AN INTRODUCTION TO PLANE AND SPHERICAL TRIGONOMETRY

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BY

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1865.

The Student is recommended, in the first instance, to make himself acquainted with Chapters I, V, and VI. He may then advance as far as page 89, and exercise himself in the Miscellaneous Problems, pages 114 to 124. After reading Chapter IV, Arts. 1 to 10, he may proceed with the Rules for the Solution of Spherical Triangles, pages 90 to 113; and the Miscellaneous Problems, pages 125 to 131; when he can turn his attention to the remaining portions of the book.

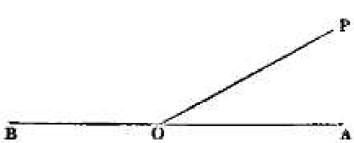
PLANE TRIGONOMETRY.

CHAPTER I.

1. PLANE TRIGONOMETRY is that science which treats of the measurement of plane angles and triangles. As Geometry enables us to construct a triangle from three independent data, so, Trigonometry enables us, from the same data, expressed in numbers, to calculate its sides and angles.

2. In Geometry, an angle is defined to be the inclination of one straight line to another, and, therefore, can never exceed two right angles. But, in Trigonometry, there is no such restriction.

For, let B O A be a fixed line, and O P a line which revolves about O, and which at first coincided with



O A. Then, when O P is in the position represented in the figure, it is said to have described the angle A O P. But this mode of conceiving an angle admits of extension to angles of any magnitude; for we may suppose O P to revolve beyond O B, and so to describe an angle greater than two right angles, or, indeed, an angle of any magnitude whatever.

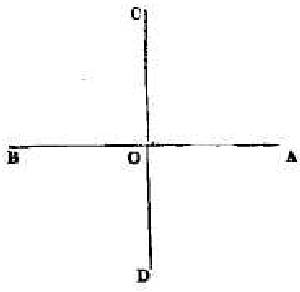
On the Mode of Measuring Angles.

3. The circumference of a circle being divided into 360 equal parts, the angle at the centre subtended by one of these parts is called a *degree*. The degree is subdivided into 60 equal parts, called *minutes;* and the minute in 60 equal parts, called *seconds*. Degrees, minutes, and seconds are thus expressed— $^\circ$ $'$ $''$; and when an angle is said to be $20^\circ\ 30'\ 40''$, we mean that it contains 20 degrees, 30 minutes, 40 seconds.

4. A right angle is the angle at the centre which is subtended by a *quadrant*, or *fourth* part of the circumference of a circle, and, therefore, contains 90 degrees.

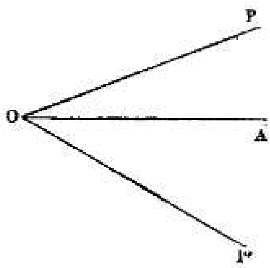
An angle is frequently denoted by a single letter. Thus, in fig. 4, the angle C P N would be called P; and P C N, C, &c.

On the Use of the Signs + and −.



5. Let A O B, C O D be two lines at right angles to each other, then those lines drawn parallel to B O A are *positive*, if to the *right* of C D, *negative*, if to the *left:* and lines drawn parallel to C O D are *positive*, if *above*, *negative*, if *below*, A O B.

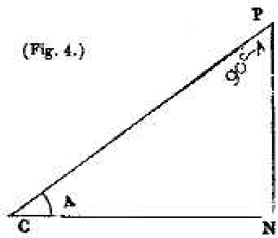
6. Again, suppose the line O P, by its revolution about O *upwards* from O A, to describe the angle A O P, and let the angles described in this manner be considered *positive*. Then if the line revolve *downwards* from O A, to describe the angle A O P′, this angle will properly be accounted *negative*.



The Trigonometrical Ratios.

7. Let P C N be a triangle, right-angled at N, and let P C N contain any number of degrees, &c., which we may denote by A.

(Fig. 4.)



Then—

$\frac{PN}{CP}$	or	$\frac{perp.}{hypoth.}$	is called	Sine A.
$\frac{CN}{CP}$	or	$\frac{base}{hyp.}$	"	Cosine A.
$\frac{PN}{CN}$	or	$\frac{perp.}{base}$	"	Tangent A.
$\frac{CN}{PN}$	or	$\frac{base}{perp.}$	"	Cotangent A.
$\frac{CP}{CN}$	or	$\frac{hyp.}{base}$	"	Secant A.
$\frac{CP}{PN}$	or	$\frac{hyp.}{perp.}$	"	Cosecant A.

and $1 - \text{Cos. } A$ is called Versine A.