Algebra 1
Core Resource: [Illustrative Mathematics Algebra 1](#)
Semester 1

Unit 1: One Variable Statistics (~19 days, IM Unit 1)

Essential Learning

In this unit on one-variable statistics, students discuss the difference between statistical and non-statistical questions and classify that data as numerical or categorical. They represent and interpret data using data displays, and describe distributions using the appropriate terminology. They create data displays and calculate summary statistics using technology, then interpret the values in context. They learn that standard deviation is a measure of variability, and they interpret standard deviation in context. They recognize outliers, investigate their source, make decisions about excluding them from the data set, and understand how the presence of outliers impacts measures of center and measures of variability. They compare measures of center and the standard deviation and the interquartile range for different data sets. In the culminating activity, students pose and answer a statistical question by designing an experiment, collecting data, and analyzing data.

Priority Standards

HSS-ID.A.2: 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.

Co-Requisite Skills/Knowledge	Non-Negotiable New Skills/Knowledge/Concepts
Calculate mean and median Create a dot plot Create a histogram	Calculate 5 Number Summary Create Box Plot Determine shape of data distribution Interpret histograms, dot plots, and box plots. Identify, interpret, and compare measures of center and spread (variability) Interpret how extremes affect center and spread (variability)

Unit 2A: Linear Equations and Inequalities (~24 days, IM Unit 2)

Essential Learning

In this unit, students expand and deepen their prior understanding of expressions, equations, and inequalities. Students reason about equations, inequalities, and systems of equations and inequalities as ways to represent constraints, and they reason about the process of solving equations and inequalities in terms of finding values that satisfy those constraints. The process of finding solutions may involve rewriting and manipulating equations. Students learn to explain and validate the steps to do so. Throughout the unit, students practice reasoning about situations and mathematical representations, interpreting expressions and numbers in context, and using mathematical tools to model quantities and relationships.

Priority Standards

HSA-CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

HSA-CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

HSF-IF.C.7.a: Graph linear and quadratic functions and show intercepts, maxima, and minima.

HSA-SSE.B.3: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*

Co-Requisite Skills/Knowledge	Non-Negotiable New Skills/Knowledge/Concepts
Graph line in slope intercept form Find slope from table, two points, and graph Write a linear equation in slope-intercept form from a graph, table and two points. Solving equations: one-step, two-step, distributing, combining like terms, variables on both sides (by undoing) No solution, infinitely many solutions, one solution Plotting inequalities on a number line Inequality notation	Graph a line from standard form Write, solve, and graph linear equations and inequalities, including when in context Rearrange a multi-variable equation to isolate a variable Create and/or identify equivalent expressions and equations.

Unit 2B/3: Two-Variable Statistics and Systems of Equations (~18 days, IM Unit 2 + 3)

Essential Learning

In grade 8, students informally constructed scatter plots and lines of fit, noticed linear patterns, and observed associations in categorical data using two-way tables. In this unit, students revisit two-way tables to find associations in categorical data using relative frequencies. The unit also builds on previous knowledge of scatter plots by assessing how well a linear model matches the data using residuals as well as the correlation coefficient for best-fit lines (found using technology). It closes with an exploration of the difference between correlation and causal relationships as well as an opportunity to apply this learning to anthropology and sports.

Priority Standards

HSA-REI.C.6: Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

HSA-REI.D.12: Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

HSA-SSE.B.3: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*

Co-Requisite Skills/Knowledge	Non-Negotiable New Skills/Knowledge/Concepts
Recognize that a system of linear equations can have one solution, no solution, or infinitely many solutions (algebraically and graphically).	Interpret a scatter plot and line of best fit and use a line of best fit to make a prediction. Write and graph a system of linear equations and linear inequalities Solve a system of linear equations using graphing, substitution, and elimination, including those with no solutions/infinitely many solutions. Identify the solutions to a system of inequalities.

Unit 4: Functions (~14 days, IM Unit 4)

Essential Learning

In this unit, students expand their understanding of functions, building on what they learned in grade 8. Students develop their capacity to represent, interpret, and use functions to make sense of quantities in situations and to solve problems. They are introduced to new tools for communicating about functions: function notation, domain and range, average rates of change, and mathematical terms for describing key features of graphs. They also develop their ability to gather information about a function from its graph, by connecting features of the graph to features of the situation and other representations, and to sketch a graph that tells the story about the function. Along the way, students begin to distinguish categories of functions: linear functions, piecewise-defined functions (the absolute value function, in particular), and inverse functions. Throughout the unit, students use, interpret, and connect the different representation of functions, both in and out of context.

Priority Standards

HSF-IF.A.2: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Co-Requisite Skills/Knowledge	Non-Negotiable New Skills/Knowledge/Concepts
Definition of function, input/output, and independent/dependent variable Determine if a graph represents a function.	Write, interpret, evaluate, and use function notation. Identify and interpret key features of graphs. Comparing and interpreting graphs. Describe the domain and range in words.

Semester 2

Unit 5: Exponential Functions (~30 days, IM Unit 5)

Essential Learning

In this unit, students are introduced to exponential relationships. Students learn that exponential relationships are characterized by a constant quotient over equal intervals, and compare them to linear relationships which are characterized by a constant difference over equal intervals. They encounter contexts with quantities that change exponentially. These contexts are presented verbally and with tables and graphs. They construct equations and use them to model situations and solve problems. They learn that the output of an increasing exponential function is eventually greater than the output of an increasing linear function for the same input.

Priority Standards

HSA-CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

HSF-IF.A.2: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

HSF-IF.C.8.b: Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)12^t$, $y = (1.2)^t/10$, and classify them as representing exponential growth or decay.

Co-Requisite Skills/Knowledge	Non-Negotiable New Skills/Knowledge/Concepts
Exponent Rules Multivariable distribution Percentage (percent/decimal conversion, percent change) Order of operations regarding powers	Determine if a function is linear or exponential. Determine if an exponential function is growth or decay (from multiple representations) Identify and calculate percentage change (from multiple representations). Write and/or interpret an exponential function (from multiple representations).

Unit 6: Introduction to Quadratic Functions (~24 days, IM Unit 6

Essential Learning

In this unit, students study quadratic functions systematically. They look at patterns which grow quadratically and contrast them with linear and exponential growth. Then they examine other quadratic relationships via tables, graphs, and equations, gaining appreciation for some of the special features of quadratic functions and the situations they represent. They analyze equivalent quadratic expressions and how these expressions help to reveal important behavior of the associated quadratic function and its graph. They gain an appreciation for the factored, standard, and vertex forms of a quadratic function and use these forms to solve problems.

Priority Standards

HSF-IF.A.2: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

HSF-IF.C.7.a: Graph linear and quadratic functions and show intercepts, maxima, and minima.

Co-Requisite Skills/Knowledge	Non-Negotiable New Skills/Knowledge/Concepts
	Multiply binomials Identify and interpret key features (direction, x-intercepts, y-intercept, vertex, min/max) of quadratic graphs and equations in standard form, factored form and vertex form. Introduce Zero Product Property Graph a quadratic function from factored form (x-intercepts, vertex, y-intercept). Identify appropriate domain and range for a quadratic graph in context.

Unit 7: Quadratic Functions (~31 days, IM Unit 7)

Essential Learning

In this unit, students interpret, write, and solve quadratic equations. They learn that writing and solving quadratic equations is a way to precisely describe and answer questions about quadratic functions. It is especially useful for finding input values that produce certain outputs.

Students solve quadratic equations by reasoning, by rewriting expressions in factored form and using the zero product property, by completing the square, and by applying the quadratic formula. They also rewrite expressions in vertex form to solve problems about the maximum or minimum value of a function. Along the way, students see that quadratic equations may have 2, 1, or 0 solutions, and that the solutions may be rational or irrational.

Priority Standards

HSF-IF.A.2: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

HSF-IF.C.7.a: Graph linear and quadratic functions and show intercepts, maxima, and minima.

HSF-IF.C.8.a: Use the process of factoring and 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

HSA-CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

HSA-REI.B.4: Solve quadratic equations in one variable

HSA-SSE.B.3: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*

Co-Requisite Skills/Knowledge	Non-Negotiable New Skills/Knowledge/Concepts
GCF Factors	Factor trinomials Identify and factor special cases (difference of squares, perfect squares when a value =1) Solve quadratics by reasoning/square root, Zero Product Property, quadratic formula.

Mathematical Practices	Definitions
	Co-Requisite Skills/Knowledge: These are the skills and concepts that students should have encountered prior to the unit of study. Teachers should gather data regularly on their students and might use the Pre-Unit readiness assessments to determine their students' mastery of these skills. Based on data collected and teacher observation, these skills may need to be re-engaged with in order to best support students in learning the content in the unit. These are things that can be differentiated based on the students who need additional support or can be re-engaged whole class if necessary.
Make sense of problems and persevere in solving them	
	Priority Standards: These are the course standards from the unit that represent the major content of the course and should be re-engaged with if students need additional support or time to master them. These are standards that we guarantee students will master before the end of the course.
Reason abstractly and quantitatively	
	Non-Negotiable New SKills/Knowledge/Concepts: These are the new skills/concepts that students should know and be able to do by the completion of the unit. These are the skills/knowledge/concepts that students will be expected to have as they move into the next course. These skills/concepts are aligned to the priority standards within the unit.
Construct viable arguments and critique the reasoning of others	
Model with mathematics	
Use appropriate tools strategically	
Attend to precision	
Look for and make use of structure	
Look for and express regularity in repeated reasoning	