

## Course Title

Interactive Mathematics Program (I.M.P.) Course 3 A, B (P)

## Department

Mathematics

## Description of Target Group

(I.M.P.) Course 3 is for students who have successfully completed (I.M.P.) Course 2

## Purpose

(I.M.P.) Course 3 is the third year of a fully integrated, three-year college preparatory course in mathematics designed to replace the traditional Algebra 1, Geometry, Algebra 2 sequence. It was developed to fulfill the goals of the new Math Framework of the state, and the curriculum standards of the National Council of Teachers of Mathematics. The topics listed below are covered in a unified fashion, in the context of meaningful larger mathematical problems.

### Content for Course 1

From Algebra

- ? Working with exponential and logarithmic functions:
  - describing their graphs
  - finding that the derivative of an exponential function is proportional to the value of the function
  - developing general laws of exponents
  - understanding the meaning and significance of  $e$
  - approximating data by an exponential function
- ? Understanding and using function notation
- ? Understanding and using inverse functions
- ? Solving systems of linear equations and inequalities in several unknowns
- ? Working with matrices
  - developing the operations of matrix addition and multiplication in the context of applied problems
  - understanding their use in representing systems of linear equations
  - developing the concepts of identity element and inverse in the context of matrices
  - reacting existence of matrix inverses to uniqueness of solution of corresponding systems of linear equations
  - using calculators to multiply and invert matrices
- ? Extending concepts of linear programming to problems with several variables

From Analytic and Coordinate Geometry

- ? Defining slope and understanding its relationship to rate of change and to equations for straight lines
- ? Developing equations for straight lines from two points and from point-slope information
- ? Understanding the meaning of the derivative of a function at a point and its relationship to instantaneous rate of change

- ? Approximating the value of a derivative at a given point
- ? Developing and applying various formulas from coordinate geometry, including:
  - distance formula
  - midpoint formula
  - equation of a circle with arbitrary center and radius
- ? Finding the distance from a point to a line
- ? Developing and working with equations of planes in 3-dimensional coordinate geometry

From Geometry:

- ? Developing the relationship of the area and circumference of a circle to its radius
- ? Understanding the definition and significance of  $p$
- ? Using regular polygons to approximate the area and circumference of A circle
- ? Defining congruence of triangles and understanding the relationship between congruence and similarity
- ? Developing and justifying criteria for establishing congruence
- ? Developing and justifying straightedge and compass constructions
- ? Finding locus descriptions of various geometric entities, such as
  - perpendicular bisector
  - angle bisector
- ? Developing properties of parallel lines
- ? Developing the relationship between the volumes of similar figures
- ? Studying the possible intersections of planes in 3-space

From Trigonometry:

- ? Applying right triangle trigonometry to geometric problem situations

From Probability and Statistics

- ? Developing and applying principles for finding the probability for sequence of events
- ? Estimating probabilities
- ? Using area diagrams and tree diagrams to analyze probability problems
- ? Developing methods for systematic listing of possibilities for complex problems
- ? Developing the meaning of combinatorial and permutation coefficients in the context of meaningful problems, and understanding the distinction between them
- ? Developing principles for computing combinatorial and permutation coefficients
- ? Understanding and using Pascal's triangle
- ? Developing and applying the binomial distribution

From Logic:

- ? Using "if" and only "if" in describing sets of points fitting given criteria
- ? Writing proofs to justify geometric constructions

Performance Skills for all three courses

- ? Problem-solving
  - Working on long-term problems
  - Drawing on diverse knowledge and methods to solve problems
  - Applying appropriate technology to problem solving
  - Posing questions related to a problem
  - Generalizing problems

? Group work

- ☒ Working cooperatively with others
- ☒ Sharing ideas
- ☒ Asking for assistance
- ☒ Subdividing a task so that group members can work independently on different parts of it

? Writing and communication

- ☒ Reading and understanding complex problems
- ☒ Summarizing the essential ideas of a problem
- ☒ Describing methods used to approach a problem
- ☒ Explaining reasoning used in solving a problem
- ☒ Evaluating and improving the quality of written work
- ☒ Making oral presentations

## **Instructional Materials**

### Text and Supplementary Materials

Refer to: Secondary Adopted Texts and Approved Supplementary Books used in the Santa Maria Joint Union High School District

## **Activities**

This course will be presented as determined by the methods and techniques of the instructor and will utilize lecture, demonstration, group work, cooperative learning, investigations, manipulatives, graphing calculators, oral and written communication, study, drills, quizzes, and examinations.