

# SPRINGFIELD PUBLIC SCHOOLS

## DISCRETE MATH II

### Course Description

Discrete Mathematics II is designed for students who are planning a career in computer science, business, education, the biological sciences, the social sciences, or liberal arts. Calculators, “hands-on” activities, computer technology, and visual media will be used to explore, develop, and solve problems dealing with statistics, probability, coding, geometric growth, informal logic, symmetry, and patterns. Optional topics that may be covered are formal logic and tiling patterns. This course will encourage the modeling of real-world situations through finite methods.

Prerequisite: Algebra II, Integrated Algebra II, or Integrated Math III.

### Course Rationale

Discrete Mathematics courses have been developed for students interested in computer science, pre-law, business, education, social studies, the biological sciences, etc. Computers are discrete machines so topics from discrete mathematics are essential in solving problems by computer methods. The topics for courses in discrete mathematics are not selected just because of their computer applications, but because they will give college-bound students the background to solve math-related problems in their selected areas of interest. The students will be involved in collecting information and communicating the information mathematically to solve problems and make decisions.

### Major Instructional Goals

The intent of the Springfield R-12 Secondary Mathematics Program is to explore, investigate, and understand the importance of mathematics through real-world experiences. In mathematics, students will acquire the knowledge and skills to problem solve, communicate, reason, create models, and make connections. Students will:

1. Apply concepts of **Number and Operations** including:
  - a. Use matrices as systems and compare their properties to the real number system. (MA5)
  - b. Apply operations to matrices, using mental computation or paper-and-pencil calculations for simple cases and technology for more complicated cases. (MA1; MA4; 5, 1.4, 3.4)
  - c. Judge the reasonableness of numerical computations and their results. (MA1; MA4; 5.8)
2. Apply concepts of **Algebraic Relationships** including:
  - a. Generalize patterns using recursively-defined functions. (MA4; 1.6, 3.5)
  - b. Compare and contrast various forms of representations of patterns. (MA4; 1.6)
  - c. Identify quantitative relationships and determine the type(s) of functions that might model the situation to solve the problem (including recursive forms). (MA4; 1.6, 3.6)
3. Apply concepts of **Geometric and Spatial Relationships** including:
  - a. Determine the final outcome of successive transformations using various methods (e.g., sketches, constructions and matrices). (MA2; 3.6)

- b. Draw or use visual models to represent and solve problems. (MA2; 3.6)
  - c. Apply the concepts of set theory, including Venn diagrams, to model relationships and solve problems. (MA4; 1.6, 1.8)
  - d. Apply the principles of logic and truth tables to critique arguments and establish the validity of conclusions. (MA5; 1.6, 1.7, 3.5)
4. Apply concepts **of Data Analysis and Probability** including:
- a. Formulate questions, design studies and collect data about a characteristic. (MA3; 1.2)
  - b. Describe differences among various studies and which types of inferences can legitimately be drawn from each. (MA3; 1.5)
  - c. Recognize how linear transformations of single-variable data affect shape, center, and spread. (MA3; 3.1)
  - d. Create a scatterplot, describe its shape, determine and analyze regression equations using technological tools. (MA3; 1.4, 1.6)
  - e. Evaluate published reports that are based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions. (MA3; 1.5)
  - f. Describe how basic statistical techniques are used in the workplace. (MA3; 1.4)
  - g. Use simulations to construct empirical probability distributions. (MA3; 1.2)
  - h. Analyze and describe the uses for different codes. (MA6; 1.6)