South Orange & Maplewood School District
Mathematics Curriculum Grade 7
Pre-Algebra

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

TABLE OF CONTENTS

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Course Title: Pre-algebra

Grade: 7

Description:

Over a three-year sequence, students develop the concepts and skills of beginning algebra. This Pre-algebra curriculum, as the introductory course, provides an informal and intuitive approach, and a deliberate connection between arithmetic and algebra. Further, mathematical content is focused on big ideas, such as equivalence, variables, functions, operational reasoning, and properties. Algebraic activities include representational and transformational tasks, as well as generalizing and justifying activities. Appropriate for the developmental level of seventh 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 frame instructional activity and assessment.

Evaluation:

Student performance will be measured using a variety of tools, including (but not limited to) quizzes and tests, class work and homework. All seventh graders will also take common departmental assessments, including common tests on learning 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.

Common Core State Standards:

The delineation of objectives and content outline reflects not only complete coverage of the CCSS for 7th grade (coded under objectives and detailed in Appendix B), this blueprint for instruction also draws from all the current empirical research and professional literature available at the time of its development.

Textbook: Prealgebra (Glencoe, 2006)

GRADE 7 MATHEMATICS CURRICULUM: PRE-ALGEBRA

Learning Objective The student will ...	Pacing	Content Outline	Instructional materials	Notes	Standards for Mathematical Practice
1a. Recognize, represent and apply equivalent forms of arithmetic and algebraic expressions to solve problems. 1b. Use properties of operations to generate equivalent expressions. CCSS: 7EE1& 2	College Prep September - October 4-5 weeks Honors September 2-3 weeks	A. Arithmetic expressions 1. Model contextual situations and relationships 2. **Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.** 3. Determine if expressions are equivalent 4. **In a problem context, rewrite and analyze an expression in different forms to shed light on the problem's structure and how the quantities in it are related.** B. Algebraic expressions 1. Model and develop concepts related to the different uses of variables 2. Expand the relationship between values and variables in a give expression by considering an equivalent form represented with inverse relationships. 3. Focus on operational sense a. Analyze and represent real life situations b. Solve real-life and mathematical problems using numerical and algebraic expressions. 4. Apply the order of operations 5. Apply and describe the use of properties of zero and one	Glencoe Pre-Algebra Ch. 1.2-1.4 pp. 12-32 Ch. 3.1-3.2 pp. 98-107 Extra Practice: Lesson1-1,2,3 p. 724; p.758 1-10 p.728 Lesson 3-1 PRINT: Jacob's Algebra Algebridge: Concept of Variable Fractions in Expressions Algebra Puzzles &Problems 7 District constructed materials **MANIPULATIVES:** **Area models for the distributive property** **Algebra Tiles**	Operational sense requires more than the example the CCSS provides in #2. Two aspects to emphasize include: (1) the logical connection between operation and the contextualized relationship in an expression; and (2) an analysis of some real and diverse applications or situations in applying properties.	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 7 MATHEMATICS CURRICULUM: PRE-ALGEBRA

Learning Objective The student will ...	Pacing	Content Outline	Instructional materials	Notes	Standards for Mathematical Practice
2. Develop, represent, apply and explain the concepts of integers, integer relations and operations, and absolute value. CCSS: 7NS1, 2, & 3 7EE 1, 3	College Prep October - November 4 weeks Honors October 2-3 weeks	Integer concepts 1. Represent with linear and discrete models 2. **Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.** 3. **Describe situations in which opposite quantities combine to make 0.** Integer relations 1. Apply properties as strategies to represent equivalent forms of an integer. Example: Using the additive inverse to rewrite 7-4 as 7+ (-4) 2. Ordering / sequencing Integer computation 1. **Understand *p* + *q* as the number located a distance |*q*| from *p*, in the positive or negative direction depending on whether *q* is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.** 2. **Understand subtraction of rational numbers as adding the additive inverse, *p* – *q* = *p* + (–*q*).**	Glencoe Prealgebra Ch. 2.1-2.5 pp.55-94 Extra Practice pp. 726-727; pp. 759 #5-10 PRINT: Algebridge: Meaning of Negative Numbers Computational Competencies Mental Math in the Middle School District constructed materials MANIPULATIVES: Two Color Counters, Communicators Number lines	A continued emphasis on equivalence is important in the development of this objective. Integer relations should be expanded to include negative rational numbers. A wide variety of examples of absolute value should be clustered to focus on specific distinctions. For example, -2|a| and |-2a|	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.

		3. **Recognize that multiplication is extended from whole numbers to integers requiring that operations continue to satisfy the properties of operations, particularly the distributive property**. Interpret products of rational numbers by describing real-world contexts. 4. **Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number**.			7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 7 MATHEMATICS CURRICULUM: PREALGEBRA

Learning Objective The student will ...	Pacing	Content Outline	Instructional materials	Notes	Standards for Mathematical Practice
3. Solve real-life and mathematical problems using numerical and algebraic equations, and inequalities. CCSS: 7EE 4 CP: 7G 5 H: 7G 5, 6	College Prep November - December 4 weeks Honors October - November 4 weeks	1. Model with a balance scale. 2. **Solve word problems leading to equations of the form *px* + *q* = *r* and *p*(*x* + *q*) = *r*, where *p*, *q*, and *r* are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.** *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?* 3. Writing and solving inequalities to match situations. 4. **Solve word problems leading to inequalities of the form *px* + *q* > *r* or *px* + *q* < *r*, where *p*, *q*, and *r* are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the proble**m. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.* 5. **Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.**	Glencoe Prealgebra Ch. 3.3-3.7 pp.108-136 Ch. 7.1-7.6 pp. 328-359 Extra Practice Equations: pp.729-730 Lesson 3-1 to Lesson3-7; p.760 pp. 739-740 Lesson 7-1; 7-2 Extra Practice Inequalities pp. 740-741 Lesson 7-3; 7-4; 7-5-6 p. 764 PRINT: Jacob's Algebra Algebra Puzzles and Problems 7 District constructed materials MANIPULATIVES: Algebra Tiles, Pan Balance	Use the Hand Method to intuitively establish reasoning and drawn attention to the use of inverse in the process of equation solving. Provide an expansive range of real contexts to enable students to make sense of inequalities. Enable students to generate formulas and justify the connections between formulas and diagrams	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. **Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.** 7. **Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms**.			6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Grade 7 Mathematics Curriculum: Prealgebra

Learning Objective The student will …	Pacing	Content Outline	Instructional materials	Notes	Standards for Mathematical Practice
4. Draw, construct, and describe geometrical figures and describe the relationships between them. CCSS: 7G 2, 3	College Prep December 2 weeks Honors November - December 2 weeks	1. **Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions**. 2. **Focus on constructing triangles from three measures of angles or sides.** **3. Recognizing when the conditions determine a unique triangle, more than one triangle, or no triangle.** 4. **Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids**.	Glencoe Prealgebra Ch. 9.3-9.4 pp. 447-457 Ch. 10.1-10.2 pp. 492-504 CH. 11.1 pp. 556-561 PRINT: District constructed materials Common Core Practice and Instruction (Curriculum Associates) MANIPULATIVES: Ruler, protractor, patty paper, 3D models	Use *Discovering Geometry* Teacher Notes and textbook investigations to approach each topic or relationship.	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 7 MATHEMATICS CURRICULUM: PREALGEBRA

Learning Objective The student will…	Pacing	Content Outline	Instructional materials	Notes	Standards for Mathematical Practice
5. Develop meaning for ratios, proportions, and percents; develop, apply, and explain methods for solving problems involving proportions and percents in a variety of situations. CCSS: 7RP1-3, 7G1	College Prep January - February 5-6 weeks (with a break for midterms) Honors December – February 4-5 weeks (with a break for midterms)	1. Represent ratios with two different unit rates 2. **Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.** For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour. 3. Represent proportional relationships of situations using equivalent ratios (Conceptual meaning, logical language, applications, unit rates, scales) 4. Decide whether two quantities are in a proportional relationship, -**testing for equivalent ratios in a table** -graphing on a coordinate plane and observing whether the graph is a straight line through the origin. 5. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. 6. I**dentify the constant of proportionality** (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. 7. **Model and explain equivalence between proportional relationships and equations**. E.g., the total cost divided by the number purchased is the unit price. t/n=p/1 and its equivalent, t = pn.	Glencoe Prealgebra Ch. 6.1-6.8 pp. 264-309 Ch. 9.7 pp. 471-476 Extra Practice: pp. 736-738; p752, 763 PRINT: District constructed materials MANIPULATIVES:	**Proportional reasoning needs to frame and permeate each activity and discussion, strategy and solution.** **Reserving making a connection between proportions and equations until the end of the objective. Triangulate real situations, proportions and equations in making the connection.**	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.

		8. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. 9. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. 10. Converting fractions, decimals, and percents		**Use relational thinking to develop the connection between fractions, decimals, and percents. For example, look for patterns in form between halves, fourths, eighths and sixteenths.**	6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 7 MATHEMATICS CURRICULUM: PREALGEBRA

Learning Objective The student will …	Pacing	Content Outline	Instructional materials	Notes	Standards for Mathematical Practice
6. Solve real-life and other mathematical problems involving angle measure, area, surface area, and volume. CCSS: 7EE 4 CP: 7G 4, 6 H: 7G 4	College Prep February - March 1-2 weeks Honors February 1 week	1. Generate the formulas for the area and circumference of a circle and use them to solve problems 2. Give an informal derivation of the relationship between the circumference and area of a circle. 3. Solve real-world and mathematical problems involving area of two- dimensional objects composed of triangles, quadrilaterals, and other polygons 4. Solve real-world and mathematical problems involving **volume and surface area** of three-dimensional objects composed cubes, and right prisms.	Glencoe Prealgebra Ch.10.5-10.8 pp. 520-543 Ch. 11.2-11.5 pp.563-582 Extra Practice: pp.749 Lesson 10-5; 10-7; pp. 750-751 Lesson 10-8; 11-1; 11-2; 11-3; 11-4 PRINT: Common Core Practice and Instruction (Curriculum Associates) District constructed materials MANIPULATIVES: Patty paper, protractors, compasses, rulers, 2D and 3D models, nets, and multilinks;	Before approaching formula derivations, be sure students recognize the appropriate unit for each type of measurement, the connection between unit iteration and multiplicative nature of this process, and invariance for area and volume.	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 7 Mathematics Curriculum: Prealgebra

Learning Objective The student will …	Pacing	Content Outline	Instructional materials	Notes	Standards for Mathematical Practice
7. Use random sampling to draw inferences about a population. CCSS 7SP 1, 2	College Prep March 1-2 weeks Honors February – March 1-2 weeks	1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. 2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be*.	Glencoe Prealgebra Ch. 12.5 pp 630-634 Carnegie Learning Math Series, Course 2 Vol. 2 14.2 & 14.3 pp707-730 Bridges to Classroom Mathematics (COMAP/TERC) pp51-72 (Teacher resource) Math as a Human Endeavor Chapter 9 & Test Bank pp 63-72 Mathematics in Context: Dealing with Data pp72-101 Insights into Data pp27-47 (Sampling)	During the first year of development, this content will be further delineated.	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

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

Grade 7 Mathematics Curriculum: Prealgebra

Learning Objective The student will …	Pacing	Content Outline	Instructional materials	Notes	Standards for Mathematical Practice
8. Draw informal comparative inferences about two populations. CCSS 7SP 3, 4	College Prep March - April 1-2 weeks Honors March 1-2 weeks	1. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable* 2. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book*.	Glencoe Prealgebra Ch. 12.2 pp 612-616 Carnegie Learning Math Series, Course 2 Vol. 2 14.3-14.5 pp731-772 Math as a Human Endeavor Chapter 9 & Test Bank pp 63-72 Mathematics in Context: Dealing with Data pp72-101 Statistics and the Environment pp49-61 District Constructed materials	During the first year of development, this content will be further delineated	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	Notes	Standards for Mathematical Practice
9. Investigate chance processes and develops, use, and evaluate probability models. CCSS: 7SP 5-8	College Prep April 1-2 weeks Honors March – April 1-2 weeks	1. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. 2. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. 3. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. -Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. 4. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.	Glencoe Prealgebra Ch. 6.9 pp. 310-315 Ch. 12.8-12.9 pp. 646-656 Extra Practice: pp739 Lesson 6-9; pp.755 Lessons12-8, 12-9 PRINT: District constructed materials MANIPULATIVES: Spinners, dice, frequency tables	During the first year of development, this content will be further delineated	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

		a. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event. b. Design and use a simulation to generate frequencies for compound events.			6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

GRADE 7 MATHEMATICS CURRICULUM: PREALGEBRA

Learning Objective The student will ...	Pacing	Content Outline	Instructional materials	Notes	Standards for Mathematical Practice
10. Model, develop, and apply the concept of exponentiation. Evaluate expressions containing exponents. CCSS: Grade 8 8EE1 & 2	College Prep May 3 weeks Honors April - May 3 weeks	1. Model powers of 2, 3, and 4 with Multilinks 2. Investigate expanded form and relationship between exponents and bases 3. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *E.g., -32 = $(-2)^5$; $3^{-3} = 1/3^3 = 1/27$* 4. Recognize square root as an inverse 5. 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. 6. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. (calculator investigation) 7. Generate, conjecture, and test patterns and relationships between bases 8. Investigate powers of zero 9. Approximate Using Newton's method 10. Distinguish between linear and exponential functions in real situations. 11. Informally investigate power rules; describe their general behavior	. Glencoe Prealgebra Ch. 4.2 pp. 153-158 Ch. 4.7 pp. 181-185 Ch. 9.1-9.2 pp. 436-445 PRINT: Jacob's Algebra District constructed materials MANIPULATIVES: Multi-Links	After the concepts are developed, generate a variety of activities that present common errors, and allow students sufficient time for problem solving and reflection.	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 7 MATHEMATICS CURRICULUM: PREALGEBRA

Learning Objective The student will ...	Pacing	Content Outline	Instructional materials	Notes	Standards for Mathematical Practice
10b. Identify, factor, multiply and divide monomials. CCSS: none	Honors only May - June 3 weeks	1. Recognize monomial and non-monomial expressions 2. Determine prime factorization 3. Find GCF in arithmetic monomials 4. Find the GCF in algebraic monomials 5. Simplify algebraic fractions 6. Multiply and divide monomial expressions	**Glencoe** **A. Divisibility** 1. Review divisibility p 150 #3 a,b,c 2. Explore p 152 #52-54 B Monomials 1. Concept: examples or non-examples p151 #36-47 2. Applications: p151 Music & History #48-50, p152 Money Ask students to predict which situation represents monomials **C. Factoring**- Write monomials as a product of its factors 1. CYU p161 #2-3 Create more error analysis examples 2. Prime factorization – exponential and expanded form p162 #10-12, 30-41; (challenge) #43 OE, and #45 WiM 3. Practice: MYS p 163 # 49, 50-53, Quiz 7-10 **D. GCF** P167 GCF #55 –great application! **E. Simplifying Algebraic fractions** 1. Simplest form p 170-1, p171 Ex 5 CTU, PA; p173 Prerequisite skills 65-68; p 174 Equivalence # 11-16 **F Mult. & Div** p 175	Honors only objective This objective is included to lay a foundation for factoring, provide an essential review of fraction, and extension to algebraic fractions. If time permits… After developing the concept and a sufficient range of monomials, include binomials to distinguish the difference and reinforce the use of the distributive property.	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 PREALGEBRA

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., Analyze 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

Seventh Grade Program Development Points

- Give an assessment 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.
- Test will be drafted for an honors level class and will be shared and adapted for the other levels.

II. Midterm

- Students will receive a review for the midterm at least a week prior to the exam.

III. Other Topics

- Class Starters will provide students with adequate exposure to NJ ASK topics that will be more fully developed after the May testing.
- Students are required to know:
  - Perfect Squares up to 15 squared and 20 and 25/Square Roots
  - Fraction/decimal/percent conversions
  - Geometry and statistics vocabulary

Appendix A: Practice Standards (from the 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.

Appendix B: Level Distinctions in Grade 7

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.

Objective	College Prep	Honors	Content Outline
1a. Recognize, represent and apply equivalent forms of arithmetic and algebraic expressions to solve problems. 1b. Use properties of operations to generate equivalent expressions. CCSS: 7EE1& 2	4-5 weeks (September-October) **Represent** real-world and mathematical **situations** using algebraic expressions. Apply **properties** of operations to generate **equivalent** numerical and algebraic expressions. Apply and justify the **properties** strategically **to model** everyday situations, **make sense of and apply** the order of operations. Represent, distinguish, and compare situations with identical structure and varied contexts to **focus on operational sense**. Applications and numerical relationships are limited to **whole numbers and common fractions**.	2-3 weeks (September) Assess prior knowledge of each topic listed in the content outline through problems, examples and discussion of concepts and skills. **Instructional time is spent only where students demonstrate gaps or weaknesses for the content below**. Developmental activities are **limited to algebraic expressions**. Instruction focuses primarily on the application of the **distributive property** and the identity element. Applications and numerical relationships include **positive rational numbers**.	A. Arithmetic expressions 1. Model contextual situations and relationships 2. **Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.** 3. Determine if expressions are equivalent 4. **In a problem context, rewrite and analyze an expression in different forms to shed light on the problem's structure and how the quantities in it are related.** B. Algebraic expressions 1. Model and develop concepts related to the different uses of variables (variables as placeholders, in formulas, and how they vary with independent/dependent events) 2. Expand the relationship between values and variables in a given expression by considering an equivalent form represented with inverse relationships. 3. Focus on operational sense a. Analyze and represent real life situations b. Solve real-life and mathematical problems using numerical and algebraic expressions. 4. Apply the order of operations 5. Apply and describe the use of properties of zero and one

Objective	College Prep	Honors	Content Outline
2. Develop, represent, apply and explain the concepts of integers, integer relations and operations, and absolute value. CCSS: 7NS1, 2, & 3 7EE 1, 3	4 weeks (October-November) Develop and demonstrate knowledge of integer concepts and relations (equivalence and comparisons) using two-colored counters, number lines, and pictorial models. Develop, model and apply integer operations in real world contexts Develop the concept of absolute value through familiar situations and number line representations. Use **select rational numbers** (positive and negative) to develop and practice concepts, relations, and operations.	2-3 weeks (October) Assess prior knowledge of each topic listed in the content outline through problems, examples and discussion of concepts and skills. **Instructional time is spent only where students demonstrate gaps or weaknesses**. Use **all rational numbers** (positive and negative) to review and develop concepts, relations, and operations.	<u>Integer concepts</u> 1. Represent with linear and discrete models 2. **Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.** 3. **Describe situations in which opposite quantities combine to make 0.** <u>Integer relations</u> 1. Apply properties as strategies to represent equivalent forms of an integer. Example: Using the additive inverse to rewrite 7-4 as 7+ (-4) 2. Ordering / sequencing <u>Integer computation</u> 1. **Understand $p + q$ as the number located a distance $\|q\|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.** 2. **Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (–q)$.** 3. **Recognize that multiplication is extended from whole numbers to integers requiring that operations continue to satisfy the properties of operations, particularly the distributive property**. Interpret products of rational numbers by describing real-world contexts. 4. **Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number**.

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3. Solve real-life and mathematical problems using numerical and algebraic equations, and inequalities. CCSS: 7EE 4 CP: 7G 5 H: 7G 5, 6	4 weeks (November-December) **Make sense of equation solving** using 'doing and undoing' language and strategies. **Begin with single operation equations** and related situations. **Gradually add examples** and problems of **increasingly higher levels of cognitive demand**. Write equations with **emphasis on representing real world contexts using language that is evident of algebraic thinking.** Write inequalities to represent real world situations, graph the solution set, and interpret the solution in the context of the problem. **Situations involve whole numbers only.** <u>Transition to formally solving equations with an emphasis on the concept of balance and the use of inverse</u>.	4 weeks (October-November) Assess prior knowledge of each topic listed in the content outline through problems, examples and discussion of concepts and skills. **Instructional time spent only where gaps or weaknesses are identified for the content below.** Solve linear equations, and **justify strategies that maintain equality**. Write inequalities to represent real world situations, graphing the solution set, and interpreting the solution in the context of the problem. **Situations involve rational numbers.** **Extend algebraic equation to geometric formulas and applications** (including composite figures), using circumference, area, volume and angle measures. Transform a variety of formulas and other equations to **solve for one variable in terms of the others**.	1. Model with a balance scale. 2. **Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.** *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?* 3. Writing and solving inequalities to match situations. 4. **Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the proble**m. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.* 5. **Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.** 6. **Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.** 7. **Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms**.

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4. Draw construct, and describe geometrical figures and describe the relationships between them. CCSS: 7G 2, 3	2 weeks (December) Construct 2-dimensional geometric figures using rulers, protractors, compasses, patty paper and technology to informally investigate conjectures generated from the content outline. Create models and slice cross sections to identify the resulting 3d shapes.	2 weeks (November-December) Construct 2-dimensional geometric figures using rulers, protractors, compasses, patty paper and technology to informally investigate conjectures generated from the content outline. Create models and slice cross sections to identify the resulting 3d shapes.	1. **Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions**. 2. **Focus on constructing triangles from three measures of angles or sides.** **3.** **Recognizing when the conditions determine a unique triangle, more than one triangle, or no triangle.** 4. **Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids**.

This is a new objective. Variations in instruction by level will be posted after teachers assess the necessary level of support and instructional modifications required after the first year of instruction.

Objective	College Prep	Honors	Content Outline
5. Develop meaning for ratios, proportions, and percents; develop, apply, and explain methods for solving problems involving proportions and percents in a variety of situations. CCSS: 7RP1-3, 7G1	5-6 weeks (January-February, with a break for midterms) Develop real world applications with **emphasis on setting up the proportions using language that evidences proportional reasoning.** Represent, distinguish, and compare situations with identical structure and varied contexts to **focus on proportional reasoning**. **Model and connect proportional relationships using situations, tables and graphs**. **Apply and articulate proportional reasoning to solve percent problems in a variety of contexts**. **Investigate** the relationships between fractions, decimals and percents. Use these to build automaticity.	4-5 weeks (December-February, with a break for midterms) Apply and explain proportional relationships to solve multi-step percent problems. **Test for proportional relationships using situations, tables and graphs.** Expand proportional relationships with **various considerations of unit rates**. (Content outline 1, 2 and 6) Explore and **connect proportional relationships expressed as an equation**. **Recognize** the relationships between fractions, decimals and percents. Use these to build automaticity.	1. Represent ratios with two different unit rates 2. **Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.** For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour. 3. Represent proportional relationships of situations using equivalent ratios (Conceptual meaning, logical language, applications, unit rates, scales) 4. Decide whether two quantities are in a proportional relationship, 5. -**testing for equivalent ratios in a table** 6. -graphing on a coordinate plane and observing whether the graph is a straight line through the origin. 7. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. 8. I**dentify the constant of proportionality** (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. 9. **Model and explain equivalence between proportional relationships and equations**. E.g, the total cost divided by the number purchased is the unit price. t/n=p/1 and its equivalent, t = pn. 10. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. 11. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. 12. Converting fractions, decimals, and percents

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6. Solve real-life and other mathematical problems involving angle measure, area, surface area, and volume. CCSS: 7EE 4 CP: 7G 4, 6 H: 7G 4	1-2 weeks (February-March) Investigate the relationships between diameter and circumference, and the relationships between circumference and area of a circle. **Extend algebraic equation to geometric formulas and applications (including composite figures), using circumference, area, volume and angle measures.** **Transform a variety of formulas and other equations to solve for one variable in terms of the others.**	1 week (February) Investigate the relationships between diameter and circumference, and the relationships between circumference and area of a circle. [Formulas are developed in the Equation Solving Objective 3.]	1. Generate the formulas for the area and circumference of a circle and use them to solve problems 2. Give an informal derivation of the relationship between the circumference and area of a circle. 3. Solve real-world and mathematical problems involving area of two- -dimensional objects composed of triangles, quadrilaterals, and other polygons 4. Solve real-world and mathematical problems involving **volume and surface area** of three-dimensional objects composed cubes, and right prisms.

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7. Use random sampling to draw inferences about a population. CCSS 7SP 1, 2	1-2 weeks (March) Generate surveys and select sampling techniques, and describe different ways of finding a sample and determine which sample is the most representative of a given population. Recognize that a representative sample can be used to make predictions about a large population. Select a representative sample and use it to make predictions about a population. Distinguish random and biased samples and discuss the differences between random and biased samples. Use data from a random sample to draw inferences about a population and generate multiple samples of a same size to gauge the variation in estimates or predictions.	1-2 weeks (February-March) Investigate the notion of using random samples as a way of getting information about a whole population. Delineate the important components of how to find a random sample of a population. Generate ways of selecting samples that might result in biased samples and conclude ways of selecting samples that might result in a biased sample. Use data from a random sample to draw inferences about a population and generate multiple samples of a same size to gauge the variation in estimates or predictions.	1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. 2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be*.

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8. Draw informal comparative inferences about two populations. CCSS 7SP 3, 4	1-2 weeks (March-April) Describe the shape of a **limited or selected** data set **Describe** the center of the distribution of a sample data set through **one measure of center at a time.** **Describe the spread** of the distribution of a sample data set Compare the shape, center and **spread** of a sample data set in order to draw inferences about the data	1-2 weeks (March) Describe the shape of a **real or expansive** data set **Describe and compare** multiple measures of center for the distribution of **various sample data set** Describe and use measures of variability for various data sets Compare the shape, center and **variability** of a sample data set in order to draw inferences about the data	1. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable* 2. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*

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9. Investigate chance processes and develops, use, and evaluate probability models. CCSS: 7SP 5-8	1-2 weeks (April) Find probability of **simple events** and use the actions to predict the outcome of a larger group. Develop probability models and use them to find the probability of events. Find the probabilities of **selected and limited outcomes** for compound events using organized lists, tables, tree diagrams, and simulation.	1-2 weeks (March-April) Find the probabilities of **compound events** using organized lists, tables, tree diagrams, and simulation. Extend understanding of compound probability through **independent and dependent events**	1. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. 2. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. 3. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. 4. -Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. 5. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. b. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. c. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event. d. Design and use a simulation to generate frequencies for compound events.

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10. Model, develop, and apply the concept of exponentiation. Evaluate expressions containing exponents. CCSS: Grade 8 8EE1 & 2	3 weeks (May) Create exponential models using multi-links. Use expanded notation to demonstrate relationship between exponents and bases. Create and represent 2d and 3d area models Estimate square roots to the nearest whole number	3 weeks (April-May) Use and apply the properties of negative exponents Informally investigate power rules Estimate square roots to the nearest tenth	1. Model powers of 2, 3, and 4 with Multilinks 2. Investigate expanded form and relationship between exponents and bases 3. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *E.g, -32 = $(-2)^5$; $3^{-3} = 1/3^3 = 1/27$* 4. Recognize square root as an inverse 5. 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. 6. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. (calculator investigation) 7. Generate, conjecture, and test patterns and relationships between bases 8. Investigate powers of zero 9. Approximate Using Newton's method 10. Distinguish between linear and exponential functions in real situations. 11. Informally investigate power rules; describe their general behavior
10b. Identify, factor, multiply and divide monomials. CCSS: none	Honors only **In the month of June, College Prep classes will spend 3 weeks in focused reviews of number and operations leading to the cumulative final exam.**	3 weeks (May-June) Extend knowledge GCF to determine the GCF of a set of monomial expressions Identity monomial vs. non-monomial expressions and provide justification Extend knowledge of factorization to polynomial expressions	1. Recognize monomial and non-monomial expressions 2. Determine prime factorization 3. Find GCF in arithmetic monomials 4. Find the GCF in algebraic monomials 5. Simplify algebraic fractions 6. Multiply and divide monomial expressions