

Major Work of Secondary Mathematics III

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 (polynomial, logarithmic, radical, rational, and trigonometric)

Prior grades: In Secondary Math I and II, students have created, interpreted, manipulated and solved linear, exponential, and quadratic functions. In Secondary Math I and II, students have performed arithmetic operations on linear, exponential, and quadratic functions (SII.A.SSE.1-3; SII.A.CED.1-2; SII.A.REI.4,7).

Secondary Math III: Create, interpret, manipulate, and **solve algebraic equations:** Perform arithmetic operations on polynomials, extending beyond the quadratic polynomials and including rationals and understand the relationship between zeros and factors (SIII.A.APR.1-7). Solve polynomial, rational, radical, logarithmic and trigonometric functions (SIII.A.REI.2; SIII.F.BF.4; SIII.F.TF.7; SIII.A.CED.1-4).

Future grades: In precalculus (or college algebra), students will expand their solving to all types of equations including complex number systems, vectors, matrices, and polar coordinates (N.VM; N.CN).

Major Work: Understand, Compare, and Represent Functions (polynomial and inverse)

Prior grades: In Secondary Math I and II, students have compared and contrasted linear, quadratic, exponential functions (SII.IF.4, 5, 7-9; SII.F.BF.1-3).

Secondary Math III: Understand, compare, and represent functions: Building on prior knowledge of functions, extend to polynomial, rational, trigonometric, logarithmic and inverse functions. Create and interpret various representations of functions (SIII.A.CED.2, 4; SIII.F.IF.6-9; SIII.F.BF.1; SIII.F.LE.3).

Future grades: In precalculus and calculus, students will extend to parametric and conics (F.IF.7; F.IF.11; G.GPE.2-3).

Major Work: Describe Characteristics of Functions

Prior grades: In Secondary Math I and II, students have compared and identified key features and transformations of linear, quadratic and exponential functions. (SI.F.IF.1-5; SII.F.IF.4,5,7-9).

Secondary Math III: Describe characteristics of functions: Building on prior knowledge of key features and transformations of linear, quadratic and exponentials extend to all available function types as well as the normal curve to identify key characteristics. (SIII.F.IF.4-7; SIII.F.BF.3; SIII.F.TF.5; SIII.S.ID.4; SIII.A.REI.11).

Future grades: In precalculus and calculus, students will continue to solidify understanding of key characteristics of functions (F.IF.7).

Major Work: Extend Congruence and Similarity

Prior grades: In Secondary Math II, students explored and proven similar triangles and have begun right triangle ratios for trig functions that can be extended to the unit circle (SII.G.CO.9-11; SII.G.SRT.1,2,4,5).

Secondary Math III: Understand, apply, and prove congruence and similarity as defined in terms of geometric transformations: Building off prior knowledge of congruency, similarity and right triangle ratios to extend the domain of trigonometric functions using the unit circle (SIII.F.TF.1-3). Apply trigonometry to general triangles (SIII.G.SRT.9-11)

Future grades: In precalculus and calculus, students will continue to solidify understanding of trigonometric properties, identities and graphs. (F.TF.4-9).

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 III:

- *Produce, interpret, and use expressions, equations and functions to model real-world phenomena (SIII.A.SSE.1,4; SIII.A.CED.1-4; SIII.F.IF.4-6; SIII.BF.1; SIII.F.TF.5,7);*
- *Graph and analyze functions (SIII.F.IF.4-9; SIII.BF.1; SIII.F.TF.5);*
- *Relate characteristics of functions to graphical key features and quantitative relationships (SIII.A.REI.11; SIII.F.IF.4-7; SIII.F.TF.5); and*
- *Apply geometric concepts in modeling situations (SIII.G.MG.1-3).*

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