NEWCOMB'S MATHEMATICAL COURSE; ELEMENTS OF PLANE AND SPHERICAL TRIGONOMETRY WITH LOGARITHMIC AND OTHER MATHEMATICAL TABLES

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SIMON NEWCOMB

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NEWCOMB'S MATHEMATICAL COURSE

ELEMENTS

OF

PLANE AND SPHERICAL TRIGONOMETRY

WITH

LOGARITHMIC AND OTHER MATHEMATICAL TABLES

AND EXAMPLES OF THEIR USE AND HINTS ON THE ART OF COMPUTATION

BY

SIMON NEWCOMB

Professor of Mathematics, U.S.N.

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PREFACE.

THE distinctive features of the following work belong partly to the course of which it forms a part, and need but a brief statement.

I. The device by which mathematical teaching is to be most promoted is, the author conceives, to be found in the minute subdivision of subjects, and the drill of the student in the separate details before combining them into a whole. The system to which we are thus led is seen in the arrangement of Chapters I., II., and V.

II. By exercises in which the subject is taken up in a concrete form, the formation of mathematical conceptions is greatly facilitated. An application of this principle is seen in the cases where the student is exercised in finding the values of trigonometric functions by construction and measurement.

III. The problems for exercise are quite varied in their character, and are intended to test not only the student's knowledge of the usual methods of computation, but his ability to grasp them and trace them out in the numerous forms they may assume in practical applications.

IV. In the arrangement, strictly logical order has been subordinated to order of teaching. In accordance with this principle, all the simpler applications of the trigonometric functions have been disposed of before their complex relations.

V. The scope of the work is generally limited to the subjects and treatment necessary in the fullest course of mathematics usually taught in our colleges and technological schools. The concluding chapter of each part perhaps exceeds the limit thus

set. That of Part I. is an introduction to the employment of imaginary quantities in trigonometric developments, while that of Part II. is an introduction to the higher forms of solid geometry.

VI. To the usual list of subjects treated, has been added a chapter on the theory of polygons. This theory is closely connected with a variety of subjects, including geometry, quaternions, mechanics, graphical statics, surveying, and navigation, and therefore deserves a more prominent place than has hitherto been assigned to it.

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ELEMENTS OF TRIGONOMETRY

PART I.

PLANE TRIGONOMETRY.

CHAPTER I.

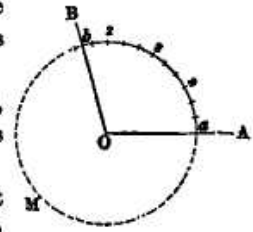
OF GONIOMETRY, OR THE MEASURE OF ANGLES.

1. *Definition.* **Trigonometry** is that branch of geometry in which the relations of lines and angles are treated by algebraic methods.

2. *Def.* An **angle** is the figure formed by two straight lines emanating from the same point, called the **vertex** of the angle.

Def. The lines which form an angle are called its **sides.**

3. *Measures of Angles.* An angle is measured by the length of a circular arc having its centre at the vertex of the angle and its ends on the sides of the angle.



If the angle to be measured is AOB, we conceive that with an arbitrary radius Oa an arc is drawn from a to b.

We regard as the positive direction that in which the arc is described by a motion opposite to that of the hands of a watch, and as the negative direction that in which the hands move.

Hence we may consider the angle as measured either by the