URBANDALE COMMUNITY SCHOOL DISTRICT
CURRICULUM FRAMEWORK OUTLINE

SUBJECT: **Mathematics**
COURSE TITLE: **Algebra IB**   **2 Credits/2 Semesters**
PREREQUISITES: Algebra I credit or Algebra IA credit or Teacher Approval

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COURSE DESCRIPTION:
Algebra I B is the second year of the two-year course sequence of Algebra I A and B. This course is designed for students who want to take algebra but find it hard the abstract concepts difficult to grasp and need additional time to refine skills and build confidence. Algebra IB allows students to include the same curriculum as students in second semester Algebra I. Students will be able to spend more time on each concept and will have more time to practice and demonstrate skills that will develop and internalize the abstract concepts presented in Algebra.

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 IB 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.

Standard II: Understand quantities.

Benchmark: Reason quantitatively and use units to solve problems. (Iowa Core: HSN.Q.A.1, 2, 3)
Indicators: Choose and interpret both the scale and the origin in graphs and data displays.

Standard III: Understand the use of expressions.

Benchmarks: Interpret the structure of expressions. (Iowa Core: HSA.SSE.A.1a, 1b, 2)
Indicators: 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: 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: Solve equations and inequalities in one variable. (Iowa Core: HSA.REI.B.3, 4a, 4b)
Indicators: 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: **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 new functions from existing functions. (Iowa Core: HSF.BF.3, 4)**

Indicators: Perform geometric transformations of graphs.

Benchmark: **Construct and compare linear, quadratic, and exponential equations. (Iowa Core: HSF.LE.1, 2, 3)**

Indicators: 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: 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.