Geometry Seeing, Doing Understanding By Harold R. Jacobs

TABLE OF CONTENTS

Forewords A Letter to the Student Acknowledgements Introduction: Euclid, the Surfer, and the Spotter Inductive Reasoning

1. AN INTRODUCTION TO GEOMETRY

Lines in Designing a City
Angles in Measuring the Earth
Polygons and Polyhedra: Pyramid Architecture
Constructions: Telling Time with Shadows
We Can't Go On Like This

Summary and Review

Algebra Review

2. THE NATURE OF DEDUCTIVE REASONING

- 1. Conditional Statements
- 2. Definitions
- 3. Direct Proof
- 4. Indirect Proof
- 5. A Deductive System
- 6. Some Famous Theorems of Geometry
- Summary and Review
- Algebra Review

3. LINES AND ANGLES

- 1. Number Operations and Equality
- 2. The Ruler and Distance
- 3. The Protractor and Angle Measure
- 4. Bisection
- 5. Complementary and Supplementary Angles
- 6. Linear Pairs and Vertical Angles
- 7. Perpendicular and Parallel Lines
- Summary and Review

Algebra Review

4. CONGRUENCE

- 1. Coordinates and Distance
- 2. Polygons and Congruence
- 3. ASA and SAS Congruence
- 4. Congruence Proofs
- 5. Isosceles and Equilateral Triangles
- 6. SSS Congruence
- 7. Constructions
- Summary and Review
- Algebra Review

5. INEQUALITIES

- 1. Properties of Inequality
- 2. The Exterior Angle Theorem
- 3. Triangle Side and Angle Inequalities
- 4. The Triangle Inequality Theorem
- Summary and Review
- Algebra Review

6. PARALLEL LINES

- 1. Line Symmetry
- 2. Proving Lines Parallel
- 3. The Parallel Postulate
- 4. Parallel Lines and Angles
- 5. The Angles of a Triangle
- 6. AAS and HL Congruence
- Summary and Review
- Algebra Review

7. QUADRILATERALS

- 1. Quadrilaterals
- 2. Parallelograms and Point Symmetry
- 3. More on Parallelograms
- 4. Rectangles, Rhombuses, and Squares
- 5. Trapezoids
- 6. The Midsegment Theorem
- Summary and Review
- Algebra Review

8. TRANSFORMATIONS

- 1. Transformations
- 2. Reflections
- 3. Isometries and Congruence
- 4. Transformations and Symmetry
- Summary and Review

MIDTERM REVIEW

9. AREA

- 1. Area
- 2. Squares and Rectangles
- 3. Triangles
- 4. Parallelograms and Trapezoids
- 5. The Pythagorean Theorem
- Summary and Review
- Algebra Review

10. SIMILARITY

- 1. Ratio and Proportion
- 2. Similar Figures
- 3. The Side-Splitter Theorem
- 4. The AA Similarity Theorem
- 5. Proportions and Dilations
- 6. Perimeters and Areas of Similar Figures
- Summary and Review
- Algebra Review

11. THE RIGHT TRIANGLE

- 1. Proportions in a Right Triangle
- 2. Similar Figures
- 3. Isosceles and 30°-60° Right Triangles
- Summary and Review
- Algebra Review

12. CIRCLES

- 1. Circles, Radii, and Chords
- 2. Tangents
- 3. Central Angles and Arcs
- 4. Inscribed Angles
- 5. Secant Angles
- 6. Tangent Segments and Intersecting Chords
- Summary and Review
- Algebra Review

13. THE CONCURRENCE THEOREMS

- 1. Triangles and Circles
- 2. Circle Quadrilaterals
- 3. Incircles
- 4. The Centroid of a Triangle
- 5. Ceva's Theorem
- 6. Napoleon's Discovery and Other Surprises
- Summary and Review

14. REGULAR POLYGONS AND THE CIRCLE

- 1. Regular Polygons
- 2. The Perimeter of a Regular Polygon
- 3. The Area of a Regular Polygon
- 4. From Polygons to Pi
- 5. The Area of a Circle
- 6. Sectors and Arcs
- Summary and Review

15. GEOMETRIC SOLIDS

- 1. Lines and Planes in Space Solid Geometry as a Deductive System
- 2. Rectangular Solids
- 3. Prisms
- 4. The Volume of a Prism
- 5. Pyramids
- 6. Cylinders and Cones
- 7. Spheres
- 8. Similar Solids
- 9. The Regular Polyhedra
- Summary and Review

16. NON-EUCLIDEAN GEOMETRIES

- 1. Geometry on a Sphere
- 2. The Saccheri Quadrilateral
- 3. The Geometriews of Lobachevsky
- 4. The Triangle Angle Sum Theorem
- Summary and Review

FINAL REVIEW

Glossary Formulary Postulates and Theorems Answers to Selected Exercises Illustration Credits Index