

**Department:** Mathematics  
**Course Name:** College Math Prep

**Course Description:**

This problem-based, inquiry-oriented, technology-rich, mathematics course is intended for college-bound students whose intended program of study does not require calculus. The course is designed around four quarter-long units or two semester long units. The units studied each year are based on teacher preference and student input. We place an emphasis on critical thinking, complex communication, collaboration, creativity, and risk taking.

**Content:**

Financial Literacy Unit  
Statistics & Probability Unit  
Decision-Making Unit  
Discrete Mathematics Unit  
Logic & Theory Unit

**Skills:**

Financial Literacy Unit

Employment (types of pay, payroll, benefits)  
Banking (managing cash, financial services, ways to save, understanding fees, good banking habits)  
Loans and Credit Cards (lending basics, applying for a loan, types of loans, managing credit cards)  
Saving and Investing (types of investments, mutual funds, investment accounts)  
Retirement (retirement realities, tax advantage investing, retirement plans, mutual funds, retirement needs)  
Buying or Leasing a Vehicle (budgeting, types of vehicles, new vs. used, buy vs. lease, making purchase)  
Housing (types of housing, renting versus buying, deciding on a rental, purchasing)  
Building and Managing Credit (5 C's of credit, credit reports, credit scores, credit assistance)  
Taxes (basics, types of taxes, federal income tax, filing tax returns, tax strategies and considerations)

Statistics & Probability Unit

Two-way frequency tables  
Conditional probability and independence  
Graphical representations  
Comparison of proportions (to include absolute risk reduction and relative risk)  
Characteristics and terminology of well-designed experiments  
Expected frequency  
Chi-square test of homogeneity  
Statistical significance  
Counting trees  
Multiplication Principle of Counting  
Addition Principle of Counting  
Combinations and permutations  
Binomial theorem and Pascal's Triangle  
Combinatorial reasoning  
Multiplication rule for probability

### Decision-Making Unit

Preferential voting and associated vote-analysis methods

-majority, plurality, runoff, points-for-preference, pairwise comparison, Arrow's Theorem

Weighted voting

-weight, power of vote, Banzhaf power index, Shapley-Shubik index

Fair division techniques

-apportionment, Huntington-Hill principle, standard divisors and quotients, paradoxes

Voting methods

-plurality, Borda counting method, plurality with elimination, pairwise comparison

### Discrete Mathematics Unit

Graphs, puzzles, and map coloring (Euler's Theorem, Euler paths, Euler circuits, four-color)

Traveling Salesman Problem (Hamilton circuits; brute force, nearest neighbor, and best edge algorithms)

Directed graphs

Scheduling projects using PERT

Evolution of number systems (Egyptian, Roman, and Chinese number systems)

Place value systems (Babylonian, Mayan, Hindu-Arabic systems)

Calculating other bases (binary, octal, hexadecimal)

Modular systems (operations, congruencies)

### Logic & Theory Unit

Problem solving (Polya's method, fundamental strategies)

Inductive and Deductive reasoning

Sets (vocabulary, notation, cardinal number, subsets, Venn diagrams, finite vs infinite sets)

Set operations (vocabulary, union, intersection, complement, difference, Inclusion-Exclusion Principle)

Statements, connectives, and quantifiers

Truth tables (DeMorgan's Laws for logic, three-valued logic)

Conditional and Biconditional

Verify arguments (Euler diagrams to verify syllogisms)

### **Text and Materials: (used as a reference)**

Transition to College Mathematics and Statistics McGraw Hill

Mathematics All Around Pearson

Budget Challenge (**fee of \$25**)

### **Methods of Instruction:**

Class discussion

Group investigation

Individual tasks

### **Methods of Evaluation:**

College Readiness Assessments

Budget Challenge (when available) – computer based

Projects

Tests

Quizzes