

Mathematics

The Interactive Mathematics Program (IMP) Year 2

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

- Develop and use principles for equivalent expressions, including the distributive property
- Express real-world situations in terms of equations and inequalities
- Understand and use the distributive property
- Develop principles for equivalent equations and apply these principles to solve equations
- Solve linear equations in one variable
- Discover and understand relationships between the algebraic expression defining a linear function and the graph of that function
- Develop and use several methods for solving systems of linear equations in two variables
- Define and recognize dependent, inconsistent, and independent pairs of linear equations

- Solve nonroutine equations using graphing calculators
- Write and graph linear inequalities in two variables
- Develop and use principles of linear programming for two variables
- Create linear programming problems with two variables
- Understand and use exponential expressions, including zero, negative, and fractional exponents
- Develop and use laws of exponents
- Use scientific notation
- Use the concept of order of magnitude in estimation

From Geometry

- Develop the meaning of area using both standard and nonstandard units
- Develop and use several methods for finding areas of polygons, including development of formulas for area of triangles, rectangles, parallelograms, trapezoids, and regular polygons
- Understand and find surface area and volume for three-dimensional solids, including prisms and cylinders
- Discover and use the Pythagorean theorem
- Understand and explain a proof of the Pythagorean theorem
- Find figures of maximum area for a given perimeter
- Understand the relationship between the areas and volumes of similar figures
- Use and develop methods for creating tessellations

From Trigonometry

- Apply right triangle trigonometry to area and perimeter problems

From Probability and Statistics

- Draw inferences from statistical data
- Design, conduct, and interpret statistical experiments
- Make and test statistical hypotheses
- Formulate null hypotheses and understand their role in statistical reasoning
- Understand and use the chi square statistic
- Understand and appreciate that tests of statistical significance do not lead to definitive conclusions
- Solve problems that involve conditional probability

From Logic

- Work with indirect proof and proof by contradiction
- Use "if, then" statements

Number Systems (IM 2) A, B, D, E, F; Measurement (IM 2) B; Geometry (IM 2) A, B, C, D, J; Patterns, Algebra & Functions (IM 2) A, F, H, K; Using Data, Statistics & Probability (IM 2) C; Problem Solving & Reasoning (IM 2) A, B; Applications & Connections (IM 2) B; Communication (IM 2) A, B, C, D, E

PA STANDARDS: 2.1, 2.2, 2.4, 2.5, 2.6, 2.7, 2.8, 2.10, 2.11