# Algebra 2, Part 2
# Course Outline & Objectives

**Course Description:**

In Algebra 2 Part 2, students will work with rational expressions, exponent, roots, and radicals, and will learn to solve and interchange exponential and logarithmic functions. Students will move on to conic sections, including parabolas, circles, ellipses, and hyperbolas, and will learn the basics of trigonometry and special triangles. Students will learn to solve permutations and combinations, as well as know which is used when, and will become proficient in working with sequence and series. They will also learn ways of analyzing and visualizing data.

Credits -One Semester (0.5 Carnegie unit / CA: 5 credits)| Prerequisites: Algebra 1; Geometry; Algebra 2, Part 1

## Course Outline

### Unit 1: Rational Expressions

1.1 Simplifying Rational Expressions
1.2 Adding & Subtracting Rational Expressions
1.3 Multiplying & Dividing Rational Expressions
1.4 Positive and Negative Powers
1.5 Solving Rational Equations
1.6 Graphing Rational Functions

## Common Core Standards

**In Unit 1 students will learn:**

How to perform operations such as addition, subtraction, which require finding a least common denominator, multiplication and division.
How to apply negative exponents and the relationship between inverses and rational expressions.
How to solve a rational expression and recognize invalid solutions.
How to graph rational functions, including finding vertical, slant and horizontal asymptotes.
**[A-SSE, A-APR, A-REI]**

### Unit 2: Exponents, Roots, Radicals

2.1 Roots and Exponents
2.2 Radical Equations and Operations
2.3 Radicals in Fractions
2.4 Fractions in the Exponent
2.5 Complex Fractions

**In Unit 2 students will learn:**

How to work with exponents, including both positive and negative power exponents.
To develop an understanding of the relationship between roots and exponents, and their reciprocal relationship, and how to solve equations with roots and equations with exponents.
How to manipulate and work with radical equations and to perform operations with radical expressions, including how to add and subtract like radicals.
How to simplify radicals in fractions, understanding how to rationalize a denominator by multiplying top and bottom by the root in the denominator or by multiplying the top and bottom by the conjugate of the denominator.
How to manipulate and simplify complex fractions.
**[A-APR, A-REI, F-IF]**

## Course Outline

### Unit 3: Exponential and Logarithmic Functions

3.1 Exponential Functions
3.2 Exponential Equations
3.3 Inverse Functions
3.4 Properties of Log Functions
3.5 Base e
3.6 Logarithmic Equations
3.7 Translation of Exponential and Logarithmic Graphs

### Unit 4: Conic Sections - Solving, Graphing

4.1 Circles: Equations & Graphs of
4.2 Ellipses: Equations & Graphs of
4.3 Hyperbolas: Equations & Graphs of
4.4 Parabolas: Equations & Graphs of

### Unit 5: Trigonometry

5.1 Sin, Cos, Tan, Cosec, Sec, Cot
5.2 Converting Between Radians & Degrees
5.3 Trig Ratios of Special Angles
5.4 The Unit Circle
5.5 Inverses of Trigonometric Functions
5.6 The Law of Sines
5.7 The Law of Cosines

## Common Core Standards

**In Unit 3 students will learn:**

How to identify and analyze exponential functions, paying special attention to the end behavior of graphs based on the key characteristics of the function.
How to use this understanding of exponential functions to solve exponential equations and how to be aware of domain and range restrictions for exponential equations.
How to manipulate exponential equations and expressions.
To grasp an understanding of base e expressions and equations, and that base e and the natural log are inverses of one another.
**[A-SSE, A-CED, A-REI, F-IF, F-BF, F-LE]**

**In Unit 4 students will learn:**

The equations for and graphs of conic sections, including those for circle, ellipses, hyperbolas, and parabolas.
How to decipher the center and radius of a circle, given its equations, as well as match graphs of circles to their equations.
How to put equations for circles into standard form, so they can be analyzed more easily.
To master ellipses and how to sketch an ellipse from its equations by identifying its center, major and minor axis, and focal points.
The parts and characteristics of hyperbolas and how to sketch their graphs, given an equation.
To become proficient in graphing parabolas using key components of their equations, such as their vertex, axis of symmetry, and focus.
How to distinguish between circles, ellipses, hyperbolas, and parabolas, using only their equations.
**[A-SSE, A-CED, F-IF, G-GPE]**

**In Unit 5 students will learn:**

How to solve for the six trigonometric functions and to determine the sine, Cosine, Tangent, Cosecant, Secant, and Cotangent given the sketch of a right triangle.
How to find the remaining trigonometric functions given one of the six trig functions.
How to convert between radians and degrees and how to solve problems in which a certain angle is expressed in either and is to be converted to the other.
To gain a mastery of recognizing and working with special triangles, knowing the ratios of the sides of 30-60-90 triangles and 45-45-90 triangles. How to solve for missing sides of special triangles given one side length and two angles.
**[F-BF, F-TF]**

## Course Outline

### Unit 6: Permutations & Combinations

6.1 Permutations
6.2 Combinations
6.3 Basic Probability
6.4 Binomial Theorem/Probability

## Common Core Standards

**In Unit 6 students will learn:**

How to solve real-life problems involving permutations and combinations, with scenarios like how many ways a certain number of players can form a roster, or how many ways some friends can be arranged in a photo.
How to assess whether a combination or a permutation is required to solve a particular problem, and how to perform the appropriate calculation. How to solve random chance probability problems and to solve both "replacement" and "without replacement" problems.
How to use the binomial theorem to raise polynomials to large powers.
**[A-APR, A-REI, S-ID, S-IC, S-MD ]**

### Unit 7: Data

7.1 Measures of Central Tendency
7.2 Visuals of Central Tendency
7.3 Variance and Standard Deviation
7.4 Normal Distribution
7.5 Standardizing data

**In Unit 7 students will learn:**

How to organize data, manipulate data and compute measures of central tendency such as mean, median and mode.
How to create visuals for measures of central tendency such as bar graphs, box plots, and histograms
How to compute standard deviation of large and small data sets
How to determine if a data set is normal in order to make comparisons
How to use statistic analysis to compare data sets
**[S-ID, S-IC]**

### Unit 8: Sequence and Series

8.1 Arithmetic Sequence (nth Term)
8.2 Arithmetic Series (Sum Of)
8.3 Geometric Sequence (nth Term)
8.4 Geometric Series (Sum Of)
8.5 Sum of Infinite Series

**In Unit 8 students will learn:**

How to identify and manipulate arithmetic sequence to solve for nth terms within that sequence, up to any value for n.
How to create a formula for solving for the nth term, given as few as two or three values within the arithmetic sequence.
How to work to find the sum of n terms of an arithmetic sequence, up to any value for n.
To master identification of geometric sequences, how to find the common ratio, & to solve for an nth term.
How to find the sum of any geometric sequence for up to any value of n.
How to identify an infinite series and to understand when it is possible to find the sum of a converging infinite series, or how to identify a diverging infinite series, and realize that no sum exists.
In the case that a sum does exist for an infinite series, how to find that sum.
**[F-BF]**