Integrated Math 3

Course Description:
Integrated Math 3 is the third year of a three-year high school mathematics sequence. The program is designed to build upon each year, increasing in difficulty and application of patterns, modeling and conjectures to develop a student's understanding and competency in mathematics.

Part 1: 5 credit hours
Part 2: 5 credit hours

Course Outline

Common Core Standards

Integrated Math 3, Part 1

Unit 1 – Linear Equations and Inequalities

1.1 Solving Linear Equations in One Variable
1.2 Solving Linear Equations in One Variable - Multiple Steps
1.3 Arithmetic Sequence and Series
1.4 Linear Inequalities and Compound Linear Inequalities
1.5 Absolute Value Equations and Inequalities

In this unit:
Students will review linear equations and how to solve them. They will solve multistep linear equations involving distribution, fractions, and decimals. They will analyze patterns and learn to recognize an arithmetic sequence, and then learn to find the sum of a finite number of terms. They will solve and graph multiple-step inequalities in one variable. They will solve and graph compound inequalities in one variable. They will solve and graph absolute value equations and inequalities in one variable.

[A-REI-A.1, A-REI-A.2, A-REI-B.3, F-BF-A.1, F-BF-A.2]

Unit 2 – Linear Functions

2.1 What is a Function?
2.2 Calculating Slope and Slope-Intercept Form
2.3 Parallel and Perpendicular Lines
2.4 Writing Equations of Lines
2.5 Geometry on the Coordinate Plane
2.6 Modeling Linear Equations

In this unit
Students will recognize functions based on a set of data, graphs, and descriptions. They will calculate slope, identify slope given points and lines, and identify the slope of the graphed line. They will identify characteristics of parallel and perpendicular lines and write the equations of lines that are parallel and perpendicular to a given line. They will apply the characteristics of parallel and perpendicular lines on the coordinate plane to polygons. They will model real-world problems with linear equations.

[F-IF-A-1, F-IF-B-6, F-IF-C-7-A, F-LE-A, G-GPE-B-4, G-GPE-B-5]

Unit 3 – Systems of Linear Equations

3.1 Graphing Systems of Linear Functions
3.2 Solving Systems of Linear Functions
3.3. Graphing Inequality Functions & Systems of Inequality Functions
3.4 Graphing & Solving Linear Equations - 3 Variables
3.5 Modeling Systems of Equations

In this unit:
Students will identify lines that have a single solution, graph systems of equations to determine a solution, and recognize characteristics of pairs of lines that result in consistent and inconsistent equations. They will solve systems of equations by substitution and elimination method. They will solve systems of inequalities by graphing. They will write pairs of equations to model real-world problems and model equations with three variables. They will solve systems of three equations and three variables.

[A-CED-A-2, A-CED-A-3, A-REI-C-6, A-REI-C-7, A-REI.D.10]

Unit 4 – Quadratic Equations and Functions

4.1 Solving Quadratic Equations - Factoring
4.2. Solving Quadratic Equations by Completing the Square and the Quadratic Formula
4.3 Quadratics with Complex Roots
4.4 Graphing Quadratic Functions
4.5 Piecewise Functions

In this unit:
Students will learn the various forms of a quadratic equation and how to solve a quadratic equation by factoring. They will learn how to use the process of completing the square to write a quadratic function in the vertex form. They will solve un-factorable quadratic equations by using the quadratic formula. They will learn how to find the square root of a negative number and other properties of imaginary numbers. They will analyze a quadratic function such as identifying the domain, range, maximum and minimum points. They will learn how to graph piecewise functions that include linear and quadratic functions.

[A-REI-B-3, A-REI-B-4, A-REI-D-10, N-CN-C]

Unit 5 – Polynomial Equations and Functions

5.1 What is a Polynomial? Computations with Polynomials
5.2 Multiplication of Polynomials
5.3 Long Division of Polynomials
5.4 Synthetic Division / Remainder Theorem
5.5 Rational Roots Theorem
5.6 Zeros and Factors of Polynomials
5.7 Fundamental Theorem of Algebra

In this unit:
Students will identify polynomials and add and subtract polynomials. They will multiply a monomial by a polynomial (distribute) and learn multiple polynomials with a varying number of terms. They will use long division to divide polynomials that cannot be factored. They will use synthetic division to determine remainders and apply this to evaluating polynomials. They will use the Remainder and Factor theorem to decompose a polynomial into the product of binomials. They will apply the conjugate and real root theorem to identify the factors of polynomials as well as write the equation of polynomials given roots. They will apply the Fundamental Theorem of Algebra to determine the number of roots of a polynomial, the roots and write a polynomial given roots.

[A-APR-A, A-APR-B-2, A-APR-B-3, A-APR-C-4, A-APR-C-5,A-APR-D-6, APR-D-7, N-CN-A, N-CN-C]

Unit 6 – Radical Equations and Functions

6.1 Exponents and Expressions
6.2 Rational Exponents
6.3 Computations with Radical Expressions
6.4 Solving Radical Equations
6.5 Graphing Radical Functions

In this unit:
Students will simply exponents, solve equations with exponents, simplify with rational exponents, and raise an exponent to a power. They will divide with exponents and simplify negative exponents. They will simplify radicals, rationalize denominators, and compute with radicals. They will solve radical equations with one and two radicals. They will graph radical functions and transform from a parent function.

[A-SSE-A-1, A-SSE-A-2, A-SSE-B-3, F-LE-A-1, F-LE-A-2, F-LE-A-3, F-LE-B-5]

Unit 7 – Rational Expressions, Equations and Functions

7.1 Simplifying Rational Expressions
7.2 Multiplying & Dividing Rational Expressions
7.3 Solving Rational Equations
7.4 Graphing Rational Functions
7.5 Modeling with Rational Functions and Expressions

In this unit:
Students will simplify, add and subtract rational expressions. They will multiply and divide rational expressions. They will solve rational equations. They will analyze rational equations including asymptotes, end behavior, and zeros.

[A-APR-D-6, A-APR-D-7, F-BF-A, F-IF-C-7-D, F-IF-C-9]

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Course Outline   **Common Core Standards**

Integrated Math 3, Part 2

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

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 angles 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 trigonometry 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]

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

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]

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

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 statistic analysis to compare data sets.

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