University of the State of New York

Examination Department

154TH EXAMINATION

SPHERIC TRIGONOMETRY

Tuesday, June 14, 1898—1:15 to 4:15 p. m., only

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100 *credits, necessary to pass,* 75

Answer 10 questions but **no more.** *If more than 10 are answered only the first 10 answers will be considered. Division of groups is not allowed. In a spheric triangle A, B and C represent the angles and a, b and c the opposite sides. In a right triangle C represents the right angle and c the hypotenuse. Each complete answer will receive 10 credits.*

1 Define *spheric triangle.* Give the four equations (or proportions) known as Napier's analogies.

2 Show how to solve a right spheric triangle, having given (*a*) the two legs, (*b*) the two oblique angles.

3 In an equilateral spheric triangle, given the side a; find the angle A.

4 Prove that when the two sides of a spheric triangle including the right angle (*a*) are in the same quadrant the hypotenuse is less than 90°, (*b*) are in different quadrants the hypotenuse is greater than 90°.

5 State Napier's rules and mention in order the parts referred to.

6 In a right triangle prove that $\sin^2 B - \cos^2 A = \sin^2 b \sin^2 A$.

7 Given two sides a and b and the included angle C, what formulas should be used in solving the triangle? Describe fully the process of solution.

8–9 The shortest distance d between two places and their latitudes l and l' are known; find their difference of longitude.

10–11 Find the exact time of sunrise at a place 38° N. when the sun's declination is 18° N. Give a plan of the work, simplifying as much as possible without the use of tables.

12–13 Given the sun's altitude and declination and the latitude of a place; show clearly how the time of day may be determined.

14–15 Prove that in a spheric triangle $\sin a : \sin b = \sin A : \sin B$, and show how the formula may be used.