

## **Aufmann, Mathematical Excursions, TOC**

### **1. PROBLEM SOLVING.**

Inductive and Deductive Reasoning. Excursion: KenKen Puzzles: An Introduction. Problem Solving with Patterns. Excursion: Polygonal Numbers. Problem-Solving Strategies. Excursion: Routes on a Probability Demonstrator. Chapter 1 Summary. Chapter 1 Review. Chapter 1 Test.

### **2. SETS.**

Basic Properties of Sets. Excursion: Fuzzy Sets. Complements, Subsets, and Venn Diagrams. Excursion: Subsets and Complements of Fuzzy Sets. Set Operations. Excursion: Union and Intersection of Fuzzy Sets. Applications of Sets. Excursion: Voting Systems. Infinite Sets. Excursion: Transfinite Arithmetic. Chapter 2 Summary. Chapter 2 Review Exercises. Chapter 2 Test.

### **3. LOGIC.**

Logic Statements and Quantifiers. Excursion: Switching Networks. Truth Tables, Equivalent Statements, and Tautologies. Excursion: Switching Networks--Part II. The Conditional and the Biconditional. Excursion: Logic Gates. The Conditional and Related Statements. Excursion: Sheffer's Stroke and the NAND Gate. Symbolic Arguments. Excursion: Fallacies. Arguments and Euler Diagrams. Excursion: Using Logic to Solve Crypterithms. Chapter 3 Summary. Chapter 3 Review Exercises. Chapter 3 Test.

### **4. APPORTIONMENT AND VOTING.**

Introduction to Apportionment. Excursion: Apportioning the 1790 House of Representatives. Introduction to Voting. Excursion: Variations of the Borda Count Method. Weighted Voting Systems. Excursion: Blocking Coalitions and the Banzhaf Power Index. Chapter 4 Summary. Chapter 4 Review Exercises. Chapter 4 Test.

### **5. THE MATHEMATICS OF GRAPHS.**

Graphs and Euler Circuits. Excursion: Pen-Tracing Puzzles. Weighted Graphs. Excursion: Extending the Greedy Algorithm. Planarity and Euler's Formula. Excursion: The Five Regular Convex Polyhedra. Graph Coloring. Excursion: Modeling Traffic Lights with Graphs. Chapter 5 Summary. Chapter 5 Review Exercises. Chapter 5 Test.

### **6. NUMERATION SYSTEMS AND NUMBER THEORY.**

Early Numeration Systems. Excursion: A Rosetta Tablet for the Traditional Chinese Numeration System. Place-Value Systems. Excursion: Subtraction via the Nines Complement and the End-Around Carry. Different Base Systems. Excursion: Information Retrieval via a Binary Search. Arithmetic in Different Bases. Excursion: Subtraction in Base Two via the Ones Complement and the End-Around Carry. Prime Numbers. Excursion: The Distribution of the Primes. Topics from Number Theory. Excursion: A Sum of the Divisors Formula. Chapter 6 Summary. Chapter 6 Review Exercises. Chapter 6 Test.

### **7. GEOMETRY.**

Basic Concepts of Euclidean Geometry. Excursion: Preparing a Circle Graph. Perimeter and Area of Plane Figures. Excursion: Perimeter and Area of a Rectangle with Changing Dimensions. Properties of Triangles. Excursion: Topology: A Brief Introduction. Volume and Surface Area. Excursion: Water Displacement. Right Triangle Trigonometry. Excursion: Approximating the Value of Trigonometric Ratios. Non-Euclidean Geometry. Excursion: Finding Geodesics. Fractals. Excursion: The Heighway Dragon Fractal. Chapter 7 Summary. Chapter 7 Review Exercises. Chapter 7 Test.

### **8. MATHEMATICAL SYSTEMS.**

Modular Arithmetic. Excursion: Computing the Day of the Week. Applications of Modular Arithmetic. Excursion: Public Key Cryptography. Introduction to Group Theory. Excursion: Wallpaper Groups. Chapter 8 Summary. Chapter 8 Review Exercises. Chapter 8 Test.

#### 9. APPLICATIONS OF EQUATIONS.

First-Degree Equations and Formulas. Excursion: Body Mass Index. Rate, Ratio, and Proportion. Excursion: Earned Run Average. Percent. Excursion: Federal Income Tax. Second-Degree Equations. Excursion: The Sum and Product of the Solutions of a Quadratic Equation. Chapter 9 Summary. Chapter 9 Review Exercises. Chapter 9 Test.

#### 10. APPLICATIONS OF FUNCTIONS.

Rectangular Coordinates and Functions. Excursion: Dilations of a Geometric Figure. Properties of Linear Functions. Excursion: Negative Velocity. Finding Linear Models. Excursion: A Linear Business Model. Quadratic Functions. Excursion: Reflective Properties of a Parabola. Exponential Functions. Excursion: Chess and Exponential Functions. Logarithmic Functions. Excursion: Benford's Law. Chapter 10 Summary. Chapter 10 Review Exercises. Chapter 10 Test.

#### 11. THE MATHEMATICS OF FINANCE.

Simple Interest. Excursion: Day-of-the-Year Table. Compound Interest. Excursion: Consumer Price Index. Credit Cards and Consumer Loans. Excursion: Car Leases. Stocks, Bonds, and Mutual Funds. Excursion: Treasury Bills. Home Ownership. Excursion: Home Ownership Issues. Chapter 11 Summary. Chapter 11 Review Exercises. Chapter 11 Test.

#### 12. COMBINATORICS AND PROBABILITY.

The Counting Principle. Excursion: Decision Trees. Permutations and Combinations. Excursion: Choosing Numbers in Keno. Probability and Odds. Excursion: The Value of Pi by Simulation. Addition and Complement Rules. Excursion: Keno Revisited. Conditional Probability. Excursion: Sharing Birthdays. 12.6 Expectation. Excursion: Chuck-a-luck. Chapter 12 Summary. Chapter 12 Review Exercises. Chapter 12 Test.

#### 13. STATISTICS.

Measures of Central Tendency. Excursion: Linear Interpolation and Animation. Measures of Dispersion. Excursion: Geometric View of Variance and Standard Deviation. Measures of Relative Position. Excursion: Stem-and-Leaf Diagrams. Normal Distribution. Excursion: Cut-Off Scores. Linear Regression and Correlation. Excursion: An Application of Linear Regression. Chapter 13 Summary. Chapter 13 Review Exercises. Chapter 13 Test.