# Algebra II Overview

| Seeing Structure in Expressions | Mathematical Practices |
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| • Interpret the structure of expressions<br>• Write expressions in equivalent forms to solve problems | 1. Make sense of problems and persevere in solving them.<br><br>2. Reason abstractly and quantitatively.<br><br>3. Construct viable arguments and critique the reasoning of others.<br><br>4. Model with mathematics.<br><br>5. Use appropriate tools strategically.<br><br>6. Attend to precision.<br><br>7. Look for and make use of structure.<br><br>Look for and express regularity in repeated reasoning |
| **Arithmetic with Polynomials and Rational Expressions** | |
| • Perform arithmetic operations on polynomials<br>• Understand the relationship between zeros and factors of polynomials<br>• Use polynomial identities to solve problems<br>• Rewrite rational expressions | |
| **Creating Equations** | |
| • Create equations that describe numbers or relationships | |
| **Reasoning with Equations and Inequalities** | |
| • Understand solving equations as a process of reasoning and explain the reasoning<br>• Solve equations and inequalities in one variable<br>• Solve systems of equations<br>• Represent and solve equations and inequalities graphically | |
| **Interpreting Functions** | |
| • Understand the concept of a function and use function notation<br>• Interpret functions that arise in applications in terms of the context<br>• Analyze functions using different representations | |
| **Building functions** | |
| • Build a function that models a relationship between two quantities<br>• Build new functions from existing functions | |
| **Linear, Quadratic and Exponential Models** | |
| • Construct and compare linear, quadratic, and exponential models and solve problems<br>• Interpret expressions for functions in terms of the situation they model | |
| **Trigonometric Functions** | |
| • Extend the domain of trigonometric functions using the unit circle<br>• Model periodic phenomena with trigonometric functions<br>• Prove and apply trigonometric identities | |
| **The Complex Number System** | |
| • Perform arithmetic operations with complex | |

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| numbers<br>• Represent complex numbers and their operations on the complex plane<br>• Use complex numbers in polynomial identities and equations | |
| **Making Inferences and Justifying Conclusions** | |
| • Understand and evaluate random processes underlying statistical experiments<br>• Make inferences and justify conclusions from sample surveys, experiments and observational studies | |
| **Interpreting Categorical and Quantitative Data** | |
| • Summarize, represent, and interpret data on a single count or measurement variable<br>• Summarize, represent, and interpret data on two categorical and quantitative variables<br>• Interpret linear models | |

# Algebra II Introduction

Building on their work with linear, quadratic, and exponential functions, students extend their repertoire of functions to include polynomial, rational, and radical functions. These standards are the baseline expectations of students completing this course. Since repeated exposure and practice is needed in order to master concepts, some standards introduced in Algebra I will be expanded upon in Algebra II. Individual school districts or teachers are welcome to expand on these standards as they see fit to meet the needs of their students. Students work closely with the expressions that define the functions, and continue to expand and hone their abilities to model situations and to solve equations, including solving quadratic equations over the set of complex numbers and solving exponential equations using the properties of logarithms. The Mathematical Practice Standards apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.

Develop the structural similarities between the system of polynomials and the system of integers. Students draw on analogies between polynomial arithmetic and base-ten computation, focusing on properties of operations, particularly the distributive property. Students connect multiplication of polynomials with multiplication of multi-digit integers, and division of polynomials with long division of integers. Students identify zeros of polynomials, including complex zeros of quadratic polynomials, and make connections between zeros of polynomials and solutions of polynomial equations. The unit culminates with the fundamental theorem of algebra. A central theme of this unit is that the arithmetic of rational expressions is governed by the same rules as the arithmetic of rational numbers.

Building on their previous work with functions, and on their work with trigonometric ratios and circles in Geometry, students now use the coordinate plane to extend trigonometry to model periodic phenomena.

Students synthesize and generalize what they have learned about a variety of function families. They extend their work with exponential functions to include solving exponential equations with logarithms. They explore the effects of transformations on graphs of diverse functions, including functions arising in an application, in order to abstract the general principle that transformations on a graph always have the same effect regardless of the type of the underlying function. They identify appropriate types of functions to model a situation, they adjust parameters to improve the model, and they compare models by analyzing appropriateness of fit and making judgments about the domain over which a model is a good fit. The description of modeling as “the process of choosing and using mathematics and statistics to analyze empirical situations, to understand them better, and to make decisions” is at the heart of this unit. The narrative discussion and diagram of the modeling cycle should be considered when knowledge of functions, statistics, and geometry is applied in a modeling context.

Students see how the visual displays and summary statistics they learned in earlier grades relate to different types of data and to probability distributions. They identify different ways of collecting data—including sample surveys, experiments, and simulations—and the role that randomness and careful design play in the conclusions that can be drawn.