Glendale Unified School District

High School

April 16, 2019

Department:	Mathematics
Course Title:	Integrated Math IIIA – Accelerated (Summer Bridge B)
Course Code:	3515JH/3516JH
School(s) Course Offered:	Crescenta Valley High School, Hoover High School
UC/CSU Approved (Y/N, Subject):	No
Course Credits:	10, Full Year, elective credit, Summer School only
Recommended Prerequisite:	Integrated Math II, teacher approval
Recommended Textbook:	*California Integrated Mathematics 3* Timothy D. Kanold, Edward B. Burger, Juli K. Dixon, Matthew R. Larson, Steven J. Leinwand Houghton Mifflin Harcourt 2015
Course Overview:	Integrated Mathematics IIIA Accelerated is the summer bridge course for students who have completed Integrated II and would like to accelerate into Integrated IIIB/Precalculus Accelerated the following year. Integrated IIIB/Precalculus is a year and a half course. Along with this course, students will have completed all the standards in Integrated III and Precalculus in one summer and one school year. This course will strengthen and build on students' previous knowledge from Integrated Mathematics I and II standards. This course will focus on polynomial expressions and functions, quadratic functions and equations, rational functions and equations, radical functions and equations.

Course Content:

Unit 1: **Measurement and Modeling in Two and Three Dimensions**

STANDARDS
G-GMD.4, G-GMD.5, G-MG.1

A. Students will learn about cross sections and solids of rotation. They will utilize formulas to calculate the surface area of prisms, cylinders, pyramids, cones, and spheres. Students will work with geometric probability and scale factor. They will explore the differences between Euclidean and spherical geometry.

Major Topics:
Cross sections and solids of rotation
Formulas for the surface area of a prism, cylinder, pyramid, cone and sphere
Scale factor
Calculating density
Modeling to meet constraints

B. Unit Assignment(s):
At the end of this unit, students will complete a Math in Careers task relating to a scale model of a sphere. Critical skills include finding a scale factor and applying knowledge of spherical geometry. Students will experience how a model maker uses mathematics on the job.

Mathematical Practices Used in Unit:

- MP.1 - Students will make sense of problems when they use multiple formulas to find the surface area and/or volume of composite solids.
- MP.2 - Students must reason abstractly to visualize the cross sections of solids. Students relate the properties of three-dimensional figures (faces, vertices, and intersections of planes) and their rotational symmetry to help identify cross sections of solids. Students will use their knowledge of surface area of spheres and scale to find actual distances on the globe.
- MP.4 - Students represent real-world problems with mathematical models when they find the density of real-life objects as the weight or mass per unit of volume, and extend that idea to density to population density, or the population of a region per unit area of the region.
- MP.8- Students will decompose solids into two-dimensional shapes for finding surface area and determine shortcuts (formulas) for finding surface area of prisms and cylinders. Students will apply their knowledge of two- and three- dimensional figures to describe the transformation of figures by scale factor *a.*

Unit 2: **Polynomial Functions, Expressions, and Equations**

STANDARDS
F-IF.4, F-IF.4, A-APR.1, A-APR.2, A-APR.5, A-APR.6, A-SSE.2

A. Students will learn about transforming function graphs and inverses of functions. They will perform operations on polynomials. Student will expand their ability to solve equations by finding rational and complex solutions.

Major Topics:
Transforming function graphs and inverses of functions
Graphing cubic and polynomial functions
Operations with polynomials
Binomial theorem
Finding rational and complex solutions of polynomial equations

B. Unit Assignment(s):
After completing this unit, students will complete a performance task by evaluating and subtracting quadratic functions representing the labor force of the United States. Critical skills include evaluating polynomial functions and operations with polynomials.

Using data from the U.S. Census Bureau, the students will be provided with two functions for approximating the labor force, one for the total number of workers and one for the number of female workers. First, students will use the functions to calculate the two estimates for the number of workers. Next, students will work in pairs to write a polynomial function that models the number of male workers and will explain to another pair how they found their function. Finally, students will discuss, as a class, alternative strategies for determining the number of males without using the function they wrote.

Mathematical Practices Used in Unit:

- MP.1, MP.3 - Students will make sense of problems and persevere in solving them and construct viable arguments and critique the reasoning of others as they discuss factored form of a polynomial, describe the graphs of polynomials, and develop their understanding of polynomial division.
- MP.2, MP.7, MP.8 - Students will reason abstractly and quantitatively, look for and make use of structure, and look for and express regularity in repeated reasoning as they make connections between the transformations of quadratic functions and transformations of polynomial functions. Students will also understand the relationship between a function and its inverse.
- MP.7 - Students will also look for and make use of structure as they draw graphs of polynomials, and use polynomial division to determine factors of polynomials and how those factors relate to the zeros of the function.

Unit 3: **Rational Functions, Expressions and Equations**

STANDARDS
F-IF.7d, A-APR.7, A-REI.2

A. Students will learn about graphing rational functions. They will perform operations on rational expressions. Students will graph and solve rational equations.

Major Topics:
Graphing simple and complex rational functions
Adding, subtracting, multiplying and dividing rational functions
Solving rational equations

B. Unit Assignment(s):
After finishing this unit, students will complete a Math in Careers task by writing, analyzing, and graphing a function representing the concentration of acid in a mixture. Critical skills include representing real-world situations using rational functions, determining domain and range, and interpreting asymptotes.

Students will write a rule for a function that represents a specific acid and water mixture. Students will determine a reasonable domain for their function and explain to a partner. They will graph the function labeling the axes with the quantities they represent and indicate the axis scales. With a partner, a student will analyze the function's rule to determine the vertical and horizontal asymptotes and determine their relevance or irrelevance.

Mathematical Practices Used in Unit:

- MP.7, MP.8 - Students will look for and make use of structure as well as look for and express regularity in repeated reasoning as they connect multiplication and division of fractions to that of rational expressions, and make connections between adding and subtracting fractions and adding and subtracting rational expressions.
- MP.7 - Look for and make use of structure as they graph rational functions with the parameters a, b, h, and k.
- MP.3 - Students will construct viable arguments as they solve rational equations graphically to find the zeros of the function, and algebraically by rewriting an equivalent polynomial equation to solve the original rational equation.

Unit 4: **Radical Functions, Expressions and Equations**

STANDARDS
F-BF.4a, F-IF.7b, N.RN.1, A-REI.2

A. Students will learn about inverses of quadratic and cubic functions. They will graph square and cube root functions. Students will simplify and solve radical equations.

Major Topics:
Inverses of simple quadratic and cubic functions
Graphing square and cube root functions
Radical expressions and rational exponents
Simplifying radical expressions
Solving radical equations

B. Unit Assignment(s):
Upon finishing this unit, students will do a performance task in which they will take on the role of a nutritionist. Students will find a quadratic function that models BMI data. Critical skills include fitting a function to data, finding the appropriate domain and range, and finding the inverse of a function.

Given the median BMI measures for a group of boys, students will create a scatter plot for the data. They will find a quadratic regression model for the data and explain their model. Students will then work with a partner to determine the domain and its restrictions for both the data set and its inverse. Lastly, students will graph the inverse of the function and determine what it models.

Mathematical Practices Used in Unit:

- MP.1 - Students will make sense of problems and persevere in solving them as they use various strategies to solve radical equations, and to obtain extraneous solutions.
- MP.4 - Students will explore how a function and its inverse can both model a given real-world situation.
- MP.7 - Students will look for and make use of structure about how the various parameters, a, b, h, and k, affect the graph of a square-root and cubic function, in relation to a quadratic and cubic function respectively.

Unit 5: **Properties of Circles**

STANDARDS
G-C.1, G-C2, G-C.3, G-C.5, G-GMD.1, G-GPE.1

A. Students will learn relationships among inscribed angles, radii, chords, secants and tangents. They will derive and apply the formula for arc length and sector area and convert degree to radian measure.

Major Topics:

- Central, inscribed and circumscribed angles
- Relationship of radii to chords and tangents

- Tangents to a circle
- Radian measure
- Arc length and sector area

B. Unit Assignment(s):

After finishing this unit, students will complete a Math in Careers task by using knowledge of the properties of circles in the context of an astronomical event. Critical skills include modeling real world situations and applying theorems about tangents, secants and arc measures in a circle. With a partner, students will create a diagram to make sense of the problem and label the given information. Students will determine the best method to calculate the degree of the arc where the eclipse may be observed. Once the measure of the arc is known, students can calculate the length of the arc.

Mathematical Practices Used in Unit:

- MP.4 - Students will model with mathematics as they apply what they know to solve problems involving circles. For example, students will find the distance between the Space Station and Earth's horizon.
- MP.3 - Students construct viable arguments and critique the reasoning of others when they answer the question, "Is it possible for 50% of the Earth's equator to be within range of a satellite's signal?"
- MP.8 - Students will look for and express regularity in repeated reasoning to understand that the radian measure is the constant of proportionality between the length of an arc of a circle and its radius.