

Chapter Two

Patterns and Reasoning: Fun with Math!

2.0 Introduction and Objectives

The thumbnail sketches below represent selected topics in this chapter that you will encounter on your adventure—*an adventure that can last a lifetime!*

2.1 Deductive and Inductive Reasoning: Top-down and Bottoms-up Logic

Riddles of the Ages

Leaves no footprints, nary a track.
Travels the world around and back.



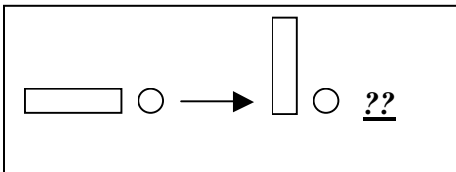
Sherlock Holmes' Analytical Reasoning

The Slippery Slope of Inductive Reasoning



2.2 Pattern Recognition: Searching for Connections

Pattern Recognition



Successive Differences

3, 10, 17, 24, 31, ...
7 7 7 7



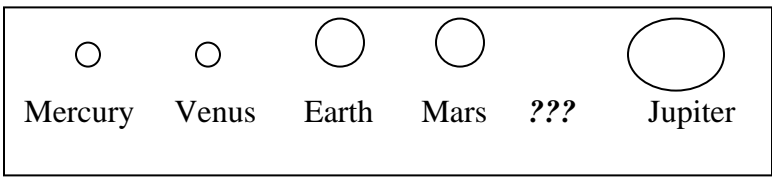
The "Eureka!" Moment

Math Is Everywhere! Explore and Discover It!
2.0 Introduction and Objectives

2.3 The *n*th Term: The Power of Generalization

Analyzing Relationships

$$7, 11, 15, 19, 23, \dots \rightarrow 4n + 3$$



The Missing Planet?

2.4 Logical Thinking and Reasoning Backwards: Puzzles for Fun and Profit

The Case of the Missing Digits:

$$\begin{array}{r} T E \\ + E \\ \hline T H \end{array}$$

Word-sum Puzzles:

$$\begin{array}{r} \text{PLAY} \\ + \text{BALL} \\ \hline \text{GAME} \end{array}$$

2.5 Magic Squares: Sum Fun!

Magic Squares

16	3	2	13
5	10	11	8
9	6	7	12
4	15	14	1

Math Is Everywhere! Explore and Discover It!
2.0 Introduction and Objectives

Learning Objectives for Chapter 2

1. To enable students to develop their analytical reasoning skills through riddle solving, pattern recognition and problem solving.
2. To enable students to develop their deductive and inductive reasoning skills in recognizing patterns of various types.
3. To enable students to appreciate the power of generalization and to develop the ability to use inductive reasoning to form generalizations from sets of specific facts or data.
4. To allow students to exercise their mathematical creativity by proposing riddles and creating numerical and non-numerical sequences.
5. To promote the use of critical thinking skills through the use of puzzles and mathematical challenges.
6. To enable students to gain familiarity with Web-based mathematical resources and to gain experience and skill in assessing and evaluating these resources.
7. To engage students in active learning through the use of projects and activities.
8. To alleviate student math anxiety through expositional encouragement.
9. To enable students to develop confidence in their mathematical abilities.