



# TABLE OF CONTENTS

ABOUT THIS BOOK ..... vii

INTRODUCTION ..... 1

CHAPTER 1

**Transforming Our World ..... 9**

    Fold Me! Flip Me! ..... 12

    Mirror, Mirror, on the Wall ..... 14

    Slide Me Now ..... 17

    Design This ..... 18

    Gliding Along ..... 20

    Into the Light with Transformations ..... 21

    Transforming with Matrices ..... 26

CHAPTER 2

**The Geometry of Position and Map Making ..... 27**

    Delivering Packages ..... 32

    Where Are We Now? ..... 35

    Intuitive Cartography ..... 38

    Projecting on a Cylinder ..... 41

CHAPTER 3

**Multiple Dimensions of Similarity ..... 45**

    Scale Factors ..... 49

    Basic Dilations ..... 51

    Coordinate Connections ..... 52

    Multiple Transformations ..... 54

    Shadowy Measurements ..... 56

    Field of Vision ..... 58

CHAPTER 4

**Visualizing Limits in Our World ..... 61**

    What's My Sum? ..... 63

    Sum Me Up ..... 64

    The Koch Snowflake Curve: How Big Am I? ..... 67

    Smoke and Mirrors ..... 69

    Discontinuous, That's What You Are! ..... 70

    How Small Are the Squares? ..... 73

LOOKING BACK AND LOOKING AHEAD ..... 75

|                                               |           |
|-----------------------------------------------|-----------|
| <b>Black Line Masters and Solutions</b> ..... | <b>77</b> |
| Fold Me! Flip Me! .....                       | 78        |
| Mirror, Mirror, on the Wall .....             | 80        |
| Slide Me Now .....                            | 82        |
| Design This .....                             | 84        |
| Gliding Along .....                           | 85        |
| Into the Light with Transformations .....     | 87        |
| Transforming with Matrices .....              | 95        |
| Delivering Packages .....                     | 97        |
| Where Are We Now? .....                       | 99        |
| Intuitive Cartography .....                   | 101       |
| Projecting on a Cylinder .....                | 105       |
| Scale Factors .....                           | 107       |
| Basic Dilations .....                         | 110       |
| Coordinate Connections .....                  | 111       |
| Multiple Transformations .....                | 113       |
| Shadowy Measurements .....                    | 115       |
| Field of Vision .....                         | 117       |
| What's My Sum? .....                          | 119       |
| Sum Me Up .....                               | 121       |
| The Koch Snowflake Curve: How Big Am I? ..... | 122       |
| Smoke and Mirrors .....                       | 125       |
| Discontinuous, That's What You Are! .....     | 126       |
| How Small Are the Squares? .....              | 127       |
| Solutions .....                               | 128       |
| REFERENCES .....                              | 150       |

## CONTENTS OF CD-ROM

**Applets**

- Tessellation Exploration (Chapter 1)
- Viewing-Tube Geometry (Chapter 3)
- Koch Snowflake Curve (Chapter 4)
- Least Squares (Chapter 4)

**Supplemental Materials**

- Time Line of Important Events in Map Making (Chapter 2)
- Applications of the Global Positioning System (Chapter 2)
- Trilateral Coordinates and Triangular Grids (Chapter 2)
- Similar Triangles for "Scale Factors" (Chapter 3)
- Directions for Sketchpad Users for "How Small Are the Squares?" (Chapter 4)

**Blackline Masters****Readings from Publications of the National Council of Teachers of Mathematics**

Godzilla: Fact or Fiction

Rick Billstein and James Trudnowski

*NCTM Student Math Notes*

Visual Thinking with Translations, Half-Turns, and Dilations

Tom Brieske

*Mathematics Teacher*

5-Con Triangles

Maurice Burke

*NCTM Student Math Notes*

Similarity from Multiple Perspectives

Arthur F. Coxford, Linda Burks, Claudia Giamati, and Joyce Jonik

*Geometry from Multiple Perspectives: Curriculum and Evaluation Standards for School Mathematics* Addenda Series, Grades 9–12, pp. 55–56

Integrating Geometry into the Secondary Mathematics Curriculum

Timothy V. Craine

*The Secondary School Mathematics Curriculum*, pp. 119–33

An Interesting Introduction to Sequences and Series

John Eggsgard

*Mathematics Teacher*

Similarity: Investigations at the Middle Grades Level

Alex Friedlander and Glenda Lappan

*Learning and Teaching Geometry K–12*, pp. 136–43

Mathematics and Applications of a Global Positioning System

Peggy House

*Mission Mathematics: Linking Aerospace and the NCTM Standards, 9–12*, pp. 37–62

Fracturing Our Ideas about Dimension

Tami Martin

*NCTM Student Math Notes*

Conic Sections

Alton T. Olson

*Mathematics through Paper Folding*, p. 33

Visualizing Least-Square Lines of Best Fit

Charles Vonder Embse

*Mathematics Teacher*

Experiencing Functional Relationships with a Viewing Tube

Melvin R. Wilson and Barry E. Shealy

*Connecting Mathematics across the Curriculum*, pp. 219–24