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Integrated Mathematics I A/B

Glendale Unified School District

Basic Course Information

School(s) Offering This Course:

School Name	Course Learning Environment	Transcript Code(s)
Crescenta Valley High School (051313)	Classroom Based	Abbreviation: Integrated Math IA; Course Code: Abbreviation: Integrated Math IB; Course Code:
Herbert Hoover High School (051060)	Classroom Based	Abbreviation: Integrated Math IA; Course Code: Abbreviation: Integrated Math IB; Course Code:
Verdugo Academy (054386)	Classroom Based	Abbreviation: Integrated Math IA; Course Code: Abbreviation: Integrated Math IB; Course Code:

Title: Integrated Mathematics I A/B

Length of course: Full Year

Subject area: Mathematics ("c") / Mathematics I

UC honors designation? No

Prerequisites: Math 8 (Recommended)

Co-requisites: None

Integrated (Academics / CTE)? No

Grade levels: 9th, 10th, 11th, 12th

Course Description

Course overview:

The fundamental purpose of Integrated Mathematics I is to formalize and extend the mathematics that students learned in the middle grades. The Standards for Mathematical Practice embedded throughout the course, 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.

Integrated Mathematics I is the first of a three course sequence including Integrated Mathematics I, Integrated Mathematics II, and Integrated Mathematics III. This course satisfies the California State Standards for Mathematics and is intended for all ninth graders. Integrated Mathematics I builds and strengthens students' conceptual knowledge of functions, linear functions, equations, inequalities, sequences, basic exponential functions, systems of linear equations, systems of linear inequalities, one variable descriptive statistics, correlation and residuals, analyzing categorical data, mathematical modeling, and both coordinate and transformational geometries.

The purpose of Integrated Mathematics I is to develop students' ability to think mathematically and develop their conceptual understanding of mathematics and procedural fluency in mathematics. Integrated Mathematics I will extend the mathematics students learned in earlier grades and begin the development of concepts in: Number and Quantity, Algebra, Functions, Modeling, Geometry, and Statistics and Probability needed for higher level mathematics courses. Use of models/real world situations, manipulatives, graphs, and diagrams will help students see the connections between topics which will promote students' view that mathematics is a set of related topics as opposed to a set of discrete topics. In addition, students will learn to solve problems graphically, numerically, algebraically, and verbally and make connections between these representations. Students in this course will learn to use mathematical models to understand real-world events and situations and use algebraic reasoning to manipulate these models for deeper learning.

Course content:

Unit 1: Quantities and Modeling

In this unit, student will learn about creating and solving equations, inequalities, and proportions. Students will use dimensional analysis to convert measurements. Students will determine the precision of measurements while exploring significant digits.

Major Topics:

- Solving equations
- Modeling quantities
- Reporting with precision and accuracy
- Modeling expressions
- Creating and solving equations and inequalities (simple and compound)
- Solving for a variable

Unit Assignment(s):

Sample Assignment

After completing this unit, students will complete a Math in Careers task by creating algebraic models for the number of calories burner per hour of exercise given a person's body weight, as one would do as a personal trainer. Critical skills include modeling real-world situations and writing expressions, equations and compound inequalities.

Given a table of Calories Burned per Hour of Exercise by Body Weight, students will write an expressions for a person with a given weight who completes specific exercises in *t* minutes. Students will then combine exercises (expressions) to write and solve an equation for a total number of calories burned and identify the domain of the equation. Finally students will write an explanation of whether this person can burn 500 calories a day from exercising for 30 minutes.

Mathematical Practices used in Unit 1:

- MP.3 - Students must provide examples and non-examples of proportions and explain how they know they are or are not proportions. Students must also explain the meaning of scale by describing what is know about an original object if the scale ratio is less than 1. Throughout, students explain the meaning of solutions as well as each term when writing and solving equations and inequalities given a context.
- MP.4 - Students use algebraic models to represent real-world scenarios. Students will model compound inequalities by graphing them on a numberline.
- MP.5 - Students will use appropriate tools strategically. "By understanding that the measuring tools which measure to the smallest increment are the most precise, while those that provide measurements closest ot the actual value are the most accurate, students learn how to select the most precise of most accurate measuring tools for an application." (*California Integrated Mathematics 1*, HMH, page 28)
- MP.6 - Students must attend to precision when using dimensional analysis; the proportionate relationship of each measurement must be stated and attended to throughout. Students will learn to accurately use the symbols similar to, congruent to, and approximately
- MP.7 - Students must "look for structure" and recognize the relationships between inverse operations in order to solve equations and inequalities.

Unit 2: Understanding Functions

In unit 2, students will graph relationships and understand relations and functions. They will graph and model functions. Students will identify and graph sequences as well as construct and model arithmetic sequences. (Geometric sequences will be covered in Unit 6.)

Major Topics:

- Graphing relationships
- Understanding relations and functions
- Modeling and graphing functions

- Identifying and graphing sequences
- Construction and modeling arithmetic sequences

💻 Unit Assignment(s):

Sample Assignment

During this unit, students will complete a Math in Careers task by creating and graphing an algebraic model for a titled floor for an Interior Designer. Critical skills include representing real-world situations algebraically, with a table, an on a graph, as well as determining the domain and evaluating the function for a given value.

Students will write a function for the area of a square tile, then identify the domain of the function. They will then create a table using the independent and dependent variables, and writing ordered pairs. Then they will create a graph of the function. Using function notation, students will write and evaluate the function when $s = 3$, and explain what $s = 3$ means in the context of the problem.

Mathematical Practices used in Unit 2:

- MP.2 - Students explain limitations of a range in a given situation and explain how to determine a reasonable domain.
- MP.2 and 3 - Students will explain the meaning of the y-intercept on a graph of a real-world situation and explain why some graphs start higher or lower on the vertical axis. Students must explain what each axis of a graph represents, including how and what is measured and how to read the graph.
- MP.4 - Students will model real-world situations using both explicit and recursive functions. Students will be asked to explain if one wants to determine the ninetieth term in an arithmetic sequence, whether and explicit or recursive rule would be more efficient.
- MP.4 and 6 - Students will sketch and create graphs to model real-world situations. Students will use precision and determine if their graph for a given situation should be discrete or continuous.
- MP.6 - Students use set builder notation and accurately read the set $\{x/1 \leq x \leq 3\}$ as "all x such that x is greater than or equal to 1 and x is less than or equal to 3".
- MP.8 - Students discuss and notice patterns in tables and relate those patterns to slope when graphed.

Unit 3: Linear Functions

In this unit, students will learn about linear functions, rate of change and slope. Students will also write equations in slope-intercept form and point-slope form. They will model linear relationships and use functions to solve one-variable equations. Then they will graph linear inequalities in two variables.

Major Topics:

- Using Intercepts
- Interpreting rate of change and slope
- Slope-Intercept, Point-Slope, and Standard Forms
- Transforming and comparing properties of linear functions

- Modeling linear relationships
- Using functions to solve one-variable equations
- Graphing linear inequalities in two-variables

💻 Unit Assignment(s):

Sample Assignment

During this unit, students will engage in a performance task to determine which of two lawyers is most cost effective given differing numbers of deeds to process. Critical skills include constructing a table from a graph, interpreting a graph with two lines, writing equations, and justifying solutions.

Students will use the points on the graph to construct a table of results and two equations, one for each lawyer. Students will then answer which is a better choice if she has 8 deeds to write and which is a better choice if she has two deeds to write. Students write an explanation of their thinking, then determine which lawyer is more cost-effective in the long run and justify their answer.

Math Practices used in Unit 3

- MP.2 - Students must think abstractly and quantitatively to determine if negative values should be included on a graph, if values less than zero don't make sense, for example, one cannot sell less than zero of something. Students explain the relationship between point-slope form and slope-intercept form and decide which form works best for a situation.
- MP.4 - Students will model in point-slope form the graph of a line, then use the equation to answer a real-world problem. Students will model real-world situations using both verbal models and linear equations. They will then graph their equations and use the graphs to answer questions about the real-world situations.
- MP.5 - Students use a graphing calculator or graphing program to graph a line given in various algebraic forms. Students use a graphing calculator to check their answers.

Unit 4: Statistical Models

In Unit 4: Statistical Models, students will learn about multi-variable data and two-way frequency tables. They will explore, discuss, and compare centers of measure and spread. Students will create and analyze histograms and box plots. Then they will determine trend lines in scatter plots and find the line of best fit.

Major Topics

- Two-Way Frequency Tables
- Relative Frequency
- Measures of center and spread
- Data Distribution and Outliers
- Histograms and Box Plots
- Scatter Plots and Trend Lines

Unit Assignment(s):

Sample Assignment

During this unit, students will complete a performance task using data of city, latitude and average temperature. Critical skills include representing real-world situations graphically, using a graphing calculator, interpreting slope, making predictions based on data, and understanding correlation coefficients.

Students will use a graphing calculator to find the line of best fit for a data set in a table that shows the latitude and average temperature of the ten largest cities in the Southern Hemisphere, then interpret the meaning of the slope of this line. They will then be given a city that is not on the table and it's latitude and average temperature and are asked to account for the difference in the predicted temperature and average temperature, thus explaining the strength of the correlation. Students will then predict how the line of best fit for a data set of the ten largest cities in the Northern Hemisphere might compare to the Southern Hemisphere's cities' line.

Mathematical Practices used in Unit 4

- MP.1 - Students will distinguish between causation and correlation by identifying the mechanism for the cause.
- MP.2 - Students describe and analyze the relationship between two variables in a scatter plot, then make predictions based on the line of best fit.
- MP.2 and MP.4 - Students will reason abstractly and quantitatively by creating dot-plots and histograms to model real-world situations.
- MP.5 - Students will use a graphing calculator or graphing program to find line of best fit and to generate statistics. Students will use a graphing calculator to find linear regression and the correlation coefficient.
- MP.7 - Students will use the structure of two-way frequency tables and two-way relative frequency tables to analyze data and solve problems. Students will use the structure of histograms to to estimate the mean value of a data set; when they construct box plots, they recognize that the basic structure represents center, spread, and shape of distribution of the data set.

Unit 5: Linear Systems

In Unit 5, students will learn about solving and creating systems of linear equations. They will graph both systems of linear equations and linear inequalities. Students will also solve absolute value equations and inequalities.

Major Topics

- Solving linear systems by
  - graphing
  - substitution
  - adding or subtracting
  - multiplying first
- Creating systems of linear equations and inequalities
- Modeling with linear systems
- Solving absolute value equations and inequalities

💻 Unit Assignment(s):

Sample Assignment

After completing this unit, students will complete a Math in Careers task by creating and graphing and algebraic model for a personal shopper purchasing clothing for a client. Critical skills include representing a real-world situation both algebraically and graphically, solving a system of equations algebraically and graphically, and explaining why one method is preferred in the given situation.

Given the cost of jeans and t-shirts, students will write two equations: one equation to represent *x* pairs of jeans and *y* t-shirts to be purchased for a given amount of money and one equation to represent purchasing a total number of 5 items. Students will then solve the system algebraically to determine how many pairs of jeans and how many t-shirts the shopper should purchase. Students will also graph the system and discuss the meaning of the point of intersection. Finally, students will state which method (algebraically or by graphing) was easier to solve the system, then explain their reasoning.

Mathematical Practices used in Unit 5

- MP.2 - "Students learn to write and solve systems of linear equations for real-world situations represented by verbal descriptions, table, or graphs. By analyzing the relationships between variables, they are able to translate each of these representations into algebraic equations. After solving the systems of equations, students interpret the solutions by connecting them to the real-world situations they represent."
- (*California Integrated Mathematics 1*, HMH, page 534)
- MP.4 - Students will model the solution to a system of equations algebraically and graphically and explain how the two are related. Students will model solving systems with algebra tiles.
- MP.5 - Students will use graph paper and a straightedge to accurately draw both lines in a system. Students will also use a graphing calculator to solve systems by graphing. Students will choose between a graphing calculator and graph paper when graphing the solution to a system with decimal coefficients. Students will check their solutions with a graphing calculator or by substitution.
- MP.6 - Students will adjust the scale on a graphing calculator showing the intersection of the lines of a system more precisely.

Unit 6: Exponential Relationships

In Unit 2, students learned about arithmetic sequences and wrote general recursive and explicit rules for them. In this unit, students will learn about geometric sequences. Students will also learn about and explore exponential functions, including exponential growth and decay functions.

Major Topics

- Geometric sequences
- Exponential functions: constructing, graphing, transforming
- Exponential growth and decay

- Exponential regression
- Linear and exponential models

💻 Unit Assignment(s):

Sample Assignment

After completing this unit, students will complete a math in Careers task by writing and interpreting exponential functions based on a graph. Students will see how a financial research analyst uses mathematics on the job. Critical Skills include modeling real-world situations and interpreting functional relationships.

Students will interpret a graph modeling the value of two different shares of stock over a period of four years. They will need to identify if each stock show exponential growth or decay and find the initial values and growth or decay factor of each. Students will then have to determine after how many years the stock values were about equal and what that value was. Finally, students will need to determine after how many years one stock was about twice the value of the other and explain how they found their answer.

Mathematical Practices used in Unit 6

- MP.2 and 4 - Students will model a real-world situations as exponential functions.
- MP.3 - Student explain why they would choose to use the fraction 3/2 or its decimal equivalent, 1.5, when solving a given an exponential function.
- MP.4 - Students will write both recursive and explicit rules for the same geometric sequence. Students will model a geometric sequence by repeatedly folding a piece of paper.
- MP.5 - Students will use a graphing calculator to graph and compare exponential functions. They will also use the graphing calculator to graph two functions and adjust the viewing window so the intersection is clear.
- MP.6 - Students will continue to use precise mathematical vocabulary in discussion in the unit. Students will be introduced to asymptotes and be able to describe the end behavior of an exponential function in algebraic terms.
- MP.7 - "Students will compare exponential functions. They will explore how changing the parameters of the functions affects the shapes of their graphs, including how quickly the graphs rise or fall, end behavior, and y-intercepts. They will identify patterns that will allow them to predict how increasing, decreasing, or changing the sign of a parameter will affect the graph of an exponential function."
- (*California Integrated Mathematics 1*, HMH, page 692)

Unit 7: Transformations and Congruence

In previous courses, students have worked with geometric terms and figures. Many of these ideas are revisited in Unit 7 systematically and more formally. Students will learn about segments and angles; reasoning and proof; translations, reflections, and rotations; symmetry; and corresponding parts of congruent figures.

Major Topics

- Constructions using compass and straightedge
- Reasoning and proof

- Geometric transformations
- Symmetry
- Congruence and corresponding parts

💻 Unit Assignment(s):

Sample Assignment

After completing this unit, students will complete a Math in Careers task by using given measurements in three dimensions to calculate distances. Critical skills include modeling real-world situations and use the distance formula.

Students can see how a geomatics surveyor uses mathematics on the job. Students are given the dimensions and elevation of a piece of land. Students will find the distance between a surveyor and the middlemost point of a piece of land both considering and ignoring elevation and the elevation of the middlemost point in comparison to his location, assuming the elevation increases at a constant rate. After making sense of the task, students must write and solve equations with exponents and use the distance formula.

Mathematical Practices in Unit 7

- MP.3 - Students will use postulates and conditional statements in their study of proofs. Students will provide examples and counter examples to justify hypotheses. Students will discuss, explore, and draw examples to prove or disprove whether a preimage and a reflected image can have any points in common. Students will analyze preimages and images, determining the kind of translation(s) shown, then explain and justify their answers. Students will determine if there is more than one way to identify the translation(s) of a preimage and image.
- MP.4 - Students will express transformations verbally as well as algebraically.
- MP.5 - Students will use a compass and straightedge to copy segments and angles. Use a compass and straightedge to construct and angle bisector. Use a protractor to measure and construct angles of a specific measurement. Students will use appropriate tools (protractors, rules, coordinates, compasses) to determine if length and angle measure have been preserved after a transformation. Students will use tracing paper, rulers, and protractors to explore reflections. Students will use geometry software, such as Desmos, to explore and check predictions of rotations and other transflormations.
- MP.6 - Students must use precision of language to accurately describe transformations, including angle and direction of rotations, reflections, and distance and direction of translations.

Unit 8: Coordinate Proof Using Slope and Distance

In this unit, students will learn about coordinate proofs with slopes and lines that are parallel and perpendicular. They will learn the distance and midpoint formulas. Then they will find the perimeter and area on a coordinate plane, as well as the area of composite figures.

Major Topics

- Justifying constructions
- Slope and parallel lines

- Slope and perpendicular lines
- Coordinate proof using distance with segments, triangles, and quadrilaterals
- Perimeter and area on the coordinate plane

💻 Unit Assignment(s):

Sample Assignment

At the end of this unit, students will complete a performance task where they calculate the percentage of the containment of a forest fire. Critical skills include interpreting figures on the coordinate plane and finding slope and distance.

Students are given an image (a coordinate plane) that shows a forest fire. The forest is represented by a shaded square, while the fire is show by a darker irregular pentagon. Two sides of the pentagon have darker lines that represent a fire line that has been dug to contain the blaze. Students are asked to estimate the percentage of containment of the fire. Students must write down their data and assumptions, as well as use graphs, numbers, words, or algebra to explain how they reached their conclusions.

Mathematical Practices used in Unit 8:

- MP.4 - Students will use the appropriate tools (reflective devices, compass, straightedge) for a given construction: perpendicular lines, parallel lines, copy angles, angle bisectors, perpendicular bisectors, construct equilateral triangles.
- MP.5 - Students will use a graphing calculator or graphing program to check that two lines are perpendicular or parallel.
- MP.6 - Students will describe their constructions in terms of vertices, coordinates, and attributes such as parallel or perpendicular lines.
- MP.7 - Students use the structure of parallel lines and their coordinates on a coordinate plane to predict whether a set of given points are parallel, will or will not form a given quadrilateral, or will or will not be colinear. Students will then justify their answers. Students will determine that two non-vertical lines are perpendicular if the product of their slopes is -1

Course Materials

Textbooks

Title	Author	Publisher	Edition	Website	Primary
California Integrated Mathematics 1	Timothy D. Kanold, Edward B. Burger, Juli K. Dixon, Matthew R. Larson, and Steven J. Leinwand	Houghton Mifflin Harcourt	2015	[empty]	Yes