ELEMENTARY AND CONSTRUCTIONAL GEOMETRY

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Elementary and Constructional Geometry by Edgar H. Nichols

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EDGAR H. NICHOLS

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BY

EDGAR H. NICHOLS, A.B.

OF THE BROWNE AND NICHOLS SCHOOL, CAMBRIDGE, MASS.

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PREFACE

THIS book is designed for pupils beginning Geometry at the age of twelve, or even younger. It is based upon the author's class-room experience with young boys during the last twelve years. It is hoped that it may prove an aid to those teachers who do not want a text-book except as a guide to the pupil, to enable him to review the principles developed in the class by answering for himself a set of questions similar to those asked in the class-room, and by working out practical problems illustrative of the principles studied. It cannot be used as a text-book from which lessons are assigned in advance to the class. Each principle should be developed by the teacher and the class, working together—the principle coming at the end, not at the beginning, of the study—and then a lesson from the book, covering essentially the same ground, should be assigned. The book has not been divided into lessons, because sometimes a single paragraph will afford material for several lessons, and, again, several pages can be mastered in one lesson. Each teacher should be free to develop his subject in his own way without artificial lines of division.

The main object of the first year's study is to make the pupils perfectly familiar with the use of their tools, so that in the study of Theoretical Geometry the construction of the figures will present no difficulty. In the pursuit of this object a great many useful working principles are learned, which greatly simplify the more advanced study of the subject.

The proof of principles is introduced very gradually,

and the use made of even the few proofs given must depend upon the age and the ability of the particular class concerned.

From the beginning it is insisted that the pupil shall have a clear idea of the exact direction of any line named with two letters. No slovenliness of thought should be permitted in this matter. For greater accuracy of expression two words have been coined—*symparallel* and *antiparallel*. Parallel lines that have the same direction are called symparallel lines, and those that have exactly opposite directions are called antiparallel lines. Thus, antiparallel lines form an angle of 180° with each other, but symparallel lines form no angle. It is found that this distinction prevents all confusion in the study of parallels, and helps to make the pupils think clearly and express themselves with accuracy. Simple and natural signs are used for these words.

Attention is called to the treatment of areas. The author has found that the subject lends itself especially to the object aimed at in the first year's study. An indefinite field for the ingenuity of the pupils is opened, and often excellent results have been obtained. In his manipulation of areas the ordinary problems of construction (often reserved as the very last subject of Geometry) become a mere matter of course to the pupil, and his familiar acquaintance with valuable principles is assured. A similar treatment of volumes opens a still larger field, if the time allotted to the subject allows it.

A proper use of the Summary will add greatly to the interest and to the value of the subject. In the first place, each teacher can word his definitions to suit his own convictions, and can decide what principles he will take up, and how those principles shall be expressed. In the second place, the pupil feels an added interest in the princi-

ples, because he has helped to decide upon the best wording of them. An important feature of the work, therefore, is the training that it gives in accuracy of expression. The teacher ought first to make the pupils express the principles in their own words, and then by interpreting their English literally, to bring out any inaccuracies of expression.

A pupil who has acquired a familiar knowledge of the principles developed in this book should be able to take up the study of Theoretical Geometry, both plane and solid, in a text-book where no complete proofs, but suggestions only, are given to aid in the solution of the more difficult problems and theorems. He should be encouraged to consult, after his own solution, the text-books that contain proofs (of which there should be several kinds in the school library), in order to develop his critical power and to add life to the subject.

The author has in mind the preparation of a Geometry to supplement this book, in which the principles of Plane and Solid Geometry will be developed according to the suggestions just made. He will be grateful to any who will call his attention to typographical errors and ambiguous expressions in this book that may have crept in, in spite of the greatest care on the part of himself and of friends, who have kindly read and re-read the proofs. He is indebted to one of his former pupils for the best of the diagrams.

EDGAR H. NICHOLS.

December, 1895.

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