TAMALPAIS UNION HIGH SCHOOL DISTRICT
Larkspur, California

Course of Study

<u>Advanced Algebra 1H-2H</u>

I.   INTRODUCTION

The Advanced Algebra 1H-2H program is designed to parallel the Advanced Algebra 1-2 class covering all of the material of that course with additional time spent on enrichment topics.

Advanced Algebra 1H-2H is intended for students who have shown strong mastery of the concepts presented in Geometry. The course is designed for very competent, successful mathematics students who need an extra challenge in addition to standard course work.

II.   STUDENT LEARNING OUTCOMES

These courses address the following district Student Learning Outcomes:

#2.   Read and analyze material in a variety of disciplines.
#3.   Use technology as a tool to access information, analyze and solve problems, and communicate ideas.
#5.   Apply mathematics knowledge and skills to analyze and solve problems.

This course covers all the objectives of Advanced Algebra 1-2 and, in addition, explores enrichment topics selected by the teacher. The following list is illustrative, not definitive:

- Recursive sequences and series, appropriate graphing calculator related skills
- Explicit sequences and series for arithmetic, geometric, and infinite geometric as well as writing explicit rules for sequences that are non-arithmetic and non-geometric (techniques such as factoring, doubling and factoring, etc).
- Exponential and logarithmic functions, continuous vs. discrete data, fractional, exponential, natural base and ln, log properties, developing equations from given points that are exponential and linear, linearizing data and developing appropriate equations for the curved data.
- Functions: composite functions, odd, even or neither, domain and range from equations and graphs, inverses (including deriving those that are rational), transformations of graphs and effects on domain and range, moving from vertex form to general form of a quadratic and vice-versa.
- Data Analysis: median-median line, line of regression, correlation coefficient (by hand and with calculator), plots, residuals, accuracy, decision making, collecting

data and finding best-fit equations (linear and non-linear), standard deviation, standard scores (PSAT is a good example of context for data analysis)

- Topics in Discrete math and Matrices: randomness, expected value, theoretical probability, waiting time and probability distribution, permutations, combinations, binomial theorem (with combination and Pascal's triangle), transition matrices, operations with matrices, matrix solutions to systems, 2 x 2 and 3 x 3 inverse matrices by hand and calculator, determinants, Cramer's Rule, augmented matrices, systems of quadratics and matrices, linear programming
- Polynomial functions: complex numbers, building polynomials, conjugates, Remainder, Factor and Rational Root Theorems, synthetic and long division, Fundamental Theorem of Algebra, Descartes Rule of Signs
- Rational functions: graphing, domain and range, asymptotes, using long division for shifts and asymptotes, holes
- Conics: traditional treatment of circles, ellipses, hyperbolas, parabolas, foci, eccentricity, graphing, identifying conics in general form
- Parametric equations: parametric to non-parametric, right triangle review, using trig to set a course, motion with an outside agent (wind, current), projectile motion; conics in parametric form.
- Trigonometry: unit circle, radian measure, graphing sine and cosine, phase shifts, period, amplitude changes, special emphasis on f(ax) and what effect "a" has on the graph (difficult to see in chapter 5, but clear with sine and cosine); intro to graphs of tangent, cotangent, secant, and cosecant, some sinusoidal models.

Projects/Activities may include: poker probability, game-making probability, folding a box exercise, message coding/decoding(encryption), base conversions, linear programming, Mathematical Tourist. Monty's Dilemma

III.   ASSESSMENT

Student Assessment
Assessment should be made on the basis of a variety of means such as quizzes and tests, projects, investigations, writing samples, and daily work.

IV.   METHODS AND MATERIALS

A.   Methods

The instructional strategies used by teachers of the course will enable students to:

1.   Work collaboratively and individually in solving problems.
2.   Use calculators and computers as an integral part of their work.
3.   Explain and justify their work and thinking both in oral and written form.
4.   Develop confidence and perseverance in tackling mathematics.
5.   Develop an appreciation of mathematics.

6. Develop consistent study habits, organizational skills, and personal responsibility for learning.
7. Direct instruction and modeling will be used as appropriate.

B. **Materials**

Board of Trustees adopted textbook: <u>Advanced Algebra Through Data Exploration</u> (Murdock, Kamischke, Kamischke) and other materials as determined by the instructor to enhance learning.

V. **GENERAL INFORMATION**

Advanced Algebra 1H-2H is a two-semester sequence, open to students who meet the qualifying criteria listed above, which carries five credits per semester.

This course carries a weighted grade. Students who enroll in course after signing the Tamalpais Union High School District contract for honors placement are required to complete the year.

Prerequisites:

- Grade of A- or better in Geometry 1 and Geometry 2 (to date of qualifying exam) or a grade of B or better in Honors Geometry 1 and 2 (to date of qualifying exam)
- AND Students must maintain a grade of A- or better in geometry (B or better in honors) until the end of the second semester
- AND Students must also earn a qualifying score on the District's qualifying exam

Placement Criteria:
- The course may be used to meet high school graduation and college entrance mathematics requirements.
- It is approved for the UC "c" requirement.
- This course, designated as an honors course, **does not carry extra grade points** for the University of California.

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