Moonachie School District Mathematics Curriculum: Grade Six

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The following maps outline the New Jersey Student Learning Standards for grade six mathematics determined by the State Standards Initiative. Below is a list of assessment tools that are recommended for tracking student progress in these areas. In addition, resources that can be used in conjunction with instruction of these standards are provided but not limited to the list below.

Assessment:

Formative Assessment
Open-Ended Problems
Self-Assessment
End of Year Assessment
Benchmark Assessment
Homework Review
Summative Assessment
Class-Work Review
Project-Based Assessment
Teacher Observation
Group & Cooperative Work
Math Software (ex. Study Island)

Resources:

Math Journals
Bar Models
Math Word Wall
Connecting Cubes
Number Line
Grid Paper
Computer Software
Interactive White Board
Compass
Center Games
Ten Frame
Protractors
Mini White Boards
Manipulatives
Math Songs/Poems
Calculators
Fraction Tiles
Measurement Tools
Tangrams
Geometric Shapes
Geo-Board
Textbooks
Rulers
Three Dimensional Shapes
Wiki-Sticks
Pattern Blocks

Websites:

http://www.aplusmath.com
http://www.studyisland.com
http://www.funbrain.com
http://www.songsforteaching.com
www.purplemath.com
www.wolframalpha.com
www.kutasoftware.com
www.illuminations.nctm.org
www.interactmath.com
www.number2.com
www.khanacademy.org
www.betterlesson.com
www.illustrativemathematics.org
www.buzzmath.com
www.ixl.com

References: http://www.state.nj.us/education/aps/cccs/math/
NJ Technology Standards: http://www.state.nj.us/education/cccs/2014/tech/8.pdf
NJ Career Ready Practices: http://www.state.nj.us/education/aps/cccs/career/

Standards for Mathematical Practice
MP. 1 - Make Sense of problems and persevere in solving them.
MP. 2 - Reason Abstractly and Quantitatively
Mp. 3 - Construct Viable Arguments and Critique the Reasoning of Others
MP. 4 - Model with Mathematics
MP. 5 - Use Appropriate Tools Strategically
MP. 6 - Attend to Precision
MP. 7 - Look for and make use of Structure
MP. 8 - Look for and Express Regularity in Repeated Reasoning

MATHEMATICS: GRADE 6
DOMAIN: RATIO AND PROPORTIONAL RELATIONSHIPS

Length of Time: 40 days

Cluster Heading
6.RP.A: Understand ratio concepts and use ratio reasoning to solve problems.

Performance Indicators

6.RP.A.1	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."
6.RP.A.2	Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠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 ¾-cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger." (Clarification: Expectations for unit rates in this grade are limited to non-complex fractions.)
6.RP.A.3	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. - 6.RP.A.3.a: 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. - 6.RP.A.3.b: 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? - 6.RP.A.3.c: 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.
6.RP.A.3.d	Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Student Learning Objectives	Key Vocabulary	Suggested Tasks/Activities
The students will be able to: - Use ratio language to describe a ratio relationship between two quantities. - Explain the concept of unit rate. - Use ratio and rate reasoning to solve real-world and mathematical problems. - Make and use tables to compare ratios. - Solve unit rate problems. - Find a percent of a quantity as a rate per 100. - Use ratio reasoning to convert measurement units and manipulate/transform units.	Ratio Quantities Rate Rate reasoning Equivalent ratios Tape diagrams Number lines Equations Plot Table Coordinate plane Unit pricing	- Use real-world objects to determine ratios - Use real-world shopping unit pricing - Data tables & charts - Collaborative activities - Class discussion - Independent practice - Note-taking - Sentence frames - Labeling

	Constant speed Percent	

MATHEMATICS: GRADE 6
DOMAIN: THE NUMBER SYSTEM

Length of Time: 40 days

Cluster Heading
6.NS.A: Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

Performance Indicators	
6.NS.A.1	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 ÷ 3/4 and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that 2/3 ÷ 3/4= 8/9 because 3/4 of 8/9 is 2/3. (In general, a/b ÷ 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?

Student Learning Objectives	**Key Vocabulary**	**Suggested Tasks/Activities**
The student will be able to: - Interpret and compute quotients of fractions. - Solve word problems involving division of fractions. - Use visual fraction models and equations to represent and solve problems.	Fraction Quotient Numerator Denominator	- Fraction bars - Pie charts - Recipes - Measurement activities - Collaborative activities - Class discussion - Independent practice - Note-taking - Sentence frames - Labeling

Cluster Heading
6.NS.B: Compute fluently with multi-digit numbers & find common factors & multiples.

Performance Indicators	
6.NS.B.2	With accuracy and efficiency, divide multi-digit numbers using the standard algorithm.
6.NS.B.3	With accuracy and efficiency, add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
6.NS.B.4	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. For example, express 36 + 8 as 4 (9+2).

Student Learning Objectives	Key Vocabulary	Suggested Tasks/Activities
The students will be able to: - Add, subtract, multiply, and divide multi-digit decimals. - Find the greatest common factor of two whole numbers less than or equal to 100. - Find 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 with a common factor as a multiple of a sum of two whole numbers with no common factor.	Division Quotient Divisor Dividend Factors Multiples Whole Numbers Distributive property Common denominator Common factors Greatest Common Factor (GCF) Least Common Multiple (LCM)	- Multi-digit equations - Model finding GCF and LCM - Collaborative activities - Class discussion - Independent practice - Note-taking - Sentence frames - Labeling

Cluster Heading
6.NS.C: Apply and extend previous understandings of numbers to the system of rational numbers.

Performance Indicators

6.NS.C.5 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.

6.NS.C.6 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.

- 6.NS.C.6.a: 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.
- 6.NS.C.6.b: 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.
- 6.NS.C.6.c: 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.

6.NS.C.7 Understand ordering and absolute value of rational numbers.

- 6.NS.C.7.a: 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.
- 6.NS.C.7.b: Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write -3°C > -7°C to express the fact that -3°C is warmer than -7°C.
- 6.NS.C.7c: 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.

	- 6.NS.C.7d: 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.
6.NS.C.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Student Learning Objectives	Key Vocabulary	Suggested Tasks/Activities
The students will be able to: - Describe quantities having opposite directions or values using positive and negative numbers. - Plot rational numbers as points on the number line. - Represent negative numbers of number lines and line diagrams. - Understand ordering and absolute value of rational numbers. - Solve real-world and mathematical problems using coordinate planes.	X-axis Y-axis Ordered pairs Quadrants Origin X-coordinate Y-coordinate Coordinate plane	- Number line activities - Data table & charts - Collaborative activities - Class discussion - Independent practice - Note-taking - Sentence frames - Labeling

MATHEMATICS: GRADE 6
DOMAIN: EXPRESSIONS AND EQUATIONS

Length of Time: 40 days

Cluster Heading
6.EE.A: Apply and extend previous understandings of arithmetic to algebraic expressions.

Performance Indicators

6.EE.A.1	Write and evaluate numerical expressions involving whole-number exponents.
6.EE.A.2	Write, read, and evaluate expressions in which letters stand for numbers. - 6.EE.A.2.a: 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. - 6.EE.A.2.b: 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. - 6.EE.A.2.c: 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 $V=6s^3$ and $A=6s^2$ to find the volume and surface area of a cube with sides of length s=1/2.
6.EE.A.3	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.
6.EE.A.4	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.

Student Learning Objectives	Key Vocabulary	Suggested Tasks/Activities
Students will be able to: - Write and solve expressions using whole-number exponents. - Solve for unknown values. - Apply the distributive property to generate equivalent expressions. - Identify when two expressions are equivalent.	Exponent Expressions Sum Term Product Factor Quotient Coefficient Variables Order of Operations Distributive Property Equivalent	- Math expression puzzles - Solve and color expressions - 24 Game (PEMDAS) - Collaborative activities - Class discussion - Independent practice - Note-taking - Sentence frames - Labeling

Cluster Heading
6.EE.B: Reason about and solve one-variable equations and inequalities.

Performance Indicators	
6.EE.B.5	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.
6.EE.B.6	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.
6.EE.B.7	Solve real-world and mathematical problems by writing and solving equations of the form x+p and px=q for cases in which p, x and q are all nonnegative rational numbers.
6.EE.B.8	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.

Student Learning Objectives	Key Vocabulary	Suggested Tasks/Activities
Students will be able to: - Use substitutions to determine if equations and inequalities are true.	Equation Variable Inequalities	- Bar diagrams - Data table & charts - Collaborative activities

- Understand that variables can represent unknown numbers or any number in a specified set. - Use variables to represent numbers and write expressions. - Solve real-world and mathematical problems by writing and solving equations. - Write inequalities to represent constraint or condition - Explain how some inequalities may have infinite solutions - User number line diagrams to represent solutions to inequalities.	Substitution Unknown numbers Rational numbers Nonnegative Constraint Condition Number line diagrams	- Class discussion - Independent practice - Note-taking - Sentence frames - Labeling

Cluster Heading **6.EE.C: Represent and analyze quantitative relationships between dependent and independent variables.**	
Performance Indicators	
6.EE.C.9	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.

Student Learning Objectives	Key Vocabulary	Suggested Tasks/Activities
Students will be able to: - 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. - Use graphs to analyze relationships between dependent and independent variables.	Equation Dependent variable Independent variable	- Data table & charts - Collaborative activities - Class discussion - Independent practice - Note-taking - Sentence frames - Labeling - 4 Quadrant Graphing - Linear Equation Worksheet

DOMAIN: GEOMETRY
Length of Time: 30 days

Cluster Heading **6.G.A: Solve real-world and mathematical problems involving area, surface area, and volume**	
Performance Indicators	
6.G.A.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
6.G.A.2	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.
6.G.A.3	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.
6.G.A.4	Represent three-dimensional figures (e.g., pyramid, triangular prism, rectangular prism) 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.

Student Learning Objectives	Key Vocabulary	Suggested Tasks/Activities
The students will be able to: - Find the area of composite shapes by composing into rectangles or decomposing into triangles. - User unit cubes to find the volume of rectangular prisms. - Construct the net of a three-dimensional figure by identifying the shapes that compose each face or surface of the figure and attaching the edges of those shapes to form a new two dimensional object.	Area Right triangles Special Quadrilaterals Polygon Volume Unit cube Pyramid Triangular prism Rectangular prism Two-dimensional Three-dimensional Base Edge Vertex/vertices Face	- Volume demonstrations - Wrapping gifts - Create a space - Composing figures - Data table & charts - Collaborative activities - Class discussion - Independent practice - Note-taking - Sentence frames - Labeling

MATHEMATICS: GRADE 6 DOMAIN: STATISTICS AND PROBABILITY

Length of Time: 30 days

Cluster Heading
6.SP.A: Develop understanding of statistical variability.

Performance Indicators

6.SP.A.1 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.

6.SP.A.2 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.

6.SP.A.3 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 single number.

Student Learning Objectives	Key Vocabulary	Suggested Tasks/Activities
Students will be able to: - Identify statistical questions and variability. - Write statistical questions and display the collected data. - Summarize data using measures of variability. - Explain how statistical data sets have distribution and that distribution can be described as the data's center, spread, and overall shape. - Describe the center, spread, and overall shape of a data set. - Distinguish between a measure of center and a measure of variation.	Statistical questions Data set Variability Data distribution - Center - Spread - Shape Measure of center - Mean - Median - Mode Measure of variation	- Statistical data tables & charts - Collaborative activities - Class discussion - Independent practice - Note-taking - Sentence frames - Labeling

Cluster Heading
6.SP.B: Summarize and describe distributions.

Performance Indicators

6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

6.SP.B.5 Summarize numerical data sets in relation to their context, such as by:

- 6.SP.B.5.a: Reporting the number of observations.
- 6.SP.B.5.b: Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

	- 6.SP.B.5.c: 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.
6.SP.B.5.d	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.

Student Learning Objectives	Key Vocabulary	Suggested Tasks/Activities

Students will be able to:
- Use plots on a number line to display numerical data:
  - Dot plots
  - Histograms
  - Box plots
- Summarize numerical data sets using number of observations, units of measurement, measures of center (mean/median) and variability.
- Identify and describe deviations in data patterns.
- Apply measures of center and variability based on the shape of the data distribution.
	Statistical question
	Dot plots
	Histograms
	Box plots
	Observations
	Data distribution
	Measures of center
	  - Mean
	  - Median
	  - Mode
	Deviations
	Variability
		- Statistical data tables & charts
		- Data table & charts
		- Collaborative activities
		- Class discussion
		- Independent practice
		- Note-taking
		- Sentence frames
		- Labeling
		- Statistics Lab

INTERDISCIPLINARY CONNECTIONS	
Other Core Content Areas	**English Language Arts** - L.KL.6.2.A: Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases. - SL.PE.6.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. - SL.II.6.2: Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study. - SL.UM.6.5: Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information. **Science** - MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

	- MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. **Social Studies** - 6.1.8.EconET.3.a: Identify the effect of inflation and debt on the American people and evaluate the policies of state and national governments during this time. - 6.3.8.CivicsPR.4: Use evidence and quantitative data to propose or defend a public policy related to climate change. - 6.3.8.EconET.1: Using quantitative data, evaluate the opportunity cost of a proposed economic action, and take a position and support it (e.g., healthcare, education, transportation).
Career Readiness, Life Literacies and Key Skills	- 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions. - 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.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. - 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event.
Computer Science and Design Thinking	- 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). - 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).

MODIFICATIONS				
English Language Learners	**Special Education**	**At-Risk**	**Gifted and Talented**	**504**
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think Alouds Read Alouds Highlight key vocabulary	Word walls Visual aides Graphic organizers Multimedia Leveled-readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments Counseling	Curriculum compacting Challenge assignments Enrichment activities Tiered activities Independent research/inquiry Collaborative teamwork Higher level questioning	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator

Annotation guides Think-pair-share Visual aides Modeling Cognates	Highlighter Color Contrast		Critical/Analytical thinking tasks Self-directed activities	Highlighter Color contrast Parent communication Modified assignments Counseling