TAMALPAIS UNION HIGH SCHOOL DISTRICT
Larkspur, California

Course of Study

INTERMEDIATE ALGEBRA

Length of Course: Full Year – 2 Semesters	Subject Area: Mathematics Discipline: Algebra II
Grade Levels: 10-12	Is this course an integrated course? no
Is this course being submitted for possible UC honors designation? no	UC Approved, Mathematics "C"
Prerequisites (required or recommended): Successful completion of Algebra and Geometry	Co-requisites (required or recommended): None

Check all that apply:
- ✓ UC A-G course
- ✓ Graduation Requirement

1. **COURSE OVERVIEW**
   - Intermediate Algebra addresses topics of Algebra II to prepare students for higher level math courses. Over the course of the year, students will participate in a broad range of instructional experiences using a variety of methods including the Common Core mathematical practices. Students will be exposed to simplifying, graphing, and solving of polynomial, rational, radical, exponential and logarithmic expressions and functions. Successful completion of this course will prepare students for Trigonometry or Statistics. The intended audience is college bound students.

2. **PREREQUISTE SKILLS** and knowledge suggested for success in this course:
   - Combine algebraic expressions of all types, including adding, subtracting, and multiplying binomials
   - Solve linear equations of all types in one variable
   - Graph linear functions and understand the meaning of slope and intercepts
   - Understand and be able to apply the rules of exponents
   - Be able to solve a system of equations using at least one method
   - Graph linear and quadratic functions
   - Successful completion of Algebra and Geometry or their equivalent

3. **COURSE CONTENT**
   Students will participate in activities that emphasize the 8 Mathematical Practices and require them to demonstrate their understanding of each topic listed below through computation and explanation.

   Polynomials:
   - Perform operations with polynomials (addition, subtraction, multiplication, and division)
   - Solve and factor polynomials using GCF and grouping
   - Sketch polynomial functions
   - Find zeros of polynomial functions both algebraically and graphically.

   Sample Assignment
   Students are shown visuals of graphs that are polynomial functions vs those that are not. With partners they talk about key characteristics of the graphs and as a class develop a verbal description. Next given clues (relative max or min, x-intercepts – bounce or cross, y-intercept) students draw reasonable sketches of a graph of a polynomial function on whiteboards. Students compare the graphs and discuss if all are reasonable. This is followed by students receiving the polynomial function in factored form and using Desmos graphing app to find patterns as to when the graph will cross or bounce at a given x-intercept. Students share their findings. Students practice their skills with graph paper and pencil- still in factored form. Finally students receive a polynomial function in standard form and transform to factored form, get x-intercepts, y-intercepts, and key data points and graph the function with graph paper and pencil. Students apply these skills to application problems –ex- write a function to model the volume of a box formed by removing square corners from a rectangular sheet- Team activity with paper, ruler, scissors... Find a variety of volumes formed for different size squares removed. Draw a reasonable sketch of your math model and include the real data collected. Use your graph to predict the length of the side of the square that should be removed to get the max volume. Graph your equation on Desmos and see how close your predictions are.

   Rational Functions
   - Simplify rational expressions
   - Perform basic operations with rational expressions (addition, subtraction, multiplication, division)
   - Solve equations with rational expressions with like and unlike denominators

   Sample Assignment
   Students use data from the U.S. Department of Energy to find a formula that models the relationship between the wind speed and the amount of electricity generated hourly by a windmill. Students use the formula to complete a table of given wind speeds to predict the watt-hours of electricity generated over a period of time. Students validate their understanding of rational relationships through calculations and real world predictions.

Radical Functions
- Simplify radical expressions
- Perform basic operations with radical expressions (addition, subtraction, multiplication, division)
- Solve equations with radical expressions identifying any extraneous solutions
- Understand the relationship between rational exponents and radical expressions
- Graph radical functions

Sample Assignment
Students work in small groups to perform basic operations on radical expressions (+, -, x, ÷). Some members of the group use a calculator and approximate each result to 4 decimal places. The other members of the group keep all work in radical form. Together, the group converts the radical form results into decimal form with the use of a calculator. Students then compare the two sets of results.
For any discrepancies, students discuss what needed to be done to correct the problem. Students validate their understanding of the properties of radicals and their understanding of each numerical value associated with numbers written in radical notation.

Exponential and Logarithmic Functions:
- Perform basic operations on exponential and logarithmic expressions (+, -, x, ÷)
- Find and verify the inverse of a function by using a graph or equation
- Graph exponential and logarithmic functions understanding their inverse relationship
- Solve equations using logarithms

Sample Assignment
Newton's Law of Cooling Experiment
Students produce data and graphs representing the change in temperature of a hot cup of coffee over time. Student also provides a prediction of the coffee's temperature in the future from his/her calculations. The student completes the assignment by comparing their calculated prediction with the actual measured temperature of the coffee. Students discuss their finding in small groups and share their group conclusions with the entire class. Students validate their understanding of exponential functions/formulas.

Overview of Graphing Goals for all Functions:
- Identify key features which include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums, symmetries
- Identify key features above within mathematical modeling problem (projectile motion, etc).
- Solve real world scenarios by using either graphs or equations to support reasoning

Sample Assignment
With a partner or small group, students record a video of a ball being thrown from one person to another, allowing the ball to bounce once. This is done outside and the ball

should be thrown fairly high and landing at least 20 feet away. They freeze frame the video to find launch height, maximum height and when the ball hits the ground. They create a quadratic model based on this information and graph their data points and their model, using graphing calculators or software. Then, they use their model to calculate time to hit the ground. They compare this to the actual time to hit the ground. Noting any discrepancies, students discuss what might cause the differences between calculated values and actual values. Students complete a report and share with the class. Students learn about the forces which affect a projectile and make a connection with physical forces and the structure of a quadratic equation.

Probability:
- Calculate probabilities
- Use probabilities to make fair decisions
- Use probability concepts to analyze the expected outcome for real life scenarios

Sample Assignment
Students work with a partner to play 20 rounds of craps and record their win/loss record. All students' records are recorded and an overall class recording of win/loss is observed and discussed. Students work with their groups using a table of possible rolls to establish theoretical probabilities for winning and losing in the game and calculate probabilities for other games of chance.

Course Materials
Textbook: Martin-Gay, K. Elayn, <u>Intermediate Algebra</u>, 4th Edition, Pearson Prentice-
              Hall, 2005.
Graphing Calculators
Computer software
Online research

Approved: 5/93
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