



8th Grade Mathematics Curriculum Framework

	Mathematics Curriculum Framework	I CAN Learn® Lesson Number	I CAN Learn® Lesson Title
Number and Numerical Operations			
4.1.8.A	Number Sense		
	1. Extend understanding of the number system by constructing meanings for the following (unless otherwise noted, all indicators for grade 8 pertain to these sets of numbers as well):		
	· Rational numbers	MM1-602	Comparing and Ordering Rational Numbers
	· Percents	MPA-081	Converting Fractions, Decimals, and Percents I
		MPA-082	Converting Fractions, Decimals, and Percents II
	· Exponents	MPA-013	Using Powers and Exponents in Expressions
	· Roots	MPA-064	Finding Square Roots of Perfect Squares
		MPA-065	Estimating Square Roots
	· Absolute values	HA1-030	Using Opposites and Absolute Values
	· Numbers represented in scientific notation	MPA-021	Converting Between Standard and Scientific Notation
	2. Demonstrate a sense of the relative magnitudes of numbers.	MM1-602	Comparing and Ordering Rational Numbers
	3. Understand and use ratios, proportions, and percents (including percents greater than 100 and less than 1) in a variety of situations.	MPA-079	Unit rates
		MPA-080	Solving Proportions
		MPA-081	Converting Fractions, Decimals, and Percents I
		MPA-082	Converting Fractions, Decimals, and Percents II
	4. Compare and order numbers of all named types.	MM1-602	Comparing and Ordering Rational Numbers
	5. Use whole numbers, fractions, decimals, and percents to represent equivalent forms of the same number.	MPA-081	Converting Fractions, Decimals, and Percents I
		MPA-082	Converting Fractions, Decimals, and Percents II
	6. Recognize that repeating decimals correspond to fractions and determine their fractional equivalents. $5/7 = 0.714285714285... = 0.714285$	HA1-485	Writing Rational Numbers as Decimals or Fractions
	7. Construct meanings for common irrational numbers, such as π (pi) and the square root of 2.	MPA-065	Estimating Square Roots
		MPA-124	Classifying Numbers in the Real Number System
4.1.8.B	B. Numerical Operations		
	1. Use and explain procedures for performing calculations involving addition, subtraction, multiplication, division, and exponentiation with integers and all number types named above with:	Throughout	
	· Pencil-and-paper	Throughout	
	· Mental math	Throughout	
	· Calculator	Throughout	
	2. Use exponentiation to find whole number powers of numbers.	MPA-013	Using Powers and Exponents in Expressions

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	3. Find square and cube roots of numbers and understand the inverse nature of powers and roots.	HA1-492	Simplifying Square and Cube Roots
	4. Solve problems involving proportions and percents.	MPA-155	Comparing and Converting Rates
		MPA-121	Identifying Similar and Congruent Polygons Using Proportions
		MPA-087	Finding Percent Increase and Decrease
		MPA-126	Solving Real-World Problems Involving Sales Tax
		MPA-127	Solving Real-World Problems Involving Discounts, Markup, and Commission
		MPA-128	Solving Real-World Problems Involving Simple and Compound Interest
	5. Understand and apply the standard algebraic order of operations, including appropriate use of parentheses.	MPA-008	Order of Operations
4.1.8.C	C. Estimation		
	1. Estimate square and cube roots of numbers.	HA1-492	Simplifying Square and Cube Roots
		MPA-065	Estimating Square Roots
	2. Use equivalent representations of numbers such as fractions, decimals, and percents to facilitate estimation.	MPA-004	Using Rounding to Estimate
		MPA-005	Estimating Products and Quotients Using Patterns
		MPA-017	Rounding Decimals and Estimating Computations Using Decimals
	3. Recognize the limitations of estimation and assess the amount of error resulting from estimation.	MPA-006	Determining Reasonableness of Answers and Appropriate Method of Computation
		MPA-133	Distinguishing Between Exact and Approximate Answers
Geometry and Measurement			
4.2.8.A	Geometric Properties		
	1. Understand and apply concepts involving lines, angles, and planes.		
	· Complementary and supplementary angles	MPA-057	Identifying and Applying Supplementary and Complementary Angles
	· Vertical angles	MPA-105	Determining the Measure of Angles Made by Parallel Lines and a Transversal
	· Bisectors and perpendicular bisectors	*Activity	
	· Parallel, perpendicular, and intersecting planes	MPA-105	Determining the Measure of Angles Made by Parallel Lines and a Transversal
	· Intersection of plane with cube, cylinder, cone, and sphere	MPA-072	Identifying 3-D Figures
	2. Understand and apply the Pythagorean theorem.	HA1-515	Using the Pythagorean Theorem
	3. Understand and apply properties of polygons.	MPA-058	Identifying Polygons
	· Quadrilaterals, including squares, rectangles, parallelograms, trapezoids, rhombi	MPA-059	Classifying Triangles and Quadrilaterals
	· Regular polygons	MPA-060	Determining Which Figures Tessellate
	· Sum of measures of interior angles of a polygon	MPA-060	Determining Which Figures Tessellate
	· Which polygons can be used alone to generate a tessellation and why	MPA-060	Determining Which Figures Tessellate
	4. Understand and apply the concept of similarity.	MPA-121	Identifying Similar and Congruent Polygons Using Proportions
	· Using proportions to find missing measures	MPA-121	Identifying Similar and Congruent Polygons Using Proportions
	· Scale drawings	MPA-110	Solving Problems Using Proportions, Scale Drawings, Models, and Maps
	· Models of 3D objects	MPA-072	Identifying 3-D Figures
	5. Use logic and reasoning to make and support conjectures about geometric objects.	HGM-020	Using Inductive Reasoning
4.2.8.B	B. Transforming Shapes		
	1. Understand and apply transformations.	MPA-108	Graphing Translations and Reflections on the Coordinate Plane
	· Finding the image, given the pre-image, and vice-versa	MPA-108	Graphing Translations and Reflections on the Coordinate Plane
	· Sequence of transformations needed to map one figure onto another	MPA-108	Graphing Translations and Reflections on the Coordinate Plane
	· Reflections, rotations, and translations result in images congruent to the pre-image	MPA-180	Examining Line and Rotational Symmetry (New lesson)
	· Dilations (stretching/shrinking) result in images similar to the pre-image	MPA-120	Applying Dilations in the Coordinate Plane
	2. Use iterative procedures to generate geometric patterns.		

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	· Fractals (e.g., the Koch Snowflake)	HA1-447	Identifying Number Patterns
	· Self-similarity	HA1-448	Finding the nth Term of a Pattern
	· Construction of initial stages	HA1-447	Identifying Number Patterns
	· Patterns in successive stages (e.g., number of triangles in each stage of Sierpinski's Triangle)	HA1-448	Finding the nth Term of a Pattern
4.2.8.C	C. Coordinate Geometry		
	1. Use coordinates in four quadrants to represent geometric concepts.	MPA-160	Plotting Polygons and Finding the Area
	2. Use a coordinate grid to model and quantify transformations (e.g., translate right 4 units).	MPA-108	Graphing Translations and Reflections on the Coordinate Plane
4.2.8.D	D. Units of Measurement		
	1. Solve problems requiring calculations that involve different units of measurement within a measurement system (e.g., 4'3" plus 7'10" equals 12'1").	MPA-062	Converting Units in Customary System
		MPA-061	Converting Metric Units of Length, Capacity, and Mass
	2. Use approximate equivalents between standard and metric systems to estimate measurements (e.g., 5 kilometers is about 3 miles).	MPA-130	Developing a Sense of Relative Sizes of Measures
	3. Recognize that the degree of precision needed in calculations depends on how the results will be used and the instruments used to generate the measurements.	MPA-134	Calculating with Precision, Accuracy, and Significant Digits
	4. Select and use appropriate units and tools to measure quantities to the degree of precision needed in a particular problem-solving situation.	MPA-134	Calculating with Precision, Accuracy, and Significant Digits
	5. Recognize that all measurements of continuous quantities are approximations.	MPA-134	Calculating with Precision, Accuracy, and Significant Digits
	6. Solve problems that involve compound measurement units, such as speed (miles per hour), air pressure (pounds per square inch), and population density (persons per square mile).	*Activity	
4.2.8.E	E. Measuring Geometric Objects		
	1. Develop and apply strategies for finding perimeter and area.		
	· Geometric figures made by combining triangles, rectangles and circles or parts of circles	MPA-068	Finding the Area of Irregular Figures
	· Estimation of area using grids of various sizes	MPA-160	Plotting Polygons and Finding the Area
	· Impact of a dilation on the perimeter and area of a 2-dimensional figure	MPA-111	Comparing Perimeters, Areas, and Volumes of Similar Geometric Figures and Solids
	2. Recognize that the volume of a pyramid or cone is one-third of the volume of the prism or cylinder with the same base and height (e.g., use rice to compare volumes of figures with same base and height).	MPA-115	Finding the Volumes of Prisms, Cylinders, Pyramids, and Cones Using Models
		HA1-890	Using Models to Derive Formulas for Two-Dimensional Geometric Figures
	3. Develop and apply strategies and formulas for finding the surface area and volume of a three-dimensional figure.		
	· Volume - prism, cone, pyramid	MPA-115	Finding the Volumes of Prisms, Cylinders, Pyramids, and Cones Using Models
	· Surface area - prism (triangular or rectangular base), pyramid (triangular or rectangular base)	MPA-073	Finding the Surface Area of Rectangular Prisms
		MPA-106	Identifying a Solid Figure From a Net
	· Impact of a dilation on the surface area and volume of a three-dimensional figure	HA1-891	Using Models to Derive Formulas for Three-Dimensional Solids
	4. Use formulas to find the volume and surface area of a sphere.	HA1-891	Using Models to Derive Formulas for Three-Dimensional Solids
Patterns and Algebra			
4.3.8.A	Patterns		
	1. Recognize, describe, extend, and create patterns involving whole numbers, rational numbers, and integers.		
	· Descriptions using tables, verbal and symbolic rules, graphs, simple equations or expressions	MPA-270	Generating Algebraic Expressions from Patterns of Models

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	· Finite and infinite sequences	HA1-447	Identifying Number Patterns
		HA1-448	Finding the nth Term of a Pattern
	· Arithmetic sequences (i.e., sequences generated by repeated addition of a fixed number, positive or negative)	HA1-447	Identifying Number Patterns
	· Geometric sequences (i.e., sequences generated by repeated multiplication by a fixed positive ratio, greater than 1 or less than 1)	HA1-448	Finding the nth Term of a Pattern
	· Generating sequences by using calculators to repeatedly apply a formula	MPA-270	Generating Algebraic Expressions from Patterns of Models
4.3.8.B	B. Functions and Relationships		
	1. Graph functions, and understand and describe their general behavior.		
	· Equations involving two variables	HA1-380	Graphing Linear Equations
	· Rates of change (informal notion of slope)	MPA-135	Determining the Slope of a Line (New lesson)
		MPA-140	Examining Linear Equations in Slope-Intercept Form
	2. Recognize and describe the difference between linear and exponential growth, using tables, graphs, and equations.	MPA-150	Identifying and Graphing Linear and Nonlinear Functions
4.3.8.C	C. Modeling		
	1. Analyze functional relationships to explain how a change in one quantity can result in a change in another, using pictures, graphs, charts, and equations.	MPA-140	Examining Linear Equations in Slope-Intercept Form
	2. Use patterns, relations, symbolic algebra, and linear functions to model situations.		
	· Using concrete materials (manipulatives), tables, graphs, verbal rules, algebraic expressions/equations/inequalities	MPA-142	Solving Problems With Linear Functions and Direct Variation
	· Growth situations, such as population growth and compound interest, using recursive (e.g., NOW-NEXT) formulas (cf. science standard 5.5 and social studies standard 6.6)	MPA-142	Solving Problems With Linear Functions and Direct Variation
4.3.8.D	D. Procedures		
	1. Use graphing techniques on a number line.		
	· Absolute value	HA1-030	Using Opposites and Absolute Values
	· Arithmetic operations represented by vectors (arrows) (e.g., "-3 + 6" is "left 3, right 6")	HA1-035	Adding Real Numbers Using a Number Line
	2. Solve simple linear equations informally, graphically, and using formal algebraic methods.		
	· Multi-step, integer coefficients only (although answers may not be integers)	HA1-124	Using a Concrete Model to Solve One- and Two-Step Equations
		HA1-125	Solving Equations Using More Than One Property
		HA1-140	Solving Equations by Combining Like Terms
	· Using paper-and-pencil, calculators, graphing calculators, spreadsheets, and other technology	*Activity	
	3. Solve simple linear inequalities.	MPA-109	Solving and Graphing Linear Inequalities on a Number Line
	4. Create, evaluate, and simplify algebraic expressions involving variables.		
	· Order of operations, including appropriate use of parentheses	HA1-060	Evaluating Numerical Expressions Using the Order of Operations
	· Distributive property	HA1-076	Basic Distributive Property
	· Substitution of a number for a variable	HA1-005	Evaluating Algebraic Expressions
		HA1-065	Evaluating Expressions Containing Exponents
	· Translation of a verbal phrase or sentence into an algebraic expression, equation, or inequality, and vice versa	HA1-095	Translating Word Phrases into Algebraic Expressions
	5. Understand and apply the properties of operations, numbers, equations, and inequalities.		
	· Additive inverse	MPA-054	Solving One-Step Equations with Integers Using all Four Operations
	· Multiplicative inverse	MPA-054	Solving One-Step Equations with Integers Using all Four Operations

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	· Addition and multiplication properties of equality	MPA-100	Solving Two-Step Equations with Positive Coefficients
		MPA-165	Solving Two-Step Equations with Negative Coefficients
		MPA-101	Solving Two-Step Equations by Combining Like Terms
	· Addition and multiplication properties of inequalities	MPA-109	Solving and Graphing Linear Inequalities on a Number Line
Data Analysis, Probability, and Discrete Mathematics			
4.4.8.A	Data Analysis (or Statistics)		
	1. Select and use appropriate representations for sets of data, and measures of central tendency (mean, median, and mode).	MPA-095	Find the Mean, Median, and Mode
	· Type of display most appropriate for given data	MPA-098	Making Predictions from Graphs and Choosing the Correct Graph
	· Box-and-whisker plot, upper quartile, lower quartile	MPA-097	Constructing Box-and-Whisker Plots
	· Scatter plot	MPA-132	Interpreting and Creating Scatterplots
	· Calculators and computer used to record and process information	*Activity	
	· Finding the median and mean (weighted average) using frequency data.	MPA-095	Find the Mean, Median, and Mode
	· Effect of additional data on measures of central tendency	HA1-541	Analyzing Data Using the Measures of Central Tendency and the Range
	2. Make inferences and formulate and evaluate arguments based on displays and analysis of data.	MPA-098	Making Predictions from Graphs and Choosing the Correct Graph
	3. Estimate lines of best fit and use them to interpolate within the range of the data.	MPA-132	Interpreting and Creating Scatterplots
	4. Use surveys and sampling techniques to generate data and draw conclusions about large groups.	MM1-385	Collecting Data
4.4.8.B	B. Probability		
	1. Interpret probabilities as ratios, percents, and decimals.	MPA-090	Finding the Probability of Simple Real-Life Events
	2. Determine probabilities of compound events.	MPA-112	Constructing Sample Spaces for Compound Events (Dependent and Independent)
		MPA-113	Finding the Probability of Compound Events Through Experimentation
	3. Explore the probabilities of conditional events (e.g., if there are seven marbles in a bag, three red and four green, what is the probability that two marbles picked from the bag, without replacement, are both red).	*Activity	
	4. Model situations involving probability with simulations (using spinners, dice, calculators and computers) and theoretical models.	MM1-235	Finding Experimental Probability
	Frequency, relative frequency		
	5. Estimate probabilities and make predictions based on experimental and theoretical probabilities.	MM1-235	Finding Experimental Probability
	6. Play and analyze probability-based games, and discuss the concepts of fairness and expected value.	*Activity	
4.4.8.C	C. Discrete Mathematics—Systematic Listing and Counting		
	1. Apply the multiplication principle of counting.		
	· Permutations: ordered situations with replacement (e.g., number of possible license plates) vs. ordered situations without replacement (e.g., number of possible slates of 3 class officers from a 23 student class)	MPA-091	Finding the Number of Combinations of a Set of Objects
	· Factorial notation	MPA-091	Finding the Number of Combinations of a Set of Objects
	· Concept of combinations (e.g., number of possible delegations of 3 out of 23 students)	MPA-091	Finding the Number of Combinations of a Set of Objects
	2. Explore counting problems involving Venn diagrams with three attributes (e.g., there are 15, 20, and 25 students respectively in the chess club, the debating team, and the engineering society; how many different students belong to the three clubs if there are 6 students in chess and debating, 7 students in chess and engineering, 8 students in debating and engineering, and 2 students in all three?).	*Activity	

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	3. Apply techniques of systematic listing, counting, and reasoning in a variety of different contexts.	MPA-091	Finding the Number of Combinations of a Set of Objects
4.4.8.D	D. Discrete Mathematics—Vertex-Edge Graphs and Algorithms		
	1. Use vertex-edge graphs and algorithmic thinking to represent and find solutions to practical problems.		
	· Finding the shortest network connecting specified sites	*Activity	
	· Finding a minimal route that includes every street (e.g., for trash pick-up)	*Activity	
	· Finding the shortest route on a map from one site to another	*Activity	
	· Finding the shortest circuit on a map that makes a tour of specified sites	*Activity	
	· Limitations of computers (e.g., the number of routes for a delivery truck visiting n sites is $n!$, so finding the shortest circuit by examining all circuits would overwhelm the capacity of any computer, now or in the future, even if n is less than 100)	*Activity	

*Activities include Problem Sets of the Day and Journal Questions.

MM1-Fundamentals of Mathematics

MPA- Pre-Algebra

HA1-Algebra 1

HGM - Geometry (New course in development)

Note: Standards were taken from the New Jersey 8th Grade Mathematics Content Standards document adopted by the New Jersey State Board of Education in 1/9/2008.