Natomas Unified School District
Connecting students to their future

New Course Approval Application

Submission Date: 06/22/2016 **Person Initiating Course:** A. Herrera **Site(s):** High Schools
Date Submitted to Board: ___/___/_____ **Date of Approval:** ___/___/_____

Course Title: EAP Senior Math
Unit Value: 5 units per semester

Subject Area:
- ☐ Algebra/Math 1 *(9-12 course only)*
- ☐ American Government *(9-12 course only)*
- ☐ Economics *(9-12 course only)*
- ☒ Elective
- ☐ English
- ☐ Health
- ☐ History/Social Science *(K-8 course only)*
- ☐ Life Science *(9-12 course only)*
- ☐ Mathematics *(not Algebra/Math 1)*
- ☐ Physical Education
- ☐ Physical Science *(9-12 course only)*
- ☐ Science *(K-8 course only)*
- ☐ Technology
- ☐ U.S. History *(9-12 course only)*
- ☐ Visual & Performing Arts
  - ☐ Intro
  - ☐ Advanced
- ☐ World Geography *(9-12 course only)*
- ☐ World History *(9-12 course only)*
- ☐ World Language

Fulfills UC/CSU Entrance Requirement?
☒ Yes ☐ No

Please indicate the letter (A-F, G electives):
☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☒ G

Satisfies Graduation Requirement As:
- ☐ Required Class
- ☐ Required Subject Area Elective
- ☒ Elective Requirement Option

"Honors" Distinction: ☐ Yes ☒ No
Advanced Placement: ☐ Yes ☒ No
International Baccalaureate: ☐ Yes ☐ No
Special Education: ☐ Yes ☒ No
Level: ☐ RSP ☐ SDC ☐ ILS
English Language Development: ☐ Yes ☒ No
CTE ☐ Yes ☒ No

Pre-/Co-requisites:

Approved Text(s):

Transcript Title(s) / Abbreviation(s)
EAP Math, EAP Senior Math

Grade Level:
☐ 9 ☐ 10 ☐ 11 ☒ 12 ☐ Other_____

Grading Scale to Use:
- ☒ Default (not weighted)
- ☐ AP scale (weighted)

Additional versions of this course?
- ☐ CECA
- ☐ Scholars
- ☐ Special Education (.98)
- ☐ Special Education (.99)

Internal Use Only **- Transcript Course Code(s) / Number(s) (CALPADS):** _____

Modeled After:
Model Course Title: EAP Senior Math **Course code for model course:** _____

*****Please submit form electronically to the Assistant Superintendent of School Leadership and Support***

PROCEDURES FOR APPROVAL

The "New Course Approval Procedures" are designed to insure that the courses offered to students in the Natomas Unified School District are of uniformly high quality and have been designed with appropriate input from all concerned parties. ***(see NUSD Knowledge Base article for Flow Chart.)***

NEW COURSE DEVELOPMENT GUIDE

The following checklist is intended to ensure content consistency in curriculum development in NUSD.

Please include **all** sections described in the guidelines.

- ☐ Preparation: Has the High School Course Catalog been checked to avoid duplication of title and content?
- ☐ Text & Supplemental Instructional Materials (costs for site/district)
- ☐ Course Title
- ☐ Transcript Title/Abbreviation
- ☐ School
- ☐ Grade Level for which course is intended
- ☐ Department or Discipline (Subject Area)
- ☐ Seeking Honors Distinction? (If so, indicate clearly how content is distinct from non-Honors.)
- ☐ Unit Value
- ☐ Fulfills "a-g" requirement? (Pending UC Doorways approval)
- ☐ Modeled after a UC course from outside of our district? If so, which school district? Course title at other school.
- ☐ AP course? Please concurrently submit to College Board.
- ☐ Prerequisites/Co-requisites
- ☐ Course Description for High School Course Catalog
- ☐ Course Rationale: statement of student needs
- ☐ Common Core Standards addressed
- ☐ Course Objectives
- ☐ Course Outline
- ☐ Budget Impact
- ☐ Key Assignments
- ☐ Instructional Methods and/or Strategies: Outline of Resources Needed
- ☐ Student Assessment Methods and/or Tools
- ☐ Course Evaluation

Courses may be site- or district-initiated (see NUSD Knowledge Base article for Flow Chart.)

The responsibility for site-initiated courses remains with the site administrator until such time as the course has met the requirements of site standards or until it has been denied. Denials at any level may be challenged by submitting the *New Course Approval Application* and the written justification for denial to the Assistant Superintendent of School Leadership and Support (SLS). *Appeals of cases where a course is denied at any level will be handled by SLS*

New courses are directed to the Assistant Superintendent of SLS and then channeled through the appropriate steps of the procedure.

The Assistant Superintendent of SLS is also responsible for notifying the initiator/site of changes or recommendations as the new course advances through the steps of the procedure.

During some part of the procedure, all courses must have approval from:

- ☐ Subject Area Department Chair
- ☐ Site Principal
- ☐ School Leadership & Support
- ☐ Administrative Services
- ☐ Superintendent's Cabinet
- ☐ Board of Trustees

Any denial requires written justification.

COURSE CONTENT

Texts & Supplemental Instructional Materials ***(Failure to complete this section will delay the approval process.)***

☐ List of texts and supplemental instructional materials is attached.

☐ **REQUIRED:** Submit (concurrently with this application) the ***Request for District Approval for Adoption of Textbooks, Reference Materials, and Literature Form(s)*** along with the referenced textbooks/materials.

- ☐ To be funded by:
- ☐ Cost per pupil -

☐ Textbooks/materials to be used in this course are currently going through or have already gone through the district's approval process.

Course overview:

This course is designed to strengthen mathematical foundation and to prepare students to be successful in college level math. The goal of the course is to deepen conceptual understandings of mathematical theory, skills and strategies. The course is designed to incorporate National Common Core Standards for Mathematical Practice and is aligned with specific high school standards listed in the California Common Core. Utilizing practical life applications this course serves both college and career bound High School Seniors.

This course was designed to assist students in making their transition from high school to college successful. This is a supplemental course that addresses topics previously covered in Algebra II courses, at a deeper level, as well as additional material identified by college instructors as necessary skills for college success. Using the Standards of Mathematical Practice from the Common Core Standards as a guideline, the course was designed in a manner which stresses deeper understanding, communication and critical thinking. Most of the time, students work in groups, discussing strategies for problem solving and persevering in solving problems that sometimes span more than one school day. Students are encouraged to come up with multiple ways of finding solutions and to test the validity of their answers, making them more reflective learners, and fostering independence. Students will build a mathematical "tool kit" of strategies, vocabulary and skills, with the ability to apply these in both new and practical situations. Most units contain specific real life problems, increasing the motivation of students to learn. A high emphasis is placed on students' ability to justify their reasoning, and communicate the depth of their understanding of concepts. This course was originally developed for students who scored conditional on the EAP portion of the math Star test, but was found to be effective with students of all ranges, including those who had passed, and those who had failed.

Prerequisites:

Algebra 2 or Mathematics 3 (Required)

Co-requisites:

None

Course content:

The shaded background of the following field indicates this course was approved by UC for the 2014-15 school year or earlier. Please refer to the current "a-g" course criteria and guidelines when completing your course submission form.

Course Outline & Common Cores State Standards addressed (in the absence of adopted standards, list major student outcomes):

Units 1 - 8

This course does not have a published text. The multi leveled writing team built the curriculum based on input from all stakeholders, determining what students will need to gain mastery of mathematical concepts for a successful transition to college-level mathematics courses. With traditional textbooks students tend to only be able to solve problems for which they have seen explicit examples for. This does not support the Common Core thinking in the Standards for Mathematical practice. In choosing the units for this course the team of writers considered what concepts students struggled with in Algebra II, and would require more practice in order to achieve mastery. The topics were reviewed by a number of college instructors and amended to reflect their

input. There are eight units in the curriculum; Problem Solving, Linear Math Applications, Quadratic Math Applications, Exponential Math Applications, Logarithmic Math Applications, Math of Finance, Solving Systems of Equations and Inequalities and Absolute Value with Piece Functions. Each unit has a number of lessons, which vary in length and content, so may take one or more days to complete. Many lessons were designed to take multiple days to develop understanding and perseverance. A crucial element of the class is pedagogy. The course is designed to ignite a passion for math, a willingness to persevere and work collaboratively, and to seek new ways of looking at and understanding math. Teachers need to be facilitators of learning and foster an environment which allows students to make mistakes but also holds students accountable for their own learning.

Unit 1 Problem Solving: In this unit students will gain insight into the applications of a variety of problem solving strategies. These include using a guess and check table to derive an equation, finding patterns, making a simpler problem, drawing diagrams and acting out the problem. Each problem requires that students engage in multiple standards of mathematical practice as outlined in the Common Core. In addition, students will develop team building skills to work well in groups and enhance their mathematical communication skills.

This sets the climate for the rest of the course, stressing skills such as reasoning and perseverance in traditional as well as nontraditional problems. These types of problems will be used throughout the course, not just in these four days.

In this unit students will:

- Define the problem and persevere in solving it.
- Arrive at an accurate solution.
- Justify their answer verbally, and in writing.
- Work cooperatively to solve problems
- Investigate and explore a variety of ways to solve a problem, even when a suitable solution is already determined.
- Test conjectures, and build self-reliance in determining if solutions are correct.
- Create a journal with a list of problem solving strategies.

Students will not necessarily solve the problems in the same manner, thus the following are things students might do:

- Make a series of similar problems and identify patterns.
- Determine an equation that leads to a solution.
- Act out the problem.
- Work backwards.
- Look for patterns.
- Use logical reasoning.
- Crate tables and diagrams.

CCSS alignment: All 8 of the standards of mathematical practice are integrated repeatedly into this unit, as well as throughout the course.

Unit 2 Linear Functions: This is the first of several units in which students will revisit concepts learned previously. The approach is different than it is in traditional textbooks and will result in a deeper understanding of the concepts, as well as the ability to apply the learning to real situations. Physical models will be used to illustrate the concepts of slope and intercepts, and students will transition to understanding more abstract models. Students will make sense of what makes a function linear or nonlinear and use functions to make predictions. Function notation will be used as well as iterative and recursive notation. Students will distinguish between discrete and continuous graphs and ascertain appropriate domain and range for each situation.

In this unit students will:

- Determine if a set of data or a given situation is linear or not.
- Recognize that a linear function has a constant rate of change, and identify this rate, given a graph, a table, a diagram, or a situation.
- Give specific examples of linear and nonlinear functions.
- Find the equation of a line, given points, a graph or a situation.
- Solve algebraically to determine intercepts.
- Explain the significance of the y- intercepts, using specific examples to illustrate their knowledge.
- Use an equation to determine points unknown for a linear function.
- Use function notation accurately.
- Determine the domain and range of a function

Content Standards: N-Q 1 & 2; A-SSE 1 & 2.l, A-CED 1, 1.1 & 2 A-REI 1, F-IF 1-7,F-BF 1 & 2; F-LE 1 & 5

Unit 3 Quadratic Math: In this unit, students will identify the key components unique to quadratic equations, distinguish them from other equations, and solve problems that utilize quadratics in both physical models and business applications. Students will develop introductory understanding of fundamental trigonometric functions to apply equations for projectile motion for an engaging catapult project. Students will also recognize and compare local maxima and minima within various business models, and must draw conclusions and explain their meaning and impact to the business.

In this unit students will:

- Distinguish quadratic equations from other equations by identifying unique characteristics of quadratics
- Identify vertices and intercepts of a given quadratic equation, and be able to accurately describe its overall shape
- Create accurate quadratic equations when given quadratic sequences
- Utilize multiple different methods for solving quadratic equations, including: Completing the square, factoring, graphing, and the quadratic formula
- Apply solutions to a variety of quadratic problems, and interpret the significance of intercepts, vertices, and maxima or minima

- Construct a catapult and derive the equation that describes the path of a projectile launched by the catapult.
- Solve the derived equation to precisely determine the proper location for their catapult to hit a given target.
- Create and apply both linear and quadratic equations to construct an accurate mathematical business model for an entrepreneurial student
- Solve a system of equations to find the optimal sales volume for maximum profit for the proposed business
- Interpret the meaning of the solution, both in mathematical terms and by describing its significance to the business.

Content Standards: N-Q 1-3; N – CN 1-9A-SSE 1 -3;A-APR1 & 3; A-CED 2 & 4; A-REI 1, 4,10 & 11; F-IF 3. 4. 5. 7. 8. & 10: F-BF 1 & 3; F-LE 6; F-TF 6; G-SRT 8

Unit 4 Exponential Functions: Emphasis is placed on real world applications in this unit. The math developed here is necessary for a future unit, Math of Finance. As with the linear units, students will develop an understanding of what is and is not an exponential function. Exponential growth and decay are explored here, and numeracy is built by using the concept that every number is 100% of itself. The unit begins with concrete lessons, using manipulatives to demonstrated growth and decay, and progresses to more abstract situations. Students learn that the math of half –live can be used to determine how old a substance is, by measuring the carbon-14 content.

In this unit students will:

- Utilize given data to generate exponential equations and functions
- Give specific examples of exponential growth and decay
- Utilize the equations to make evaluations for other input values, in both directions.
- Determine x and y intercepts and any asymptotes
- Graph exponential functions
- Solve and/or approximate solutions to exponential equations.
- Apply exponential mathematics to real-life problems.
- Determine the half-life of a substance, given parameters.
- Use half- life to determine the age of something.

Content Standards: N-Q 1-3: A-SEE1 & 3; A-CED 1.1, 2& 3; A-REI 1, 10 & 11; F-IF 1-10; F-BF 1 & 2; F-LE 1-5

Unit 5 Logarithmic Functions: Logarithms logically follow exponentials. This allows the approximate answers in Unit 4 to be achieved more accurately. The properties of logs are not re-addressed, with the exception of one. Most students in Algebra II find the study of logarithms confusing, and do not leave the course with much confidence in their ability to solve or even define logarithms. The lessons in this unit were designed to demystify logarithms and build a strong foundation, increasing students' knowledge and confidence.

In this unit students will:

- Comprehend the reasoning behind logarithms

- Increase numeracy to approximate logarithmic values
- Augment the understanding that logarithms use different base numbers; 10 and e being the ones utilized on the calculator
- Display appropriate mathematical tactics to accurately solve exponential and logarithm equations
- Given practical applications of logarithms; students will dissect givens, obtain solution and be able to logically defend outcome
- Demonstrate the ability to construct appropriate graphs for logarithmic and exponential functions
- Explore the inverse function relationship between logarithmic and exponential functions

Real World Examples: pH, Richter scale

Content Standards: N - Q 2&3; A - SSE 1b; F-IF 4, 5, & 7a & e.; F -BF 1 & 2; F-LE 4 & 5

Unit 6 Math of Finance: The math related to finance is a new topic for most students. Practical applications and intricate formula derivation will be used for their adult life decisions. This unit is only an introduction and does not detail all the complex points of the financial subject.

In this unit students will:

- Show numeracy skills using percentages for determining tips, sales tax and cost of a item when it is discounted
- Explain how the concept of simple interest is employed to generate the formula for compound interest
- Utilize the concepts above to mathematically derive the compound interest formula
- Verify the generation of the formula for a financial annuity, building on the compound interest formula
- Incorporate both the compound interest and annuity formulas to produce the formula for the amortization of a loan
- Decide which formula to use in the solution of a financial problem and be able to explain thoroughly why to employ that formula
- Clarify the vocabulary associated with the math of finance; annual interest, principal, compound periods and more
- Develop the adeptness to determine if a calculator given answer is correct using mathematical abilities
- Generate appropriate problems to show the understanding of the material that can be shared with fellow students

Content Standards: N- Q 3; N – RN 1; A – SEE 1 & 2:A-REI 1 &11; F-IF 3-6 & 8; F-BF 1 &2; F -LE 1-5

Unit 7: Solving Systems of Equations and Inequalities Students will develop a deeper understanding of what the solution to a System of Equations and Inequalities would represent. The students will explore two functions and their input-output tables through graphing to determine that the solution represents where one input yields the same output for two separate functions, both linear to linear as well as linear to quadratic. Once students become conscience of what a

solution to a system is, they will have additional real world supply and demand problems and explore actual decision making questions based on the graph and solution. Finally the students will explore Linear Programming which includes constraint inequality equations and a profit equation.

In this unit students will:

- Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.
- Represent and solve equations and inequalities graphically.
- Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions Solve word problems using systems of equation and/or inequalities.
- Evaluate a real life example of a system and make several logical/mathematical predictions for a sequence of questions. Use graphical and mathematical methods to answer the questions regarding supply and demand of a manufactured item.
- Solve systems of non-linear equalities using graphical representation, tabular and algebraic methods or solving. This exercise allows students to make the connection between the algebra, graph and table solutions.
- Perform linear programming to determine the maximum or minimum of the objective equation. This real world application lets student see that each variable has its own parameters such as 'x must be positive" etc. The student will then connect the System of Inequalities with a profit equation exploring the vertices of the bounded area as the maximum and minimum values of the profit statement

Content Standards: N - Q 1-3; A - CED 1-3; A-REI 1, 3, 5,6, 7, 10 & 12; F-IF 4 & 5; F-BF1; F-LE 1, 2, & 5

Unit 8 Absolute Value and Piece-wise Functions: Students will explore, in depth, the concepts of absolute value equations and inequalities including graphical representations of graphing any function as an absolute value. Understand the importance of piecewise functions in the real world. Students will also be able to rewrite an absolute value graph into a piecewise function.

In this unit students will:

- Create equations and inequalities in one variable including ones with absolute value and use them to solve problems.
- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
- Represent and solve equations and inequalities graphically.
- Write a function that describes a relationship between two quantities. Given a real world word problem, transform the words into an absolute value or piecewise function.

Content Standards: N-Q; A - CED 1 & 2; A-REI 3.1 & 10; F- BF 1 & 3; F-IF 4 & 5

This course does not have a published text. The multi leveled writing team built the curriculum based on input from all stakeholders, determining what students will need to gain mastery of

mathematical concepts for a successful transition to college-level mathematics courses. With traditional textbooks students tend to only be able to solve problems for which they have seen explicit examples for. This does not support the Common Core thinking in the Standards for Mathematical practice. In choosing the units for this course the team of writers considered what concepts students struggled with in Algebra II, and would require more practice in order to achieve mastery. The topics were reviewed by a number of college instructors and amended to reflect their input. There are eight units in the curriculum; Problem Solving, Linear Math Applications, Quadratic Math Applications, Exponential Math Applications, Logarithmic Math Applications, Math of Finance, Solving Systems of Equations and Inequalities and Absolute Value with Piece Functions. Each unit has a number of lessons, which vary in length and content, so may take one or more days to complete. Many lessons were designed to take multiple days to develop understanding and perseverance. A crucial element of the class is pedagogy. The course is designed to ignite a passion for math, a willingness to persevere and work collaboratively, and to seek new ways of looking at and understanding math. Teachers need to be facilitators of learning and foster an environment which allows students to make mistakes but also holds students accountable for their own learning.

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Real World Examples: pH, Richter scale

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- Verify the generation of the formula for a financial annuity, building on the compound interest formula
- Incorporate both the compound interest and annuity formulas to produce the formula for the amortization of a loan
- Decide which formula to use in the solution of a financial problem and be able to explain thoroughly why to employ that formula
- Clarify the vocabulary associated with the math of finance; annual interest, principal, compound periods and more
- Develop the adeptness to determine if a calculator given answer is correct using mathematical abilities
- Generate appropriate problems to show the understanding of the material that can be shared with fellow students

Content Standards: N- Q 3; N – RN 1; A – SEE 1 & 2:A-REI 1 &11; F-IF 3-6 & 8; F-BF 1 &2; F -LE 1-5

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- Represent and solve equations and inequalities graphically.
- Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions* Solve word problems using systems of equation and/or inequalities.
- Evaluate a real life example of a system and make several logical/mathematical predictions for a sequence of questions. Use graphical and mathematical methods to answer the questions regarding supply and demand of a manufactured item.
- Solve systems of non-linear equalities using graphical representation, tabular and algebraic methods or solving. This exercise allows students to make the connection between the algebra, graph and table solutions.
- Perform linear programming to determine the maximum or minimum of the objective equation. This real world application lets student see that each variable has its own parameters such as 'x must be positive" etc. The student will then connect the System of Inequalities with a profit equation exploring the vertices of the bounded area as the maximum and minimum values of the profit statement

Content Standards: N - Q 1-3; A - CED 1-3; A-REI 1, 3, 5,6, 7, 10 & 12; F-IF 4 & 5; F-BF1; F-LE 1, 2, & 5

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In this unit students will:

- Create equations and inequalities in one variable **including ones with absolute value** and use them to solve problems.
- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

- Represent and solve equations and inequalities graphically.
- Write a function that describes a relationship between two quantities. Given a real world word problem, transform the words into an absolute value or piecewise function.

Content Standards: N-Q; A - CED 1 & 2; A-REI 3.1 & 10; F- BF 1 & 3; F-IF 4 & 5

Key Assignments:

Each lesson includes activities which develop understanding, as well as practice problems to build mastery. These problems are intended to motivate students to explore the topic, make a conjecture for the method of solution and solve the problem. Working in groups allows debate to determine if the method of attack on the problem is reasonable or not and to investigate other possible approaches. At the end of each lesson a journal question is posed for students to address. Student response in the journal entry will allow the teacher to determine if the students have attained understanding of the material investigated in that lesson. At the end of each unit, an overall performance task is given to culminate all of the lessons in the unit. Some will require research; some demonstrate creativity allowing students to exhibit that they have gained mathematical depth in the topic presented. The whole course was designed around the Standards for Mathematical Practice as part of the structure. Embedded in each task and activity is practice to support students in creating viable arguments and supporting their answers in a safe environment. Critiquing the work of others and accepting evaluation of their technique builds mathematical and personal confidence. The premise in this class is that students persevere with the problems and won't be satisfied to go on until the math makes sense. Instructors strive for this in their questioning strategies when facilitating the group work.

NOTE: Students will be doing daily math assignments from the on line curriculum located athttp://math.sierracollege.edu/Staff/Barron/A%20-%20G%20curric%20post/Senior%20Mth%20Curric.htm that will be used to assess their ability to develop concepts both working in groups and as individuals.

Unit 1 Problem Solving

For each task in this unit students will be required to communicate their thinking and means of reaching a solution, including those which were not successful. Students will often share their findings with the class as a whole.

Handshake problem Students are challenged to determine how many handshakes will take place if each person in the room shakes hands with each other person in the room. While students may arrive at conclusions in different ways, most will conduct a mini – sampling of the problem by shaking hands with each of their group members, and recording the information. By creating a series of simpler problems, students can use patterns to deduce the correct answer. Students will then be challenged to answer similar, but more complex problems. This problem will be revisited in Unit 3, when students derive a quadratic equation which will allow them to determine the number of handshakes amongst any given number of people.

Bear Problem In this lesson students examine a task with a certain set of parameters, and determine how to accomplish the task. Many groups will choose to act out the problem, and communicate their ideas as they work.

Train Switcheroo Students will be allowed manipulatives to solve this classic problem of switching trains on a track, given certain parameters. They will find it necessary to record each of their steps in order to be able to demonstrate the solution to the teacher.

Color Square Logic Game Emphasis is placed on the ability to communicate logical reasoning in deducing the solution to each of these puzzles. Students will then create their own puzzles, and challenge classmates to solve them.

Cooperative Squares Working in groups of four or five, each student is given a set of puzzle pieces. Working within certain constraints, including no talking, students much trade pieces until each is able to build a congruent square. Students will often find that the building of one square prohibits the proper distribution allowing all participants in the group to achieve the goal, and they will find it necessary to restart. After the activity, the class will discuss strategies, experiences, and benefits of the assignment.

Galleons In this problem student are asked to find the original amount of money a person had after examining their spending habits. While this is one of the easier problems in the unit to solve, it is particularly interesting for students to find that there are multiple means toward determining the solution, and that not everyone looked at it the way they did.

Unit 2 Linear Functions

How tall is your teacher? In this lesson, inspired by Dan Meyer, *http://blog.mrmeyer.com*, students will predict, then calculate the number of cups they will need to stack to match the height of the teacher. The relationship is linear, but most students will first believe that the height of the cup is the slope, and only upon trying to verify this conclusion will they realize that the lip of the cup is the slope, and the "body" of one cup is the y-intercept. An extension can be done by introducing a new size cup, and solving a system of equations to determine the number of cups of each type required to reach equivalent heights. An interesting investigation to pursue when discussing domain is whether fractions of cups can be used. Depending on how the cup is sliced it can produce the same height affect as a full cup, or that of no cup at all.

Recursive Notation In this lesson, students will use patterns to develop an understanding of what make a function linear. They will be able to distinguish between linear and non-linear functions and write equations in a variety of forms including slope – intercept form, and recursive notation.

The last one Game A fun and challenging game, contributed by Elaine Kasimatis at CSUS will entice students to employ various strategies for winning the game. Repeated exploration and problem solving will help them see that there is a linear relationship in the strategy. Students will test their strategies, and defend their reasoning to others. In small groups students will critique the reasoning of others. Students will be encouraged to test their skills at home with siblings or parents.

What's it all mean? Students will demonstrate their understanding of linear functions by presenting original, real life scenarios which are linear to the class. They will determine the equation that best models their scenario and justify their conclusion that it is linear. They will demonstrate to the class why it is a discrete or continuous relationship and give a reasonable and accurate domain and range for the situation.

Unit 3 Quadratic Functions

Patterns Students find the product of arithmetic series to develop an understanding of what a quadratic function is. They derive equations and use them to calculate inputs and outputs.

Graphing Students focus on the components of quadratic graphs including the vertex, intercept, focus and directrix. Understanding of the latter is developed by "building" a human parabola in the classroom. Assignments include problems about real world parabolas such as satellites and listening vessels.

Projectile Motion Students will construct a simple spring-loaded catapult that launches a projectile with a consistent launch angle and initial force. Through observing and accurately measuring trajectory data (height, range, and time of flight), students will graphically produce the projectile's path, and then create a quadratic equation that accurately models the trajectory. Students will then apply their equation formulate the precise catapult location required for their projectile to hit a given target. Throughout the project, students must interpret data from their model, and must assess the precision and accuracy of their data based on the results of each projectile launch. Upon the project's completion, students then must apply these concepts to new quadratic models, assess the meaning of key components (intercepts, vertices, launch angle and range), and predict the outcome by solving 2nd order equations with reasonable precision.

Real World Applications Students solve word problems which allow them to determine how to fence an area to maximize profit, as well as how to maximize profit for a company. They also use graphing calculators to find quadratic regressions for given data sets.

Unit 4 Exponential Functions

Population Growth Students use two sided disks or coins in a concrete activity which replicates exponential growth. Each time the "red" side is facing up, students add another disk. They keep track of each "flip", year in a chart then graph the results, determine the exponential regression which represents the growth, and use the equation to make predictions about future growth.

One Grain of Rice In the book One Grain of Rice by Demi, the main character Rani cleverly tricks the raja into giving rice to the village. Students calculate how much rice the village will receive each day, and derive the equation which represents the growth. They quickly come to understand the power of exponential growth.

Geometric Series Using tables and series students learn that repeated multiplication/division can be translated into exponential mathematics. The derive equations, and revisit recursive notation as a means of representing the functions. In instances where they are solving for the input , some students will use logarithms, having learned about them in a previous course. Others, who have not mastered logarithms will use guess and check, but realize the need for a more expedient method, thus setting the stage for Unit 5.

M&M Activity Students toss M&M's, removing those with the m showing approximately 20 times to gain a concrete understanding of half-life. This leads to a study of how different chemicals decompose with half-life timelines. One example of what they learn is that when a living organism dies, it stops taking in carbon-14 (C14), which has a half –life of 5730 years. They solve a variety of exponential word problems which include determining the age of an object using the science of half-life.

Natural Logarithm Using the power of repeated compounding, students come to realize that there is a natural constant, Euler's number which occurs. They do simple calculations involving e. A deeper understanding is developed in the next unit.

Unit 5 Logarithms

Develop Solutions to Exponential equations In the previous unit, Unit 4 Exponential problems were given where students did not recall how to solve. Approximation solutions were determined. By examining the problems from a different point of view, the concept of logarithm is re-established. Solving exponential and logarithmic equations develops more smoothly. The one property of logarithms which is discussed is $\log_b A^t = t \log_b A$.

Half-life of Chemical Material Students are presented with real-life problems to determine the amount of material that well demonstrate chemical characteristics depending on the half-life of the material. These problems are presented from various standpoints to determine the extent to which students have gained comprehension. This is an interesting topic because of the utilization to determine the age of an object or to determine how to design containment of nuclear waste.

pH Another practical application of logarithms, determining the acidic or basic qualities of some substance and what effect that generates.

Logarithms with Varied Base Numbers Students are asked to survey the viability of logarithms that are not mounted on the calculator face. Base 2 is used in many computer procedures. How can this be related to log and ln keys on the calculator.

Graphing Logarithmic Functions Students generate graphs of logarithmic functions, discuss their asymptotes and what generates other important data. Then students are requested to determine how these graphs relate to exponential graphs and what that relationship indicates.

Unit 6 Math of Finance

The topic taught in the EAP class is a novice view of the realistic financial field. The Math of Finance is a very complex arena in real-life. However, the basic concepts presented here yield an overview of adult decision making for personal finance. One major accomplishment is exhibited when given a math of finance problem, determine which lesson formula is applicable and be able to explain why. This demonstrates that students have gained appropriate expertise in the unit.

Simple Interest Given a percentage value, enhance numeracy skills to determine sales tax, tip amount, overall cost of some purchased item. Dialogue within student groups produces means of finding these values (or approximations) without the use of a calculator.

Compound Interest Practical application of money gaining interest or credit card balances being charged interest establishes the exploration of compound interest. Vocabulary must be established; interest rate, compound periods, principal and effective rate. Students generate the formula for compound interest on given amount of principal using algebraic skills, tenacity and group discussion. The general formula is then derived. Discussion as to the number of compounding periods per year builds confidence of if answers determined are realistic.

Annuity Building on the compound interest lesson of one deposit of principal to consistent deposit payments, how to calculate the amount of money to which the deposits will grow is explored and dissected. Students build another formula for the more complicated, but realistic, set-up. Problems asked here want to know the amount that payments will grow to, as well as what size payments to make if a desired amount is established for a certain period of time.

Amortization of Loan or Reverse Annuity Culminating the unit of the Math of Finance is determination of what loans actually do. Students learn that money means different things to financial institutions and applicants for loans depending on perspective. For the financial institution, a lump sum for compound interest. For the applicant it is an annuity to pay down the borrowed amount. These two points of view allow the students to generate the formula to determine payment size, amount that can be requested for a

loan, which interest rates offered are sensible. Exploration leads to realization of how much interest is paid during the life of the loan, overall amount spent to pay off a loan and what affect this will have on adult financial decisions.

Unit Project To display understanding of the unit, student groups select a financial topic and do a classroom presentation. Topics may include:

Decide on an automobile purchase. Discuss data that makes the purchase reasonable and logic behind the decision.

Once a full-time job is acquired, determine the amount of money to deposit per month to establish a fund that will make certain size payments upon retirement. Reveal the thought process utilized to determine all values used in presentation.

Discuss the differences between what an annuity represents vs a loan.

Unit 7: Solving Systems of Equations and Inequalities

Linear Systems of Equations Students explore input-output tables of multiple function through graphing to develop an understanding of the three types of solutions for systems of equations; one, none and infinite solutions. Apply systems of equations through the BurgerRama restaurant company.

System of Equations Non-linear Students solve systems of non-linear equations graphically, input-output tables as well as algebraically. Students apply the knowledge to systems of a variety of conic systems as well.

System of Inequalities Students explore a system of inequalities and are asked to color code areas that represent a solution to the system, a solution for just one of the inequalities but not the other and finally the area that is not included at all.

Real World Systems Students will explore a wide variety of real world problems to develop system of equations and systems of inequalities.

Linear Programming Students will complete a series of linear programming word problems including inequality constraints and a profit statement.

Unit 8 Absolute Value & Piecewise functions

Absolute Value Equations Solve absolute value equations from basic to complex. Finish the lesson by writing the equation given the solutions to an absolute value equation.

Absolute Value Inequalities Solve absolute value inequalities and represent the solutions graphically. Finish the lesson by writing the absolute value inequality given the solutions.

Graphing Absolute Value functions Graph a large variety of absolute value equations both linear, quadratic and beyond. Explore what the absolute value function represents in the real world and how to represent that graphically.

Piecewise functions Given a large variety of real life word problems, students draw the graphs as well as write the equation to represent the situations. In turn, use the graph to answer a variety of questions from the graph. Finally give the students a piecewise graph with predefined x and y axis and have them write the equation and a word problem to represent the graph.

More graphing Graph absolute value equations including linear, quadratic, exponential, logarithmic, and cubic and rewrite as a piecewise function.

Department of Water Resources The final project for Unit 8 shows the motor vibrations graph files of an actual pipeline project as well as a bearing temperatures graph files. Student will interpret the data through a series of questions and finally write piecewise functions for both.

Instructional Methods and/or Strategies: See unit activities/assignments above

Use of Technology: Students will use technology frequently for collaboration.

Collaborative Focus: See unit activities/assignments above

Student Assessment Methods and/or Tools: See unit activities/assignments above

Course Evaluation

The primary issue being examined is the degree to which the course content, materials, and instructional strategies result in the acquisition of skills and knowledge by students exposed to the course. It must answer the question, "How can a teacher or administrator gauge whether the course has been successful at transferring the intended body of knowledge to students?" **To be adequate,** the evaluation design must concretely measure the extent to which learning in the desired areas actually takes place.

Course: EAP Senior Math

Objective: This course was designed to assist students in making their transition from high school to college successful. This is a supplemental course that addresses topics previously covered in Algebra II courses, at a deeper level, as well as additional material identified by college instructors as necessary skills for college success.

Performance Level:

Measure: Grade of "C" or better

C. HONORS/ADVANCED COURSES ONLY

Please refer to instructions

Indicate how the curriculum and instruction in this honors course is different from the standard course.

Approval Process

A. *Presented to Subject Area Department Chair:*

N/A District-Initiated DA

Approval Date

B. *Presented to Site Principal:*

N/A District-Initiated DA

Approval Date

C. *Presented to School Leadership and Support:*

Angela Ake 6/14/16

Approval Date

D. *Presented to Administrative Services:*

6/14/16

Approval Date

E. *Presented to the Superintendent's Cabinet:*

Heather Gunn 6/14/16

Approval Date

F. *Presented to the NUSD Board of Trustees:*

Approval Date

For Office Use Only

Attachment A: Request for District Approval of Textbooks, Reference Materials, and Literature

Course Title:

Textbook Title, Publisher, and Copyright Date:

- **Principle text:**

Title	Author	Publisher	Edition	Website	Primary
None	None	None	None	[empty]	Yes

Supplementary Source Readings and Materials:

☐ Textbooks/materials to be used in this course are currently going through the district's approval process.
☒ Textbooks/materials to be used have completed the district's approval process.