

Course Description

The Interactive Mathematics Program (IMP) is a comprehensive, problem-based mathematics curriculum that integrates traditional content, such as algebra, geometry, and trigonometry, with other topics such as statistics and probability. The program prepares students to use mathematics and problem-solving skills in further education and on the job.

The curriculum is designed to help all students develop a deep understanding of mathematical concepts and how to apply them. It challenges students to explore open-ended situations actively, in a way that resembles the inquiry method used by mathematicians and scientists in their work. Students routinely investigate specific cases, look for and articulate patterns, and make, test, and prove conjectures. Each year of the program consists of five units. Most units of the IMP curriculum begin with a central problem or theme, which students explore and/or solve over the course of the unit. Solving a particular unit problem often requires concepts from several branches of mathematics, allowing students to see how a variety of ideas relate to each other. Graphing calculators are used in all units to enhance student understanding.

The Interactive Mathematics Program elaborates concepts through all four years. Each year of the program covers fewer topics than traditional programs, but covers them in greater depth. A strength of the program is the opportunity provided to students to build understanding of mathematics as they work on fairly unstructured problems.

Assessment is an integral part of IMP. Students are provided diverse ways to demonstrate understanding, including homework, portfolios, presentations, reinforcement and extension problems, unit and semester exams, and discussion.

The student should be able to:

From Algebra:

- Use variables and algebraic expressions to represent concrete situations
- generalize results
- describe functions
- Use different representations of functions--symbolic, graphical, situational, and numerical--and understand the connections between these representations
- Understand and use function notation
- Understand, model, and compute with signed numbers
- Solve equations using trial and error
- Interpret graphs and use graphs to represent situations
- Relate graphs to their equations, with emphasis on linear relationships

- Solve pairs of linear equations by graphing
- Fit equations to data, both with and without graphing calculators

From Geometry

- Understand the meaning of angles and their measurement
- Develop relationships among angles of polygons, including angle-sum formulas

- Define similarity and congruence
- Develop criteria for establishing similarity and congruence
- Use properties of similar polygons to solve real-world problems

From Trigonometry

- Use similarity to define right-triangle trigonometric functions
- Apply right-triangle trigonometry to real-world problems

From Probability and Statistics

- Develop basic methods for calculating probabilities
- Construct area models and tree diagrams to represent probabilistic situations
- Distinguish between theoretical and experimental probabilities
- Plan and carrying out simulations in order to estimate probabilities
- Collect and analyze data
- Construct frequency bar graphs
- Understand, calculate, and interpret expected value
- Apply the concept of expected value to real-world decision making
- Learn about normal distributions and properties of the normal curve
- Calculate mean and standard deviation
- Use normal distribution, mean, and standard deviation to understand real-world situations

From Logic

- Make and testing conjectures
- Formulate counterexamples
- Construct sound logical arguments
- Understand the idea of proof
- Write proofs
- Develop and describe algorithms and strategies

Number Systems (IM 1) D, E; Measurement (IM 1) B, C; Geometry (IM 1) A, B, K, L, M, N; Patterns, Algebra & Functions (IM 1) A, B, C, D, E, J; Using Data, Statistics & Probability (IM 1) A, C, D, E, F, H, I, J, K, L; Problem Solving & Reasoning (IM 1) A, B; Applications & Connections (IM 1) A; Communication (IM 1) A, B, C, E, F; Use of Tools & Technology (IM 1) I

PA STANDARDS: 2.2, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10