Algebra I

UNIT TITLE	CORE TOPICS (Key Concepts & Real World Context)	MATH BENCHMARKS	MATH DISTRICT BENCHMARKS
CHAPTER 1	▪ Using variables ▪ Exponents and Order of Operations ▪ Exploring real numbers ▪ Adding real numbers ▪ Subtracting real numbers ▪ Multiplying and dividing real numbers ▪ The Distributive Property ▪ Properties of real numbers ▪ Graphing data on the coordinate plane		**IV-1-1 (H):** Develop an understanding of irrational, real, and complex numbers. **IV-1-4 (H):** Apply their understanding of number systems to model, and solve mathematical and applied problems. **I-1-2 (H):** Analyze, interpret, and translate among representations of patterns including tables, charts, graphs, matrices, and vectors. (M.S. 1-1-2) **I-1-3 (H):** Study and employ mathematical models of patterns to make inference, predictions, and decisions. (M.S. I-1-3) **I-1-5 (H):** Use patterns and reasoning to solve problems and explore new content. (M.S. I-1-5) **II-2-1 (H):** Locate and describe objects in terms of their position, including polar coordinates, three-dimensional Cartesian coordinates, vectors, and limits. (M.S. II-2-1) **IV-3-5 (H):** Apply their understanding of number relationships in solving problems. **V-1-2 (H):** Compute with real numbers, complex numbers, algebraic expressions, matrices and vectors using technology and for simple instance, with paper-and-pencil algorithms. (M.S. V-1-2, V-1-4) **V-1-3 (H):** Describe the properties of operations with numbers, algebraic expressions, vectors and matrices, and make generalizations about the properties of given mathematical systems. (M.S. V-1-1) **V-1-4 (H):** Efficiently and accurately apply operations with real numbers, complex numbers, algebraic expressions, matrices and vectors in solving problems. (M.S. V-1-4, V-1-3) **V-2-1 (H):** Identify important variables in a context, symbolize them and express their relationships algebraically. (M.S. V-2-1) **V-2-2 (H):** Represent algebraic concepts and relationships with matrices, spreadsheets, diagrams, graphs, tables, physical models, vectors, equations and inequalities; and translate among the various representations.

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UNIT TITLE	CORE TOPICS (Key Concepts & Real World Context)	MATH BENCHMARKS	MATH DISTRICT BENCHMARKS
			(M.S. V-2-2)
CHAPTER 2	▪ Solving one-step equations ▪ Solving two-step equations ▪ Solving multi-step equations ▪ Equations with variables on both sides ▪ Equations and problem solving ▪ Formulas ▪ Using measures of central tendencies		**III-1-1 (H):** Collect and explore data through observation, measurement, surveys, sampling techniques, and simulations **III-1-12 (H):** Organize data using tables, charts, graphs, spreadsheets, and databases. (M.S. III-1-2) **IV-3-1 (H):** Compare and order real numbers and compare rational approximations to exact values. **IV-3-2 (H):** Extend the relationships of primes, factors, multiples and divisibility in an algebraic setting. **IV-3-4 (H):** Express number relationships using positive and negative rational exponents, logarithms, and radicals. **IV-3-5 (H):** Apply their understanding of number relationships in solving problems. **V-2-1 (H):** Identify important variables in a context, symbolize them, and express their relationships algebraically. (M.S. V-2-1)
CHAPTER 3	▪ Inequalities and their graphs ▪ Solving inequalities using addition and subtraction ▪ Solving inequalities using multiplication and division ▪ Solving multi-step inequalities ▪ Compound inequalities ▪ Absolute value equations and inequalities.		**V-2-2 (H):** Represent algebraic concepts and relationships with matrices, spreadsheets, diagrams, graphs, tables, physical models, vectors, equations, and inequalities; and translate among the various representations. (M.S. V-2-2) **V-2-3 (H):** Solve linear equations and inequalities algebraically and non-linear equations using graphing, symbol-manipulating or spreadsheet technology; and solve linear and non-linear systems using appropriate methods. (M.S. V-2-3) Chapter 3 similar to Chapter 2

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UNIT TITLE	CORE TOPICS (Key Concepts & Real World Context)	MATH BENCHMARKS	MATH DISTRICT BENCHMARKS
CHAPTER 4	▪ Ratio and proportion ▪ Proportions and similar figures ▪ Proportions and percent equations ▪ Percent of change ▪ Applying ratios to probability ▪ Probability of compound events		**II-3-5 (H):** Use proportional reasoning and indirect measurements, including applications of trigonometric ratios, to measure inaccessible distances and to determine derived measures such as density. **II-3-3 (H):** Estimate measures with a specified degree of accuracy and evaluate measurements for accuracy, precision and tolerance. (M.S. II-3-3) **II-3-4 (H):** Interpret measurements and explain how changes in one measure may affect other measures. **II-3-6 (H):** Apply measurement to describe the real world and to solve problems. **VI-1-1 (H):** Develop an understanding of randomness and chance variation and describe chance and certainty in the language of probability. **VI-1-2 (H):** Give a mathematical definition of probability and determine the probabilities of more complex events, and generate and interpret probability distributions. **VI-1-3 (H):** Analyze events to determine their dependence or independence and calculate probabilities of compound events. **VI-1-5 (H):** Conduct probability experiments and simulations, to model and solve problems, including compound events. **IV-3-1 (H):** Compare and order real numbers and compare rational approximations to exact values. **IV-3-2 (H):** Extend the relationships of primes, factors, multiples, and divisibility in an algebraic setting. **IV-3-5 (H):** Apply their understanding of number relationships in solving problems.
CHAPTER 5	▪ Relating graphs to events ▪ Relations and functions		**I-1-1 (H):** Analyze and generalize mathematical patterns including sequences, series, and recursive patterns. (M.S. I-1-1) **I-1-2 (H):** Analyze, interpret, and translate among representations of patterns including

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UNIT TITLE	CORE TOPICS (Key Concepts & Real World Context)	MATH BENCHMARKS	MATH DISTRICT BENCHMARKS
	▪ Function rules, tables, and graphs ▪ Writing a function rule ▪ Direct variation ▪ Describing number patterns		tables, charts, graphs, matrices, and vectors. (M.S. I-1-2) **I-1-3 (H):** Study and employ mathematical models of patterns to make inference, predictions and decisions. (M.S. I-1-3) **I-1-4 (H):** Explore patterns (graphic, numeric, etc.) characteristic of families of functions; explore structural patterns within systems of objects, operations or relations. (M.S. I-1-4) **I-1-5 (H):** Use patterns and reasoning to solve problems and explore new content. (M.S. I-1-5) **I-2-2 (H):** Develop a mathematical concept of function and recognize that functions display characteristic patterns of change (e.g. linear, quadratic, exponential). **I-2-3 (H):** Expand their understanding of function to include non-linear functions, composition of functions, inverses of functions, the piecewise, and recursively defined functions.
CHAPTER 6	▪ Rate of change and slope ▪ Slope-intercept form ▪ Standard form ▪ Point-slope form and writing linear equations ▪ Parallel and perpendicular lines ▪ Scatter plots and equations of lines ▪ Graphing absolute value equations		**I-2-1 (H):** Identify and describe the nature of change and begin to use the more formal language such as rate of change, continuity, limit, distribution, and deviation. **I-2-2 (H):** Develop a mathematical concept of function and recognize that functions display characteristic patterns of change (e.g. linear, quadratic, exponential) **I-2-6 (H):** Increase their use of functions and mathematical models to solve problems in context. **IV-3-2 (H):** Extend the relationships of primes, factors, multiples, and divisibility in an algebraic setting. **V-2-2 (H):** Represent algebraic concepts and relationships with matrices, spreadsheets, diagrams, graphs, tables, physical models, vectors, equations and inequalities, and translate among the various representations. (M.S. V-2-2) **V-2-1 (H):** Identify important variables in a context, symbolize them and express their

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UNIT TITLE	CORE TOPICS (Key Concepts & Real World Context)	MATH BENCHMARKS	MATH DISTRICT BENCHMARKS
			relationships algebraically. (M.S. V-2-1) **V-2-3 (H):** Solve linear equations and inequalities algebraically and non-linear equations using graphing, symbol-manipulating or spreadsheet technology; and solve linear and non-linear systems using appropriate methods. (M.S. V-2-3)
CHAPTER 7	▪ Solving systems by graphing ▪ Solving systems using substitution ▪ Solving systems using elimination ▪ Applications of linear systems ▪ Linear inequalities ▪ Systems of linear inequalities		**V-2-1 (H):** Identify important variables in a context, symbolize them and express their relationships algebraically. (M.S. V-2-1) **V-2-2 (H):** Represent algebraic concepts and relationships with matrices, spreadsheets, diagrams, graphs, tables, physical models, vectors, equations and inequalities; and translate among the various representations. (M.S. V-2-2) **V-2-3 (H):** Solve linear equations and inequalities algebraically and non-linear equations using graphing, symbol-manipulating or spreadsheet technology; and solve linear and non-linear systems using appropriate methods. (M.S. V-2-3) **V-2-4 (H):** Analyze problems that can be modeled by functions, determine strategies for solving the problems and evaluate the adequacy of the solutions in the context of the problems. (M.S. V-2-4) **V-2-5 (H):** Explore problems that reflect the contemporary uses of mathematics in significant contexts and use the power of technology and algebraic and analytic reasoning to experience the ways mathematics is used in society. (M.S. V-2-5)
CHAPTER 8	▪ Zero and negative exponents ▪ Scientific Notation		**I-2-2 (H):** Develop a mathematical concept of function and recognize that functions display characteristic patterns of change (e.g. linear, quadratic, exponential).

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UNIT TITLE	CORE TOPICS (Key Concepts & Real World Context)	MATH BENCHMARKS	MATH DISTRICT BENCHMARKS
	▪ Multiplication properties of exponents ▪ More multiplication properties of exponents ▪ Division properties of exponents ▪ Geometric sequences ▪ Exponential functions ▪ Exponential growth and decay		**I-1-4 (H):** Explore patterns (graphic, numeric, etc.) characteristic of families of functions; explore structural patterns within systems of objects, operations or relations. (M.S. I-1-4) **I-2-3 (H):** Expand their understanding of function to include non-linear functions, composition of functions, inverses of functions, the piecewise, and recursively defined functions. **I-2-6 (H):** Increase their use of functions and mathematical models to solve problems in context. **IV-3-4 (H):** Express number relationships using positive and negative rational exponents, logarithms, and radicals. **IV-3-5 (H):** Apply their understanding of number relationships in solving problems. **IV-2-2 (H):** Developing an understanding of more complex representations of numbers, including exponential and logarithmic expressions, and select an appropriate representation to facilitate problem solving. **I-1-1 (H):** Analyze and generalize mathematical patterns including sequences, series, and recursive patterns. (M.S. I-1-1)
CHAPTER 9	▪ Adding and subtracting polynomials ▪ Multiplying and factoring ▪ Multiplying binomials ▪ Multiplying special cases ▪ Factoring trinomials of the Type $x^2 + bx + c$ ▪ Factoring trinomials of the Type $ax^2 + bx + c$ ▪ Factoring special cases ▪ Factoring by grouping		**IV-1-3 (H):** Develop an understanding of the properties of the real and complex number systems and of the properties of special numbers including pi, I, e, and conjugates. **V-1-1 (H):** Present and explain geometric and symbolic models for operations with real and complex numbers and algebraic expressions. (M.S. V-1-1) **V-1-2 (H):** Compute with real numbers, complex numbers, algebraic expressions, matrices and vectors using technology and for simple instance, with paper-and-pencil algorithms. (M.S. V-1-2, V-1-4) **V-1-3 (H):** Describe the properties of operations with numbers, algebraic expressions, vectors and matrices, and make generalizations about the properties of given

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UNIT TITLE	CORE TOPICS (Key Concepts & Real World Context)	MATH BENCHMARKS	MATH DISTRICT BENCHMARKS
			mathematical systems. (M.S. V-1-1) **V-1-4 (H):** Efficiently and accurately apply operations with real numbers, complex numbers, algebraic expressions, matrices and vectors in solving problems. (M.S. V-1-4, V-1-3)
CHAPTER 10	▪ Exploring quadratic graphs ▪ Quadratic functions ▪ Finding and estimating square roots ▪ Solving quadratic equations ▪ Factoring to solve quadratic equations ▪ Completing the square ▪ Using the quadratic formula ▪ Using the discriminant ▪ Choosing a model		**I-1-1 (H):** Analyze and generalize mathematical patterns including sequences, series, and recursive patterns. (M.S. I-1-1) **I-1-2 (H):** Analyze, interpret, and translate among representations of patterns including tables, charts, graphs, matrices, and vectors. (M.S. I-1-2) **I-1-4 (H):** Explore patterns (graphic, numeric, etc.) characteristic of families of functions; explore structural patterns within systems of objects, operations or relations. (M.S. I-1-4) **I-1-5 (H):** Use patterns and reasoning to solve problems and explore new content. (M.S. I-1-5) **I-2-2 (H):** Develop a mathematical concept of function and recognize that functions display characteristic patterns of change (e.g. linear, quadratic, exponential). **I-2-3 (H):** Expand their understanding of function to include non-linear functions, composition of functions, inverses of functions, the piecewise, and recursively defined functions. **I-2-5 (H):** Differentiate and analyze classes of functions including linear, power, quadratic, exponential, circular and trigonometric functions, and realize that many different situations can be modeled by a particular type of function. **I-2-6 (H):** Increase their use of functions and mathematical models to solve problems in context. **V-2-1 (H):** Identify important variables in a context, symbolize them and express their relationships algebraically. (M.S. V-2-1) **V-2-2 (H):** Represent algebraic concepts and relationships with matrices, spreadsheets, diagrams, graphs, tables, physical models,

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UNIT TITLE	CORE TOPICS (Key Concepts & Real World Context)	MATH BENCHMARKS	MATH DISTRICT BENCHMARKS
			vectors, equations and inequalities; and translate among the various representations. (M.S. V-2-2) **V-2-3 (H):** Solve linear equations and inequalities algebraically and non-linear equations using graphing, symbol-manipulating or spreadsheet technology; and solve linear and non-linear systems using appropriate methods. (M.S. V-2-3) **V-2-4 (H):** Analyze problems that can be modeled by functions, determine strategies for solving the problems and evaluate the adequacy of the solutions in the context of the problems. (M.S. V-2-4)
CHAPTER 11	▪ Simplifying radicals ▪ The Pythagorean Theorem ▪ The distance and midpoint formulas ▪ Operations with radical expressions ▪ Solving radical equations ▪ Graphing square root functions ▪ Trigonometric ratios		**I-2-5 (H):** Differentiate and analyze classes of functions including linear, power, quadratic, exponential, circular and trigonometric functions, and realize that many different situations can be modeled by a particular type of function. **I-2-6 (H):** Increase their use of functions and mathematical models to solve problems in context. **II-2-1 (H):** Locate and describe objects in terms of their position, including polar coordinates, three-dimensional Cartesian coordinates, vectors, and limits. (M.S. II-2-1) **II-2-3 (H):** Give precise mathematical descriptions of transformations and describe the effects of transformations on size, shape, position, and orientation. **IV-1-1 (H):** Develop an understanding of irrational, real, and complex numbers. **IV-1-2 (H):** Use scientific notation to express large numbers and small numbers between 0 and 1. **IV-1-3 (H):** Develop an understanding of the properties of the real and complex number systems and of the properties of special numbers including pi, I, e, and conjugates. **IV-1-4 (H):** Apply their understanding of number systems to model, and solve

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UNIT TITLE	CORE TOPICS (Key Concepts & Real World Context)	MATH BENCHMARKS	MATH DISTRICT BENCHMARKS
			mathematical and applied problems. **IV-2-1 (H):** Give decimal representations of rational and irrational numbers and coordinate and vector representations of complex numbers. **IV-2-2 (H):** Developing an understanding of more complex representations of numbers, including exponential and logarithmic expressions, and select an appropriate representation to facilitate problem solving. **IV-3-1 (H):** Compare and order real numbers and compare rational approximations to exact values. **IV-3-2 (H):** Extend the relationships of primes, factors, multiples, and divisibility in an algebraic setting. **IV-3-4 (H):** Express number relationships using positive and negative rational exponents, logarithms and radicals. **IV-3-5 (H):** Apply their understanding of number relationships in solving problems.
CHAPTER 12	▪ Inverse variation ▪ Graphing rational functions ▪ Simplifying rational expressions ▪ Multiplying and dividing rational expressions ▪ Dividing polynomials ▪ Adding and subtracting rational expressions ▪ Solving rational equations ▪ Counting methods and permutations ▪ Combinations		**VI-2-1 (H):** Derive and use formulas for calculating permutations and combinations. **VI-1-1 (H):** Develop an understanding of randomness and chance variation and describe chance and certainty in the language of probability. **VI-1-2 (H):** Give a mathematical definition of probability and determine the probabilities of more complex events, and generate and interpret probability distributions. **IV-2-1 (H):** Give decimal representations of rational and irrational numbers and coordinate and vector representations of complex numbers. **V-1-2 (H):** Compute with real numbers, complex numbers, algebraic expressions, matrices and vectors using technology and for simple instance, with paper-and-pencil algorithms. (M.S. V-1-2, V-1-4) **IV-2-5 (H):** Select appropriate representations for numbers, including representations of

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UNIT TITLE	CORE TOPICS (Key Concepts & Real World Context)	MATH BENCHMARKS	MATH DISTRICT BENCHMARKS
			rational and irrational numbers and coordinate and vector representations of complex numbers, in order to simplify and solve problems. **IV-3-1 (H):** Compare and order real numbers and compare rational approximations to exact values. **IV-3-2 (H):** Extend the relationships of primes, factors, multiples, and divisibility in an algebraic setting. **IV-3-4 (H):** Express number relationships using positive and negative rational exponents, logarithms and radicals. **IV-3-5 (H):** Apply their understanding of number relationships in solving problems. **V-1-4 (H):** Efficiently and accurately apply operations with real numbers, complex numbers, algebraic expressions, matrices and vectors in solving problems. (M.S. V-1-4, V-1-3) **VI-2-1 (H):** Derive and use formulas for calculating permutations and combinations.