WENTWORTH'S SOLID GEOMETRY, PP. 273-463

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649143030

Wentworth's solid geometry, pp. 273-463 by George Wentworth & David Eugene Smith

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

GEORGE WENTWORTH & DAVID EUGENE SMITH

WENTWORTH'S SOLID GEOMETRY, PP. 273-463

Trieste

WENTWORTH'S
SOLID GEOMETRY

REVISED BY

GEORGE WENTWORTH

AND

DAVID EUGENE SMITH

GINN AND COMPANY

BOSTON · NEW YORK · CHICAGO · LONDON

The Athenæum Press
GINN AND COMPANY · PROPRIETORS · BOSTON · U.S.A.

PREFACE

Long after the death of Robert Recorde, England's first great writer of textbooks, the preface of a new edition of one of his works contained the appreciative statement that the book was "entail'd upon the People, ratified and sign'd by the approbation of Time." The language of this sentiment sounds quaint, but the noble tribute is as impressive to-day as when first put in print two hundred fifty years ago.

With equal truth these words may be applied to the Geometry written by George A. Wentworth. For a generation it has been the leading textbook on the subject in America. It set a standard for usability that every subsequent writer upon geometry has tried to follow, and the number of pupils who have testified to its excellence has run well into the millions.

In undertaking to prepare a revision of the Solid Geometry, the authors have been guided by certain well-defined principles, based upon an extended investigation of the needs of the schools and upon a study of all that is best in the recent literature of the subject. The effects of these principles they feel should be summarized for the purpose of calling the attention of the wide circle of friends of the Wentworth text to the points of similarity and of difference in the editions.

1. Every effort has been made not only to preserve but to improve upon the simplicity of treatment, the clearness of expression, and the symmetry of page that have characterized the successive editions of the Wentworth Geometry. It has been the purpose to prepare a book that should do even more than maintain the traditions this work has fostered.

2. The proofs have been given substantially in full, to the end that the pupil may always have before him a model for his independent treatment of the exercises.

3. To meet a general demand, the number of propositions has been decreased so as to include only the great basal theorems and problems. A little of the less important material has been placed in the Appendix, to be used or not as circumstances demand.

4. The exercises, in some respects the most important part of a course in geometry, have been rendered more dignified in appearance and have been improved in content. The number of simple exercises has been greatly increased, while the difficult puzzle is much less in evidence than in most American textbooks. The exercises are systematically grouped, appearing in general in full pages, in large type, and at frequent intervals. They are not all intended for one class, but are so numerous as to allow the teacher to make selections from year to year.

5. The work throughout has been made as concrete as is reasonable. Definitions have been postponed until they are actually needed, only well-recognized terms have been employed, the pupil is led to apply his geometry to practical cases in mensuration, and correlation is made with the algebra already studied.

6. All the references to Plane Geometry that are directly made in the proof of Solid Geometry have been prefixed to this edition so as to be easily accessible.

The authors are indebted to many friends of the Wentworth Geometry for assistance and encouragement in the labor of preparing this edition, and they will welcome any further suggestions for improvement from any of their readers.

GEORGE WENTWORTH
DAVID EUGENE SMITH

CONTENTS

	Page
REFERENCES TO PLANE GEOMETRY	vii
BOOK VI. LINES AND PLANES IN SPACE	273
Lines and Planes	273
Dihedral Angles	293
Polyhedral Angles	308
Exercises	314
BOOK VII. POLYHEDRONS, CYLINDERS, AND CONES	317
Polyhedrons	317
Prisms	317
Parallelepipeds	322
Pyramids	337
Regular Polyhedrons	350
Cylinders	353
Cones	362
Exercises	376
BOOK VIII. THE SPHERE	381
Spheres	381
Plane Sections and Tangent Planes	382
Spherical Polygons	392
Measurement of Spherical Surfaces	410
Measurement of Spherical Solids	421
Exercises	424
APPENDIX	431
Polyhedrons	432
Spherical Segments	444
Recreations of Geometry	449
History of Geometry	453
INDEX	459

SYMBOLS AND ABBREVIATIONS

$=$	equals, equal, equal to, is equal to, or is equivalent to.	Adj.	adjacent.
		Alt.	alternate.
		Ax.	axiom.
$>$	is greater than.	Const.	construction.
$<$	is less than.	Cor.	corollary.
$\parallel$	parallel.	Def.	definition.
$\perp$	perpendicular.	Ex.	exercise.
$\angle$	angle.	Ext.	exterior.
$\triangle$	triangle.	Fig.	figure.
$\square$	parallelogram.	Hyp.	hypothesis.
$\square$	rectangle.	Iden.	identity.
$\odot$	circle.	Int.	interior.
st.	straight.	Post.	postulate.
rt.	right.	Prob.	problem.
$\because$	since.	Prop.	proposition.
$\therefore$	therefore.	Sup.	supplementary.

These symbols take the plural form when necessary, as in the case of $\parallel$s, $\measuredangle$s, $\triangle$s, $\odot$s.

The symbols $+$, $-$, $\times$, $\div$ are used as in algebra.

There is no generally accepted symbol for "is congruent to," and the words are used in this book. Some teachers use $\cong$ or $\backsimeq$, and some use $\equiv$, but the sign of equality is more commonly employed, the context telling whether equality, equivalence, or congruence is to be understood.

Q. E. D. is an abbreviation that has long been used in geometry for the Latin words *quod erat demonstrandum*, "which was to be proved."

Q. E. F. stands for *quod erat faciendum*, "which was to be done."

REFERENCES TO PLANE GEOMETRY

28. A portion of a plane bounded by three straight lines is called a triangle.

41. The whole angular space in a plane about a point is called a perigon.

52. The following are the most important axioms used in geometry:

1. If equals are added to equals, the sums are equal.
2. If equals are subtracted from equals, the remainders are equal.
3. If equals are multiplied by equals, the products are equal.
4. If equals are divided by equals, the quotients are equal.

In division the divisor is never zero.

5. Like powers and like positive roots of equals are equal.
6. If unequals are operated on by positive equals in the same way, the results are unequal in the same order.
7. If unequals are added to unequals in the same order, the sums are unequal in the same order; if unequals are subtracted from equals, the remainders are unequal in the reverse order.
8. Quantities that are equal to the same quantity or to equal quantities are equal to each other.
9. A quantity may be substituted for its equal in an equation or in an inequality.
10. If the first of three quantities is greater than the second, and the second is greater than the third, then the first is greater than the third.
11. The whole is greater than any of its parts, and is equal to the sum of all its parts.