

**URBANDALE COMMUNITY SCHOOL DISTRICT  
CURRICULUM FRAMEWORK OUTLINE**

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<b>SUBJECT:</b>	<b>Mathematics</b>	
<b>COURSE TITLE:</b>	<b>Algebra I</b>	<b>2 Credits/2 Semesters</b>

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**COURSE DESCRIPTION:**

Algebra I provides the opportunities for students to develop mathematical concepts in a variety of applications. The emphasis is on the use of algebraic equations to model real data and solve problems. Algebra I provides the means of operating with concepts at an abstract level and then applying them. It gives students the opportunities to represent situations that involve variable quantities with expressions, equations, and inequalities; use tables and graphs; and solve equations and inequalities. Students successful in Algebra I are able to use statistics, graphing techniques, technology, and estimation to describe the world around them. Students are able to solve equations and inequalities, simplify algebraic expressions, and apply various problem-solving skills. Students in Algebra I integrate reading, writing, speaking, listening, and cooperative learning skills in order to expand their knowledge and apply it to real-life situations.

**STANDARDS AND COURSE BENCHMARKS WITH INDICATORS:**

**In order that our students may achieve the maximum benefit from their talents and abilities, the students of Urbandale Community School District's Algebra I course should be able to...**

**Standard I: Understand real and complex number systems.**

**Benchmark: Extend the properties of exponents to rational exponents. (Iowa Core: HSN.RN. A.1, 2)**

Indicators: Rewrite expressions involving radicals and rational exponents using the properties of exponents, and justify their work.

**Benchmark: Use properties of rational and irrational numbers (Iowa Core: HSN.RN.3)**

Indicators: Know and justify that the sum or product of two rational numbers is rational.  
Know and justify that the sum of a rational number and an irrational number is irrational.  
Know and justify that the product of a nonzero rational number and an irrational number is irrational.

**Standard II: Understand quantities.**

**Benchmark: Reason quantitatively and use units to solve problems. (Iowa Core: HSN.Q.A.1, 2, 3)**

Indicators: Interpret units in the context of the problem.  
Use units to evaluate the appropriateness of the solution.

Choose the appropriate units for a specific formula.  
Choose and interpret both the scale and the origin in graphs and data displays.  
Determine and interpret appropriate quantities when using modeling.  
Determine the accuracy of values based on their limitations in the context of the situation.

**Standard III: Understand the use of expressions.**

**Benchmarks: Interpret the structure of expressions. (Iowa Core: HSA.SSE.A.1a, 1b, 2)**

Indicators: Interpret and identify the parts of an expression, such as terms, factors, coefficients, and exponents.  
Rewrite algebraic expressions in different equivalent forms such as factoring or combining like terms.

**Benchmark: Write expressions in equivalent forms to solve problems. (Iowa Core: HSA.SSE.B.3a, 3b, 3c)**

Indicators: Solve quadratic expressions using factoring.  
Solve quadratic equations by completing the square.  
Use properties of exponents to rewrite expressions.

**Benchmark: Perform arithmetic operations on polynomials. (Iowa Core: HSA.APR.A.1)**

Indicators: Add, subtract, and multiply polynomials and understand how closure applies under these operations.

**Standard IV: Create equations.**

**Benchmark: Create equations that describe numbers or relationships. (Iowa Core HSA.CED.A. 1, 2, 3, 4)**

Indicators: Write and solve one variable equations.  
Write and solve one variable inequalities.  
Create equations in two or more variables to represent relationships between quantities.  
Graph equations on coordinate planes with labels for axes and scales.  
Use equations and inequalities to model real world applications and check reasonableness of answers.  
Solve for an appropriate variable in a formula.

**Standard V: Demonstrate reasoning with equations and inequalities.**

**Benchmark: Understand solving equations as a process of reasoning and explain the reasoning. (Iowa Core: HSA.REI.A.1)**

Indicators: Justify each step in solving an equation.

**Benchmark: Solve equations and inequalities in one variable. (Iowa Core: HSA.REI.B.3, 4a, 4b)**

Indicators: Solve linear equations in one variable, including equations with coefficients represented by letters.  
Solve linear inequalities in one variable, including inequalities with coefficients represented by letters.  
Complete the square to transform equations.  
Derive the quadratic formula using the method of completing the square.  
Solve quadratic equations by the most appropriate method.  
Recognize when the quadratic formula gives complex solutions and write them as  $a \pm bi$  for real numbers  $a$  and  $b$ .

**Benchmark: Solve systems of equations. (Iowa Core: HSA.REI.C. 5, 6, 7)**

Indicators: Solve systems by graphing.  
Solve systems of equations using the elimination method.  
Solve systems of equations using the substitution method.  
Solve a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

**Benchmark: Represent and solve equations and inequalities graphically. (Iowa Core: HSA.REI.D.10, 11, 12)**

Indicators: Graph linear and nonlinear 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  $f(x) = g(x)$ .  
Solve by graphing sides of the equation.  
Graph a linear inequality.  
Graph a system of linear inequalities.

**Standard VI: Understand functions.**

**Benchmark: Understand the concept of a function and use function notation. (Iowa Core: HSF.IF.A. 1, 2, 3)**

Indicators: Demonstrate understanding 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.  
Demonstrate an understanding of function notation and evaluate functions for inputs in their domains.  
Interpret statements that use function notation in terms of a context.  
Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

**Benchmark: Interpret functions that arise in applications in terms of a context. (Iowa Core: HSF.IF.B. 4, 5, 6)**

Indicators: Given a function, identify key features that include: intercepts; intervals where the function is increasing, decreasing, positive, or negative.

Sketch a graph with key features that include: intercepts; intervals where the function is increasing, decreasing, positive, or negative.

State appropriate domain.

Calculate, interpret, and estimate the rate of change from a graph.

**Benchmark: Analyze functions using different representations. (Iowa Core: HSF.IF.C. 7a, 7b, 7e, 8a, 8b, 9)**

Indicators: Use the process of factoring in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

Use the process of 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.

Use the properties of exponents to interpret expressions for exponential functions. 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.

Compare properties of two functions each represented in a different way.

**Benchmark: Build a function that models a relationship between two quantities. F.BF.1a, 1b, 2**

Indicators/Success criteria:

Determine an explicit expression from a context.

Create new functions using arithmetic operations.

**Benchmark: Build new functions from existing functions. F.BF.3, 4a**

Indicators/Success criteria:

Perform geometric transformations of graphs.

**Benchmark: Construct and compare linear, quadratic, and absolute-value exponential equations. F.LE.1a, 1b, 1c, 2, 3**

Indicators/Success criteria:

Determine slope.

Demonstrate that exponential functions grow by equal factors over equal intervals.

Apply constant rate of change.

Apply exponential rate of change.

Construct linear and exponential functions, given a graph.

Construct linear and exponential functions given a real world application.

Construct linear and exponential functions given two ordered pairs.

Demonstrate using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

**Benchmark: Interpret expressions for functions in terms of the situation they model. (Iowa Core: HSF.LE.B.5)**

Indicators: Interpret linear function parameters in a real world situation.  
Interpret exponential function parameters in a real world situation.

**Standard VII: Understand statistics & probability.**

**Benchmark: Summarize, represent, and interpret data on a single count or measurement variable. (Iowa Core: HSS.ID.A. 1, 2, 3)**

Indicators: Represent data with plots on the real number line (dot plots, histograms, and box plots).  
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.  
Interpret differences in shape, center, and spread in the context of data sets, accounting for possible effects of extreme data points (outliers).

**Benchmark: Summarize, represent, and interpret data on two categorical and quantitative variables. (Iowa Core: HSS.ID.B. 5, 6a, 6b, 6c)**

Indicators: 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.  
Represent data on two quantitative variables on 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.  
Use given functions or choose a function suggested by the context.  
Emphasize linear, quadratic, and exponential models.  
Informally assess the fit of a function by plotting and analyzing residuals.  
Fit a linear function for a scatter plot that suggests a linear association.

**Benchmark: Interpret linear models. (Iowa Core: HSS.ID.C. 7, 8, 9)**

Indicators: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.  
Compute (using technology) and interpret the correlation coefficient of a linear fit.  
Distinguish between correlation and causation.

No student enrolled in the Urbandale Community School District shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination in the District's programs on the basis of race, color, creed, sex, religion, marital status, ethnic background, national origin, disability, sexual orientation, gender identity, or socio-economic background. The policy of the District shall be to provide educational programs and opportunities for students as needed on the basis of individual interests, values, abilities and potential.

