# Integrated Math 3, Part 2
# Course Outline & Objectives

**Course Description:**
Integrated Math 3 is the third year of a three-year high school mathematics sequence. In Integrated Math 3 Part 2, students learn about trigonometric ratios in right triangles and extend the knowledge to trigonometric functions. They learn about the relationship between exponential and logarithmic functions, and use properties of each to solve equations. Students explore the concepts of conic sections, polar coordinates, and vectors. Finally, they learn how to apply their knowledge of expressions and equations to situations involving probability and statistics.

Credits - One Semester (0.5 Carnegie unit / CA: 5 credits)
Prerequisites: Integrated Math 1; Integrated Math 2; Integrated Math 3, Part 1

## Course Outline

### Unit 1 – Trigonometry Ratios

1.1 Pythagorean Theorem
1.2 Basic Trigonometry Ratios
1.3 Inverse Trigonometric Ratios
1.4 Trigonometry Ratios on Special Functions
1.5 Law of Sine and Cosines

## Common Core Standards

**In this unit**:
Students will use the Pythagorean theorem to find the lengths of sides of right triangles and polygons on the coordinate plane. They will evaluate the six basic trigonometric functions and use them to find the lengths of sides of a right triangle. They will find the measures of angles of a right triangle using the inverse trig functions. They will use the ratios of special 30-60-90 triangles and 45-45-90 triangles to identify angle measures and lengths of triangles. They will use the law of sines and the law of cosines to find the lengths of sides of any triangle.

**[G-SRT-C-6, G-SRT-C-7,G-SRT-C-8, G-SRT-D-10, G-SRT-D-11]**

### Unit 2 – Trigonometric Functions

2.1 Radians and Special Triangles
2.2 The Unit Circle
2.3 Properties of Trig Functions
2.4 Solving Trig Functions
2.5 Graphing and Transforming Trigonometric Functions

**In this unit:**
Students will learn about radians, a method for measuring angles. They will learn about the unit circle with a radius of one. They will learn how to prove trigonometric identities. They will learn how to find the angle when you know a ratio and solve trigonometric functions. They will learn how to graph a trigonometric function and find the amplitude, phase shift, and period.

**[G-C-B-5, F-TF-A-1, F-TF.A-2, F-TF-A-3, F-TF-A-4]**

## Course Outline

### Unit 3 – Exponential and Logarithmic Functions

3.1 Inverse Functions
3.2 Exponential Functions
3.3 Properties of Logarithmic Functions
3.4 Base 10 and Base e
3.5 Logarithmic Equations
3.6 Transforming Exponential and Logarithmic Functions
3.7 Geometric Sequence and Series

## Common Core Standards

**In this unit**:
Students will learn how to find inverse functions. They will solve exponential equations by changing the base. They will learn the relationship between a logarithmic and exponential function and properties of logarithmic functions. They will prove logarithmic identities. They will solve logarithmic equations including growth and decay. They will graph logarithmic and exponential functions. They will learn to recognize and predict terms for geometric sequences as well as calculate the sum of finite geometric series and convergent infinite series.

**[F-LE-A-1, F-LE-A-2, F-LE-A-3, F-LE-A-4, F-BF-B-4, F-BF-B-5]**

### Unit 4 – Conic Sections

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

**In this unit:**
Students will recognize equations for and graphs of conic sections, including those for circle, ellipses, hyperbolas, and parabolas. They will decipher the center and radius of a circle, given its equations, as well as match graphs of circles to their equations. They will manipulate equations for circles into standard form, so they can be analyzed more easily. They will sketch an ellipse from its equations by identifying its center, major and minor axis, and focal points. They will analyze the elements and characteristics of hyperbolas and sketch their graphs, given an equation. They will graph parabolas using key components of their equations, such as their vertex, axis of symmetry, and focus. They will distinguish between circles, ellipses, hyperbolas, and parabolas, using only their equations.

**[G-GPE-A-1, G-GPE-A-2, G-GPE-A-3]**

### Unit 5 – Polar Coordinates

5.1 Coordinates in the Polar Plane
5.2 Using Trigonometry to convert points
5.3 Polar Equations and Rectangular Equations
5.4 Graphing Polar Equations

**In this unit:**
Students will learn the elements of a polar coordinate, and how to graph them. They will use trigonometry to determine the rectangular coordinates of a corresponding point on a polar graph. They will learn the relationships between rectangular and polar coordinates to find equivalent equations. They will graph polar equations. They will create a masterpiece using polar equations using Desmos calculator.

**[N-CN-B-4, G-SRT-C]**

## Course Outline

### Unit 6 – Vectors and Motion

6.1 Introduction to Vectors
6.2 Magnitude and Directions
6.3 Sum and Difference Vectors
6.4 Scalar Multiples
6.5 Dot Products

## Common Core Standards

**In this unit:**
Students will graph vectors on the coordinate plane using magnitude and direction. They will determine the magnitude and direction of a vector using trigonometry. They will add and subtract vectors both analytically and visually. They will multiply vectors by a scalar. They will multiply vectors using the dot product.

**[N-VM-A-1, N-VM-A-2, N-VM-B-4, N-VM-B-5]**

### Unit 7 – Probability

7.1 Permutations
7.2 Combinations
7.3 Basic Probability
7.4 Binomial Theorem/Probability
7.5 Two Way Tables
7.6 Compound Events

**In this unit:**
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. They will learn how to assess whether a combination or a permutation is required to solve a particular problem, and how to perform the appropriate calculation. They will learn how to solve random chance probability problems and to solve both "replacement" and "without replacement" problems. They will learn how to use the binomial theorem to raise polynomials to large powers.

**[S-CP-A-1, S-CP-A-2, S-CP-A-3, S-CP-A-4, S-CP-B-6, S-CP-B-9]**

### Unit 8 – Data and Statistics

8.1 Data Gathering - Surveys, Experiments
8.2 Measures of Central Tendency
8.3 Variation
8.4 Sampling Distribution
8.5 Normal Curve

**In this unit:**
Students will learn how to choose the right types of data to gather to create a statistical analysis. They will learn how to organize data, manipulate data, and compute measures of central tendency such as mean, median, and mode. They will learn how to create visuals for measures of central tendency such as bar graphs, box plots, and histograms. They will learn how to compute the standard deviation of large and small data sets. They will learn how to determine if a data set is normal in order to make comparisons. They will learn how to use statistical analysis to compare data sets.

**[S-IC-B-3, S-IC-B-4, S-IC-B-5, S-MD-B-6]**