# Major Work of Secondary Mathematics I

The purpose of this document is to provide a brief overview of the most essential content in the grade level along with a progression of how the content was addressed in the prior grade level and will prepare students for content in the future grade level. This is not a comprehensive list of content in the grade level as defined in the Utah Core Standards, but rather highlights the major work of the grade level.

## *Major Work of Grade Band:* Grades 9 - 11

- Create, interpret, manipulate, and solve algebraic equations.
- Understand, compare, and represent functions (defined by rates of change, multiple representations and building functions)
- Describe characteristics of functions (definition of function, transformations, features of functions)
- Understand, apply, and prove congruence and similarity as defined in terms of geometric transformations

## Vertical Alignment of Major Work

## *Major Work:* Solve Algebraic Equations (linear and exponential)

*Prior grades*: In grade 8, students learned to solve linear equations (including absolute value) and inequalities in one variable (6.EE.7-8; 7.EE.4; 8.EE.7), and to analyze and solve, by graphing, pairs of simultaneous linear equations (8.EE.8).

**Secondary Math I: Solve Algebraic Equations (linear and exponential):** Interpret the structure of linear and exponential expressions (SI.A.SSE.1). Create equations and inequalities in one two or more variables and use them to solve problems (SI.A.CED.1-4). Solve equations and inequalities in one or two variables and systems of linear equations exactly and approximately (numerically, algebraically, and graphically) with pairs of linear equations in two variables (SI.A.REI.3,5-6).

*Future grades*: Rewrite and reveal aspects of expressions (SII.A.SSE.1-3). Create and solve equations, inequalities, and systems of equations, extending to include quadratic relationships (SII.A.CED.1,2; SII.A.REI.4,7). Extend the number system to include complex numbers when real solutions do not exist. (SII.N.RN.1-3; SII.N.CN.7,8).

## *Major Work:* Understand, Compare, and Represent Functions (linear and exponential)

*Prior grades:* In grade 8, students made connections between proportional relationships, linear functions, and linear equations. They learned to identity, define, evaluate, and compare linear functions, linear equations, and systems of linear equations (8.F.1-5).

**Secondary Math I: Understand, compare, and represent functions**: Students use function notation to represent linear and exponential functions, including arithmetic and geometric sequences. Understand, compare, and represent linear and exponential functions (SI.F.BF.1-3; SI.F.LE.2) including: Calculate and interpret the average rate of change of a function (SI.F.IF.6; SI.S.ID.7). Interpret and compare different representations of functions (SI.F.IF.7,9), Represent and solve equations and inequalities graphically (SI.A.REI.10-12). Distinguish between situations that can be modeled with linear functions and with exponential functions (SI.F.LE.1).

*Future grades:* Compare key characteristics of quadratic functions to those of linear and exponential functions. Interpret different forms of quadratic functions. Expand experience to include absolute value, step, and functions that are piecewise-defined (SII.F.IF.4,5,7-9; SII.F.BF.1,3).

## Major Work: Describe Characteristics of Functions (linear and exponential)

**Prior grades:**  In grade 8, students learned to identity, define, evaluate, and compare linear functions (8.F.1-5), linear equations, and systems of linear equations (8.EE.7-8).

**Secondary Math I: Describe characteristics of functions:**  Describe characteristics of a linear or exponential function (SI.F.IF.1-3). Interpret key features of graphs that model a relationship between two quantities (SI.IF.4-5), and compare (on a graph or a table) the relationship between linear and exponential functions (SI.F.LE.3) and interpret the parameters of such functions in terms of context (SI.F.LE.5; SI.S.ID.6).

**Future grades:** In grade Secondary Math II, students will interpret and analyze quadratic functions (SII.F.IF.4-6) using different representations (SII.F.IF.7-9).  Build a function that models a relationship between two quantities (SII.F.BF.1a). Build new functions from existing functions (SII.F.BF.3).

## Major Work:  Understand, and Apply Congruence as Defined in terms of Geometric Transformations

**Prior grades:** Explore properties of rotations, reflections, and translations that maintain congruent figures (8.G.1-4).

**Secondary Math I:** Build on prior knowledge with properties of rigid motions, to extend understanding of **congruence** in coordinate geometry.  Use the property of correspondence to determine congruency (I.G.CO.6-8). Represent and compare transformations in the plane (SI.G.CO.2-5) and prove simple geometric theorems algebraically (SI.G.GPE.4-5, 7).

**Future grades:** In Secondary Math II, students will extend their understanding of similar figures (SII.G.SRT.1-3). They will verify properties of dilations (SII.G.SRT.1), decide whether two figures are similar (SII.G.CO.9-11) and similarity (SII.B.SRT.4,5).  In Secondary Math III, students will extend triangle congruence to the unit circle (SIII.F.TF.1-3; SIII.G.SRT.9-11).

## Mathematical Modeling:

Mathematical modeling is a "process that uses mathematics to represent, analyze, make predictions or otherwise provide insight into real-world phenomena" (GAIMME, 2016).  It is a conceptual priority at the high school level and is a curricular goal that is incorporated regularly. Standards that are marked with a (★) indicate distinct opportunities to engage with modeling in the *Utah Core Standards*. Modeling activities may extend across multiple standards.
*The following relate to modeling in Secondary Mathematics I:*
- *Produce, interpret, and use expressions, equations and functions to model real-world phenomena (SI.A.SSE.1; SI.F.IF.4-7; SI.BF.1-2);*
- *Graph and analyze functions (SI.F.IF.4-7; SI.BF.1-2);*
- *Relate characteristics of functions to graphical key features and quantitative relationships (SI.F.IF.5,7); and*
- *Apply geometric concepts in modeling situations (SI.G.GPE.7).*

"Modeling can be used to motivate curricular requirements and can highlight the importance and relevance of mathematics in answering important questions" (GAIMME, 2016).