply polynomials 4. Use polynomials to represent real world situations; solve problems using polynomials 5. For enrichment… investigate polynomials as a system analogous to the integers, (i.e, they are closed under the operations of addition, subtraction, and multiplication)	**Textbooks** *Discovering Algebra:* 10.3 Example A *Larson Algebra:* 9.1-9.3 **Technology** *Classzone. com* *regentsprep. org* **District Supplements**	Teacher selected or created quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction. Writing tasks	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

12. Factor simple polynomial expressions with or without context. 12b. Solve factored polynomial equations without context. CCSS A-APR-3	March 5 days	1. Identify and factor out the GCF. 2. Factor trinomials. Use products of binomials to represent area. 3. Identify and factor the difference of squares. 4. .Apply the zero product property to solve polynomial equations. 5. Select and justify a factoring strategy for a given polynomial expression.	**Textbooks** *Discovering Algebra:* Zero Product Property page 554 *Larson Algebra:* 9.4-9.8 **Technology** *Classzone.com* *regentsprep.org:* **District Supplements**	Teacher selected or created quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
13. Recognize, describe, represent, analyze and solve quadratic functions in vertex form using words, tables, graphs and equations. . CCSS A-SSE-3,	April 10 days	1. Investigate the characteristics of the parent function and its transformations. (Green Globs and classroom activities) 2. Identify that the vertex is a maximum or minimum value. 3. Identify the vertex, roots, and equation of the quadratic from a graph. 4. Determine the change in the graph based on different a values. 5. Investigate the connection between graphs to vertex form. 6. Solve equations in vertex form symbolically to find the roots of the quadratic.	**Textbooks** *Discovering Algebra:* 10.1-10.4 *Larson Algebra:* 10.1-10.3 **Technology** *Classzone.com* *regentsprep.org:* TI83+ **District Supplements**	Teacher selected or created quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assessments are integrated during instruction. Writing tasks	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 8 MATHEMATICS CURRICULUM: ALGEBRA I ADVANCED HONORS

Learning Objective The student will...	Pacing	Content Outline	Instructional Materials	Assessment	Standards for Mathematical Practice
14. Recognize, describe, represent, analyze and solve quadratic functions in standard form using various approaches. CCSS A-SSE-3	May 10 days	1. Recognize the advantage of standard form to identify the axis of symmetry, the vertex and the graph of the quadratic. 2. Investigate and identify the roles of the a,b, and c values. 3. Factor and use the zero product property to identify the roots. 4. Complete the square to find the roots. 5. Use the quadratic formula to find the roots.	**Textbooks** *Discovering Algebra:* 10.4, 10.6, 10.7 *Larson Algebra:* 10.4-10.6, Extension Derive Quadratic Formula page 727 **Technology** *Classzone.com* *regentsprep.org:* TI83+ for verification of solution only **District Supplements**	Teacher selected or created quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assess-ments are integrated during instruction. Writing tasks	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

15. Analyze quadratic situations to select and solve using the most efficient solution method. CCSS A-SSE-3,	May – June 15 days	Given a quadratic situation distinguish between given solution methods to determine the most appropriate strategy to find the roots. 1. Generalize when each strategy is most appropriate based on the given equation, situation or graph.	**Textbooks** *Larson Algebra:* 10.8 **Technology** *Classzone.com* *regentsprep.org:* TI83+ **District Supplements**	Teacher selected or created quizzes - every 5 to 7 school days. A common assessment which is tailored for each level is administered at the end of the unit. Formative assess-ments are integrated during instruction. Writing tasks	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with math. 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GENERAL INSTRUCTIONAL CONSIDERATIONS AND PRIORITIES FOR ADVANCED HONORS ALGEBRA

Strategies for shifting attention to number and operational sense

- Approach all things with this perspective: Math is a puzzle not a recipe.
- Design questions to frame out task selection and presentation. What mathematics are we aiming to develop?
- What questions can we ask to have students reflect on or analyze the particular aspects of mathematical concept, structure, or property?

Consider and prepare:

(6) Task selection begins with the mathematics, and offers variation and range of content and contexts

(7) Initial question should be open-ended, often encouraging conjecturing

(8) Prompts should enable connections to prior learning and draw out evidence of existing knowledge or understanding

(9) Follow-up questions should encourage generalization and evidence of critical thinking

(10) Pedagogical reflection and notes for reframing and discussion

Lesson design

Learning objectives provide focus for tasks by the nature of the verb
e.g., Examine the relationship between number and operations in arithmetic expressions.

Display rather than say directions. The written statement articulates purpose that can be (and should be encouraged to be) reviewed as needed.

Make student communication of mathematical ideas central, essential, and purposeful. Communication is not language for the sake of language. It is purposeful and not incidental.

Teacher Notes

Eighth Grade Curriculum Meeting Notes

- Give a quiz every 5 to 7 days
- Common assessments within 2 days within a building and within a week across both middle schools.
- To adapt to each different class, and to initiate new assessment items, develop similar class starters to judge how much time the students need to complete these.
- Emphasize number sense and estimation throughout the year. E.g., expect mastery of Newton's Method for approximating square roots.
- Whenever possible, develop visual models of the mathematics.
- Enable students to recognize the value of equivalent forms of a number and the ubiquitous use of the Distributive Property.

Appendix A: Practice Standards (from Common Core State Standards)

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.

The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices.

In this respect, those content standards which set an expectation of understanding are potential "points of intersection" between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

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

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Appendix B: Level Distinctions in 8th Grade

Leveling is not a function of intelligence or mathematical talent or the ability to learn. Leveling in math begins with a consideration of the mathematical content that has to be developed, takes a measure of students' prior learning, and enacts a plan to maximize learning across a spectrum of student achievement.

This appendix defines the instructional distinctions which address the variation in students' preparation to do mathematics in each level. This appendix describes the parameters of content by level for each learning objective based on the content outline. At each level, students will address every learning objective prescribed by State Standards. Variations and modifications in approaching the content outline are based on evidence of foundational knowledge, the instructional time required for students to obtain mastery of essential aspects of content, and the opportunity to make mathematical decisions as the content is developed. The mathematics identified here establishes the expectations for mastery in each level.

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Appendix B: Level Distinctions in 8th Grade

Objective	Level 2	Level 3	Level 4	Content Outline
1a. Represent and connect equivalent forms of exponential expressions. 1b.Represent situations and solve problems using scientific notation. 1c. Distinguish rational from irrational numbers. CCSS: 8EE1-4 8NS 1-2 <u>Central ideas</u>: Equivalence Doing and undoing	1-2 days Use unit cubes to construct 3-D models of decreasing powers to demonstrate the meaning of the powers of 1-3. zero power and negative exponents. Construct a table to show zero power and negative exponents as well. 1-2 days Use exponent expansion to prove the properties of exponents and to write equivalent exponential expressions using positive exponents. 2-3 days Estimate the irrational root of non-perfect squares by using Newton's method to approximate the decimal equivalence to the nearest tenth, 1-2 days Use long division to find the decimal expansion of ½, ¼, 1/8, 1/3, 1/6, 2/3, and 1/7, and approximate their location on a number line. 2-3 days Compare, order	1 day Construct a table of decreasing powers to demonstrate the meaning of the zero power and negative exponents. 1-2 days Use exponent expansion to prove the properties of exponents and to write equivalent exponential expressions. Write conjectures about the properties of exponents. Use of positive and negative exponents. 1-2 days Estimate the irrational root of non-perfect squares by using Newton's method to approximate the decimal equivalence to the nearest tenth. 1-2 days Find powers and roots of values between 0 and 1. 1-2 days Use long division to find the decimal expansion of ½, ¼, 1/8, 5/8,1/3, 1/6, 1/9, 2/3, and 1/7, Approximate their location on a number line.	2-3 days Apply the properties of exponents with integer and rational exponents Use tables and patterns to prove that $x^{-y} = 1/x^y$. 1-2 days Evaluate square and cube roots of any number using Newton's method. Investigate the n^{th} root of numbers 1 day Find the decimal expansion of any fraction and approximate them on a number line. Distinguish rational and irrational numbers. 1-2 days Rewrite expressions from standard from to scientific notation and from scientific notation to standard form. Use of positive and negative exponents. Apply knowledge of scientific notation to solve for missing exponents.	<u>Work with radicals and integer exponents</u>. 11. Know and apply the properties of integer exponents to generate equivalent numerical expressions. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities Interpret scientific notation that has been generated by technology. <u>Work with irrational numbers</u> Approximate irrational numbers using rational numbers. For rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. 10. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a

Appendix B: Level Distinctions in 8th Grade

Objective	Level 2	Level 3	Level 4	Content Outline
Obj 1 (continued)	and locate rational and irrational numbers on a number line. 2-3 days Determine visual whether numbers written in scientific notation represent large or small numbers. Rewrite expressions from standard from to scientific notation and from scientific notation to standard form. Use of positive and negative exponents. <u>Throughout the unit</u>: Develop instant recall of perfect squares to 225 and perfect cubes to 125. Develop instant recall of the decimal expansion for common rational numbers such as ½, 1/3, etc.	1-2 days Compare, order and locate irrational numbers and the value of expressions on a number line. 1-2 days Rewrite expressions from standard from to scientific notation and from scientific notation to standard form. Use of positive and negative exponents. 1-2 days Perform operations with numbers in standard form and in scientific notation. <u>Throughout the unit</u>: Develop instant recall of perfect squares to 400 and perfect cubes to 125. Develop instant recall of the decimal expansion for common rational numbers such as ½, 1/3, etc.	1-2 days Perform operations with numbers in scientific notation and in standard form. <u>Throughout the unit</u>: Develop instant recall of perfect squares to 400 and perfect cubes to 125. Develop instant recall of the decimal expansion for common rational numbers such as ½, 1/3, etc.	number line diagram, and estimate the value of expressions (e.g., π^2).

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Appendix B: Level Distinctions in 8th Grade

Objective	Level 2	Level 3	Level 4	Content Outline
2. Solve linear equations in one variable. CCSS: 8EE7 <u>Central ideas</u>: Equivalence Doing and undoing Substitution	1-2 days Investigate pan balance equations 1-2 days Solve one and two step equations by balancing, inverse operations, or the "hand method" 2-3 Days develop the distributive property using 2-D models. Combine like terms using Algebra tiles. 1 week Solve linear equations in one variable with one solution including equations with variables on both sides, using the distributive property, and combining like terms, or a mix of these methods. 2-3 days Solve equations with rational number coefficients (common fractions) with one solution, infinitely many solutions, or no solution 3-4 days Represent real life situations with equations and solving to find the solution to the problem. One and two step equations and equations that use combining like terms will be represented.	2-3 days Model the distributive property and combining like terms 2-3 days Solve linear equations in one variable with one solution, including combining like terms, the distributive property, and variables on both sides, or a mix of these methods. 2-3 days Solve equations with rational number coefficients with one solution, infinitely many solutions or no solution. 2-3 days Connect solving equations to solving real life situations. Representing real life situations with equations and solving them for the solution. This will include one and two step equations, equations that require combining like terms and the distributive property. .	Prior mastery of linear equations of one variable with one solution, including combining like terms, the distributive property, and variables on both sides 1 week Solve equations with rational number coefficients with one solution, infinitely many solutions or no solution. This will include representing real life situations with equations, including two step and equations that require combining like terms and the distributive property.	1. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. 2. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). 3. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

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Appendix B: Level Distinctions in 8th Grade

Objective	Level 2	Level 3	Level 4	Content Outline
3. Use rates and variation to solve real world problems. Identify how quantities vary directly and inversely. CCSS: EE 5	1-2 days Plot points, identifying locations, axes, and quadrants of the coordinate plane. 1-2 days Use graphs to visually represent a direct variation and identify the characteristics of the graphs of direct variations. 2-3 days Connect graphs and tables of direct variation relationships, use rates to develop a constant of variation. 5-7 days Model direct variation using graphs, equations, tables, and real life situations.	2-3 days Use graphs and tables to identify relationships that represent direct variations. Identify the characteristics of a direct variation graph. 2-3 days Use rates to develop the concept of constant of variation, fist with whole numbers then with benchmark fractions 2-3 days Investigate the graphs of inverse variation relationships. Determine the key differences between direct and inverse variations. 3-5 days Determine if a situation is an inverse or direct variation by investigating situations, tables, equations and graphs	2-3 days Investigate direct variation relationships using graphs, tables, equations and situations. Use rates to develop the concept of a constant of variation. 2-3 days Investigate Inverse variation using equations, tables, graphs and situations. 1-2 days Determine if a situation, graph or equation represents an inverse or direct variation Graph and write equations for situations of inverse variations and direct variations.	1. Constant of variation 2. Connect the concept of rate and unit conversions to direct variation 3. Graph direct variation and read direct variation graphs to find missing values 4. Distinguish between quantities that vary directly and inversely

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Appendix B: Level Distinctions in 8th Grade

Objective	Level 2	Level 3	Level 4	Content Outline
4. Recognize that the primary characteristic of linearity is a constant rate of change. CCSS: EE 5 <u>Central ideas</u>: Equivalence Doing and undoing Substitution	1-2 days Investigate arithmetic sequences and patterns. 2-3 days Use rates to show linearity. Graph situations that have a constant rate of change and relate these to direct variation graphs. 1-2 days Investigate graphs to identify the starting value and the rule and write recursive routines to represent these graphs. 1-2 days Relate graphs to tables, identifying the starting value and the pattern from a table. Write recursive routines from tables connecting the starting value and the rule the given table and its corresponding graph. . 1-2 days Connect recursive routines to slope intercept form of a line. Write equations for lines from graphs, tables, and recursive routines. 2-3 days Write recursive routines to represent linear relationships using all representations. Identify the starting value and the rule by investigating graphs, tables, real life situations and recursive routines.	1-2 days Use rates to show linearity. Graph situations that have a constant rate of change and relate these to direct variation graphs. 2-3 days Determine the starting value and the rule by investigating graphs and tables. Write recursive routines using the starting value and the rule. 1 day Connect recursive routines to slope intercept form of a line. Write equations for lines from graphs, tables, and recursive routines. 2-3 days Write recursive routines to represent linear relationships using all representations. Identify the starting value and the rule by investigating graphs, tables, real life situations and recursive routines.	2-3 days determine the starting value and the rule from tables and graphs. Write recursive routines to represent these relationships. 1 day Connect recursive routines to slope intercept from of a line and write equations for lines from graphs, tables, and recursive routines. 1-2 days Write recursive routines to represent linear relationships using all representations. Identify the starting value and the rule by investigating graphs, tables, real life situations and recursive routines.	1. Approach linearity via: a. constant rate of change b. equations that relate variables c. graphs 2. Write recursive routines 3. Write equations for lines 4. Use equations and tables to graph lines

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Objective	Level 2	Level 3	Level 4	Content Outline
5. Define and calculate slope. CCSS: 8EE 5&6 <u>Central ideas</u>: Equivalence Doing and undoing Substitution	1 day Visually identifying whether the slope of a line is positive, negative, zero or no slope. (card sort activity) 1 week Develop the concept of slope using slope triangles and by visually recognizing rise/run. Relate the rule in a recursive routine to the slope of a line. 3-5 days Develop slope-intercept form of an equation by connecting the y-intercept to the starting value of a recursive routine and the slope to the rule of a recursive routine. 7-8 days Determine equations from tables, graphs, and situations 1 week Graph lines and writing equations given two points, a point and the slope, and points from a table, situations and graphs.	2-3 days Develop the concept of slope using slope triangles and by visually recognizing rise/run, including visually determining whether a line has positive, negative, no or zero slope. 1-2 days Develop the slope formula. 5-7 days Develop slope-intercept form of an equation by connecting the form to recursive routines. Equations will be generated from tables, graphs, situations, and recursive routines. 3-5 days Graph lines and writing equations given various information, including two points, a point and the slope, and points from a table, situations and graphs.	2-3 days Develop slope using slope triangles and slope formula 2-3 days Develop slope-intercept form and point-slope form of an equation 3-5 days Determine equations from tables, graphs, situations, and recursive routines. Graphing lines and writing equations when given two points, a point and the slope, and points from a table situations and graphs. 2-3 days Investigate parallel and perpendicular lines. Writing conjectures that relate the slopes of these types of lines.	1. Investigate slope 2. Recognize visually rise/run 3. Positive/falling(negative)/zero slope (horizontal)/undefined slope (vertical) 4. Equations all in intercept form. 5. Connect recursive routine to intercept form 6. Determine the equation given using tables, graphs, and situations. 7. Graph using two points, a point and the slope, and points from a table. 8. Identify an equation from its graph

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Objective	Level 2	Level 3	Level 4	Content Outline
6. Investigate patterns of association in bivariate data. CCSS: 8SP1-4	1-2 days Investigate and draw conclusions from scatter plots: positive, negative, no trend. Interpreting scatter plots that have been created using specific data sets. Match scatter plots to given data sets. 2-3 days Construct scatter plots given data sets. Distinguish which relationships model linearity. Continue to visually determine positive, negative, and no trend. 1 week Investigate informally finding the line of best fit and interpreting the slope and intercept of this line 1-2 days Use a scatter plot/line of best fit , to predict missing data items. 2-3 days Construct and interpreting two-way tables	2-3 days Construct and interpret scatter plots given data sets. Distinguish which relationships model linearity. Visually determine positive, negative, and no trend. 1 week Investigate informally finding the line of best fit and interpret the slope and intercept of this line Use the line of best fit to predict data values. 1-2 days Construct and interpret two-way tables	1-2 days Construct and interpret scatter plots given data sets. Distinguish which relationships model linearity. 2-3 days Investigate the line of best fit using five number summary (Lesson 5.6 Investigation: Fire!!!!) Use the line of best fit to determine missing data items. 1 day Construct and interpret two-way tables.	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. 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 by judging the closeness of the data points to the line. 3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. 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.

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Objective	Level 2	Level 3	Level 4	Content Outline
7. Model and solve systems of linear equations. CCSS: 8EE8a,b,c <u>Central ideas</u>: Equivalence Doing and undoing Substitution	1 week Develop standard form of an equation from situations 2-3 days Review graphing lines and slope-intercept form Given the graph a system of equations, determine the solution by identifying the point of intersection. 5-7 days Solve systems by graphing (This will include investigating systems with no solution.) 1 week Solve systems of equations by substitution in problems where the value of a variable is given. Solutions will be whole numbers. 1 week Solve systems of equations by elimination where the coefficients of the two equations are already opposites. Solutions will be whole numbers. 1 week Solve real-world application problems. Decide best way to represent the problem (intercept form or standard form) and determine best method to use to solve the system. Match situations to their systems and then to the best method for solving them.	3-5 days Develop standard form of an equation from situations. 1- 2 days Graph lines and using slope intercept form. Identify the solution to a system by locating the point of intersection on a given graph. 3-5 days Solve systems by graphing, including investigating the graphs of systems that give one solution, no solution, and infinitely many solutions. 1 week Solve systems of equations by substitution. This will include problems in which the value of one variable is give, or where one variable can be easily solved for, and will include use of the distributive property, combining like terms, and subtraction. Solutions will be whole numbers or common fractions. 1 week Solve systems of equations by elimination. This will include elimination where two of the terms are already opposites, or where one of the equations must be multiplied by a factor to make elimination possible, 1 week Solve real-world application problems. Determine the best way to represent the problem (intercept or standard form) and best method to use to find the solution.	2-3 days Develop standard form of an equation from situations 3-5 days Develop the methods of graphing and substitution to solve systems. When substitution is used, one of the equations will have to be solved for a variable. Solutions will include rational numbers. The solutions to these systems will include one solution, no solution or infinitely many solutions. Visually determine when a system will have one, no or infinitely many solutions from the equations. 3-5 days Solve systems of equations using elimination. This will include systems where one or both equations need to be multiplied to end up with opposite terms. This will include systems with one solution, no solution, or infinitely many solutions. 3-5 days Solve real-world application problems. Determine and apply the best method to solve each system based on equations' structure.	Develop Standard form: a) Develop standard form through situations. b) Determine the form of the equation to write based on the structure of the situation Analyze and solve systems of equations. 1. 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. 2. 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. 3. 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.

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Objective	Level 2	Level 3	Level 4	Content Outline
8. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. CCSS: 8G 9	1 day Investigate volume using unit cubes. 1-2 days Investigate the relationships between the volumes of different 3 dimensional figures and relating these to the formulas (ex: volume of cones related to the volume of cylinders with the same base) 2-3 days Use Volume formulas to solve many real life problems. Use the volume formulas for cones, cylinders and spheres to solve real word situations. 2-3 days Solve formulas for specific variables (literal equations) Limit these formulas to the volume formulas used and area and perimeter formulas that can be solved in one or two steps.	1 day Develop that formula for the volume of a cylinder by investigating the volume of a rectangular prism. 1 day Relate the volume of a cylinder to the volume of a cone by writing conjectures and testing them. 1-2 days Use Volume formulas to solve many real life problems. Use the volume formulas for cones, cylinders and spheres to solve real word situations. 1-2 days Solve literal equations. Determine when a formula should be solved for a specific variable and explain why that would be valuable to identify the answer to a real life problem.	1 day Write and test conjectures that relate the volume of a cone and a cylinder. Generate the formula for the volume of each. 1 day Use the formulas for volumes of spheres, cones and cylinders to answer real life questions. 1-2 days Solve literal equations for the variable that will answer the real life situation that is posed. Solve any literal equation.	1. Connect models with formulas to solve measurement problems. 2. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. 3. Transform equations to solve for a particular variable.

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Objective	Level 2	Level 3	Level 4	Content Outline
9. Understand and apply the Pythagorean Theorem. CCSS: 8G 6-8	1 day Identify parts of right triangles, (hypotenuse and legs). Relate squares and square roots. 1-2 days Complete a proof of the Pythagorean theorem by investigation. Determine numbers that satisfy this relationship (Pythagorean triples) 1 day Complete problems where the hypotenuse is the missing length. 1 day complete problems where one of the legs is the missing length. 1-2 days Use the Pythagorean theorem to answer a variety of real life problems and find missing lengths of either legs or the hypotenuse. 2-3 days Use the Pythagorean theorem to answer a variety of questions that relate a right triangle to points on a coordinate plane. Including finding the distance between two points on a coordinate plane. (Side lengths will be 3-4-5 triangles).	1-2 days Complete a proof of the Pythagorean theorem by investigation. Determine numbers that satisfy this relationship and 3-4-5 triangles. (Pythagorean triples) 2-3 days Apply the Pythagorean Theorem to find the Missing side lengths of a right triangle, either the hypotenuse or one of the legs. This will include real life situations. 1-2 days Use the Pythagorean theorem to answer a variety of questions that relate a right triangle to points on a coordinate plane. Including finding the distance between two points on a coordinate plane. (Side lengths will be 3-4-5 triangles).	1-2 days Complete the proof of the Pythagorean theorem. Determine numbers that are Pythagorean triples, and investigate 3-4-5 triangles. 2-3 days Apply the Pythagorean Theorem to find the Missing side lengths of a right triangle, either the hypotenuse or one of the legs. This will include real life situations and use of the coordinate plane to find the distance between two points.	1. Explain a proof of the Pythagorean Theorem and its converse. 2. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. 3. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

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10. Understand congruence and similarity using physical models, transparencies or geometry software CCSS: 8G1-5 <u>Central ideas</u>: Equivalence Doing and undoing Substitution	1-2 days Investigate translations on a coordinate plane. Determine the effects on the coordinates. Determine whether the image and pre-image are similar or congruent to each other after a translation. 1-2 days Investigate reflections on a coordinate plane. Determine the effects on the coordinates. Determine whether the image and pre-image are similar or congruent to each other after a reflection. 2-3 days Investigate rotations on a coordinate plane. Determine the effect on the coordinates. Determine whether the image and pre-image are similar or congruent to each other after a rotation. 1-2 days Apply 2 or more transformations to a given figure and determining whether the image is congruent after a series of transformations. 1-2 days Dilate figures with whole number scale factors.	1-2 days Investigate translations and reflections on a coordinate plane. Determine the effects on the coordinates. Determine whether the image and pre-image are similar or congruent to each other after a translation or a reflection. 1-2 days Investigate rotations on a coordinate plane. Determine the effects on the coordinates. Determine whether the image and pre-image are similar or congruent to each other after a rotation. 1-2 days Apply 2 or more transformations to a given figure and determining whether the image is congruent after a series of transformations. 1-2 days Dilate figures with rational number scale factors Determine whether the image and pre-image are similar or congruent to	3-5 days Explore properties of rotations, reflections, and translations determine how each transformation affects the coordinates and determine whether the image produced is congruent or similar to the pre-image. *1-2 days Apply more than one transformation to a given figure and determine whether the image is congruent to the pre-image. *1-2 days Dilate figures with any scale factor. Determine whether the figure is congruent or similar to the original. Write a definition of similarity including that corresponding angles are congruent. *1-2 days Describe the effect of dilations, translations, rotations, and reflections using	1. Verify experimentally the properties of rotations, reflections, and translations: g. Lines are taken to lines, and line segments to line segments of the same length. h. Angles are taken to angles of the same measure. i. Parallel lines are taken to parallel lines. 2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. 3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar 2-dimensional figures, describe a sequence that exhibits the similarity between them. 5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

Obj. 10 continued	Determine whether the image and pre-image are similar or congruent to each other after a dilation. 1 day Investigate corresponding angles in similar figures. Determine that although the shapes may be different sizes, the corresponding angles are congruent. Write a definition for similar figures. *2-3 days Describe the effect of dilations, translations, rotations, and reflections, determining after each transformation whether the image is congruent or similar to the pre-image. 2-3 days Investigate the relationship between the angles that are formed when parallel lines are cut by a transversal. 2-3 days Investigate the angle sum of triangles and the exterior angles of triangles.	each other after a dilation. 1 day Investigate corresponding angles in similar figures. Determine that although the shapes may be different sizes, the corresponding angles are congruent. Write a definition for similar figures. 2-3 days Describe the effect of dilations, translations, rotations, and reflections determining after each transformation whether the image is congruent or similar to the pre-image. 2-3 days Investigate the relationship between the angles that are formed when parallel lines are cut by a transversal. 2-3 days Investigate the angle sum of triangles and the exterior angles of triangles.	algebraic rules to express the transformation. Conjecture as to whether figures will be congruent or similar after a given set of transformations. 1-2 days Investigate the relationship between the angles that are formed when parallel lines are cut by a transversal. 1-2 days Investigate the angle sum of triangles and the exterior angles of triangles.	

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11. Develop, represent, explain, and apply the concept of function. CCSS: 8F 1-5	2-3 days Develop the concept of a function through function machine stressing the role of the input and the output. Include tables and relations. Determine the domain and range of given tables and relations. .2-3 days Determine if a relationship is a function by given information: relations, tables, real life examples. 1-2 days Investigate how to determine if the graph of a relation represents a function. 1-2 days Describe the graphs of functions as continuous, non-continuous, increasing, decreasing, linear and non-linear. Be able to sketch a graph when these are described verbally. 1-2 days connect intercept form to a linear function by relating it to a table and a graph. 1-2 days Relate linear functions to those that are not linear by	1-2 days Develop the concept of a function through function machine stressing the role of the input and the output. Include tables and relations. .2-3 days Determine if a relationship is a function by analyzing given information: relations, tables, real life examples. Give the domain and range of these relations. 1-2 days Investigate how to determine if the graph of a relation represents a function. Find the domain and range of a continuous function using inequalities. 1-2 days Describe the graphs of functions as continuous, non-continuous, increasing, decreasing, linear and non-linear. Be able to sketch a graph when these are described verbally. 1-2 days Relate intercept form as a linear function and compare these functions to	1 day Develop the concept of a function through function machine Stressing the role of input and output include tables and relations. 2-3 days Use the properties of a function to determine whether given relations, tables, situations or graphs are functions. Give the domain and range of any function using inequalities and including all real numbers. 2-3 days Use function notation to find x or f(x) values on a graph. Use function notation to find x and f(x) values using substitution. 1-2 days Investigate functions that are non-linear including	**Identify, evaluate, and compare functions** 1. Recognize that a function is a rule that assigns to each input exactly one output. 2. Identify the graph of a function as the set of ordered pairs consisting of an input and the corresponding output. 3. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). 4. Interpret the equation $y = mx + b$ as defining a linear function. 5. Give examples of functions that are not linear. **Use functions to model relationships between quantities.** 6. Construct a function to model a linear relationship between two quantities. 7. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. 8. 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. 9. Describe qualitatively the functional relationship between two quantities by analyzing a graph 10. Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Obj 11 continued	investigating graphs. 1-2 days Determine whether a given relationship in any form, relation, table, graph, equation, represents a function. 1-2 days Introduce function notation and find x and f(x) values from graphs	other functions that are not linear. Discuss the domain and range of linear functions. 1-2 days Determine whether a given relationship in any form, relation, table, graph, equation, represents a function. 2-3 days Construct functions to model linear relationships of real- world applications and graphing these functions 1-2 days Introduce function notation and find x and f(x) values from graphs and find f(x) values using substitution.	quadratics, exponentials, inverse variations, piece-wise, etc. Prove that these are functions be creating tables, or using the vertical line test on a graph. 1 day Describe functions as continuous, non-continuous, increasing, decreasing, linear and non- linear. Be able to sketch a graph when these are described verbally. Use function notation throughout the unit	

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Objective	Level 2	Level 3	Level 4	Content Outline
12. Use quadratic functions to model and solve equations based on real world data. CCSS: 8F 5 CCSS: (high school) A-SSE-3, A-REI-4,7	No instruction	No instruction	2-4 days Investigate the graph of the parent function $y = x^2$. Using vertex form to investigate how the graph of the parent function is translated or made wider or narrower by a series of manipulations to the parent function. Generalize vertex from this investigation. 5-7 days Investigate real life situations that are represented by quadratic functions. Use vertex form to identify the vertex and solve symbolically to find the roots. 3-4 days Find the equation of a quadratic function given various information, the vertex, a point on the graph, a graph, etc. 2-3 days Convert vertex form into standard form using sneaky squares and sneaky rectangles. Identify the a, b, and c values of a quadratic in standard form. Graph equations in standard form using tables (integer roots and vertex) 3-4 days Factor quadratics in standard form into factored form. Factoring where a = 1 or the a value can be factored from the equation to get a = 1. 2-3 days Use the zero product property and factored form to identify the roots of a quadratic. Factoring where a = 1 or the a value can be factored from the equation to get a = 1. 5-10 days Write quadratic equations given two x-intercepts or vertex and a point. Analyzing given information to determine whether vertex, standard, or factored form of a quadratic equation should be used.	1. Model applications w/quadratic functions 2. Compare features of parabolas to their quadratic equation 3. Find the x-intercepts and vertex of a parabola graph & symbolic methods 4. Convert & analyze quadratic equations- vertex, factored, and general forms 5. Determine form to use based on info. 6. Solve quadratic equations w/ graphs, and tables 7. Solve quadratic equations In factored form by finding the roots 8. In general form by completing the square 9. Apply quadratic formula