Mathematics Standard Progressions

Skill Progressions in West Virginia College- and Career-Readiness Standards for Mathematics

The following pages outline the skill progressions found in the West Virginia College- and Career Readiness Standards for Mathematics. In Mathematics, the sequence of topics follow a programmatic progression that are reflected in the domains. These domains have been organized into programmatic levels where grade-level clusters provide detail about the skill progressions. The language of the clusters illustrates the advancing rigor and complexity of the expectations for what students should know, understand, and be able to do. Because the diversity of the mathematics in the Fourth Course Options does not support a similar skills progression alignment for these course, the document ends with a listing of the Fourth Course Options in Mathematics.

This document is intended to be a resource that fosters and supports discussion among teachers as they look at the vertical alignment found within the standards that creates a meaningful progression of skills toward college- and career-readiness.

Mathematics Progressions – High School
Traditional Pathway

Domain: The Real Number System

Course	Clusters
8th Grade High School Algebra I	• Extend the properties of exponents to rational exponents. • Use properties of rational and irrational numbers.
High School Algebra I	• Extend the properties of exponents to rational exponents. • Use properties of rational and irrational numbers.
High School Geometry	Not a primary focus of High School Geometry
High School Algebra II	Not a primary focus of High School Algebra II

Domain: Quantities

Course	Clusters
8th Grade High School Algebra I	• Reason quantitatively and use units to solve problems. (Foundation for work with expressions, equations, and functions.)
High School Algebra I	• Reason quantitatively and use units to solve problems. (Foundation for work with expressions, equations, and functions.)
High School Geometry	Not a primary focus of High School Geometry
High School Algebra II	Not a primary focus of High School Algebra II

Domain: The Complex Number System

Course	Clusters
8th Grade High School Algebra I	Initial focus begins in High School Algebra II
High School Algebra I	Initial focus begins in High School Algebra II
High School Geometry	Initial focus begins in High School Algebra II
High School Algebra II	• Perform arithmetic operations with complex numbers. • Use complex numbers in polynomial identities and equations. (Polynomials with real coefficients)

Domain: Seeing Structure in Expressions

Course	Clusters
8th Grade High School Algebra I	• Interpret the structure of expressions. (Linear, exponential, quadratic) • Write expressions in equivalent forms to solve problems. (Quadratic and exponential)
High School Algebra I	• Interpret the structure of expressions. (Linear, exponential, quadratic) • Write expressions in equivalent forms to solve problems. (Quadratic and exponential)
High School Geometry	Not a primary focus of High School Geometry
High School Algebra II	• Interpret the structure of expressions. (Polynomial and rational) • Write expressions in equivalent forms to solve problems.

Domain: Arithmetic with Polynomials and Rational Expressions

Course	Clusters
8th Grade High School Algebra I	• Perform arithmetic operations on polynomials. (Linear and quadratic.)
High School Algebra I	• Perform arithmetic operations on polynomials. (Polynomials that simplify to quadratics.)
High School Geometry	Not a primary focus of High School Geometry
High School Algebra II	• Perform arithmetic operations on polynomials. (Beyond quadratics) • Understand the relationship between zeros and factors of polynomials. • Use polynomial identities to solve problems. • Rewrite rational expressions. (Linear and quadratic denominators)

Domain: Creating Equations

Course	Clusters
8th Grade High School Algebra I	• Create equations that describe numbers or relationships. (Linear, quadratic, and exponential (integer inputs only))
High School Algebra I	• Create equations that describe numbers or relationships. (Linear, quadratic, and exponential (integer inputs only))
High School Geometry	Not a primary focus of High School Geometry
High School Algebra II	• Create equations that describe numbers or relationships. (Equations using all available types of expressions, including simple root functions.)

Domain: Reasoning with Equations and Inequalities

Course	Clusters
8th Grade High School Algebra I	• Understand solving equations as a process of reasoning and explain the reasoning. (Master linear, learn as a general principle) • Solve equations and inequalities in one variable. (Linear inequalities; literal equations that are linear in the variables being solved for; quadratics with real solutions) • Analyze and solve linear equations and pairs of simultaneous linear equations. • Solve systems of equations (Linear-linear and linear-quadratic) • Represent and solve equations and inequalities graphically. (Linear and exponential; learn as a general principle)

High School Algebra I	• Understand solving equations as a process of reasoning and explain the reasoning. (Master linear, learn as a general principle) • Solve equations and inequalities in one variable. (Linear inequalities; literal equations that are linear in the variables being solved for; quadratics with real solutions) • Solve systems of equations (Linear-linear and linear-quadratic) • Represent and solve equations and inequalities graphically. (Linear and exponential; learn as a general principle)
High School Geometry	Not a primary focus of High School Geometry
High School Algebra II	• Understand solving equations as a process of reasoning and explain the reasoning. (Simple radical and rational) • Represent and solve equations and inequalities graphically. (Combine polynomial, rational, radical, absolute value, and exponential functions)

Domain: Interpreting Functions

Course	Clusters
8th Grade High School Algebra I	• Define, evaluate, and compare functions. • Understand the concept of a function and use function notation. (Learn as a general principle. Focus on linear and exponential (integer domains) and on arithmetic and geometric sequences.) • Use functions to model relationships between quantities. • Interpret functions that arise in applications in terms of a context. (Linear, exponential, and quadratic) • Analyze functions using different representations. (Linear, exponential, quadratic, absolute value, step, piecewise-defined)
High School Algebra I	• Understand the concept of a function and use function notation. (Learn as a general principle. Focus on linear and exponential (integer domains) and on arithmetic and geometric sequences.) • Interpret functions that arise in applications in terms of a context. (Linear, exponential, and quadratic) • Analyze functions using different representations. (Linear, exponential, quadratic, absolute value, step, piecewise-defined)
High School Geometry	Not a primary focus of High School Geometry
High School Algebra II	• Interpret functions that arise in applications in terms of a context. (Emphasize selection of appropriate models) • Analyze functions using different representations. (Focus on using key features to guide selection of appropriate types of model function)

Domain: Building Functions

Course	Clusters
8th Grade High School Algebra I	• Build a function that models a relationship between two quantities. (Linear, exponential, and quadratic) • Build new functions from existing functions. (Linear, exponential, quadratic, and absolute value)
High School Algebra I	• Build a function that models a relationship between two quantities. (Linear, exponential, and quadratic)

	• Build new functions from existing functions. (Linear, exponential, quadratic, and absolute value)
High School Geometry	Not a primary focus of High School Geometry
High School Algebra II	• Build a function that models a relationship between two quantities. (Include all types of functions studied) • Build new functions from existing functions. (Include simple radical, rational, and exponential functions; emphasize common effect of each transformation across function types)

Domain: Linear, Quadratic, and Exponential Models

Course	Clusters
8th Grade High School Algebra I	• Construct and compare linear, quadratic, and exponential models and solve problems. • Interpret expressions for functions in terms of the situation they model. (Linear and exponential of form $f(x) = b^x + k$)
High School Algebra I	• Construct and compare linear, quadratic, and exponential models and solve problems. • Interpret expressions for functions in terms of the situation they model. (Linear and exponential of form $f(x) = b^x + k$)
High School Geometry	Not a primary focus of High School Geometry
High School Algebra II	• Construct and compare linear, quadratic, and exponential models and solve problems. (Logarithms as solutions for exponentials)

Domain: Trigonometric Functions

Course	Clusters
8th Grade High School Algebra I	Initial focus begins in High School Algebra II
High School Algebra I	Initial focus begins in High School Algebra II
High School Geometry	Initial focus begins in High School Algebra II
High School Algebra II	• Extend the domain of trigonometric functions using the unit circle. • Model periodic phenomena with trigonometric functions. • Prove and apply trigonometric identities.

Domain: Congruence

Course	Clusters
8th Grade High School Algebra I	Initial focus begins in High School Geometry
High School Algebra I	Initial focus begins in High School Geometry
High School Geometry	• Experiment with transformations in the plane. • Understand congruence in terms of rigid motions. (Build on rigid motions as a familiar starting point for development of concept of geometric proof) • Prove geometric theorems. (Focus on validity of underlying reasoning while using variety of ways of writing proofs) • Make geometric constructions. (Formalize and explain processes)
High School Algebra II	Not a primary focus of High School Algebra II

Domain: Similarity, Right Triangles, and Trigonometry

Course	Clusters
8th Grade High School Algebra I	Initial focus begins in High School Geometry
High School Algebra I	Initial focus begins in High School Geometry
High School Geometry	• Understand similarity in terms of similarity transformations. • Prove theorems involving similarity. (Focus on validity of underlying reasoning while using variety of formats) • Define trigonometric ratios and solve problems involving right triangles. • Apply trigonometry to general triangles.
High School Algebra II	Not a primary focus of High School Algebra II

Domain: Circles

Course	Clusters
8th Grade High School Algebra I	Initial focus begins in High School Geometry
High School Algebra I	Initial focus begins in High School Geometry
High School Geometry	• Understand and apply theorems about circles. • Find arc lengths and area of sectors of circles. (Radian introduced only as a unit of measure)
High School Algebra II	Not a primary focus of High School Algebra II

Domain: Expressing Geometric Properties with Equations

Course	Clusters
8th Grade High School Algebra I	Initial focus begins in High School Geometry
High School Algebra I	Initial focus begins in High School Geometry
High School Geometry	• Translate between the geometric description and the equation for a conic section. • Use coordinates to prove simple geometric theorems algebraically. (Include distance formula; relate to Pythagorean Theorem)
High School Algebra II	Not a primary focus of High School Algebra II

Domain: Geometric Measurement and Dimension

Course	Clusters
8th Grade High School Algebra I	• Understand and apply the Pythagorean Theorem. (Connect to radicals, rational exponents, and irrational numbers)
High School Algebra I	Not a primary focus of High School Algebra I
High School Geometry	• Explain volume formulas and use them to solve problems. • Visualize the relation between two-dimensional and three-dimensional objects. • Apply geometric concepts in modeling situations.
High School Algebra II	Not a primary focus of High School Algebra II

Domain: Interpreting Categorical and Quantitative Data

Course	Clusters
8th Grade High School Algebra I	• Summarize, represent, and interpret data on a single count or measurement variable. • Investigate patterns of association in bivariate data. • Summarize, represent, and interpret data on two categorical and quantitative variables. (Linear focus; discuss general principle) • Interpret linear models.
High School Algebra I	• Summarize, represent, and interpret data on a single count or measurement variable. • Investigate patterns of association in bivariate data. • Summarize, represent, and interpret data on two categorical and quantitative variables. (Linear focus; discuss general principle) • Interpret linear models.
High School Geometry	Not a primary focus of High School Geometry
High School Algebra II	• Summarize, represent, and interpret data on two categorical and quantitative variables.

Domain: Making Inferences and Justifying Conclusions

Course	Clusters
8th Grade High School Algebra I	Initial focus begins in High School Algebra II
High School Algebra I	Initial focus begins in High School Algebra II
High School Geometry	Initial focus begins in High School Algebra II
High School Algebra II	• Understand and evaluate random processes underlying statistical experiments. • Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Domain: Conditional Probability and the Rules of Probability

Course	Clusters
8th Grade High School Algebra I	Initial focus begins in High School Geometry
High School Algebra I	Initial focus begins in High School Geometry
High School Geometry	• Understand independence and conditional probability and use them to interpret data. (Link to data simulations or experiments) • Use the rules of probability to compute probabilities of compound events in a uniform probability model.
High School Algebra II	Not a primary focus of High School Algebra II

Domain: Using Probability to Make Decisions

Course	Clusters
8th Grade High School Algebra I	Initial focus begins in High School Geometry
High School Algebra I	Initial focus begins in High School Geometry

High School Geometry	• Use probability to evaluate outcomes of decisions. (Introductory; apply counting rules)
High School Algebra II	• Use probability to evaluate outcomes of decisions. (Include more complex situations)

FOURTH COURSE OPTIONS

Fourth course options available to students in either pathway:

- Advanced Mathematical Modeling
- Calculus
- High School Mathematics IV - Trigonometry/Pre-calculus
- STEM Readiness
- Transition Mathematics for Seniors
- AP® Calculus
- AP® Computer Science
- AP® Statistics
- Dual credit mathematics courses and advanced mathematics courses offered through WV Virtual School.