



2021 Math 5-8 Curriculum

Mendham Township Public School

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Aligned to 2016 NJSL

Board of Education Adoption Date: May 25, 2021

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The Need for Mathematics in a Changing World

We live in a time of extraordinary and accelerating change. New knowledge, tools, and ways of doing and communicating mathematics continue to emerge and evolve. Calculators, too expensive for common use in the early eighties, now are not only commonplace and inexpensive but vastly more powerful. Quantitative information available to limited numbers of people a few years ago is now widely disseminated through popular media outlets. The need to understand and be able to use mathematics in everyday life and in the workplace has never been greater and will continue to increase.

For example:

- ***Mathematics for life.*** *Knowing mathematics can be personally satisfying and empowering. The underpinnings of everyday life are increasingly mathematical and technological. For instance, making purchasing decisions, choosing insurance or health plans, and voting knowledgeably all call for quantitative sophistication.*
- ***Mathematics as a part of cultural heritage.*** *Mathematics is one of the greatest cultural and intellectual achievements of human-kind, and citizens should develop an appreciation and understanding of that achievement, including its aesthetic and even recreational aspects.*
- ***Mathematics for the workplace.*** *Just as the level of mathematics needed for intelligent citizenship has increased dramatically, so too has the level of mathematical thinking and problem solving needed in the workplace, in professional areas ranging from health care to graphic design.*
- ***Mathematics for the scientific and technical community.*** *Although all careers require a foundation of mathematical knowledge, some are mathematics intensive. More students must pursue an educational path that will prepare them for lifelong work as mathematicians, statisticians, engineers, and scientists.*

*The National Council of Teachers of Mathematics

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2021 Mathematics

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Mathematics | Standards for Mathematical Practice

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

1 Make sense of problems and persevere in solving them.

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

2 Reason abstractly and quantitatively.

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

3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account

the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4 Model with mathematics.

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

5 Use appropriate tools strategically.

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

6 Attend to precision.

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

7 Look for and make use of structure.

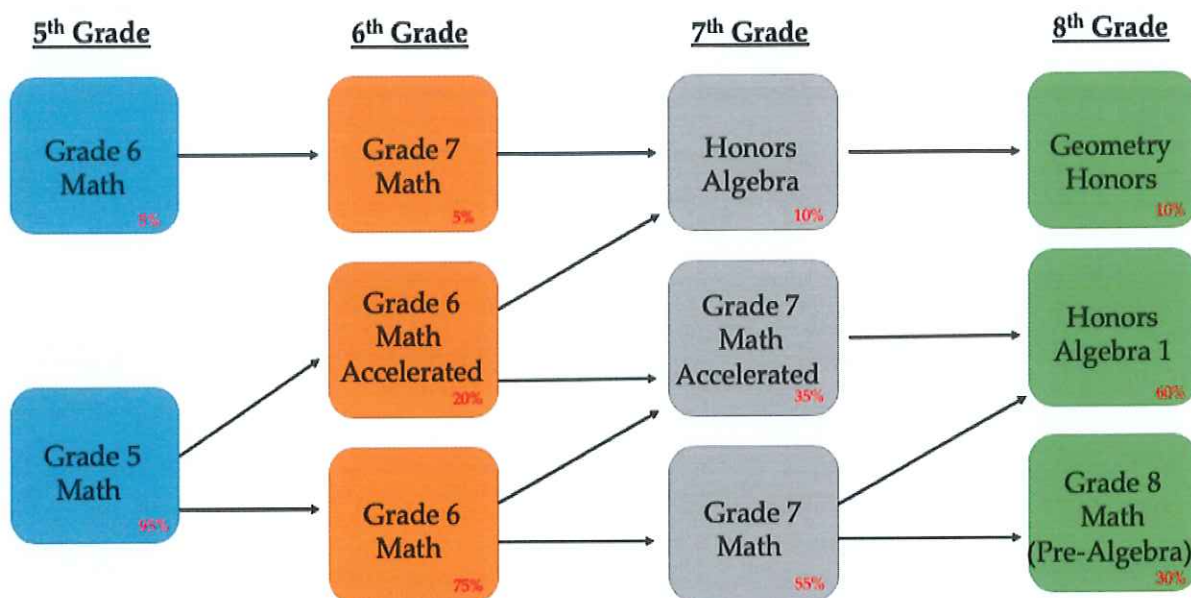
Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will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

8 Look for and express regularity in repeated reasoning.

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

Math Course Progression Flow Chart

The flow chart below illustrates the progression of MTMS math courses from 5th through 8th grade. The red percentage in the lower right-hand corner of each course box APPROXIMATES the percentage of students at each grade level participating in a specific course. Students in accelerated math classes who do not maintain a B average will be dropped from the accelerated course in the following year.



Course-Based Textbooks

Grade Level	Title	Primary / Supp
Math 5	<i>Big Ideas Math Modeling Real Life 2019</i>	Primary
Math 6 & Accelerated	<i>Big Ideas Math Modeling Real Life 2019</i>	Primary
Math 7 & Accelerated	<i>Big Ideas Math Modeling Real Life 2019</i>	Primary
Math 8	<i>Big Ideas Math Modeling Real Life 2019</i>	Primary
Honors Algebra	Big Ideas Algebra CC 2022	Primary
Honors Geometry	Big Ideas Geometry CC 2022	Primary
Fifth through Eighth	Measuring Up: People's Publishing	Supplemental
Fifth through Eighth	Com Core Performance Coach	Supplemental
Fifth through Eighth	IXLMath.Com	Supplemental Software

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Math Placement Process

Current Fourth Graders:

All student entering fifth grade will participate in one level of Math 5. A handful of students who completed Math 5 in fourth grade will begin middle school in Math 6.

Current Fifth and Sixth Graders:

All students in fifth and sixth grades will participate in three mathematics placement tests in May to determine eligibility for accelerated mathematics. The placement tests are part of a matrix including the 'end-of-year' mathematics grade, which are used to determine eligibility into accelerated mathematics in grades 6 (one section) and 7 (two sections). All accelerated and non-accelerated sections are heterogeneously grouped. See sample matrix on following pages.

Current Seventh Graders:

Typically we will facilitate two sections of Grade 8 Math and three sections of Honors Algebra. The following criteria is used to determine 8th grade mathematics placement;

Who is eligible for Honors Algebra 1?

1. Students who are currently taking Accelerated Math 7 AND earn a 'year-end math average' greater than or equal to 79.5%.
2. Students who are currently taking Math 7 and earn a 'year-end math average' greater than or equal to 93.5%.

Who is eligible for Grade 8 Math?

1. Students who are currently taking Accelerated Math 7 who earn 'year-end math average' below 79.5%.
2. Students who are currently taking Math 7 and earn a 'year-end math average' below 93.5%.

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This matrix will be used to determine math placement for students moving to grade 6.

	5	4	3	2	1	0		Points Earned
Class Average (Most recent cumulative grade average)	A's	B+	B	B-	C's	D-F's	X6	
Placement Tests	100%	99%-90%	89%-80%	79%-70%	69%-60%	59%-0%		
Part 1 out of 100%							X3	
Part 2 out of 100%							X3	
Part 3 out of 100%							X3	
TOTAL POINTS								

The student will be placed into the appropriate math class based on his/ her matrix score.

Three Part Placement Tests consists of:

Part 1 - Post Test of 5th Grade Math (Final)

Part 2 - Open Ended Response Test (application)

Part 3 - Computation Test

This matrix will be used to determine math placement for students moving to grade 7.

	5	4	3	2	1	0		Points Earned
Class Average (Most recent cumulative grade average)	A's	B+	B	B-	C's	D-F's	X6	
Placement Tests	100%	99%-90%	89%-80%	79%-70%	69%-60%	59%-0%		
Part 1 out of 100%							X3	
Part 2 out of 100%							X3	
Part 3 out of 100%							X3	
TOTAL POINTS								

The student will be placed into the appropriate math class based on his/ her matrix score.

Three Part Placement Tests consists of:

Part 1 - Post Test of 6th Grade Math (Final)

Part 2 - Open Ended Response Test (application)

Part 3 - Algebra Aptitude Test

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Accommodations Addendum

Curriculum Modifications for IEP's, 504's, ELL and Gifted and Talented

IEP and 504:

Allow for extended time on homework and assessments as described in the student's plan
Allow use of calculator
Check for comprehension and understanding
Highlight or underline key words
Permit ample time for students to respond to questions
Clearly define limits and expectations
Encourage students to ask for needed assistance
Preferential seating
Repeating, clarifying or rewording directions

ELL

Allow for alternate responses
Provide student with advanced notes
Allow for extended time on homework and assessments
Teachers modeling of what is expected and necessary steps to complete task
Provide simplified written and verbal instructions
Permit ample time for student to respond to questions
Encourage student to ask for needed assistance
Check for comprehension and understanding
Repeating, clarifying or rewording directions
Preferential seating
Allow use of eDictionary/technology to look up unknown word

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Alternate Assessments

Related Strategies

Mathematics

Teachers will employ the following materials and strategies in the event such is needed based upon I&RS plan, 504, IEP or other reasons discussed with the principal:

1. "Big Ideas" textbook alternate Chapter & Quiz assessments
2. Verbalize math minutes (times tables / equality charts etc...)
3. Calculator Versions
4. Explanation of Khan Academy video
5. Alternative IXL assessments
6. Hands on Project
7. Supplement multiple chapter tests for benchmark
8. Collaborative Test
9. Portfolio of performance-based tasks
10. Summary assessments in place of MC
11. Crib Sheet Tests

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Mendham Township Middle School

National Blue Ribbon School of Excellence

16 Washington Valley Road, Brookside, N.J. 07926

CALCULATOR PROFICIENCIES

GRADE 8 MATH

1. Graphing linear functions by entering equations into the Y= feature.
2. Graphing systems of linear equations by entering equations into the Y= feature
3. Solving systems of linear equations by graphing using the INTERSECT feature
4. Evaluating square root using $\sqrt{}$ feature
5. Evaluating cube root using the MATH button and the $\sqrt[3]{}$ feature
6. Evaluating powers using ^ symbol
7. Interpreting scientific notation as displayed by a graphing calculator
8. Entering data into a table
9. Calculating the Line of Best Fit using linear regression and the correlation coefficient
10. Converting decimals to fractions, simplifying fractions
11. Basic functions: Addition, Subtraction, Multiplication, Division, Negative sign, π button

CALCULATOR PROFICIENCIES

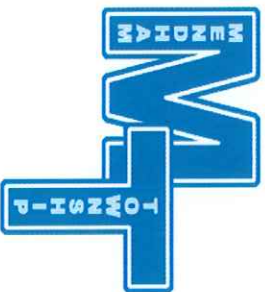
ALGEBRA 1

1. Graphing linear and non-linear functions by entering equations into the Y= feature.
2. Graphing systems of linear and non-linear equations by entering equations into the Y= feature
3. Solving systems of linear and non-linear equations by graphing using the INTERSECT feature
4. Solving systems of equations by using the TABLE feature
5. Evaluating square root using $\sqrt{}$ feature
6. Evaluating cube root using the MATH button and the $\sqrt[3]{}$ feature
7. Evaluating powers using ^ symbol
8. Interpreting scientific notation as displayed by a graphing calculator
9. Entering data into a table
10. Calculating the Line of Best Fit using linear regression and the correlation coefficient
11. Converting decimals to fractions, simplifying fractions
12. Basic functions: Addition, Subtraction, Multiplication, Division, Negative sign, π button
13. Manipulating the WINDOW for graphing and using the TBLSET feature to find specific values in a table
14. Using the TABLE feature to create a table of values for a function
15. Absolute Value
16. Solving quadratic equations using the APP feature

CALCULATOR PROFICIENCIES

GRADE 7 MATH

1. Graphing linear functions by entering equations into the Y= feature.
2. Graphing linear inequalities in one variables by entering equations into the Y = feature.
3. Graphing linear inequalities in two variables by entering equations into the Y = feature.
4. Graphing systems of linear equations by entering equations into the Y= feature
5. Solving systems of linear equations by graphing using the INTERSECT feature
6. Evaluating square root using $\sqrt{\quad}$ feature
7. Evaluating powers using $^{\wedge}$ symbol
8. Interpreting scientific notation as displayed by a graphing calculator
9. Converting decimals to fractions, simplifying fractions
10. Basic functions: Addition, Subtraction, Multiplication, Division, Negative sign, π Button
11. Creating a table of values given a linear function.
12. Use the probability simulator to explore experimental probability.
13. Use the probability simulator to generate random numbers to run a simulation.
14. Evaluate the absolute value of numeric expressions.
15. Find the least common multiple of two numbers.
16. Find the greatest common denominator of two numbers.
17. Use the zoom feature to view graphs.



Mendham Township Middle School

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2021 Mad Minute Fact Fluency by Grade Level

Math Level	Multiplication	Division	Frac – Dec Conversions	Measurement Conversions	Frac-Dec-% Conversions	Signed Integers	Perfect Square Signed Integers
5	X	X	X				
6	X	X		X	X		
7					X	X	
8					X		X
Alg					X		X
Geo							

5th Grade: Mult/Div - Oct 15 / December 15 / Jan 15 / March 15 / May (before testing)
Frac/Decimal - Jan 15 / March 15 / May (before testing)

6th Grade: Mult/Div - Oct 15 / December 15 / Jan 15 / March 15 / May (before testing)
Frac/Decimal - Dec 15 / Jan 15 / March 15 / May (before testing)
Meas Conv - Jan 15 / March 15 / May (before testing)

7th Grade: Frac/Dec/% - Oct 15 / December 15 / Jan 15 / March 15 / May (before testing)
Signed Integers - Dec 15 / Jan 15 / March 15 / May (before testing)

8th Grade: Frac/Dec/% - Oct 15 / December 15 / Jan 15 / March 15 / May (before testing)
Perfect Square - December 15 / Jan 15 / March 15 / May (before testing)

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Mendham Township Problem Solving Process

The Problem-Solving Plan Grades 5

When solving math problems follow these steps:

F: FIND the facts in the problem.

- Circle the numbers you will need to use to solve the problem.
- Underline the question

A: ACTION: What operation / formula are you going to use to solve the problem.

S: SOLVE The Problem

- Number your work in the order in which you complete the problem.
- Every step must be written out on paper (or computer)

T: TELL: Your answer in a complete sentence.

- Write a complete sentence restating the question that you underlined.
- Explain each step of your work in full sentences.



Mendham Township G5 Problem Solving Process Template

Problem 1

PROBLEM/QUESTION:

Kelly babysits five days a week Monday through Friday. She earns \$9.00 for each hour she babysits. Kelly babysits two hours on Monday, Tuesday, and Wednesday. She babysits two and a half hours each day on Thursday and Friday. Kelly saves $\frac{2}{3}$ of the money she earns each week. How much money will Kelly save from babysitting in one week?

F: FIND the facts in the problem.

- Circle the numbers you will need to use to solve the problem.
- Underline the question

A: ACTION: What operation / formula are you going to use to solve the problem.

Multiplication
Addition

S: SOLVE The Problem

- Number your work in the order in which you complete the problem.
- Every step must be written out on paper (or computer)

① Mon, Tues, Wed
 $2 + 2 + 2 = 6 \text{ hrs}$

②
$$\begin{array}{r} 6 \\ \times 9 \\ \hline \end{array}$$
 $\$54 \text{ Mon-Wed}$

③ Thur, Fri
 $2\frac{1}{2} + 2\frac{1}{2} = 5 \text{ hrs}$

④
$$\begin{array}{r} 5 \\ \times 9 \\ \hline \end{array}$$
 $\$45$

⑤
$$\begin{array}{r} 54 \\ + 45 \\ \hline \end{array}$$
 $\$99$

⑥
$$\begin{array}{r} 33 \\ 99 \\ \hline 1 \end{array} \times \frac{2}{3} = \$66$$

T: TELL: Your answer in a complete sentence.

- Write a complete sentence restating the question that you underlined.
- Explain each step of your work in full sentences.

Kelly will save \$66 from babysitting in 1 week.

① Added together how many hours she babysits Mon, Tues and Wednesday.

- ② Multiplied the money she makes per hour by number of hours she works Mon-Wed
- ③ Added together how many hours she babysits Thursday and Friday
- ④ Multiply the money she makes per hour by number of hours she works Thursday and Friday
- ⑤ Added money she made Mon-Wed and amount she made Thursday and Friday to find total money made babysitting
- ⑥ Multiplied total money made babysitting by fraction she saves to find amount she saves babysitting in one week



Mendham Township Problem Solving Process

The Problem-Solving Plan Grades 6-8

When solving math problems follow these steps:

STEP 1: WHAT IS THE QUESTION/GOAL?

Read the problem. Decide what must be found. This is sometimes in the form of a question.

STEP 2: FIND THE FACTS

Locate the factual information:

- A. KEY FACTS....the facts you need to solve the problem.
- B. FACTS YOU DON'T NEED...those facts which are not necessary for solving the problem.
- C. ARE MORE FACTS NEEDED? Decide if you have enough information to solve the problem. If not, what information would you need or what assumptions could you make to arrive at a conclusion?

STEP 3: SELECT A STRATEGY

Decide what strategies you might use, how will you use them, and in fact what form you will offer your solution. For example, will you present your solution numerically, in words, in a chart or diagram, or in some other way? If one strategy doesn't help you to solve the problem, try another.

STEP 4: SOLVE

Apply the strategy according to your plan. Communicate your solution in a clear and accurate fashion.

STEP 5: DOES YOUR RESPONSE MAKE SENSE?

Think about your solution. Read the problem again. Check to see that our answer makes sense. Use estimation to check calculations.

Step 1: Is \$50.00 enough for Migdalia to set aside for travel expenses each week?

Step 2:

2 Places to travel:

Headquarters

* 3 days/week = 6 bus trips

* takes bus @ a cost of \$48/10 one way trips

Production Site

* 2 days/week

* drives car @ a cost of .30/mile for 52 miles/day

Weekly Travel Budget = \$50.00

Step 3:

- ① Calculate cost to travel to headquarters
- ② Calculate cost to travel to production site
- ③ Add these two costs
- ④ Compare total cost to \$50.00

Step 4:

Headquarters Cost

$$48 \div 10 = \$4.80 / \text{one way trip}$$

$$4.80 \times 6 = \$28.80$$

Production Site Cost

$$0.30 \times 52 \times 2 = \$31.20$$

$$\text{Total travel expenses: } 28.80 + 31.20 = \$60.00$$

$$60 > 50$$

Migdalia did not set aside enough money for travel expenses because she needs \$60.00 per week when she only budgeted \$50.00

Step 5:



Mendham Township School District

Mathematics Curriculum - 2021

Grade 5 General & Advanced

Aligned 2019 Big Ideas Math Modeling Real Life

In Grade 5, instructional time should focus on three critical areas: (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume.

1. Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them. Students also use the meaning of fractions, of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense. (Note: this is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.)

2. Students develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations. They finalize fluency with multi-digit addition, subtraction, multiplication, and division. They apply their understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations, and make reasonable estimates of their results. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths efficiently and accurately.

3. Students recognize volume as an attribute of three-dimensional space. They understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps. They understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. They select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume. They decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes. They measure necessary attributes of shapes in order to determine volumes to solve real world and mathematical problems.

Grade 5 Overview (Mad Minute – multiplication / division / fractions – decimal conversions)

- **Operations and Algebraic Thinking**
 - Write and interpret numerical expressions.
 - Analyze patterns and relationships.
- **Number and Operations in Base Ten**
 - Understand the place value system.
 - Perform operations with multi-digit whole numbers and with decimals to hundredths.
- **Number and Operations—Fractions**
 - Use equivalent fractions as a strategy to add and subtract fractions.
 - Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
- **Measurement and Data**
 - Convert like measurement units within a given measurement system.
 - Represent and interpret data.
 - Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.
- **Geometry**
 - Graph points on the coordinate plane to solve real-world and mathematical problems.
 - Classify two-dimensional figures into categories based on their properties.
- **Mathematical Practices**
 1. 1. Make sense of problems and persevere in solving them.
 2. 2. Reason abstractly and quantitatively.
 3. 3. Construct viable arguments and critique the reasoning of others.
 4. 4. Model with mathematics.
 5. 5. Use appropriate tools strategically.
 6. 6. Attend to precision.
 7. 7. Look for and make use of structure.
 8. 8. Look for and express regularity in repeated reasoning.

NJ	NJ#	Comp & Content	Skills	Concepts
Operations and Algebraic Thinking 5OA				
Write and interpret numerical expressions.				
Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols	5OA1 C2 T1 #6, 7, 11, 12	Math Symbols (parentheses, brackets, and braces)	Evaluating expressions	Using order of operations to simplify expressions
Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation "add 8 and 7, then multiply by 2" as $2 \times (8 + 7)$. Recognize that $3 \times (18932 + 921)$ is three times as large as $18932 + 921$, without having to calculate the indicated sum or product.	5OA2 C2 T1 #6	Double means twice as much Triple means 3X as much	Write simple expressions to represent calculations of numbers Evaluate the value of expression through inspection	
Analyze patterns and relationships				
Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.	5OA3 C12 T3 #12, 15, 16	Graphing points in coordinate plane Create patterns using two rules Identify the rule associated with a specific pattern		
Number and Operations in Base Ten 5NBT				
Understand the place value system				
Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.	5NBT1 C1 T1 #1	Names of each place in a number		Each place is 10x greater than each place to its right + 1/10th of each place to its left
Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.	5NBT2 C1 T1 #2 T2 #2, 5	Identifying numbers are powers of 10 Definition of exponents		Explain patterns when multiplying or dividing by powers of 10 as: 1) movement of decimal point 2) addition of zeros
Read, write, and compare decimals to thousandths	5NBT3 C1 T1 #3	Reading decimals to thousandths	Writing decimals to thousandths	
Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.	5NBT3A C1 T1 #3, 9	Comparing decimals to thousandths Represent numbers in expanded form using base-ten numerals and number names		
Compare two decimals to thousandths based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons	5NBT3B C1	Symbols: $>$, $=$, $<$	Compare 2 decimals to thousandths using symbols	

Use place value understanding to round decimals to any place	T1 #4, 10 5NBT4 C1 T1 #5		Rounding decimals to any place	
Perform operations with multi-digit whole numbers and with decimals to hundredths.				
Fluently multiply multi-digit whole numbers using the standard algorithm.	5NBT5 C4 T2 #1		Multiply multi-digit whole numbers using the standard algorithm	
Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	5NBT6 C6 T2 #3		Divide whole numbers up to 4-digit dividends & 2-digit divisors Illustrate & explain the calculation by using equations, rectangular arrays and/or area models	Illustrate & explain the calculation by using equations, rectangular arrays and/or area models
Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	5NBT7 C3 C5 C7 T1 #8, 13, 14, 15, 16 T2 #2, 4, 5, 6, 15, 16, 17, 18, 19		Add, subtract, multiply and divide decimals using concrete models and standard algorithms Explain reasoning used	
Number and Operations—Fractions 5NF				
Use equivalent fractions as a strategy to add and subtract fractions				
Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, $2/3 + 5/4 = 8/12 + 15/12 = 23/12$. (In general, $a/b + c/d = (ad + bc)/bd$.)	5NF1 C8 T2 #8, 20	Knowledge of equivalent fractions Common denominator = LCM of denominators	Add and subtract fractions & mixed numbers with unlike denominators by writing equivalent fractions w/a common denominator	
Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result $2/5 + 1/2 = 3/7$, by observing that $3/7 < 1/2$.	5NF2 C8 T2 #7	Benchmark fractions $0, \frac{1}{2}, 1$	Solve word problems by addition and subtraction of fractions w/unlike denominators by using models Estimate sums & differences of fractions by using benchmark fractions	

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. For example, interpret $3/4$ as the result of dividing 3 by 4, noting that $3/4$ multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size $3/4$. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?	5NF3 C10 T2 #12, 23	A fraction is same as the quotient of numerator & denominator Interpret a fraction as division	Solve word problems in which division of whole number leads to fraction or mixed number quotients	
Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.	5NF4 C9 T2 #9		Multiply a fraction by a fraction Multiply a fraction by a whole number	
Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. For example, use a visual fraction model to show $(2/3) \times 4 = 8/3$, and create a story context for this equation. Do the same with $(2/3) \times (4/5) = 8/15$. (In general, $(a/b) \times (c/d) = ac/bd$.)	5NF4A C9 T2# 21, 22			Create a story context for multiplication of: 1) fraction with fraction and 2) fraction with a whole number
Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.	5NF4B C9 T2 #9	Definition of area of a rectangle	Finding area using fraction tiles Finding area by multiplying side lengths of sides	Area is equal to number of square units enclosed in a 2-D figure Derive area formula of rectangle $A = l \times w$
Interpret multiplication as scaling (resizing), by:				
Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.	5NF5A C9 T2 #11	Definition of: 1) scale factor 2) doubling 3) tripling	Comparing size of product to size of the scale factor used without multiplying	Understanding the impact on product (enlarge/reduce by size of scale factor) i.e.: <ul style="list-style-type: none"> if the number is greater than one it will enlarge the number. (>1 =enlarge) if the number is greater than zero and less than 1 it will reduce the number ($0 < x < 1$ = reduce) based on the scale factor used
			Explain why the product is greater when scale factor > 1 and	Understand that the process of writing equivalent fractions

Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.	5NFB C9 T2 #11, 14		smaller when scale factor between 0 and 1	(multiplication & division of numerator & denominators by same numbers) is same as being multiplied or divided by 1
Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.	5NF6 T2 #10, 21	Definition of mixed #	Solve real world problems involving multiplication of fractions and mixed numbers by using models or equations	
Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions	5NF7 C10 T2 #13, 23	Definition of 1) unit fractions 2) whole numbers	Divide unit fractions by whole numbers and whole numbers by unit fractions	
Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for $(1/3) \times 4$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $(1/3) \times 4 = 1/12$ because $(1/12) \times 4 = 1/3$.	5NF7A C10 T2 #13		Create a story context for division of unit fraction by a non-zero whole number and Calculate division of a non-zero whole number by a unit fraction	
Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for $4 \times (1/5)$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $4 \times (1/5) = 20$ because $20 \times (1/5) = 4$.	5NF7B C10 T2 #13		Create a story context for: division of a whole number by a unit fraction Calculate quotient of whole number by unit fraction	
Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, how much chocolate will each person get if 3 people share $1/2$ lb of chocolate equally? How many $1/3$ -cup servings are in 2 cups of raisins?	5NF7C C10 T2 #13, 23		Solve real world problems involving division of unit fractions & whole numbers & whole numbers by unit fractions by using fraction models and equations	

Measurement and Data 5MD

Convert like measurement units within a given measurement system

Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

5MD1
C11
T3 #1, 3, 4,
5, 6, 7, 8, 9

Standard units of measure including metric & customary

Convert from one unit of measure to another within a given measurement system

Use conversions to solve multi-step real world problems

Represent and interpret data

Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.

5MD2
C11
T3 #2

Line plot

Making a line plot using fractions of a unit

Using operations with fractions to solve problems presented in line plots

Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition

Recognize volume as an attribute of solid figures and understand concepts of volume measurement

5MD3
C13
T3 #17

Volume measurement tools

Understand volume as the # of cubic units contained in a 3-D figure

A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.

5MD3A
C13
T3 #17, 18

1x1x1 cube is a unit cube and is said to have one cubic unit of volume and is used to measure volume

A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.

5MD3B
C13
T3 #17, 18

A solid figure which can be packed w/o gaps or overlaps using n unit cubes is said to have a vol. of n cubic units

Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

5MD4
C13
T3 #17, 18

Units of volume: Cubic centimeter Cubic inch Cubit feet

Measure volume by counting unit cubes then assigning the appropriate unit of volume (for ex 3 unit cubes = 3 cm cubed)

Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

5MD5
C13
T3 #19, 20, 21

Relate volume to operations of \times & \div & derive vol. formula for right rect. prism

Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication

5MD5A
C13
T3 #19, 20, 21

Associate property Commutative property

Calculate volume of a right rectangular prism by using unit cubes & then by multiplying edge lengths

Volume is calculated by multiplying the area of the base times the height

Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems.	5MD5B C13 T3 #19, 20, 21		Apply volume formulas $l \times w \times h$ and $B \times h$ for rectangular prisms w/whole # edge lengths in context of real world & mathematical problems	
Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.	5MD5C C13 T3 #21			

Geometry 5G

Graph points on the coordinate plane to solve real-world and mathematical problems

Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).	5G1 C12 T3 #10, 11, 13, 14	Define coordinate plane parts (axes, origin, ordered pair, coordinates, x,y)	Understand the meaning of x,y coordinates as far as movement on the axis	
Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation	5G2 C12 T3 #11, 14		Graphing points in the first quadrant of the coordinate plane Interpret coordinate values of points of the context of the situation	

Classify two-dimensional figures into categories based on their properties

Understand that attributes belonging to a category of two dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles	5G3 C14 T3 #23, 24, 25			Understand that attributes belonging to a category of two dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles
Classify two-dimensional figures in a hierarchy based on properties	5G4 C14 T3 #22, 24, 25	Classify two-dimensional figures in a hierarchy based on properties		

Pacing Guide & Materials

Unit 1: September – November – Benchmark Test by 11/30

NJLST Standards

50A1	50A2	50A3	5NBT1	5NBT1
5NBT2	5NBT3	5NBT3A	5NBT3B	5NBT4
5NBT7				

Unit 2: November – March – Benchmark Test by 3/31

NJLST Standards

5NBT2	5NBT5	5NBT6	5NBT7	5NF1
5NF2	5NF3	5NF4	5NF4A	5NF4B
5NFS5A	5NFSB	5NF6	5NF7	5NF7A
5NF7B	5NF7C			

Unit 3: March – May – Benchmark Test by 5/31

NJLST Standards

5MD1	5MD2	5MD3	5MD3A	5MD3B
5MD4	5MD5	5MD5A	5MD5B	5MD5C
5G1	5G2	5G3	5G4	

Grade Level	Title	Primary / Supplemental
Fifth	Big Ideas Math: Modeling Real Life Common Core Grade 5 2019	Primary
Fifth through Eighth	Measuring Up: People's Publishing	Supplemental
Fifth through Eighth	Com Core Performance Coach	Supplemental
Fifth through Eighth	IXLMath.Com	Supplemental Software

Differentiation Strategies

- The unit includes presentation of material through multiple modalities such as visual, auditory, and kinesthetic to address the unique learning styles of all students.
- Assign, assess and modify if necessary to address needs of at risk learners.
- Provide student with open ended questions that stimulate higher order thinking
- Allow student to consider and express personal opinions
- Tiered Assignments
- Afford student with opportunities for independent projects based on the area of study and the student's interests
- Have student share and express their thought process, conclusions and the reasoning that led to their conclusion
- Allow for extended time on homework and assessments as described in the student's plan
- Allow use of calculator
- Check for comprehension and understanding
- Highlight or underline key words
- Permit ample time for student to respond to questions
- Clearly define limits and expectations
- Encourage student to ask for needed assistance
- Preferential seating
- Repeating, clarifying or rewording directions
- Allow for alternate responses
- Provide student with advanced notes
- Allow for extended time on homework and assessments
- Teacher modeling of what is expected and necessary steps to complete task
- Provide simplified written and verbal instructions
- Permit ample time for student to respond to questions
- Repeating, clarifying or rewording directions
- Allow use of dictionary / technology to look up unknown words

Math 5

Interdisciplinary Connections

1. Creation of tables and charts for collection and comparison of scientific data #3-5-ETS1-3
2. Calculating volume and mass to determine density #5-PS1-4
3. Averaging results for comparison of scientific data
4. Create concrete and picture graphs to organize, display, and communicate data
5. Proportions to create mixtures and solutions
6. Conversions within metrics system for accurate results
7. Graphing of results for analysis to present findings
8. Patterns for identification of crystals
9. Two-coordinate grids for comparison of dependent/independent variables
10. Using a graph as a tool to make predictions
11. Identifying a range of tolerance for organisms
12. Comparing angles for determination of outcomes within controlled experiments
13. Produce/create patterns in tables and graphs to help identify trends
14. Problem solving to carry out plans and verify results
15. Reading and measuring in metric units for tabulation of results

9.2 Career Readiness

9.2.5.CAP.2: Identify how you might like to earn an income.

9.4 Life Literacies & Technology

- 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions
- 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity
- 9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process
- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
- 9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global
- 9.4.5.TL.1: Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each.
- 9.4.5.TL.5: Collaborate digitally to produce an artifact

9.1 Financial Literacy

- 9.1.5.CP.1: Identify the advantages of maintaining a positive credit history.
- 9.1.5.EG.3: Explain the impact of the economic system on one's personal financial goals.
- 9.1.5.FI.1: Identify various types of financial institutions and the services they offer including banks, credit unions, and credit card companies.
- 9.1.5.PB.1: Develop a personal budget and explain how it reflects spending, saving, and charitable contributions.
- 9.1.5.PB.2: Describe choices consumers have with money (e.g., save, spend, donate).
- 9.1.5.FP.3: Analyze how spending choices and decision-making can result in positive or negative consequences.
- 9.1.5.FP.4: Explain the role of spending money and how it affects well-being and happiness (e.g., "happy money," experiences over things, donating to causes, anticipation, etc.).
- 9.1.5.FP.5: Illustrate how inaccurate information is disseminated through various external influencers including the media, advertisers/marketers, friends, educators, and family members.

Mendham Township School District

Mathematics Curriculum – 2021

Grade 6 General & Advanced

Aligned 2019 Big Ideas Math Modeling Real Life

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

1. Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

2. Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

3. Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

4. Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability.

Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which

the data were collected. Students in Grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. They prepare for work on scale drawings and constructions in Grade 7 by drawing polygons in the coordinate plane.

Grade 6 Overview [Mad Minute – multiplication / division / Measurement / fractions – decimal- %]

- **Ratios and Proportional Relationships**
 - Understand ratio concepts and use ratio reasoning to solve problems.
- **The Number System**
 - Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
 - Multiply and divide multi-digit numbers and find common factors and multiples.
 - Apply and extend previous understandings of numbers to the system of rational numbers.
- **Expressions and Equations**
 - Apply and extend previous understandings of arithmetic to algebraic expressions.
 - Reason about and solve one-variable equations and inequalities.
 - Represent and analyze quantitative relationships between dependent and independent variables.
- **Geometry**
 - Solve real-world and mathematical problems involving area, surface area, and volume.
- **Statistics and Probability**
 - Develop understanding of statistical variability.
 - Summarize and describe distributions.
- **Mathematical Practices**
 1. 1. Make sense of problems and persevere in solving them.
 2. 2. Reason abstractly and quantitatively.
 3. 3. Construct viable arguments and critique the reasoning of others.
 4. 4. Model with mathematics.
 5. 5. Use appropriate tools strategically.
 6. 6. Attend to precision.
 7. 7. Look for and make use of structure.
 8. 8. Look for and express regularity in repeated reasoning.

The following chart details the 6th grade curricular focus and is broken out into areas of content, skills, and concepts:

NJ	NJ#	Comp & Content	Skills	Concepts
Ratios and Proportional Relationships 6RP				
Understand ratio concepts and use ratio reasoning to solve problems.				
Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."	6RP1 C-3 T1 #15	-Different forms of ratios (a to b, a:b, etc)		-Construct meaning for a ratio -Understand that ratio is part to part, fraction is part to whole
Understand the concept of a unit rate a/b associated with a ratio $a:b$ with b not equal to 0, and use rate language in the context of a ratio relationship. For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $3/4$ cup of flour for each cup of sugar." "We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger." 1	6RP2 C-3 T1 #19	-rate is a ratio comparison to one. -representing a situation as a unit rate		-comparison to one
Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.	6RP3 C-3 T1 #16, 20		-write equivalent ratios -simplify ratios -reading tables, line diagram, etc.	-apply knowledge of ratio and rate to real world problems
Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.	6RP3A C-3 T1 #17, 18, 24	-translate graphs or diagrams into appropriate rates, ratios etc	-solve proportions -graphing on the coordinate plane -comparing ratios	
Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?	6RP3B C-3 T1 #20	Applying information and solving unit rate problems		
Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means $30/100$ times the quantity); solve problems involving finding the whole, given a part and the percent.	6RP3C C-4 T1 #1, 2, 22, 23		-solving problems involving finding the percent of a number using proportions.	-understanding that percent is a rate out of 100
Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	6RP3D C-3 T1 #21	Metric and customary conversions		

The Number System 6NS

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for $(2/3) \div (3/4)$ and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that $(2/3) \div (3/4) = 8/9$ because $3/4$ of $8/9$ is $2/3$. (In general, $(a/b) \div (c/d) = ad/bc$.) How much chocolate will each person get if 3 people share $1/2$ lb of chocolate equally? How many $3/4$ -cup servings are in $2/3$ of a cup of yogurt? How wide is a rectangular strip of land with length $3/4$ mi and area $1/2$ square mi?	6NS1 C-2 T1 #4, 5, 25	-Apply division of fractions to word problems	-Divide fraction by fraction	-construct meaning for division of fractions by using models, drawing pictures, manipulative, etc -Develop the division algorithm
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Compute fluently with multi-digit numbers and find common factors and multiples.

Fluently divide multi-digit numbers using the standard algorithm.	6NS2 C-2 T1 #7, 8		Divide multi-digit numbers	
Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation	6NS3 C-1 T1 #6, 13, 14		Add, subtract, multiply and divide decimals	
Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. <i>For example, express $36 + 8$ as $4(9 + 2)$.</i>	6NS4 C-8 T1 #11, 12 T2 #18, 20	-knowledge of the distributive property	-find the GCF by listing -find the LCM by listing -Using the distributive property	

Apply and extend previous understandings of numbers to the system of rational numbers.

Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	6NS5 C-8 T3 #1, 4			-Construct meaning for positive and negative numbers by making connections to real world content.
Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.	6NS6 C-8 T3 #2		-graphing in the coordinate plane. -plotting points on a number line	-understanding a rational number represents a specific number on a number line and a point on a coordinate plane.

Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite.	6NS6A C-8 T3 #5	-recognize the difference between opposites and negatives.		-understand that opposites represent numbers that are the same distance from zero but in the opposite direction
Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.	6NS6B C-8 T3 #7	-definition of reflection -quadrants and parts of the plane	-graph on a coordinate plane	-understand the effect on coordinates after reflection across one or both axes.
Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.	6NS6C C-8 T3 #4		-identify location given coordinates -identify coordinates given a graph	
Understand ordering and absolute value of rational numbers.	6NS7 C-8 T3 #5			
Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. For example, interpret $-3 > -7$ as a statement that -3 is located to the right of -7 on a number line oriented from left to right. Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write $-3^{\circ}\text{C} > -7^{\circ}\text{C}$ to express the fact that -3°C is warmer than -7°C .	6NS7A C-8 T3 #2 6NS7B C-8 T3 #4	-knowing the inequality symbols	-using a number line to compare numbers	-given a real world situation, be able to construct meaning for and create inequalities.
Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of -30 dollars, write $ -30 = 30$ to describe the size of the debt in dollars.	6NS7C C-8 T3 #2, 5	-distance from zero		-construct meaning for absolute value by interpreting absolute value as magnitude for a positive or negative quantity in a real-world situation
Distinguish comparisons of absolute value from statements about order. For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.	6NS7D C-8 T3 #4 6NS8		-Compare and order absolute value -graph in a coordinate	-given a situation, apply to real world concepts -apply to real world

use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

C-8
T3 #7

plane
-find vertical and horizontal distances between points on a coordinate plane

concepts

Expressions and Equations 6.EE

Apply and extend previous understandings of arithmetic to algebraic expressions.

Write and evaluate numerical expressions involving whole-number exponents.	6EE1 C-1 T1 #3, 9, 10	-translate words into symbols	-simplifying and using numerical expressions	
Write, read, and evaluate expressions in which letters stand for numbers.	6EE2 C-5 T2 #2, 3	-translating words into symbols. -defining variables.	-evaluating expressions with variables	
Write expressions that record operations with numbers and with letters standing for numbers. For example, express the calculation "Subtract y from 5" as $5 - y$.	6EE2A C-5 T2 #3	-translating words into symbols. -defining variables.		
Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. For example, describe the expression $2(8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms.	6EE2B C-5 T2 #1, 19	-Understanding vocabulary for sum, term, product, factor, quotient, coefficient etc.	-use distributive property to write equivalent expressions.	
Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = \frac{1}{2}$.	6EE2C C-5 T2 #2, 25		-evaluate formulas using the order of operations.	
Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$; apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$; apply properties of operations to $y + y + y$ to produce the equivalent expression $3y$.	6EE3 C-5 T2 #4, 5, 19, 20	-Understanding the properties (i.e.: distributive)	-Use the distributive property to simplify expressions and combine like terms	
Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions $y + y + y$ and $3y$ are equivalent because they name the same number regardless of which number y stands for.	6EE4 C-5 T2 #4, 5			Identify equivalent expressions

Reason about and solve one-variable equations and inequalities.

Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	6EE5 C-6 C-8 T2 #6, 22		-Using a replacement set to find a solution to an equation or inequality	-Construct meaning for what a solution is to an equation or inequality.
Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.	6EE6 C-5 C-6 T2 #16, 23			-Define variables and expressions/equations in order to solve word problems
Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p , q and x are all nonnegative rational numbers.	6EE7 C-6 T2 #7, 21		-Solve word problems by writing and solving involving addition and multiplication of non-negative and rational numbers.	
Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	6EE8 C-8 T3 #3, 8			-Write an inequality to represent a real world problem -Understand that the solution is a infinite number and can be graphed on a number line
Represent and analyze quantitative relationships between dependent and independent variables.				
Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.	6EE9 C-6 T2 #8, 9, 10, 23		-write an equation to model a graph - interpreting graphs	-understand the relationship of two quantities as being independent or dependent on the other using graphs, tables and equations.

Geometry 6.G

Solve real-world and mathematical problems involving area, surface area, and volume.				
Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or	6G1	-Area formula for a	-Calculate area of	-understand that a figure

decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	C-7 T2 #11, 12, 17, 25	triangle and special quadrilaterals.	complex areas and composite areas	can be broken into smaller figures
Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	6G2 C-7 T2 #15	-identify a rectangular prism	-represent fractional length using unit cubes -multiplication of fraction	- understand the concept of volume as the product of base times height by using unit cubes.
Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	6G3 C-8 T3 #6	-naming polygons	-plotting points in a coordinate plane -calculating length of horizontal and vertical sides of a polygon graphed in the coordinate plane.	-apply to problem solving
Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.	6G4 C-7 T2 #13, 14, 24	-definition of a net	- represent a 3-D figure as a net -use nets to calculate surface area	-apply to problem solving
Statistics and Probability 6.SP				
Develop understanding of statistical variability.				
Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.	6SP1 C-9 T3 #17			-understand that a statistical question is one in which data collected can be used to make comparisons.
Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape	6SP2 C-9 T3 #16, 18, 20, 22, 23, 25	-understand measures of central tendency and range		-Data can be analyzed according to its center, spread, and overall shape.
Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a	6SP3 C-9			-recognize differences between values of range

single number.	T3 #16			vs. values of measures of central tendencies.
Summarize and describe distributions.				
Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	6SP4 C-10 T3 #9, 18, 19, 21, 23		-calculate median and range -displaying data in line plots, histograms, and box-and-whisker plots.	
Summarize numerical data sets in relation to their context, such as by:				
Reporting the number of observations.	6SP5A C-10 T3 #15		-identify the size of a population from a graph.	
Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.	6SP5B C-8 T3 #15, 18		-identifying data represented in a graph -reading the labels on the axes.	
Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.	6SP5C C-9 C-10 T3 #10, 11, 12, 13, 14, 15, 16, 23		-analyze a box-and-whisker plot. -identify the effect an outlier has on mean	
Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.	6SP5D C-9 T3 #24			-understand the appropriateness of a measure of central tendency to represent a graph

Pacing Guide & Materials

Unit 1: September – November – Benchmark Test by 11/30

NJLST Standards

6RP1	6RP2	6RP3	6RP3A	6RP3B
6RP3C	6RP3D	6NS1	6NS2	6NS3
6NS4	6EE1			

Unit 2: November – March – Benchmark Test by 3/31

NJLST Standards

6NS4	6EE2	6EE2A	6EE2B	6EE2C
6EE3	6EE4	6EE5	6EE6	6EE7
6EE9	6G1	6G2	6G4	

Unit 3: March – May – Benchmark Test by 5/31

NJLST Standards

6NS5	6NS6	6NS6A	6NS6B	6NS6C
6NS7	6NS7A	6NS7B	6NS7C	6NS7D
6NS8	6EE8	6G3	6SP1	6SP2
6SP3	6SP4	6SP5A	6SP5B	6SP5C
6SP5D				

Grade Level	Title	Primary / Supplemental
Sixth	Big Ideas Math Modeling Real Life 2019	Primary
Fifth through Eighth	Measuring Up: People's Publishing	Supplemental
Fifth through Eighth	Com Core Performance Coach 2015	Supplemental
Fifth through Eighth	IXLMath.Com	Supplemental Software

Differentiation Strategies

- The unit includes presentation of material through multiple modalities such as visual, auditory, and kinesthetic to address the unique learning styles of all students.
- Assign, assess and modify if necessary, to address needs of at-risk learners.
- Provide student with open ended questions that stimulate higher order thinking
- Allow student to consider and express personal opinions
- Tiered Assignments
- Afford student with opportunities for independent projects based on the area of study and the student's interests
- Have student share and express their thought process, conclusions and the reasoning that led to their conclusion
- Allow for extended time on homework and assessments as described in the student's plan
- Allow use of calculator
- Check for comprehension and understanding
- Highlight or underline key words
- Permit ample time for student to respond to questions
- Clearly define limits and expectations
- Encourage student to ask for needed assistance
- Preferential seating
- Repeating, clarifying or rewording directions
- Allow for alternate responses
- Provide student with advanced notes
- Allow for extended time on homework and assessments
- Teacher modeling of what is expected and necessary steps to complete task
- Provide simplified written and verbal instructions
- Permit ample time for student to respond to questions
- Repeating, clarifying or rewording directions
- Allow use of eDictionary/technology to look up unknown words

Math 6

Interdisciplinary Connections

1. Use of formulas in density and graphing lessons # ESS2.C
2. Working with decimals and rounding when collecting data during investigations #MS-ESS2-5
3. Making predictions of outcomes before performing an investigation
4. Making measurements with rulers such as the size of granite pieces during weathering investigation
5. Distributions such as the distribution of fresh and salt water on the Earth
6. Collection and interpretation of data in most investigations such as the heating of various Earth materials
7. Use of variables such as time, distance, and mass when discussing erosion or gravity
8. Finding percentages when making circle graphs
9. Finding the volume of liquids and solids when finding density of materials
10. Use of positive and negative integers when discussing temperature
11. Use of fractions during graphing unit
12. Use of calculators to find density of liquids as well as the average granite size during weathering investigation
13. Finding elapsed time from sunrise and sunset times during seasons unit
14. Using proportions when comparing the size of celestial bodies
15. The idea of balancing when learning about air pressure, equilibrium, and wind formation
16. Making models of wind formation and habitable homes on other planets
17. Making designs/creating a plan when determining if air has mass

9.2 Career Readiness

- 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest.
- 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
- 9.2.8.CAP.6: Compare the costs of postsecondary education with the potential increase in income from a career of choice.
- 9.2.8.CAP.7: Devise a strategy to minimize costs of postsecondary education.
- 9.2.8.CAP.9: Analyze how a variety of activities related to career preparation
- 9.2.8.CAP.11: Analyze potential career opportunities by considering different types of resources, including occupation databases, and state and national labor market statistics.
- 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.
- 9.2.8.CAP.14: Evaluate sources of income and alternative resources to accurately compare employment options.
- 9.2.8.CAP.18: Explain how personal behavior, appearance, attitudes, and other choices may impact the job application process.
- 9.2.8.CAP.19: Relate academic achievement, as represented by high school diplomas, college degrees, and industry credentials, to employability and to potential level

9.4 Life Literacies & Technology

- 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
- 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping
- 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
- 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data.
- 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose
- 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
- 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

9.1 Financial Literacy

- 9.1.8.CR.2: Compare various ways to give back through strengths, passions, goals, and other personal factors
- 9.1.8.CR.4: Examine the implications of legal and ethical behaviors when making financial decisions.
- 9.1.8.CDM.2: Demonstrate an understanding of the terminology associated with different types of credit (e.g., credit cards, installment loans, mortgages, lines of credit) and compare and calculate the interest rates associated with each
- 9.1.8.CDM.3: Compare and contrast loan management strategies, including interest charges and total principal repayment costs.
- 9.1.8.CDM.4: Evaluate the application process for different types of loans

- 9.1.8.CP.1: Compare prices for the same goods or services.
- 9.1.8.CP.2: Analyze how spending habits affect one's ability to save.
- 9.1.8.CP.5: Compare the financial products and services available to borrowers relative to their credit worthiness
- 9.1.8.EG.1: Explain how taxes affect disposable income and the difference between net and gross income
- 9.1.8.EG.5: Interpret how changing economic and societal needs influence employment trends and future education.
- 9.1.8.FI.3: Evaluate the most appropriate financial institutions to assist with meeting various personal financial needs and goals.
- 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.
- 9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.
- 9.1.8.FP.2: Evaluate the role of emotions, attitudes, and behavior (rational and irrational) in making financial decisions.
- 9.1.8.FP.3: Explain how self-regulation is important to managing money (e.g., delayed gratification, impulse buying, peer pressure
- 9.1.8.FP.4: Analyze how familial and cultural values influence savings rates, spending, and other financial decisions.
- 9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.
- 9.1.8.PB.2: Explain how different circumstances can affect one's personal budget.
- 9.1.8.PB.4: Construct a simple personal savings and spending plan based on various sources of income and different stages of life
- 9.1.8.PB.5: Identify factors that affect one's goals, including peers, culture, location, and past experiences.
- 9.1.8.PB.7: Brainstorm techniques that will help decrease expenses including comparison shopping, negotiating, and day-to-day expense management

Mendham Township Middle School Grade 6 College and Student Loan 2021 Financial Literacy Project

NJSLA – Standards: 6.RP.3c, 6.RP.3d, 6.SP.2, 6.SP.3, 6.SP.5a, 6.SP.5c, 6.NS.3, and 6.NS.5

Overview:

The college and student loan project done in the sixth-grade math classes applies student's knowledge of negatives, adding/subtracting decimals, percent, and calculating mean to college loans based on their decisions in a college game. The lesson intended to help introduce students to the decisions they will need to make surrounding college and student loans. Students will use a simulator to role-play a college student. In the process, students will learn about how their decisions impact their student debt as well as the pressures and decisions they will face in college. Throughout this lesson, they will learn to use wise spending and saving habits, choose a major that will lead to a career, and manage their college life wisely. They will also analyze a plan on how to pay for all their decisions from college based on their debt.

1. Students take on the role of their future selves applying and choosing which college to go to. Students will play the game and assume the role of a college student to experience the circumstances of budgeting during college and managing student debt. Students will begin with what they think they know about college already. They will then calculate a rough version of their GPA now using average/mean. They will then enter information into a simulation to see what colleges they get accept into. Once they have chosen a school they will then make decisions that most college students need to make. They will have to balance happiness, focus, and connections while keeping a close eye on how much money they are adding to their debt. Once they have completed the simulation they will be given the amount of debt they have and their starting salary. The students will get into groups and answer questions based on their experiences and then we will come as a class and answer more questions about how they felt and what they know now that they did not know before. Students will reflect on the impact of the decisions they made in order to learn from them for the future.

2. Students will then assess their repayment options by inserting their information from their starting salary and the amount of student loan debt into an estimator. The students will be given nine options of different plans to pay their student loan debt back. The students will come up with a rough monthly budget of how much their planned life will cost. They will use their starting salary to estimate what their best option is for paying back their student loans. The students will be reminded to put money aside for rainy days, fun, and knowing it's okay to pay your self first too. Based on their budget they will decide what payment plan fits into their life.

3. Project conclusion: Students analyze their student loan repayment bill. The cheaper option may be the best for their budget, but it will take the most time to pay it back. Based on the interest, they can calculate the percentage of money they are additionally paying. Sometimes the decisions they make to save money may end up costing more than they think. The students will calculate how many years it will take them to pay off

four years of their life. The students will also take time to reflect on their choices now so they can apply it to their real lives in the future.

This project gives students the opportunity to have fun while using math skills to learn about making responsible decisions when it comes to college.

2020 Personal Financial Literacy Standards – 9.1

9.1.8.CR.2: Compare various ways to give back through strengths, passions, goals, and other personal factors

9.1.8.CR.4: Examine the implications of legal and ethical behaviors when making financial decisions.

9.1.8.CDM.2: Demonstrate an understanding of the terminology associated with different types of credit (e.g., credit cards, installment loans, mortgages, lines of credit) and compare and calculate the interest rates associated with each

9.1.8.CDM.3: Compare and contrast loan management strategies, including interest charges and total principal repayment costs.

9.1.8.CDM.4: Evaluate the application process for different types of loans

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9.1.8.EG.1: Explain how taxes affect disposable income and the difference between net and gross income

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9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.

9.1.8.FP.2: Evaluate the role of emotions, attitudes, and behavior (rational and irrational) in making financial decisions.

9.1.8.FP.3: Explain how self-regulation is important to managing money (e.g., delayed gratification, impulse buying, peer pressure)

9.1.8.FP.4: Analyze how familial and cultural values influence savings rates, spending, and other financial decisions.

9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.

9.1.8.PB.2: Explain how different circumstances can affect one's personal budget.

9.1.8.PB.4: Construct a simple personal savings and spending plan based on various sources of income and different stages of life

9.1.8.PB.5: Identify factors that affect one's goals, including peers, culture, location, and past experiences.

9.1.8.PB.7: Brainstorm techniques that will help decrease expenses including comparison shopping, negotiating, and day-to-day expense management

Name: _____

Introduction:

Do you want to go to college? Do you have big dreams that require a college education? It's never too early to start learning about how to get there. The game [Payback](#) will allow you to think about paying for college and the decisions you make in college that will lead to more or less student debt at the end. Along the way, you will notice that finances are not the only things that matter! Follow the directions on this sheet as you play the game to get the most out of the experience.

Part I: Engage Your College Knowledge:

Before you begin the game, let's think about what you know about college:

1. Write 3-5 sentences describing what you currently know about college. Include any facts, hopes, dreams, or qualifications you can think of!

Part II: Try It Yourself!

It is time to [play](#)! Your goal: make it to graduation and beyond with the least amount of debt to pay back after you graduate. Try not to get burnt out along the way by running out of happiness, getting failing grades, or not making enough social connections.

<https://www.timeforpayback.com>

2. Open the game and enter the details in order to “apply for college”. Enter choices based on what you think you would be doing at that age.

Record your choices below:

GPA:

	MP1 Grade	MP1 GPA #	MP2 Grade	MP2 GPA #	MP3 Grade	MP3 GPA #	MP4 Grade	MP4 GPA #	Average of all 4 GPA #'s
Math									
Language Arts									
Social Studies									
Science									

Extracurriculars: Low/Medium/High

State: New Jersey

3. Once you receive your decisions letter(s), take a look at the 3 categories: prestige, cost, and aid. Use these 3 variables to choose your school.

Which type of school did you choose? Explain why you chose it.

School:

Prestige:

Why:

Cost:

Aid:

Debt you START the game with:

4. Now, you will continue playing the game. **As you play, write down your choices each time as well as the outcomes.**

Example: If you choose the "cheap as it gets" laptop option, you would say "focus and happiness decreased but student debt also decreased" in the "Outcome" column.

Prompt	Choice	Outcome
Save or Spend Gift?		
Which Meal Plan?		
Living arrangement:		
Which Laptop?		
Transportation?		
Textbooks?		
Will you work? How many hours per week?		
Greek Life? Club? Club? Volunteer?		
*Fill in other prompt here: _____		
Major, including starting salary & unemployment rate:		

Your final debt amount:		
Your starting salary:		
Your paycheck amount:		

Part II: Compare Experiences!

Now you will have a chance to see what might have happened if you had made different choices throughout the game by comparing your experience with that of a partner or a group. Answer these questions together:

1. Did anyone drop out of school? If yes, explain why each person dropped out of college in the game. If not, explain why you think they were able to make it to graduation!

2. Did anyone graduate? If yes, describe the amount of debt and their future path given by the game. If more than one of you graduated, who has less debt?

3. Decide with your partner or as a group: If you were to play again, which types of decisions are important to make in order to get to graduation? List them below:

Part III: Reflection & Discussion

Answer the following questions using your responses from Part I and Part II. Discuss these questions as a larger group or a class.

1. List 2 things that stuck to you while playing this game:

2. Look back at your responses to the first step of the game. To keep your options open and find the best school price, what do you need to focus on in your future if you want to go to college?

3. What were the factors that you considered when choosing a college the first time you played the game?

4. Did you find it difficult to balance the three factors: happiness, focus, and connections? Why or why not?

5. Was there something that was surprisingly expensive? If so, what was it and why was it surprising?

6. Did you make certain choices in the game to try and keep your debt more manageable, and if so, what were they?

Part IV: Assess Your Repayment Plan Options

Currently, there are 9 basic repayment plans for federal loans. Now, follow the directions below, using [the Repayment Estimator](https://studentloans.gov/myDirectLoan/repaymentEstimator.action) to estimate your monthly student loan payments under each plan.

<https://studentloans.gov/myDirectLoan/repaymentEstimator.action>

NOTE: You do not need to log in or create an account.

- A. Under "Estimate Your Payments," click "View or Add Your Loans," then "Add Loans," and choose "Direct Subsidized"
- B. Add the amount as "Balance"
- C. Use the current interest rate for Direct Subsidized Loans which is: 4.53%
- D. In this activity, assume none of the characters has dependents.
- E. Under "Repayment Estimator More Information", enter your annual (yearly) income from the Starting Salary you found in the game.
- F. Choose New Jersey.
- G. Your answers will appear in the chart.

Complete the chart below for your projected loan repayment options.

Loan Repayment Plan	First Monthly Payment	Last Monthly Payment	Total Amount Paid	Projected Loan Forgiveness	Repayment Period
Standard					
Graduated					
Extended Fixed					
Extended Graduated					
Revised Pay As You Earn (REPAYE)					
Pay As You Earn (PAYE)					
Income-Based Repayment (IBR)					
IBR for New Borrowers					
Income-Contingent Repayment (ICR)					

Part VI: Budget

Come up with a monthly budget based on the plans offered and your Starting Salary.

<u>Expense Per Month</u>	<u>Cost</u>
Rent	
Cell Phone Bill	
Wi-Fi	
Car Payment	
Car Insurance	
Groceries	
Emergency	
Fun	
Savings/"Paying Yourself First"	
Student Loan Payment (You can afford)	
Total	

Part VI: Choose Your Repayment Plan

Answer the following questions based on the work you've done above.

1. Which plan offers the lowest overall cost for your student loan? What is the overall cost for that plan?
2. Which plan will you choose to incorporate into your monthly budget? Why?
3. How much are you additionally paying just for interest?

4. What percent of your overall total is interest?
5. What percent of your overall total is your student loan?
6. How many months are you paying off your debt? How many years are you paying off your debt?
7. What is your attitude about student loan debt after playing the game? What do you think will have the biggest impact on your debt amount?
8. How can you use the experience of this game to make decisions about which college to attend and to minimize debt in college?
9. What would you do differently in this hypothetical life knowing what you know now?

Mendham Township School District

Mathematics Curriculum - 2021

Grade 7 General & Advanced

Aligned 2019 Big Ideas Math Modeling Real Life

In Grade 7, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

1. Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.

2. Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

3. Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in Grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

4. Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

Grade 7 Overview (Mad Minute – fractions – decimal- % / Signed Integers)

- **Ratios and Proportional Relationships**
 - Analyze proportional relationships and use them to solve real-world and mathematical problems.
- **The Number System**
 - Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.
- **Expressions and Equations**
 - Use properties of operations to generate equivalent expressions.
 - Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
- **Geometry**
 - Draw, construct and describe geometrical figures and describe the relationships between them.
 - Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
- **Statistics and Probability**
 - Use random sampling to draw inferences about a population.
 - Draw informal comparative inferences about two populations.
 - Investigate chance processes and develop, use, and evaluate probability models.
- **Mathematical Practices**
 1. 1. Make sense of problems and persevere in solving them.
 2. 2. Reason abstractly and quantitatively.
 3. 3. Construct viable arguments and critique the reasoning of others.
 4. 4. Model with mathematics.
 5. 5. Use appropriate tools strategically.
 6. 6. Attend to precision.
 7. 7. Look for and make use of structure.
 8. 8. Look for and express regularity in repeated reasoning.

The following chart details the 7th grade curricular focus and is broken out into areas of content, skills, and concepts:

NJ	NJ#	Comp & Content	Skills	Concepts
Ratios and Proportional Relationships 7RP				
Analyze proportional relationships and use them to solve real-world and mathematical problems				
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	7RP1 C5 T2 #1	Unit Rate	Calculate unit rate using division and proportions	Understand unit rates
Recognize and represent proportional relationships between quantities.	7RP2 C5 T2 #2,4	Proportion		Understand when using a proportion is an appropriate strategy
Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.	7RP2A C5 T2 #2		Use tables and graphs to identify proportional relationships	
Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships	7RP2B C5 T2 #1,3,24		Identify and calculate unit rates in tables, graphs, equations, diagrams, and verbal descriptions	
Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p , the relationship between the total cost and the number of items can be expressed as $t = pn$.	7RP2C C5 T2 #25		Write an equation to model a proportional relationship	
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.	7RP2D C5 T2 #3	Real world meaning of $(0,0)$ and $(1, r)$		Interpret points on a graph in a real world situation
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.	7RP3 C5, C6, C8, C9, C10 T2 #7,8,9	Simple Interest Tax Markup Markdown Gratuity	Use proportional relationships to solve multi-step ratio and percent problems	

		<p>Commission</p> <p>Fees</p> <p>Percent Increase</p> <p>Percent Decrease</p> <p>Percent Error</p>		
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The Number System 7.NS

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers

Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram	<p>7NS1</p> <p>C1</p> <p>T1</p> <p>#1,2,3,4,5</p>		<p>Add and subtract signed rational numbers</p> <p>Represent addition and subtraction of signed rational numbers on a number line</p>	
Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged	<p>7NS1A</p> <p>C1</p> <p>T1 #1</p>	Additive Inverse Property		Apply additive inverse to real world situations
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.	<p>7NS1B</p> <p>C1</p> <p>T1 #1,2,5</p>	Absolute Value		The sign of numbers being added affects the direction you travel on the number line
Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. 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	<p>7NS1C</p> <p>C1</p> <p>T1 #3,4</p>	<p>Definition of Subtraction:</p> $a - b = a + (-b)$	<p>Show subtraction of rational numbers in a real world context on a number line</p>	
Apply properties of operations as strategies to add and subtract rational numbers.	<p>7NS1D</p> <p>C1</p> <p>T1</p> <p>#1,2,3,4,5</p>	<p>Inverse Property of Addition</p> <p>Commutative Property of Addition</p>	<p>Use properties to add and subtract rational numbers</p>	

		Associative Property of Addition Identity Property of Zero		
Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers	7NS2 C2, C6 T1 #6		Multiply and divide signed numbers	
Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts	7NS2A C2 T1 #8,9	The properties of multiplication apply to signed and unsigned rational numbers	Multiply signed rational numbers Apply multiplication of rational numbers to real world situations	
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. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.	7NS2B C2, C6 T1 #6	Division by zero is undefined A negative fraction can be represented as: $-(a/b)$, $-a/b$, or $a/-b$	Represent negative fractions	
Apply properties of operations as strategies to multiply and divide rational numbers	7NS2C C2 T1 #6,8,9,10,11	Distributive Property Multiplication Property of Zero Inverse Property of Multiplication Identity Property of One Commutative Property of Multiplication Associative Property of Multiplication	Use properties to multiply and divide rational numbers	
Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats	7NS2D C2, C6 T1 #7	Terminating Decimals Repeating Decimals	Use long division to convert a rational number to a decimal	

Solve real-world and mathematical problems involving the four operations with rational numbers	7NS3 C1, C2, C3, C4 T1 #12,13		Apply rational number operations to real world situations	
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Expressions and Equations 7EE

Use properties of operations to generate equivalent expressions				
Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	7EE1 C3 T1 #14,15,16, 17	Like Terms	Combine like terms with rational coefficients Factor out the greatest common factor from linear expressions	
Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, $a + 0.05a = 1.05a$ means that “increase by, 5%” is the same as “multiply by 1.05.”	7EE2 C3, C6, C9 T1 #18 T2 #2,21	Multiple representations of an expression exist and can be used in different forms to facilitate problem solving	Rewrite an expression in multiple forms	
Solve real-life and mathematical problems using numerical and algebraic expressions and equations.				
Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional $1/10$ of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar $9\frac{3}{4}$ inches long in the center of a door that is $27\frac{1}{2}$ inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.	7EE3 C1, C2, C3, C4, C5, C6, C7, C9, C10 T1 #20 T2 #5,6		Solve real-life, multi-step problems with signed rational numbers using multiple and the most appropriate strategies such as converting between forms, assessing reasonableness, using mental math and estimating	
Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities	7EE4 C4, C6, C7, C9, C10 T1 #19	Write equations and inequalities from verbal models		

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?	T2 #22,23 7EE4A C4, C6, C7, C9, C10 T1 #21 T2 #22	Understand the solution of an equation	Write a multi-step equation from a word problem Solve equations using inverse operations or a replacement set	
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 problem. 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.	7EE4B C4 T1 #19 T2 #23	Understand the solution of an inequality Understand how inverse operations using multiplication and division of signed numbers affects the solution of inequalities	Write an inequality from a word problem Solve inequalities using inverse operations or a replacement set Graph an inequality in a coordinate plane	Equations and inequalities represent different relationships between quantities

Geometry 7G

Draw, construct, and describe geometrical figures and describe the relationships between them.

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	7G1 C5, C9, C10 T2 #4	Understand the concepts of scale factor and similarity Understand how a change in scale factor affects area	Solve for missing scale or actual lengths Solve for corresponding sides of similar figures Reproduce a scale drawing at a different scale	
Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	7G2 C9 T3 #7	Identify types of triangles and other basic polygons	Draw basic geometric shapes using multiple modalities (freehand, ruler, protractor)	
Describe the two-dimensional figures that result from slicing three dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids	7G3 C10 T3 #11	Understand what a cross section is Identify rectangular prisms	Name the geometric figure formed by a cross section	

		and right rectangular pyramids		
		Identify basic polygons		
Solve real-life and mathematical problems involving angle measure, area, surface area, and volume				
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	7G4 C4 T3 #5,6,9	Identify area and circumference of circles and their corresponding formulas	Calculate the area and circumference of circles Convert between the area and circumference of circles	
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.	7G5 C4 T3 #8	Supplementary Angles Complementary Angles Vertical Angles Adjacent Angles	Write and solve simple equations from a multi-step problem to find an unknown angle in a figure	
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.	7G6 C9, C10 T3 #10,12,13	Polygons Cubes Right prisms Area of Polygons Volume and surface area of three dimensional figures	Find the area of simple polygons Find the volume and surface area of three dimensional figures	
Statistics and Probability 7SP				
Use random sampling to draw inferences about a population				
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	7SP1 C8 T3 #1	Sampling Methods Biased Samples Sample versus Population		Make generalizations about a population from a valid sample using statistics

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.	7SP2 C8 T3 #2	Emphasis on validity of random sampling	Identify a valid sample Use sample data to draw inferences Gage accuracy of inferences	
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Draw informal comparative inferences about two populations

Informally assess the degree of visual overlap of two numerical data distributions with similar variability's, 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.	7SP3 C8 T3 #3		Comparing data sets using statistical data and/or plots	
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.	7SP4 C8 T3 #4		Use measures of central tendency and range to compare data sets	

Investigate chance processes and develop, use, and evaluate probability models

Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	7SP5 C7 T2 #10	Probability can be expressed as a value ranging from zero to one – Benchmark Probabilities Probability is a ratio of favorable outcomes to total outcomes	Assess the likelihood of an event occurring based on its relativity to zero, 1/2, and one.	
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. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times	7SP6 C7 T2 #11	Experimental versus Theoretical Probability	Use experimental probability to predict future outcomes	
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.	7SP7 C7 T2 #12,13		Create an experiment for probability	

			Calculate the experimental probability of the experiment	
Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.	7SP7A C7 T2 #12,13		Explain the deviations (experimental versus theoretical) Calculate probability when all outcomes are equally likely	
Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?	7SP7B C7 T2 #12		Determine from an experiment whether outcomes are equally likely to occur	
Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.	7SP8 C7 T2 #15	Compound Events Tree Diagrams Simulations	Use organized lists, tables, tree diagrams, and simulations to calculate the probability of compound events	
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.	7SP8A C7 T2 #15	Counting Principle	Use the counting principle to determine the probability of compound events	Understand how to use a sample space to calculate the probability of a compound event
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	7SP8B C7 T2 #14		Create an organized list, table, and tree diagram for an experiment involving compound events	
Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?	7SP8C C7 T2 #16		Create a simulation to generate frequencies for compound events	

Pacing Guide & Materials

Unit 1: September – November – Benchmark Test by 11/30

NJLSL Standards

7NS1	7NS1A	7NS1B	7NS1C	7NS1D
7NS2	7NS2A	7NS2B	7NS2C	7NS2D
7NS3	7EE1	7EE2	7EE3	7EE4
7EE4A	7EE4B			

Unit 2: December – February – Benchmark Test by 2/28

NJLSL Standards

7RP1	7RP2	7RP2A	7RP2B	7RP2C
7RP2D	7RP3	7SP5	7SP6	7SP7
7SP7A	7SP7B	7SP8	7SP8A	7SP8B
7SP8C	7EE2	7EE3	7EE4	7EE4A
7EE4B	7G1			

Unit 3: March – May – Benchmark Test by 4/31

NJLSL Standards

7G2	7G3	7G4	7G5	7G6
7SP1	7SP2	7SP3	7SP4	7SP5
7SP6	7SP7	7SP7A	7SP7B	7SP8
7SP8A	7SP8B	7SP8C		

Grade Level	Title	Primary / Supplemental
Seventh	Big Ideas Math: Modeling Real Life Common Core Grade 7 2019	Primary
Fifth through Eighth	Measuring Up: People's Publishing	Supplemental
Fifth through Eighth	Com Core Performance Coach	Supplemental
Fifth through Eighth	IXLMath.Com	Supplemental Software

Differentiation Strategies

- The unit includes presentation of material through multiple modalities such as visual, auditory, and kinesthetic to address the unique learning styles of all students.
- Assign, assess and modify if necessary to address needs of at risk learners.
- Provide student with open ended questions that stimulate higher order thinking
- Allow student to consider and express personal opinions
- Tiered Assignments
- Afford student with opportunities for independent projects based on the area of study and the student's interests
- Have student share and express their thought process, conclusions and the reasoning that led to their conclusion
- Allow for extended time on homework and assessments as described in the student's plan
- Allow use of calculator
- Check for comprehension and understanding
- Highlight or underline key words
- Permit ample time for student to respond to questions
- Clearly define limits and expectations
- Encourage student to ask for needed assistance
- Preferential seating
- Repeating, clarifying or rewording directions
- Allow for alternate responses
- Provide student with advanced notes
- Allow for extended time on homework and assessments
- Teacher modeling of what is expected and necessary steps to complete task
- Provide simplified written and verbal instructions
- Permit ample time for student to respond to questions
- Repeating, clarifying or rewording directions
- Allow use of eDictionary/technology to look up unknown words

Math 7

Interdisciplinary Connections

1. Graphing Calculator Proficiency for use with Genetics and Ecology in Science Class #MS-LS4-6
2. Simplifying / evaluating / solving equations for Ecology (population density and sampling) #MS-LS4-6
3. Fractions and ratios to calculate concentration of solutions in studying cellular processes #MS-LS4-2
4. Probability for the study of genetics and inheritance patterns of diseases etc.
5. Estimation and sampling for population studies in ecology and evolution units
6. Metric conversions for measuring and calculation across units
7. Data collection and tables across all units
8. Interpreting graphs-Genetics, Ecology, Cells and cellular processes
9. Calculating percentage error during science experiments
10. Finding volume of cubes, cylinders and spheres
11. Mean, median, mode and range of data for Evolution and Ecology studies
12. Developing and using models to problem solve
13. Organizing and interpreting data
14. Constructing explanations and designing solutions
15. Identifying, extending, and formulating rules for patterns
16. Unit analysis (converting units within a given measurement system)

9.2 Career Readiness

- 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
- 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.
- 9.2.8.CAP.13: Compare employee benefits when evaluating employment interests and explain the possible impact on personal finances.
- 9.2.8.CAP.15: Present how the demand for certain skills, the job market, and credentials can determine an individual's earning power.
- 9.2.8.CAP.18: Explain how personal behavior, appearance, attitudes, and other choices may impact the job application process.
- 9.2.8.CAP.19: Relate academic achievement, as represented by high school diplomas, college degrees, and industry credentials, to employability and to potential level

9.4 Life Literacies & Technology

- 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas
- 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
- 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
- 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.
- 9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.
- 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping
- 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
- 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data.
- 9.4.8.IML.9: Distinguish between ethical and unethical uses of information and media
- 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
- 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem

9.1 Financial Literacy

- 9.1.8.CR.1: Compare and contrast the role of philanthropy, volunteer service, and charities in community development and the quality of life in a variety of cultures.
- 9.1.8.CR.2: Compare various ways to give back through strengths, passions, goals, and other personal factors.
- 9.1.8.CR.3: Relate the importance of consumer, business, and government responsibility to the economy and personal finance.
- 9.1.8.CR.4: Examine the implications of legal and ethical behaviors when making financial decisions.
- 9.1.8.CDM.1: Compare and contrast the use of credit cards and debit cards for specific purchases and the advantages and disadvantages of

- using each.
- 9.1.8.CDM.3: Compare and contrast loan management strategies, including interest charges and total principal repayment costs.
 - 9.1.8.CDM.4: Evaluate the application process for different types of loans (e.g., credit card, mortgage, student loans).
 - 9.1.8.CP.1: Compare prices for the same goods or services.
 - 9.1.8.CP.2: Analyze how spending habits affect one's ability to save.
 - 9.1.8.CP.3: Explain the purpose of a credit score and credit record, the factors and impact of credit scores.
 - 9.1.8.CP.4: Summarize borrower's credit report rights.
 - 9.1.8.CP.5: Compare the financial products and services available to borrowers relative to their credit worthiness.
 - 9.1.8.EG.1: Explain how taxes affect disposable income and the difference between net and gross income
 - 9.1.8.EG.3: Explain the concept and forms of taxation and evaluate how local, state and federal governments use taxes to fund public activities and initiatives.
 - 9.1.8.EG.5: Interpret how changing economic and societal needs influence employment trends and future education.
 - 9.1.8.EG.7: Explain the effect of the economy (e.g., inflation, unemployment) on personal income, individual and family security, and consumer decisions.
 - 9.1.8.EG.8: Analyze the impact of currency rates over a period of time and the impact on trade, employment, and income.
 - 9.1.8.FI.1: Identify the factors to consider when selecting various financial service providers.
 - 9.1.8.FI.2: Determine the most appropriate use of various financial products and services to borrow and access money for making purchases (e.g., ATM, debit cards, credit cards, check books, online/mobile banking).
 - 9.1.8.FI.3: Evaluate the most appropriate financial institutions to assist with meeting various personal financial needs and goals.
 - 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.
 - 9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.
 - 9.1.8.FP.2: Evaluate the role of emotions, attitudes, and behavior (rational and irrational) in making financial decisions.
 - 9.1.8.FP.3: Explain how self-regulation is important to managing money
 - 9.1.8.FP.4: Analyze how familial and cultural values influence savings rates, spending, and other financial decisions.
 - 9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.
 - 9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.
 - 9.1.8.PB.2: Explain how different circumstances can affect one's personal budget.
 - 9.1.8.PB.4: Construct a simple personal savings and spending plan based on various sources of income and different stages of life
 - 9.1.8.PB.5: Identify factors that affect one's goals, including peers, culture, location, and past experiences.
 - 9.1.8.PB.7: Brainstorm techniques that will help decrease expenses including comparison shopping, negotiating, and day-to-day expense management.
 - 9.1.8.RM.1: Determine criteria for deciding the amount of insurance protection needed.
 - 9.1.8.RM.2: Analyze the need for and value of different types of insurance and the impact of deductibles in protecting assets against loss.
 - 9.1.8.RM.3: Evaluate the need for different types of warranties.
 - 9.1.8.RM.4: Explain the purpose of insurance products and the reasons for property product and liability insurance protection.

Mendham Township Middle School Grade 7 Buying and Owning a Car Financial Literacy Project

NJSLA – Standards: 7RPA3 / 7NSA1d / 7NSA2 / 7NSA3 / 7EEB3 / 7EEB4

Overview:

This will be a web based project where students will shop online for a new or used car that they are interested in buying. The project will apply students' knowledge of ratio, proportion, and percent when buying a car. Prior to identifying the car to be purchased, the project begins with a discussion about the following considerations: the impact of establishing credit and a student's credit score on interest rates, the effect of bankruptcy on credit, the availability of credit counseling, how educational and career choices affect income, the establishment of a budget based on a student's employment status, fiscal responsibility, how savings contribute to financial well-being, and identifying the best financial institution for credit. Thereafter, the discussion will focus on the heart of the project, buying and owning a car. The following considerations will be incorporated into this phase of the project: finding the appropriate car (product facts vs advertising claims, selecting the proper car for "use needed vs wants," selecting the proper car to leverage debt beneficially, United States produced vs foreign produced cars), whether to buy new, buy used or lease (tax, financing vs leasing costs, the use of a loan calculator), down payment vs no down payment, length of loan, interest on loan, insurance (type of insurance, deductible, tort threshold), estimated costs of maintenance, warranty/extended warranty, registration/inspection fees, and fuel costs.

Students will base their car buying decision based upon a salary of \$65,000. The template below will be provided to each student as an aid to organize considerations and memorialize most aspects of buying and owning a car.

Name: _____

Car Buying Project

Identify the amount of money you can spend on a car. Be realistic. Answer these questions:

How much do you make per week? _____

How much are your current weekly bills? _____

How much are your current monthly bills? _____

What are your total monthly costs? _____

What do you have left to spend each month? _____

What type of car will meet your needs? Take into account all the things you may need to use your car for?

Will you need to haul anything with your car? _____

Will you need to have more than 2 people in your car? _____

Will you need four wheel drive? _____

Will you need to drive lots of distance? _____

How much gas can you afford to buy each week? _____

How much could you spend on repairs each month? _____

Finding the right car for you!

It is time to find the car that best fits your style. Below are two websites that can help you get started on finding your car.

www.cars.com , www.autotrader.com and www.kbb.com

When you find the car that you would like to purchase, answer the following questions.

What is the

Make: _____

Model: _____

Year: _____

New or Used and why?

Price: _____

How many miles has your car already been driven? _____

What is the gas mileage for your car in the city? _____,

Highway? _____, and its average gas mileage _____.

Standard or automatic: _____

Number of cylinders: _____

Other specific features your car has and any reasons for choosing these:

What was the main reason you chose this car?

Finding the Right Loan

Contact two financial institutions (bank, credit union, etc.). Find out the rates for 3-year, 4-year, 5-year auto loans with monthly payments. Also find out what percentage down payment is required.

(a) Financial institution: _____

Loan Length	APR	Percentage Down
3 years		
4 years		
5 years		

(b) Financial institution: _____

Loan Length	APR	Percentage Down
3 years		
4 years		
5 years		

State which financial institution you have chosen to use and why.

Insurance quote

Now that you have decided on the car and payment plan, you need to purchase car insurance or the dealership will not let you leave with your car. To get an idea of what you will have to pay per month, we will need to get a free auto insurance quote from GEICO and Progressive at the following addresses. If you find another site that offers free quotes and you want to compare them that would be ok.

www.geico.com and www.progressive.com

What is the total amount that you will pay with _____ for insurance for:

- a) one month: _____
- b) six months: _____
- c) one year: _____

What is the total amount that you will pay with _____ for insurance for:

- a) one month: _____
- b) six months: _____
- c) one year: _____

Based on the rates, which insurance company will you choose? _____

The amount that you are charged for your insurance can change based on the amount of your deductible.

Definition

Deductible: _____

Coverage- What is your coverage like?

Comprehensive _____
Collision _____
Liability _____
Other _____

How do you think your insurance rate will be affected if you have a low deductible and why?

Now that you have your quote, we are going to examine some other costs that occur while owning a car.

Registration Fees: Every year you need to register your vehicle with the Department of Motor Vehicles so they know if you are still driving it or not. Below is the address for the DMV, find out how much it costs a year to register your car.

<https://www.nj.gov/mvc/pdf/vehicles/GU30.pdf>

Cost of registering your car: _____

Totaling your expenses

Now this covers all of the basics of the responsibility of owning and operating a car. What you will do now is determine how much your car will cost you per year and then per month and determine whether this is a reasonable amount for you.

Amount paid yearly in car payments (monthly payments)(12)	Taxes (7%) – one time cost
Amount paid yearly in car insurance	
Amount paid yearly in registration	
Amount paid yearly for NJ Inspection	
Amount paid yearly for gas (weekly payments)(52)	
Amount paid yearly for oil changes (every 3 months)	
Total amount paid	

Now that you have the amount you will pay over one year for your car, determine how much you will pay on average for one month:

Monthly amount: _____

Does this seem realistic? Why?

What are some things that you think you would do differently to help reduce the cost of your car?

Depreciation:

Now that we know how much we are paying each month for our vehicle of choice, we now want to consider will this be a wise investment for the future. Most vehicles lose value over time.

Depreciation: Every year a vehicle loses value, so more than others. Below are some address to help find the depreciation of your vehicle in the next five years, find out how much it costs a year to register your car.

<http://www.edmunds.com/tco.html> and <http://www.kbb.com/new-cars/total-cost-of-ownership/>

Depreciation of your car in the next 5-years: _____

How much is your car worth after 5 years? _____

What percent of the original amount would your care still be worth in 5-years?

Does this seem realistic? Why?

Knowing how much your car depreciations in 5-years, would you still buy this car? Why or why not?

Summary and PowerPoint

After completing the paperwork above, you will create a power point presentation outlining the specifics of your purchase. Please put together a presentation about the car you have decided to purchase.

- What options did you choose?
- How do you plan on paying for it?
- What loan rate did you choose?
- What is the approximate monthly payment?
- How much did you depreciate?

This project will count as two test grades.

The paper work will count for one test grade. (50 Points)

The presentation will count as another test grade. (50 Points)

Presentation grades will be determined by:

Content: 0-25 (How accurate is the information in your presentation)

Presentation: 0-25 (How well did you present your information)

9.1 Financial Literacy Standards

9.1.8.CR.1: Compare and contrast the role of philanthropy, volunteer service, and charities in community development and the quality of life in a variety of cultures.

9.1.8.CR.2: Compare various ways to give back through strengths, passions, goals, and other personal factors.

9.1.8.CR.3: Relate the importance of consumer, business, and government responsibility to the economy and personal finance.

9.1.8.CR.4: Examine the implications of legal and ethical behaviors when making financial decisions.

9.1.8.CDM.1: Compare and contrast the use of credit cards and debit cards for specific purchases and the advantages and disadvantages of using each.

9.1.8.CDM.3: Compare and contrast loan management strategies, including interest charges and total principal repayment costs.

9.1.8.CDM.4: Evaluate the application process for different types of loans (e.g., credit card, mortgage, student loans).

9.1.8.CP.1: Compare prices for the same goods or services.

9.1.8.CP.2: Analyze how spending habits affect one's ability to save.

9.1.8.CP.3: Explain the purpose of a credit score and credit record, the factors and impact of credit scores.

9.1.8.CP.4: Summarize borrower's credit report rights.

9.1.8.CP.5: Compare the financial products and services available to borrowers relative to their credit worthiness.

9.1.8.EG.1: Explain how taxes affect disposable income and the difference between net and gross income

9.1.8.EG.3: Explain the concept and forms of taxation and evaluate how local, state and federal governments use taxes to fund public activities and initiatives.

9.1.8.EG.5: Interpret how changing economic and societal needs influence employment trends and future education.

9.1.8.EG.7: Explain the effect of the economy (e.g., inflation, unemployment) on personal income, individual and family security, and consumer decisions.

9.1.8.EG.8: Analyze the impact of currency rates over a period of time and the impact on trade, employment, and income.

9.1.8.FI.1: Identify the factors to consider when selecting various financial service providers.

9.1.8.FI.2: Determine the most appropriate use of various financial products and services to borrow and access money for making purchases (e.g., ATM, debit cards, credit cards, check books, online/mobile banking).

9.1.8.FI.3: Evaluate the most appropriate financial institutions to assist with meeting various personal financial needs and goals.

9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.

9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.

9.1.8.FP.2: Evaluate the role of emotions, attitudes, and behavior (rational and irrational) in making financial decisions.

9.1.8.FP.3: Explain how self-regulation is important to managing money

9.1.8.FP.4: Analyze how familial and cultural values influence savings rates, spending, and other financial decisions.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.

9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.

9.1.8.PB.2: Explain how different circumstances can affect one's personal budget.

9.1.8.PB.4: Construct a simple personal savings and spending plan based on various sources of income and different stages of life

9.1.8.PB.5: Identify factors that affect one's goals, including peers, culture, location, and past experiences.

9.1.8.PB.7: Brainstorm techniques that will help decrease expenses including comparison shopping, negotiating, and day-to-day expense management.

9.1.8.RM.1: Determine criteria for deciding the amount of insurance protection needed.

9.1.8.RM.2: Analyze the need for and value of different types of insurance and the impact of deductibles in protecting assets against loss.

9.1.8.RM.3: Evaluate the need for different types of warranties.

9.1.8.RM.4: Explain the purpose of insurance products and the reasons for property product and liability insurance protection.

Mendham Township School District

Mathematics Curriculum - 2021

Grade 8 General & Advanced

Aligned 2019 Big Ideas Math Modeling Real Life

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

1. Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($y/x = m$ or $y = mx$) as special linear equations ($y = mx + b$), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x -coordinate changes by an amount A , the output or y -coordinate changes by the amount $m \cdot A$. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y -intercept) in terms of the situation.

Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

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

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

Grade 8 Overview (Mad Minute–fractions – decimal- % / Perfect Square w Signed Integers) **The Number System**

- Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations

- Work with radicals and integer exponents.
- Understand the connections between proportional relationships, lines, and linear equations.
- Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions

- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

Geometry

- Understand congruence and similarity using physical models, transparencies, or geometry software.
- Understand and apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

Statistics and Probability

- Investigate patterns of association in bivariate data.

Mathematical Practices

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.

The following chart details the 8th grade curricular focus and is broken out into areas of content, skills, and concepts:

NJ	NJ#	Comp & Content	Skills	Concepts
The Number System 8.NS				
Know that there are numbers that are not rational, and approximate them by rational numbers.				
Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.	8NS1 C9 B3 #30,31	Definitions: 1. Rational numbers 2. Irrational numbers	Convert repeating decimals to fractions and fractions to repeating decimals	* understand that every number has a decimal expansion
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., $\pi/2$). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.	8NS2 C9 B3 #33		Compare irrational numbers by approximating them on a number line and estimate their values	
Expressions and Equations 8.EE				
Work with radicals and integer exponents				
Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.	8EE1, C8 B3 #24,26, 29,32	Exponent properties including: 1. Negative exponents 2. Multiplying powers with the same base	Simplify expressions using properties of integer exponents	
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	8EE2 C9 B3 #30	Definitions: 1. Square root 2. Cube root 3. Perfect squares 4. Perfect cubes 5. Square root of 2 is irrational	*Solve equations involving squares and cubes in which square root and cube root is used to solve the equation *Calculate square root and cube root	
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. For example, estimate the population of the United States as 3 X 108 and the population of the world as 7 X 109, and determine that the world population is more than 20 times larger.	8EE3 C8 B3 #36	Definition: 1. Scientific notation	Use scientific notation to make comparisons through estimation	
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 (e.g., use millimeters per year for seafloor spreading). Interpret scientific	8EE4 C8 B3 #25	*Choosing units of appropriate size for measurements *Interpret scientific notation shown on a calculator	*Perform operations with numbers expressed in scientific notation *Perform operations with numbers in scientific notation and in standard	

notation that has been generated by technology.

form

Understand the connections between proportional relationships, lines, and linear equations.

Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.	8EE5 C4 B3 #10	Define slope as rate of change	*Graph proportional relationships *Compare rates/slopes given a graph vs. an equation	
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; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b .	8EE6 C4, C5 B2 #17, 18	*Slope-intercept form of a linear equation *Slope = steepness of a line; rise/run	*Write an equation of a line in slope-intercept form given a graph *Calculate slope	*Construct meaning for constant slope of a line by using similar triangles (any two points on a line will equal same slope)

Analyze and solve linear equations and pairs of simultaneous linear equations.

Solve linear equations in one variable.	8EE7 C1 B1 #1 B2 #1 B3 #1		Solve linear equations by using inverse operations	
Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = x$, or $a = b$ results (where a and b are different numbers).	8EE7A C1, C5 B1 #3 B2 #3	Solutions to a linear equation in one variable: 1. No solution ($a = b$ where a and b are different numbers) 2. Infinitely many solutions ($a = a$) 3. One solution ($x = a$)	*Write equations representative of each type of solution *Solve equations in which solutions are none, one, or infinite	
Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	8EE7B C1, C4, C5 B1 #2 B2 #2		Solve linear equations with rational coefficients requiring simplifying both sides of the equation before using inverse operations (i.e. distributive property and combining like terms)	
Analyze and solve pairs of simultaneous linear equations.	8EE8 C5 B2 #19 B3 #12	Definitions: 1. Systems of Linear Equations 2. Solutions to systems of linear equations	Solve a system of linear equations	
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.	8EE8A C5 B3 #11	Solution to a system of linear equations is the point in which two lines intersect	Solve a system of linear equations using graphing	
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.	8EE8B C5 B2 B21, 22		*Solve a system of equations by substitution *Solve a system of equations by elimination *Estimate solutions to a	

	B3 #13		system of equations by graphing *Solve a system of equations by inspection to see if no solution, one solution, or infinite number of solutions exists	
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.	8EE8C C5 B2 #20		Write a system of linear equations to model a problem and solve it	

Functions 8.F

Define, evaluate, and compare functions.

Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output	8F1 C7 B3 #19	A function can be expressed as a function rule, table, or graph		A function assigns each input value to exactly one output value
Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change	8F2 C7, C4 B3 #21		Compare rate of change when the function is represented as an equation, table, graph, and/or verbal description	
Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.	8F3 C4, C5, C7 B3 #22	Slope-intercept form is a way to represent a linear function, whose graph is a straight line	Provide examples of functions that are linear and non-linear. Identify them as linear or non-linear by looking at their equations and by looking at their graphs.	

Use functions to model relationships between quantities

Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	8F4 C4, C5, C7 B3 #20	Definitions: 1. Rate of change 2. Slope 3. Y-intercept	Construct a function using rate of change and its initial value given a description of a relationship, data in a table, or graph	Interpret meaning of rate of change and initial value in real world context
Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	8F5 C7 B3 #23		Analyze a graph as data increasing, decreasing, linear, or non-linear	

Geometry 8.G

Understand congruence and similarity using physical models, transparencies, or geometry software				
Verify experimentally the properties of rotations, reflections, and translations	8G1 C2 B1 #7, 9, 10 B2 #5, 7 B3 #4	Definitions: 1. Translation 2. Reflection 3. Rotation 4. Congruency		Through inspection, conclude that rotations, reflections, and translations result in figures congruent to the preimage
Lines are taken to lines, and line segments to line segments of the same length.	8G1A C2, C3 B3 #2, 3, 5, 6			A translation, rotation, or reflection of parts of a figure into points, lines, line segments, angles, parallel lines will result in those parts being congruent to their preimages
Angles are taken to angles of the same measure	8G1B C2, C3 B1 #5 B2 #4, 8			A translation, rotation, or reflection of parts of a figure into points, lines, line segments, angles, parallel lines will result in those parts being congruent to their preimages
Parallel lines are taken to parallel lines	8G1C C2, C3 B1 #4, 6, 8 B2 #6			A translation, rotation, or reflection of parts of a figure into points, lines, line segments, angles, parallel lines will result in those parts being congruent to their preimages
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	8G2 C2 B2 #9 B3 #6		*Given a sequence of transformations (translation, reflection, rotation), map a preimage to its image. *Create a sequence of transformations (translation, reflection, rotation) that can be used to map a preimage to its image	
Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	8G3 C2 B2 #10 B3 #7	Definition: 1. Dilation	Calculate new coordinates of points after a transformation (translation, reflection, rotation, and dilation)	Discover the effects on coordinates after a transformation (translation, reflection, rotation, dilation)
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 two dimensional figures, describe a sequence that exhibits the similarity between them	8G4 C2, C3 B1 #12 B2 #11, 12	Definition: 1. Similarity	*Create similar figures using a series of transformations including dilation and translation, rotation, and reflection	

			*Create a sequence of transformations to map similar figures to each other	
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. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.	8G5 C3 B2#13, 14, 15, 16 B3#8, 9	*Angles created by parallel lines cut by a transversal *Angle sum and exterior angles of triangles *Angle-angle criterion for similar triangles		Discover that the sum of three angles of a triangle equal 180 degrees given an argument in terms of transversals

Understand and apply the Pythagorean Theorem

Explain a proof of the Pythagorean Theorem and its converse	8G6 C9 B3 #27	The Pythagorean Theorem and its converse		Prove the Pythagorean Theorem and its Converse
Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	8G7 C9 B3#34		Use the Pythagorean Theorem to solve for the unknown lengths in right triangles in 2D and 3D figures and apply to real-world problems	
Apply the Pythagorean Theorem to find the distance between two points in a coordinate system	8G8 C9 B3#35	*Distance Formula	Use the Pythagorean Theorem to find distance between two points in the coordinate plane (Distance Formula or right triangle)	

Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres

Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems	8G9 C10 B3#28	Formulas of volume: 1. Cones 2. Cylinders 3. Spheres	Solve real-world problems involving volumes of cones, cylinders, and spheres	
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Statistics and Probability 8SP

Investigate patterns of association in bivariate data				
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.	8SP1 C6 B3 #14, 15	Definitions: 1. Scatterplot 2. Correlation 3. Linear/non-linear association	Construct and interpret scatterplots given two data sets	
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	8SP2 C6 B3 #16	Definitions: 1. Trend line 2. Line of Best Fit	Draw a line of best fit to show general trend of data and use it to identify how strong or weak the correlation	

Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.	8SP3 C4, C9 B3 #17		Write the equation for the line of best fit and interpret the slope and y-intercept in context of the problem	
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. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?	8SP4 C9 B3 #18		Create a table of data from a scatterplot or experiment, calculate the frequencies, and identify any trends/correlations	

Pacing Guide & Materials

Unit 1: September – November – Benchmark Test by 11/30

NJLST Standards

8EE7	8EE7A	8EE7B	8G1	8G1A
8G1B	8G1C	8G2	8G3	8G4
8G5	8G6			

Unit 2: December – February – Benchmark Test by 2/28

NJLST Standards

8EE5	8EE6	8EE8	8EE8A	8EE8B
8EE8C	8F1	8F2	8F3	8F4
8F5				

Unit 3: March – May – Benchmark Test by 3/31

NJLST Standards

8NS1	8NS2	8EE1	8EE2	8EE3
8EE4	8G7	8G8	8G9	8SP1
8SP2	8SP3	8SP4		

Grade Level	Title	Primary / Supplemental
Eighth	Big Ideas Math 2019 Modeling Real Life	Primary
Fifth through Eighth	Measuring Up: People's Publishing Com Core Performance Coach 2015	Supplemental
Fifth through Eighth	IXLMath.Com	Supplemental Software

Differentiation Strategies

- The unit includes presentation of material through multiple modalities such as visual, auditory, and kinesthetic to address the unique learning styles of all students.
- Assign, assess and modify if necessary, to address needs of at risk learners.
- Provide student with open ended questions that stimulate higher order thinking
- Allow student to consider and express personal opinions
- Tiered Assignments
- Afford student with opportunities for independent projects based on the area of study and the student's interests
- Have student share and express their thought process, conclusions and the reasoning that led to their conclusion
- Allow for extended time on homework and assessments as described in the student's plan
- Allow use of calculator
- Check for comprehension and understanding
- Highlight or underline key words
- Permit ample time for student to respond to questions
- Clearly define limits and expectations
- Encourage student to ask for needed assistance
- Preferential seating
- Repeating, clarifying or rewording directions
- Allow for alternate responses
- Provide student with advanced notes
- Allow for extended time on homework and assessments
- Teacher modeling of what is expected and necessary steps to complete task
- Provide simplified written and verbal instructions
- Permit ample time for student to respond to questions
- Repeating, clarifying or rewording directions
- Allow use of eDictionary/technology to look up unknown words

Math 8

Interdisciplinary Connections (Science)

1. Graphing calculator proficiency for use with radar in science class #MS-PS2-2
2. Simplifying / evaluating / solving equations for chemistry and physical science #MS-PS3-1
3. Understanding velocity and acceleration formulas for balloon car challenge. #MS-PS3-2
4. Calculating slope of a line to determine speed and acceleration
5. Distributive property, coefficient, subscript, and least common multiple to balance equations
6. Interpreting independent and dependent variables to create a table and a graph
7. Interpreting line graphs in speed and acceleration
8. Using formulas to solve problems
9. Creating a scatter plot and drawing in a line of best fit to analyze data in force and motion
10. Dimensional analysis to convert units (eg meters/sec to centimeters/minute) to compare speeds
11. Interpreting rate in physical science
12. Proportional relationships (direct or inverse) in density and frequency and wavelength
13. Scientific notation in Ph and radioactive decay
14. Ratios in chemical formulas
15. Measurements (volume, mass, length, area)

9.2 Career Readiness

9.2.8.CAP.20: Identify the items to consider when estimating the cost of funding a business

9.4 Life Literacies & Technology

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option

9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem

9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.

9.1 Financial Literacy

9.1.8.CR.3: Relate the importance of consumer, business, and government responsibility to the economy and personal finance.

9.1.8.CR.4: Examine the implications of legal and ethical behaviors when making financial decisions

9.1.8.CDM.1: Compare and contrast the use of credit cards and debit cards for specific purchases and the advantages and disadvantages of using each.

9.1.8.CDM.2: Demonstrate an understanding of the terminology associated with different types of credit and compare and calculate the interest rates associated with each

9.1.8.CDM.3: Compare and contrast loan management strategies, including interest charges and total principal repayment costs.

9.1.8.CDM.4: Evaluate the application process for different types of loans

9.1.8.CP.2: Analyze how spending habits affect one's ability to save.

9.1.8.CP.3: Explain the purpose of a credit score and credit record, the factors and impact of credit scores.

9.1.8.CP.4: Summarize borrower's credit report rights

9.1.8.CP.5: Compare the financial products and services available to borrowers relative to their credit worthiness.

9.1.8.EG.8: Analyze the impact of currency rates over a period of time and the impact on trade, employment, and income.

9.1.8.FI.1: Identify the factors to consider when selecting various financial service providers.

9.1.8.FI.2: Determine the most appropriate use of various financial products and services to borrow and access money for making purchases

9.1.8.FI.3: Evaluate the most appropriate financial institutions to assist with meeting various personal financial needs and goals. 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.

9.1.8.FP.2: Evaluate the role of emotions, attitudes, and behavior (rational and irrational) in making financial decisions.

9.1.8.FP.3: Explain how self-regulation is important to managing money

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being

9.1.8.FP.6: Compare and contrast advertising messages to understand what they are trying to accomplish.

9.1.8.FP.7: Identify the techniques and effects of deceptive advertising.

9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.

9.1.8.PB.2: Explain how different circumstances can affect one's personal budget.

9.1.8.PB.5: Identify factors that affect one's goals, including peers, culture, location, and past experiences

Mendham Township Middle School Grade 8 Credit Card 2021 Financial Literacy Project

NJSLA – Standards: 7RP2 / 7G1 / 7EE3

Overview:

The credit card project done in the eighth-grade math classes applies students' knowledge of ratio, proportion, and percent to credit cards. The project begins with a discussion centered around student knowledge about credit cards.

Students share the experiences they have had with cash, check, credit card, and debit card and discuss the most appropriate uses for each. Students compare and contrast credit cards and debit cards and the advantages and disadvantages of using each. The project introduction ends with discussion of how income might affect their spending decisions. There are several aspects to this project.

1. Students take on the role of a credit card company. Working in small groups, students use ratios and proportions to create their own credit cards. Students will illustrate and communicate original ideas and stories using multiple digital tools and resources. They will advertise their cards in one of two forms: print or TV commercial. To create the TV commercial, students can either perform live in front of the class or create a video outside of class. Students will present their card and advertisement to the class. After all credit cards have been presented, in small groups, students compare and contrast the products, services, interest rates, and fees provided by each credit card company and discuss any techniques that the credit card companies may have used to either mislead or deceive the consumer. Then, as a whole class, students share their small group discussions and choose the credit card that they think would be the wisest choice.

2. Students take on the role of college students who have received their first credit card. Students "shop" online and in catalogues using their cards. Students must prioritize wants and needs with each of their purchases. Students, then, create a collage clearly distinguishing their wants from their needs.

3. Students receive a bill of their purchases. They must compare and contrast debt and credit management strategies by coming up with three reasonable ways of paying off their debt. One scenario is to pay only the minimum payment for each month. Because paying the minimum payment will take a very long time to pay off their debt, students are only required to calculate by hand and record interest and card balance for 12 months. An online credit card calculator will then be used to calculate the length of time it would take to pay off the debt and the total amount paid (including balance and accrued interest). The second and third scenarios, students will increase their monthly payment to a constant amount proportional to their monthly budget. Students will follow a system for

keeping track of their monthly payments, interest paid, and balance on their accounts. Students will deduct a payment and calculate interest added on each month until the debt is paid off. This data will be recorded in a table.

4. Project conclusion: Students analyze their three payment scenarios and identify consequences of not paying off their bills at the end of the month, only paying the minimum payment, the effects of interest, strategies for safeguarding personal information when using credit/debit cards, etc. Students calculate the amount of time it took to pay off their debt and the actual amount paid after the debt had been paid off. After writing up an analysis and having class discussion, students will explain what it means to them to be a responsible consumer/credit card holder and the factors to consider when making consumer decisions. Students will use what they have learned from this project to write a pledge about responsible credit card use.

This project gives students the opportunity to have fun while using math skills to learn about responsible credit card use.

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Mendham Township School District

Mathematics Curriculum – 2021

Aligned 2022 Big Ideas CC Algebra

Honors Algebra

The fundamental purpose of this course is to formalize and extend the mathematics that students learned in the middle grades. Because it is built on the middle grades standards, this is a more ambitious version of Algebra I than has generally been offered. The critical areas, called units, deepen and extend understanding of linear and exponential relationships by contrasting them with each other and by applying linear models to data that exhibit a linear trend, and students engage in methods for analyzing, solving, and using quadratic functions. The Mathematical Practice Standards apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.

Critical Area 1: By the end of eighth grade, students have learned to solve linear equations in one variable and have applied graphical and algebraic methods to analyze and solve systems of linear equations in two variables. Now, students analyze and explain the process of solving an equation. Students develop fluency writing, interpreting, and translating between various forms of linear equations and inequalities, and using them to solve problems. They master the solution of linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations.

Critical Area 2: In earlier grades, students define, evaluate, and compare functions, and use them to model relationships between quantities. In this unit, students will learn function notation and develop the concepts of domain and range. They explore many examples of functions, including sequences; they interpret functions given graphically, numerically, symbolically, and verbally, translate between representations, and understand the limitations of various representations. Students build on and informally extend their understanding of integer exponents to consider exponential functions. They compare and contrast linear and exponential functions, distinguishing between additive and multiplicative change. Students explore systems of equations and inequalities, and they find and interpret their solutions. They interpret arithmetic sequences as linear functions and geometric sequences as exponential functions.

Critical Area 3: This unit builds upon prior students' prior experiences with data, providing students with more formal means of assessing how a model fits data. Students use regression techniques to describe approximately linear relationships between quantities. They use graphical representations and knowledge of the context to make judgments about the appropriateness of linear models. With linear models, they look at residuals to analyze the goodness of fit.

Critical Area 4: In this unit, students build on their knowledge from unit 2, where they extended the laws of exponents to rational exponents. Students apply this new understanding of number and strengthen their ability to see structure in and create quadratic and exponential expressions. They create and solve equations, inequalities, and systems of equations involving quadratic expressions.

Critical Area 5: In this unit, students consider quadratic functions, comparing the key characteristics of quadratic functions to those of linear and exponential functions. They select from among these functions to model phenomena. Students learn to anticipate the graph of a quadratic function by interpreting various forms of quadratic expressions. In particular, they identify the real solutions of a quadratic equation as the zeros of a related quadratic function. Students expand their experience with functions to include more specialized functions—absolute value, step, and those that are piecewise-defined.

The following chart details the Algebra curricular focus and is broken out into areas of content, skills, and concepts:

Units	Includes Standard Clusters*	Mathematical Practice Standards
Unit 1 Relationships Between Quantities and Reasoning with Equations	<ul style="list-style-type: none"> Reason quantitatively and use units to solve problems. Interpret the structure of expressions. Create equations that describe numbers or relationships. Understand solving equations as a process of reasoning and explain the reasoning. Solve equations and inequalities in one variable. 	Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Construct viable arguments and critique the reasoning of others. Model with mathematics. Use appropriate tools strategically. Attend to precision.
Unit 2 Linear and Exponential Relationships	<ul style="list-style-type: none"> Extend the properties of exponents to rational exponents. Solve systems of equations. Represent and solve equations and inequalities graphically. Understand the concept of a function and use function notation. Interpret functions that arise in applications in terms of a context. Analyze functions using different representations. Build a function that models a relationship between two quantities. Build new functions from existing functions. Construct and compare linear, quadratic, and exponential models and solve problems. Interpret expressions for functions in terms of the situation they model. 	Reason abstractly and quantitatively. Construct viable arguments and critique the reasoning of others. Model with mathematics. Use appropriate tools strategically. Attend to precision.
Unit 3 Descriptive Statistics	<ul style="list-style-type: none"> Summarize, represent, and interpret data on a single count or measurement variable. Summarize, represent, and interpret data on two categorical and quantitative variables. Interpret linear models. 	Use appropriate tools strategically. Attend to precision.
Unit 4 Expressions and Equations	<ul style="list-style-type: none"> Interpret the structure of expressions. Write expressions in equivalent forms to solve problems. Perform arithmetic operations on polynomials. Create equations that describe numbers or relationships. Solve equations and inequalities in one variable. Solve systems of equations. 	Look for and make use of structure. Look for and express regularity in repeated reasoning.
Unit 5 Quadratic Functions and Modeling	<ul style="list-style-type: none"> Use properties of rational and irrational numbers. Interpret functions that arise in applications in terms of a context. Analyze functions using different representations. Build a function that models a relationship between two quantities. Build new functions from existing functions. Construct and compare linear, quadratic, and exponential models and solve problems. 	

Unit 1: Relationships Between Quantities and Reasoning with Equations

By the end of eighth grade students have learned to solve linear equations in one variable and have applied graphical and algebraic methods to analyze and solve systems of linear equations in two variables. This unit builds on these earlier experiences by asking students to analyze and explain the process of solving an equation. Students develop fluency writing, interpreting, and translating between various forms of linear equations and inequalities, and using them to solve problems. They master the solution of linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations. All of this work is grounded on understanding quantities and on relationships between them.

UNIT ONE	#	Comp & Content	Skills	Concepts
Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	NQ1 F-18 C-1 T1: #15 T2: #7 T3: #37	Convert from one unit to another	*Choose and interpret units in formulas *Label appropriately *Choose and interpret the scale and origin in graphs and data displays	Reason quantitatively and use appropriate units to solve problems
Define appropriate quantities for the purpose of descriptive modeling.	NQ2 Local C-7 T1: #15 T2: #7 T3: #37		Define appropriate quantities for the purpose of descriptive modeling	
Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	NQ3 Local		Choose the level of accuracy appropriate to limitations and	

	C-1,9 T1: #28		measurement when reporting quantities (i.e. appropriate place to round and reasonableness of answers)	
Interpret expressions that represent a quantity in terms of its context.	ASSE1 F-26 C-1,7 T1: #10,28	Review English to math vocab	*Interpret linear and exponential expressions *Verbalize meaning of linear and exponential expressions	
Interpret parts of an expression, such as terms, factors, and coefficients.	ASSE1A F-30 C-1,7 T1: #10	Definitions of: 1. Term 2. Factor 3. Coefficient		
Interpret complicated expressions by viewing one or more of their parts as a single entity. <i>For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.</i>	ASSE1B F-34 C-1,7 T1: #10,12,13,14 T3: #36		Interpret complicated expression including multi-step and multi-variable expressions including formulas	
Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions.</i>	ACED1 F-26 F-33 C-1,2	*Linear function *Exponential function	Write equations and inequalities in one variable and use them to solve problems	

Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	T1: #3 T2: #14	*The coordinate system *Graphing points	*Write linear and exponential equations in two or more variables to solve problems *Graph linear and exponential equations in the coordinate plane	
Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. <i>For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.</i>	ACED3 F-26 F-33 C-5,7,9 T2: #3,31 T3: #20,23	Definition of constraints	*Graph systems of equations and inequalities in the coordinate plane *Represent constraints by equations or inequalities, and by systems of equations and/or inequalities	Interpreting solutions as viable or non-viable in the context of a problem
Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law $V = IR$ to highlight resistance R.</i>	ACED4 F-16 C-1,9,10 T1: #1 T2: #12 T3: #1		*Transform formulas using inverse operations	Use the transformed formula to solve multiple problems for the solved variable
Explain each step in solving a simple equation	ARE11	*Inverse operations	Verbalize the steps in	

as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	F-16 C-1,7,8,9 T1: #17	*Properties of equality	solving a linear equation	
Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	AREI3 F-33 F-34 C-1,2,5,8,9 T1: #1, 2, 4, 5, 6, 7, T2: #12,13, 15,16,17,18 T3: #1, 2,4,5,6,7		Solve linear equations and inequalities in one variable	Solve literal equations

Unit 2: Linear and Exponential Relationships

In earlier grades, students define, evaluate, and compare functions, and use them to model relationships between quantities. In this unit, students will learn function notation and develop the concepts of domain and range. They move beyond viewing functions as processes that take inputs and yield outputs and start viewing functions as objects in their own right. They explore many examples of functions, including sequences; they interpret functions given graphically, numerically, symbolically, and verbally, translate between representations, and understand the limitations of various representations. They work with functions given by graphs and tables, keeping in mind that, depending upon the context, these representations are likely to be approximate and incomplete. Their work includes functions that can be described or approximated by formulas as well as those that cannot. When functions describe relationships between quantities arising from a context, students reason with the units in which those quantities are measured. Students explore systems of equations and inequalities, and they find and interpret their solutions. Students build on and informally extend their understanding of integer exponents to consider exponential functions. They compare and contrast linear and exponential functions, distinguishing between additive and multiplicative change. They interpret arithmetic sequences as linear functions and geometric sequences as exponential functions.

UNIT TWO		#	Comp & Content	Skills	Concepts
Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. <i>For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5(1/3)^3$ to hold, so $(5^{1/3})^3$ must equal 5.</i>	NRN1 F-16 F-17 C-6 T2: #4 T3: #24	*Exponents *Rational exponents *Radicals	Extend properties of exponents to rational exponents		
Rewrite expressions involving radicals and rational exponents using the properties of exponents.	NRN2 Local C-6		Rewrite expressions involving radicals and rational exponents using the properties of exponents		
Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the	AREI5 T2: #4,9 T3: #24,39	System of linear equations	Solve a system of equations by using linear		

other produces a system with the same solutions.	F-19 F-25 C-5 T2; #32		combination/elimination	
Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	AREI6 F-19 F-25 C-5 T2: #1,31 T3: #20,21	*Parallel lines = no solution *Coinciding lines = infinite number of solutions	Solve a system of equations by graphing and the substitution method	
Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	AREI10 F-18 C-5 T2: #33	Linear and exponential graphs	Use a table of values to create the graph of two-variable linear and exponential equations	
Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	AREI11 F-19 F-25 C-5,9 T2: #34	Solution to a system of equations is the point of intersection of their graphs	Find the solution to a system of linear or exponential equations by using technology to graph and to make a table of values	
Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality),	AREI12 F-2	*Boundary line *Inequality signs and how they affect placement of	*Graph solutions to linear inequality in two variables	Construct meaning for the solution to an inequality by

and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	F-33 C-5 T2: #2 T3: #22	shading	*Graph solutions to systems of linear inequalities in two variables as intersection of half planes	graphing
Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.	FIF1 F-1 F-10 C-3 T1: #8, 9 T2: #19,20 T3: #8,9	*Domain *Range *Relation *Function	Use the vertical line test and mapping diagram to identify a function from a relation	Understand the concept of a function as a one-to-one correspondence
Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	FIF2 F-1 C-3 T1: #9, 10 T2: #20,21 T3: #9,10	Function notation	*Evaluate functions given a domain *Interpret function notation in context	
Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. <i>For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.</i>	FIF3 F-20 F-26 C-4,6 T2: #11,29	*Arithmetic sequence *Geometric sequence *Recursive patterns	Write a function rule to model a sequence	

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i>	T3: #18,41 FIF4 F-27 C-3,6,8,9,10 T1: #16 T2: #8	*Intercepts, intervals where a function is increasing, decreasing, positive, or negative *Parent linear and exponential function	*Sketch a graph of a linear or exponential function showing key features given a verbal description *Identify key features of a graph given its function rule	
Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. <i>For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.</i>	FIF5 F-4 F-15 C-3,6,8,9,10 T1: #8, 13, 14, 16 T2: #19, 24, 25	*Discrete data *Continuous data	Relate domain of a function to its graph (ie interpret domain values in context)	
Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	FIF6 F-21 C-8,10 T3: #42	*Understand rate of change/slope *Slope formula	*Calculate average rate of change from a graph or from data represented symbolically *Estimate rate of change from a graph	
Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more	FIF7 F-27		Graph functions expressed symbolically by hand and using	

complicated cases.	F-29 F-31 C-3,6,8 T1: #11,12,13,14		technology	
Graph linear and quadratic functions and show intercepts, maxima, and minima.	F.IF.7.A F-18 C-3,8 T1: #11, 12	Intercepts	Graph linear functions	
Graph exponential and *logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	F.IF.7.E Local *ENR C-6 T2: #35	Intercepts	Graph exponential functions	
Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.</i>	F.IF.9 F-4 C-3,6,8,10			Compare properties of two functions represented in different ways (algebraically, graphically, in tables, or verbally)

Write a function that describes a relationship between two quantities.	T3: #36 FBF1 F-1 F-20 F-25 F-26 F-30 C-3,4,6,8 T2: #5,11 T3: #25,41		Write a function rule to model a relationship between quantities	
Determine an explicit expression, a recursive process, or steps for calculation from a context.	FBF1A Local C-3,4,6 T2: #5,11 T3: #25,41	*Explicit expressions *Recursive process	*Determine an explicit expression, a recursive process, or steps for calculation from a context (ie determine whether a linear or exponential model)	
Combine standard function types using arithmetic operations. <i>For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.</i>	FBF1B Local C-6,8 T1: #19		Transform a linear/exponential function by adding, subtracting, or multiplying by a constant number	
Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	FBF2 Local		*Write arithmetic and geometric sequences with an explicit formula *Write a function rule	

	C-4,6 T2: #10,11,29 T3: #18,40,41		to model arithmetic and geometric sequences	
Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. <i>Include recognizing even and odd functions from their graphs and algebraic expressions for them.</i>	FBF3 F-8 F-29 C-3,4,6,8,10 T1: #12,13,14 T3: #12,13		*Build new functions from existing parent (linear and exponential) functions *Use technology to show how changes to the parent function affect the graph *Relate a vertical translation of a linear function to its y-intercept	
Distinguish between situations that can be modeled with linear functions and with exponential functions.	FLE1 F-20 F-24 C-3,6 T1: #18			Distinguish between situations that can be modeled with a linear function and exponential function
Prove that linear functions grow by equal differences over equal intervals; and that exponential functions grow by equal factors over equal intervals.	FLE1A F-30 C-3,6 T1: #18	*Equal differences (aka common difference) *Equal factors (aka common ratio)		Prove linear functions grow by equal differences and exponential functions grow by equal factors
Recognize situations in which one quantity	FLE1B		Recognize situations in	

changes at a constant rate per unit interval relative to another.	F-30 C-3 T1: #18		which one quantity changes at a constant rate per unit interval relative to another	
Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	FLE1C F-9 F-30 C-6 T2: #6 T3: #26	Percent rate: *Decay factor <1 *Growth factor >1	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval	
Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	FLE2 F-9 C-3,6		Construct linear and exponential functions given a graph, a description of a relationship, or two input-output pairs	
Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	FLE3 F-9 C-8 T3: #43	T2: #5, 11, 26, 29 T3: #15, 18, 41	Compare linear growth to exponential growth by observing graphs and tables	

Interpret the parameters in a linear or exponential function in terms of a context.	FLE5 F-27 C-3,4,6 T2: #15		Interpret the parameters in a linear or exponential function in context (ie do negatives make sense? Fractions?)	
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Unit 3: Descriptive Statistics

Experience with descriptive statistics began as early as Grade 6. Students were expected to display numerical data and summarize it using measures of center and variability. By the end of middle school they were creating scatterplots and recognizing linear trends in data. This unit builds upon that prior experience, providing students with more formal means of assessing how a model fits data. Students use regression techniques to describe approximately linear relationships between quantities. They use graphical representations and knowledge of the context to make judgments about the appropriateness of linear models. With linear models, they look at residuals to analyze the goodness of fit.

UNIT THREE	#	Comp & Content	Skills	Concepts
Represent data with plots on the real number line (dot plots, histograms, and box plots).	SID1 F-28 C-11 T3: #44	*Dot plots *Histogram *Box plots	Represent data with plots on the real number line appropriately	
Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	SID2 F-28 C-11 T3: #44	*Shape *Median *Mean *IQR *Standard deviation	*Compare two or more data sets *Compute median, mean, IQR, standard deviation	

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	SID3 F-28 C-11 T3: #44	Outliers	Determine algebraically any outliers	Summarize data differences and effects on outliers
Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	SID5 F-11 C-11 T3: #45	*Categorical data *Quantitative variables	*Summarize categorical data in frequency tables *Interpret relative frequencies in context *Recognize trends in data	
Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.	SID6 Local C-4 T2: #36		Represent data in a scatter plot and describe how the variables are related	
Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear and exponential models</i>	SID6A F-28 F-30 C-4,6,9 T2: #36	Trend line	*Fit a function to the data *Draw a trend line and solve problems in context of the data	
Informally assess the fit of a function by plotting and analyzing residuals.	SID6B Local		Describe data relative to the trend line	

	C-4			
Fit a linear function for a scatter plot that suggests a linear association.	T2: #37 SID6C Local C-4 T2: #36		Fit a linear function for a scatter plot (ie write an equation for the trend line)	
Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	SID7 F-18 F-33 C-3,4 T2: #37			Interpret slope (rate of change) and the intercept (constant term) of a linear model in context
Compute (using technology) and interpret the correlation coefficient of a linear fit.	SID8 Local C-4 T2: #28 T3: #17	Correlation coefficient	Use technology to compute line of best fit and the correlation coefficient	
Distinguish between correlation and causation	SID9 Local C-4	Causation vs. correlation		

Unit 4: Expressions and Equations

In this unit, students build on their knowledge from unit 2, where they extended the laws of exponents to rational exponents. Students apply this new understanding of number and strengthen their ability to see structure in and create quadratic and exponential expressions. They create and solve equations, inequalities, and systems of equations involving quadratic expressions.

UNIT FOUR				
UNIT FOUR	#	Comp & Content	Skills	Concepts
Interpret expressions that represent a quantity in terms of its context. ★	ASSE1 F-9 F-14 C-1,2,3,6,7	English to math vocabulary	Interpret and verbalize quadratic and exponential expressions in context	
	T1: #20			
Interpret parts of an expression, such as terms, factors, and coefficients	ASSE1A F-9 F-14 C-1,3,7	Definitions of: 1. Term 2. Factor 3. Coefficient		

Interpret complicated expressions by viewing one or more of their parts as a single entity. <i>For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.</i>	T1: #20 ASSE1B F-9 C-1,2,6,7 T1: #20		Interpret complicated expressions including multi-step, multi-variable expressions and formulas	
Use the structure of an expression to identify ways to rewrite it. <i>For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.</i>	ASSE2 F-5 F-32 C-7,9 T3: #29,30,31,32		Write equivalent expressions by simplifying or by representing expressions in different forms (ie recognizing different forms of equivalent expressions)	
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.	ASSE3 F-5 F-24 C-6,7,8,9 T3: #29,30,31,32	Properties of operations	* Write equivalent forms of expressions * Explain properties of the quantity represented by the expression	
Factor a quadratic expression to reveal the zeros of the function it defines.	ASSE3A F-12 C-7 T3: #29,32	Identify zeroes of a quadratic function (by graphing)	Factor a quadratic expression to reveal the zeroes of a quadratic function (ie solve a quadratic equation by factoring)	
Complete the square in a quadratic	ASSE3B	Identify maximum or	Solve quadratic equations	Derive the

expression to reveal the maximum or minimum value of the function it defines.	<p>F-22 F-32 C-9 T3: #46</p>	minimum value of a quadratic function (ie vertex) by graphing	by completing the square (to reveal the max/min value of the function—vertex)	Quadratic Formula by completing the square
Use the properties of exponents to transform expressions for exponential functions. <i>For example the expression $1.15t$ can be rewritten as $(1.151/12)12t \approx 1.01212t$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.</i>	<p>ASSE3C F-30 C-6 T2: #38</p>	Properties of exponents	Transform exponential functions by using properties of exponents	Exponential growth and decay
Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	<p>AAPRI F-17 C-7,8 T3: #27,28</p>	Definitions of: <ol style="list-style-type: none"> 1. Polynomial 2. Degree of a polynomial 3. Types of polynomials 4. Closure Property 	*Add, subtract, multiply polynomials *Classify polynomial according to name and degree	
Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions.</i>	<p>ACED1 F-24 F-25 F-33 C-1,2 T1: #21</p>	*Quadratic functions *Simple rational Functions	Write equations and inequalities in one variable (linear, quadratic, simple rational, and exponential) and use them to solve problems	

Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales	ACED2 F-8 C-3,4,6,8,9,10 T2: #26 T3: #3,33,34,35	*The coordinate system *Graphing points	*Write linear and exponential equations in two or more variables (linear, quadratic, simple rational, and exponential) to solve problems *Graph linear, quadratic, simple rational, and exponential equations in the coordinate plane	
Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law $V = IR$ to highlight resistance R.</i>	ACED4 F-16 C-1, 9, 10 T1: #1 T3: #1		*Transform formulas involving squared variables using inverse operations	Use the transformed formula to solve multiple problems for the solved variable
Solve quadratic equations in one variable.	AREI4 F-5 F-12 C-9 T3: #47		Solve quadratic equations in one variable	
Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.	AREI4A F-13 C-9 T3: #47		Use completing the square to transform a quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions	Derive the Quadratic Formula

Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .	AREI4B F-3 F-13 F-23 C-7,9 T3: #47	Existence of complex number system (but do not solve quadratic equations with complex solutions)	*Solve quadratic equations by: 1. Inspection 2. Square roots 3. Completing the square 4. Factoring 5. The Quadratic Formula *Recognize when a quadratic equation gives complex solutions and write them as $a \pm bi$ for real numbers a and b	
Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. <i>For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.</i>	AREI7 F-19 C-9 T3: #48		Solve simple systems of linear equations and quadratic equations graphically and algebraically (including systems containing one linear and one quadratic equation)	

Unit 5: Quadratic Functions and Modeling

In preparation for work with quadratic relationships students explore distinctions between rational and irrational numbers. They consider quadratic functions, comparing the key characteristics of quadratic functions to those of linear and exponential functions. They select from among these functions to model phenomena. Students learn to anticipate the graph of a quadratic function by interpreting various forms of quadratic expressions. In particular, they identify the real solutions of a quadratic equation as the zeros of a related quadratic function. Students learn that when quadratic equations do not have real solutions the number system must be extended so that solutions exist, analogous to the way in which extending the whole numbers to the negative numbers allows $x+1 = 0$ to have a solution. Formal work with complex numbers comes in Algebra II. Students expand their experience with functions to include more specialized functions—absolute value, step, and those that are piecewise-defined.

UNIT FIVE CCS	CCCS#	Comp & Content	Skills	Concepts
Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	NRN3 F-7 C-9 T3: #49	Definitions of : 1. Closure Property 2. Rational numbers 3. Irrational numbers		Effects on outcome of addition and multiplication of rational and irrational number will result in an irrational number
For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i>	FIF4 F-3 C-3,8,9,10 T3: #34,38	*Intercepts, intervals where a function is increasing, decreasing, positive, or negative, relative maximums and minimums, symmetries, end behavior, and periodicity *Parent quadratic function	*Sketch a graph of a quadratic function showing key features *Identify key features of a graph given its function rule	
Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. <i>For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.</i>	FIF5 F-27 C-3,5,8 T1: #22	*Discrete data *Continuous data	Relate domain of a function to its graph (ie interpret domain values in context)	
Calculate and interpret the average rate of change of a function (presented symbolically or as a table)	FIF6 F-21	*Understand rate of change/slope *Slope formula	*Calculate average rate of change from a graph or from data represented	

over a specified interval. Estimate the rate of change from a graph.	C-8,10 T2: #38		symbolically *Estimate rate of change from a graph	
Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.	FIF7 F-6 C-3,4,5,8,9,10 T2: #22,23,24,25 T3: #11,12,13,14,33		Graph functions expressed symbolically by hand and using technology	
Graph linear and quadratic functions and show intercepts, maxima, and minima.	FIF7A F-6 C-3,8	Intercepts	Graph quadratic functions and show intercepts, maxima, and minima	
Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.	FIF7B Local C-3,4,6,10 T1: #13,14,24,25,30 T3: #13,14,19	*Square root *Cube root *Piecewise defined functions	Graph square root, cube root, piecewise defined functions, including step functions and absolute value functions	
Write a function defined by an expression in different but equivalent	FIF8		Write a function in equivalent forms	

forms to reveal and explain different properties of the function.	F-22 C-6,8,9 T3: #46			
Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.	FIF8A F-31 C-8 T3: #32	*Zeros *Extreme Values *Symmetry *Axis of symmetry	*Factor and complete the square in a quadratic function to show zeros, extreme values, and symmetry and interpret in context	
Use the properties of exponents to interpret expressions for exponential functions. <i>For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)12t$, $y = (1.2)^t/10$, and classify them as representing exponential growth or decay.</i>	FIF8B F-30 C-6 T2: #38		Classify an exponential function as exponential growth or exponential decay	Interpret expressions for exponential functions
Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.</i>	FIF9 F-4 C-3,8,10 T3: #50		Compare two quadratic functions when represented in different forms (algebraically, graphically, numerically in tables, or verbal descriptions)	
Write a function that describes a relationship between two quantities.	FBF1 F-20 F-30		Write a quadratic function to model a relationship between quantities	

	C-3,4,6,8,9,10 T2: #26 T3: #15,25,35			
Determine an explicit expression, a recursive process, or steps for calculation from a context.	FBF1A F-24 C-3,4,6,8,9,10 T2: #26 T3: #15,25,35	*Explicit expressions *Recursive process	*Determine an explicit expression, a recursive process, or steps for calculation from a context (ie determine if a quadratic model)	
Combine standard function types using arithmetic operations. <i>For example, build a function that models the temperature of a cooling body by adding a constant function to a</i>	FBF1B F-30 C-6,8 T1: #19		Transform a quadratic function by adding, subtracting, or multiplying by a constant number	
Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. <i>Include recognizing even and odd functions from their graphs and algebraic expressions for them.</i>	C-3,4,6,8,10 T2: #23,24,25 T3: #14,33,34		*Build new functions from existing parent (quadratic) functions *Use technology to show how changes to the parent function affect the graph	
Find inverse functions.	FBF4 Local	*Inverse function	Find inverse functions	

	C-10			
Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. <i>For example, $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$.</i>	FBF4A Local C-10 T3: #52		*Solve an equation of form $f(x) = c$ for a simple function f that has an inverse *Write an expression for inverse	
Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	FLE3 F-20 C-8 T3: #36		Compare linear growth and exponential growth to quadratic by observing graphs and tables	

Pacing Guide & Materials

Unit 1: September – November – Benchmark Test by 11/30

NJLSL Standards

NQ1	NQ2	NQ3	F18	ASSE1
ASSE1A	F30	ACED1	F26	F33
ACED4	ARE11	ARE13	F16	F33
F34	F1F1	F1	F10	F1F2
F1F3	F20	F1F4	F27	F1F5
F4	F15	F1F7	F29	F31
FBF1	F25	FBF1A	FBF1B	FBF2
FBF3	F8	F1E1	F24	F1E1A
F1E2	F9	F1E3	F1E5	F14
ASSE1B	ASSE2	F5	F32	ASSE3
ACED2	ACED4	NRN3		

Unit 2: December – February – Benchmark Test by 2/28

NJLSL Standards

NQ1	NQ2	NQ3	F18	ASSE1
F26	ASSE1B	F34	ACED2	F26
F33	ACED3	NRN1	F16	F17
NRN2	ARE15	F19	F25	ARE16
F19	F25	ARE110	F18	ARE111
ARE112	F2	F33	F1F3	F30
F1F6	F21	F1F7	F27	F29
F31	F1F7A	F18	F1F7E	F1F9
F4	FBF1	F1	F20	FBF1A
FBF1B	FBF2	FBF3	F8	F11
F24	F1E1A	F1E1B	F1E1C	F9
F1E2	F1E3	F1E5	SID5	F11
SID6	SID6A	SID6B	SID6C	SID7
F33	SID8	SID9	ASSE2	F5
F32	ASSE3	ASSE3C	ACED2	F1F8B

Unit 3: March – May – Benchmark Test by 3/31

NJSLS Standards

NQ1	NQ2	NQ3	F18	ASSE1
F26	ARE111	F19	F25	F1F7
F27	F29	F31	F1F7A	F18
F1F9	F4	FBF1	F1	F20
F30	F1E1	F20	F24	F1E1A
F1E3	F9	SID1	F28	SID2
SID3	SID5	F11	ASSE1B	ASSE2
F5	F32	ASSE3	F24	ASSE3A
ASSE3B	F22	F32	AAPRI1	F17
ACED1	F33	ACED2	ARE14	ARE14A
ARE14B	ARE17	F1F4	F1F5	F1F6
F1F7	F1F7A	F1F7B	F1F8	F1F8A
F1F9	F1F1A	F1F1B	FBF3	FBF4
FBF4A	F1E3			

Grade Level	Title	Primary / Supplemental
Algebra	Big Ideas Algebra CC 2022	Primary
Fifth through Eighth	Measuring Up: People's Publishing	Supplemental
Fifth through Eighth	Com Core Performance Coach 2015	Supplemental
Fifth through Eighth	IXLMath.Com	Supplemental Software

Differentiation Strategies

- The unit includes presentation of material through multiple modalities such as visual, auditory, and kinesthetic to address the unique learning styles of all students.
- Assign, assess and modify if necessary, to address needs of at risk learners.
- Provide student with open ended questions that stimulate higher order thinking
- Allow student to consider and express personal opinions
- Tiered Assignments
- Afford student with opportunities for independent projects based on the area of study and the student's interests
- Have student share and express their thought process, conclusions and the reasoning that led to their conclusion
- Allow for extended time on homework and assessments as described in the student's plan
- Allow use of calculator
- Check for comprehension and understanding
- Highlight or underline key words
- Permit ample time for student to respond to questions
- Clearly define limits and expectations
- Encourage student to ask for needed assistance
- Preferential seating
- Repeating, clarifying or rewording directions
- Allow for alternate responses
- Provide student with advanced notes
- Allow for extended time on homework and assessments
- Teacher modeling of what is expected and necessary steps to complete task
- Provide simplified written and verbal instructions
- Permit ample time for student to respond to questions
- Repeating, clarifying or rewording directions
- Allow use of eDictionary/technology to look up unknown words

Honors Algebra

Interdisciplinary Connections

1. Graphing calculator proficiency for use with radar in science class #MS-PS2-2
2. Simplifying / evaluating / solving equations for chemistry and physical science #MS-PS3-1
3. Understanding velocity and acceleration formulas for balloon car challenge. #MS-PS3-2
4. Calculating slope of a line to determine speed and acceleration
5. Distributive property, coefficient, subscript, and least common multiple to balance equations
6. Interpreting independent and dependent variables to create a table and a graph
7. Interpreting line graphs in speed and acceleration
8. Using formulas to solve problems
9. Creating a scatter plot and drawing in a line of best fit to analyze data in force and motion
10. Dimensional analysis to convert units (eg meters/sec to centimeters/minute) to compare speeds
11. Interpreting rate in physical science
12. Proportional relationships (direct or inverse) in density and frequency and wavelength
13. Scientific notation in Ph and radioactive decay
14. Ratios in chemical formulas
15. Measurements (volume, mass, length, area)

9.2 Career Readiness

9.2.8.CAP.20: Identify the items to consider when estimating the cost of funding a business.

9.4 Life Literacies & Technology

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option

9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem

9.1 Financial Literacy – Listed in Math 8 Project

Mendham Township School District

Mathematics Curriculum – 2021

Aligned 2022 Big Ideas Math Modeling Real Life

Honors Geometry

The fundamental purpose of the course in Geometry is to formalize and extend students' geometric experiences from the middle grades. Students explore more complex geometric situations and deepen their explanations of geometric relationships, moving towards formal mathematical arguments. Important differences exist between this Geometry course and the historical approach taken in Geometry classes. For example, transformations are emphasized early in this course. Close attention should be paid to the introductory content for the Geometry conceptual category found in the high school CCSS. The Mathematical Practice Standards apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations. The critical areas, organized into six units are as follows.

Critical Area 1: In previous grades, students were asked to draw triangles based on given measurements. They also have prior experience with rigid motions: translations, reflections, and rotations and have used these to develop notions about what it means for two objects to be congruent. In this unit, students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. They use triangle congruence as a familiar foundation for the development of formal proof. Students prove theorems—using a variety of formats—and solve problems about triangles, quadrilaterals, and other polygons. They apply reasoning to complete geometric constructions and explain why they work.

Critical Area 2: Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean theorem. Students develop the Laws of Sines and Cosines in order to find missing measures of general (not necessarily right) triangles, building on students' work with quadratic equations done in the first course. They are able to distinguish whether three given measures (angles or sides) define 0, 1, 2, or infinitely many triangles.

Critical Area 3: Students' experience with two-dimensional and three-dimensional objects is extended to include informal explanations of circumference, area and volume formulas. Additionally, students apply their knowledge of two-dimensional shapes to consider the shapes of cross-sections and the result of rotating a two-dimensional object about a line.

Critical Area 4: Building on their work with the Pythagorean theorem in 8th grade to find distances, students use a rectangular coordinate system to verify geometric relationships, including properties of special triangles and quadrilaterals and slopes of parallel and perpendicular lines, which relates back to work done in the first course. Students continue their study of quadratics by connecting the geometric and algebraic definitions of the parabola.

Critical Area 5: In this unit students prove basic theorems about circles, such as a tangent line is perpendicular to a radius, inscribed angle theorem, and theorems about chords, secants, and tangents dealing with segment lengths and angle measures. They study relationships among segments on chords, secants, and tangents as an application of similarity. In the Cartesian coordinate system, students use the distance formula to write the equation of a circle when given the radius and the coordinates of its center. Given an equation of a circle, they draw the graph in the coordinate plane, and apply techniques for

solving quadratic equations, which relates back to work done in the first course, to determine intersections between lines and circles or parabolas and between two circles.

The following chart details the Geometry curricular focus and is broken out into areas of content, skills, and concepts:

Unit 1: Congruence, Proof, and Constructions

In previous grades, students were asked to draw triangles based on given measurements. They also have prior experience with rigid motions: translations, reflections, and rotations and have used these to develop notions about what it means for two objects to be congruent. In this unit, students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. They use triangle congruence as a familiar foundation for the development of formal proof. Students prove theorems—using a variety of formats—and solve problems about triangles, quadrilaterals, and other polygons. They apply reasoning to complete geometric constructions and explain why they work.

UNIT ONE NJ	NJ#	Comp & Content	Skills	Concepts
Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	GCO1 C1, C2, C3, C4, C10, C11 B1:11,22,26 B2:20 B3:1,4,7,8,15,	Define point, line, distance along a line, and distance around a circular arc.	Develop definitions for angles, circles, parallel lines, perpendicular lines, and line segments.	
Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).	GCO2 C4 B1:1,2,5,6,7,10 B2:17,19		Describe all transformations as functions that take points in the plane as inputs and give other points as outputs.	Compare rigid and non-rigid transformations.
Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	GCO3 C4 B1:3 B2:18		Describe compound transformations that map geometric figures onto themselves.	
Develop definitions of rotations, reflections, and translations in terms of	GCO4 C4	Define rotations, reflections, and	Apply the definitions of angles, circles,	Develop and perform rigid transformations

angles, circles, perpendicular lines, parallel lines, and line segments	B1:1,2,7,10 B2:17,19	translations, parallel lines, perpendicular lines, and line segments.	parallel lines, perpendicular lines, and line segments to describe rotations, reflections, and translations.	that include reflections, rotations, and translations using different modalities and compare to non-rigid transformations.
Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.	GCO5 C4, C5 B1:1,2,3,7,10 B2:17,19		Draw rigid transformations using multiple modalities.	Specify a sequence of rigid transformations carry a given figure onto another.
Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent	GCO6 C4 B1:1,2,7,10 B2:7,8,17,19	Define congruence.		
Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	GCO7 C5 B2:4 B2:7,8,15	Define corresponding sides and corresponding angles.	Use the definition of congruence and rigid motions to show that two triangles are congruent.	
Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions	GCO8 C5 B2:7,8	Define ASA, SAS, and SSS.	Determine if triangles meet the definition of congruence using corresponding parts.	Prove triangle congruence using ASA, SAS, and SSS.
Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent;	GCO9 C2, C3, C4, C6, C8 B1:12,13,20,21,22 B2:13,22	Define vertical angles, transversals, alternate interior angles, corresponding angles, perpendicular bisector of a line segment,		Develop a rule for angle relationships given parallel lines intersected by a transversal and prove theorems about lines

points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.		equidistance, and endpoints.		and angles.
Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180° ; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.	GCO10 C2, C5, C6 B1:23 B2:5,11,16	Define interior angles of a triangle, base angles of an isosceles triangle, and midpoints and medians of a triangle.	Use triangle theorems to find angle measures.	Prove theorems about triangles.
Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.	GCO11 C2, C7 B2:23,25,26	Define parallelograms, rectangles, rhombuses, squares, opposite sides, opposite angles, diagonals, and the term conversely.	Use properties of parallelograms to find angle measures and side lengths.	Prove theorems about parallelograms.
Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.	GCO12 C1, C3, C4, C5, C6, C7, C8, C9, C10, C11 B1:15,27 B2:21,51	Make formal geometric constructions with a variety of tools and methods.		
Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	GCO13 C3, C5, C10 B2:3 B3:6	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.		

Unit 2: Similarity, Proof, and Trigonometry

Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean Theorem. Students develop the Laws of Sines and Cosines in order to find missing measures of general (not necessarily right) triangles. They are able to distinguish whether three given measures (angles or sides) define 0, 1, 2, or infinitely many triangles.

UNIT TWO NJ	NJ#	Comp & Content	Skills	Concepts
<p>Verify experimentally the properties of dilations given by a center and a scale factor:</p> <p>a. A dilation takes a line not passing through the center of the dilation to a parallel line, an leaves a line passing through the center unchanged.</p> <p>b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor</p>	<p>GSRT1</p> <p>C4 B1:8,9 B2:12</p>	<p>Define dilation and scale factor.</p>	<p>Explore relationships between dilations and scale factor. Determine scale factor.</p>	
<p>Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.</p>	<p>GSRT2</p> <p>C4, C8, C10 B1:4 B2:31</p>	<p>Define similarity.</p>	<p>Determine similarity using corresponding sides and proportionality.</p>	
<p>Use the properties of similarity transformations to establish the</p>	<p>C8</p> <p>GSRT3</p>			<p>Determine the AA criteria for two</p>

AA criterion for two triangles to be similar.	B2:29,32				triangles to be similar.
Prove theorems about triangles. <i>Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.</i>	C2, C8, C9 B2:37,49,51 GSRT4	Define the Pythagorean Theorem.	Use the Pythagorean Theorem and a line parallel to one side of a triangle to find missing side lengths.	Prove the Pythagorean Theorem and theorems involving triangle similarity.	
Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	C5, C6, C7, C8, C9, C10 B1:19 B2:2,23,29,30,32,33,34,35,36,47,50 GSRT5		Use congruence and similarity theorems for triangles to solve real-world problems.	Prove relationships in geometric figures.	
Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.	C9 B2:38,44 GSRT6	Define triangle ratios for acute angles. Define geometric mean.	Use similarity to determine side ratios in right triangles.		
Explain and use the relationship between the sine and cosine of complementary angles.	C9 B2:40,48 GSRT7			Determine the relationship between $\sin \theta$ and $90 - \sin \theta$.	
Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	C9 B2:43,46 GSRT8		Use trigonometric ratios and the Pythagorean Theorem to solve right triangles.		

Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	GMG1 C1, C3, C5, C6, C7, C9, C10, C11, C12 B2:24,28 B3:18,20		Use geometric shapes to describe three dimensional objects in a real-world context.	
Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	GMG2 C11, C12 B3:17,20,27,32	Define density, area, and volume.	Apply density based on area and volume in modeling situations.	
Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).	GMG3 C5, C6, C9, C10, C11, C12 B3:16,18,20,22,23	Apply geometric methods to solve problems involving scale.	Design an object or structure to satisfy physical constraints or to determine the maximum/minimum regarding area, volume, and/or costs.	
Derive the formula $A = 1/2 ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.	GSRT9 C9 B2:39	Define an oblique triangle.	Use a formula to find the area of an oblique triangle.	Derive the formula for finding the area of an oblique triangle.
Prove the Laws of Sines and Cosines and use them to solve problems.	GSRT10 C9 B2:41,42,45	Define the Law of Sines and the Law of Cosines.	Use the Law of Sines and the Law of Cosines to solve non-right triangles.	Prove the Law of Sines and the Law of Cosines.

Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).	GSRT11 C9 B2:41,42,45		Apply the Law of Sines and the Law of Cosines to solve real-world problems.	
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Unit 3: Extending to Three Dimensions

Students' experience with two-dimensional and three-dimensional objects is extended to include informal explanations of circumference, area and volume formulas. Additionally, students apply their knowledge of two-dimensional shapes to consider the shapes of cross-sections and the result of rotating a two-dimensional object about a line.

UNIT THREE NJ	NJ#	Comp & Content	Skills	Concepts
Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. <i>Use dissection arguments, Cavalieri's principle, and informal limit arguments.</i>	GGMD1 C11, C12 B3:13,19,24,26,28,29	Define the area and circumference of a circle. Define the volume of a prism, cylinder, pyramid, and cone. Define Cavalier's principle.		
Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	GGMD3 C11, C12 B3:24,26,28,29,31	Define sphere.	Use volume formulas for prisms, cylinders, pyramids, cones, and spheres to problem solve.	
Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	GGMD4 C12 B3:25,30,31	Define cross section.	Visualize and identify two-dimensional cross sections of three-dimensional objects.	

			Visualize and identify three-dimensional objects generated by rotations of two-dimensional objects.	
Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	GMG1 C1, C3, C5, C6, C7, C9, C10, C11, C12 B2:6,28 B3:16		Use geometric shapes, their measures, and their properties to describe objects.	

Unit 4: Connecting Algebra and Geometry Through Coordinates

Building on their work with the Pythagorean theorem in 8th grade to find distances, students use a rectangular coordinate system to verify geometric relationships, including properties of special triangles and quadrilaterals and slopes of parallel and perpendicular lines. Students continue their study of quadratics by connecting the geometric and algebraic definitions of the parabola.

UNIT FOUR NJ	NJ#	Comp & Content	Skills	Concepts
Use coordinates to prove simple geometric theorems algebraically. <i>For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point $(0, 2)$</i>	GGPE4 C5, C6, C7, C10 B1:18,24 B2:1,9,14,27	Define coordinate plane. Define slope.	Use the distance formula and slope to prove theorems about geometric shapes algebraically.	
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).	GGPE5 C3, C5, C6, C7, C8 B1:11 B2:20,36		Find the equation of a line parallel and perpendicular to a given line and passing through a given point.	Prove slope of parallel and perpendicular lines using coordinate geometry.
Find the point on a directed line segment between two given points that partitions the	GGPE6		Use a given ratio to find a point on a	

segment in a given ratio	C3, C8 B1:16,17		directed line segment between two given points.	
Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula	GGPE7 C1 B1:13,25,28,29 B2:10		Use the distance formula and given coordinates to determine the perimeter of polygons and the area of triangles and rectangles.	
Derive the equation of a parabola given a focus and directrix.	GGPE2 C10 B3:2,11			Derive the equation of a parabola given a focus and directrix.

Unit 5: Circles With and Without Coordinates

In this unit, students prove basic theorems about circles, with particular attention to perpendicularity and inscribed angles, in order to see symmetry in circles and as an application of triangle congruence criteria. They study relationships among segments on chords, secants, and tangents as an application of similarity. In the Cartesian coordinate system, students use the distance formula to write the equation of a circle when given the radius and the coordinates of its center. Given an equation of a circle, they draw the graph in the coordinate plane, and apply techniques for solving quadratic equations to determine intersections between lines and circles or parabolas and between two circles.

UNIT FIVE NJ	NJ#	Comp & Content	Skills	Concepts
Prove that all circles are similar.	GC1 C10 B3:4			Prove that all circles are similar using ratios.
Identify and describe relationships among inscribed angles, radii, and chords. <i>Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.</i>	GC2 C10 B3:7,8,9	Identify: inscribed angles, radii, cords, central angles, inscribed angles, circumscribed angles, diameter, and tangent.	Describe the relationships among inscribed angles, radii, cords, central angles, inscribed angles, circumscribed angles, diameter, and tangent.	Show that inscribed angles on a diameter

			are right angles and that the radius of a circle is perpendicular to the tangent where the radius intersects the circle.	
Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	GC3 C6, C10 B3:1		Construct the inscribed and circumscribed circles of a triangle.	Prove properties of angles for a quadrilateral inscribed in a circle.
Construct a tangent line from a point outside a given circle to the circle.	GC4 C10 B3:3		Construct a tangent line from a point outside a given circle to the circle.	
Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.	GC5 C11 B3:12,14,15,21	Define arc length, intercepting angle, radian measure, and sector.	Find arc length and the area of a sector.	Derive the formula for finding the arc length and the area of a sector.
Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.	GGPE1 C10 B3:5,10		Determine the radius and center of a circle given its standard form.	Derive the area of a circle using the Pythagorean Theorem.
Use coordinates to prove simple geometric theorems algebraically. <i>For example, prove or disprove that a figure defined by four given points in the coordinate plane is a</i>	GGPE4 C5, C6, C7, C10 B1:18,24		Complete the square to find the center and radius of a circle given by an equation.	
			Use coordinates to prove simple geometric theorems algebraically.	

<i>rectangle; prove or disprove that the point (1, $\sqrt{3}$) lies on the circle centered at the origin and containing the point (0, 2).</i>	B2:1,9,14,27			
Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	GMG1 C1, C3, C5, C6, C7, C9, C10, C11, C12 B3:16		Use geometric shapes, their measures, and their properties to describe objects.	

Pacing Guide & Materials

Unit 1: September – November – Benchmark Test by 11/30

NJLSEL Standards

GC01	GC02	GC03	GC04	GC05
GC06	GC07	GC08	GC09	GC010
GC011	GC012	GC013	GSRT2	GC4

Unit 2: December – February – Benchmark Test by 2/28

NJLSEL Standards

GSRT1	GSRT3	GSRT4	GSRT5	GSRT6
GSRT7	GSRT9	GSRT10	GSRT11	GC1
GC2	GGPE4			

Unit 3: March – May – Benchmark Test by 3/31

NJLSEL Standards

GSRT5	GSRT8	GMG1	GMG2	GMG3
GGMD1	GGMD3	GGMD4	GMG1	GGPE2
GGPE1	GGPE5	GGPE6	GGPE7	GC3
GC5	GMG1			

Grade Level	Title	Primary / Supplemental
Big Ideas	Geometry CC 2022	Primary
Fifth through Eighth	Measuring Up: People's Publishing	Supplemental
Fifth through Eighth	Com Core Performance Coach 2015	Supplemental
Fifth through Eighth	IXL Math.Com	Supplemental Software

Differentiation Strategies

- The unit includes presentation of material through multiple modalities such as visual, auditory, and kinesthetic to address the unique learning styles of all students.
- Assign, assess and modify if necessary, to address needs of at risk learners.
- Provide student with open ended questions that stimulate higher order thinking
- Allow student to consider and express personal opinions
- Tiered Assignments
- Afford student with opportunities for independent projects based on the area of study and the student's interests
- Have student share and express their thought process, conclusions and the reasoning that led to their conclusion
- Allow for extended time on homework and assessments as described in the student's plan
- Allow use of calculator
- Check for comprehension and understanding
- Highlight or underline key words
- Permit ample time for student to respond to questions
- Clearly define limits and expectations
- Encourage student to ask for needed assistance
- Preferential seating
- Repeating, clarifying or rewording directions
- Allow for alternate responses
- Provide student with advanced notes
- Allow for extended time on homework and assessments
- Teacher modeling of what is expected and necessary steps to complete task
- Provide simplified written and verbal instructions
- Permit ample time for student to respond to questions
- Repeating, clarifying or rewording directions
- Allow use of eDictionary/technology to look up unknown words

Honors Geometry

Interdisciplinary Connections

1. Graphing calculator proficiency for use with radar in science class #MS-PS2-2
2. Simplifying / evaluating / solving equations for chemistry and physical science #MS-PS3-1
3. Understanding velocity and acceleration formulas for balloon car challenge. #MS-PS3-2
4. Calculating slope of a line to determine speed and acceleration
5. Distributive property, coefficient, subscript, and least common multiple to balance equations
6. Interpreting independent and dependent variables to create a table and a graph
7. Interpreting line graphs in speed and acceleration
8. Using formulas to solve problems
9. Creating a scatter plot and drawing in a line of best fit to analyze data in force and motion
10. Dimensional analysis to convert units (eg meters/sec to centimeters/minute) to compare speeds
11. Interpreting rate in physical science
12. Proportional relationships (direct or inverse) in density and frequency and wavelength
13. Scientific notation in Ph and radioactive decay
14. Ratios in chemical formulas
15. Measurements (volume, mass, length, area)

9.2 Career Readiness

- 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
- 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.
- 9.2.8.CAP.13: Compare employee benefits when evaluating employment interests and explain the possible impact on personal finances.
- 9.2.8.CAP.15: Present how the demand for certain skills, the job market, and credentials can determine an individual's earning power.
- 9.2.8.CAP.18: Explain how personal behavior, appearance, attitudes, and other choices may impact the job application process.
- 9.2.8.CAP.19: Relate academic achievement, as represented by high school diplomas, college degrees, and industry credentials, to employability and to potential level

9.4 Life Literacies & Technology

- 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
- 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.
- 9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.
- 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
- 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem

9.1 Financial Literacy

- 9.1.8.CR.1: Compare and contrast the role of philanthropy, volunteer service, and charities in community development and the quality of life in a variety of cultures.
- 9.1.8.CR.2: Compare various ways to give back through strengths, passions, goals, and other personal factors.
- 9.1.8.CR.3: Relate the importance of consumer, business, and government responsibility to the economy and personal finance.
- 9.1.8.CR.4: Examine the implications of legal and ethical behaviors when making financial decisions.
- 9.1.8.CDM.1: Compare and contrast the use of credit cards and debit cards for specific purchases and the advantages and disadvantages of using each.
- 9.1.8.CDM.3: Compare and contrast loan management strategies, including interest charges and total principal repayment costs.
- 9.1.8.CDM.4: Evaluate the application process for different types of loans (e.g., credit card, mortgage, student loans).
- 9.1.8.CP.1: Compare prices for the same goods or services.
- 9.1.8.CP.2: Analyze how spending habits affect one's ability to save.
- 9.1.8.CP.3: Explain the purpose of a credit score and credit record, the factors and impact of credit scores.
- 9.1.8.CP.4: Summarize borrower's credit report rights.

- 9.1.8.CP.5: Compare the financial products and services available to borrowers relative to their credit worthiness.
- 9.1.8.EG.1: Explain how taxes affect disposable income and the difference between net and gross income
- 9.1.8.EG.3: Explain the concept and forms of taxation and evaluate how local, state and federal governments use taxes to fund public activities and initiatives.
- 9.1.8.EG.5: Interpret how changing economic and societal needs influence employment trends and future education.
- 9.1.8.EG.7: Explain the effect of the economy (e.g., inflation, unemployment) on personal income, individual and family security, and consumer decisions.
- 9.1.8.EG.8: Analyze the impact of currency rates over a period of time and the impact on trade, employment, and income.
- 9.1.8.FI.1: Identify the factors to consider when selecting various financial service providers.
- 9.1.8.FI.2: Determine the most appropriate use of various financial products and services to borrow and access money for making purchases (e.g., ATM, debit cards, credit cards, check books, online/mobile banking).
- 9.1.8.FI.3: Evaluate the most appropriate financial institutions to assist with meeting various personal financial needs and goals.
- 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.
- 9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.
- 9.1.8.FP.2: Evaluate the role of emotions, attitudes, and behavior (rational and irrational) in making financial decisions.
- 9.1.8.FP.3: Explain how self-regulation is important to managing money
- 9.1.8.FP.4: Analyze how familial and cultural values influence savings rates, spending, and other financial decisions.
- 9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.
- 9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.
- 9.1.8.PB.2: Explain how different circumstances can affect one's personal budget.
- 9.1.8.PB.4: Construct a simple personal savings and spending plan based on various sources of income and different stages of life
- 9.1.8.PB.5: Identify factors that affect one's goals, including peers, culture, location, and past experiences.
- 9.1.8.PB.7: Brainstorm techniques that will help decrease expenses including comparison shopping, negotiating, and day-to-day expense management.
- 9.1.8.RM.1: Determine criteria for deciding the amount of insurance protection needed.
- 9.1.8.RM.2: Analyze the need for and value of different types of insurance and the impact of deductibles in protecting assets against loss.
- 9.1.8.RM.3: Evaluate the need for different types of warranties.
- 9.1.8.RM.4: Explain the purpose of insurance products and the reasons for property product and liability insurance protection.