University of the State of New York

Examination Department

138TH EXAMINATION

SPHERIC TRIGONOMETRY

Tuesday, June 16, 1896—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 questions are answered only the first 10 of these 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 angle, oblique spheric triangle, polar triangle, quadrantal triangle, Napier's circular parts.*

2 Prove that each angle of a spheric triangle is greater than the difference between 180° and the sum of the other two angles.

3 Prove that the hypotenuse of a right spheric triangle is less than 90° only when both the other sides are in the same quadrant.

4 Prove that the half sum of two sides of any spheric triangle is in the same quadrant as the half sum of the opposite angles.

5–6 Prove that in a right spheric triangle $\sin A = \frac{\cos B}{\cos b}$; $\cos c = \text{ctn } A \text{ ctn } B$.

7–8 Prove that in a spheric triangle $\cos A = \sin B \sin C \cos a - \cos B \cos C$.

9 Show how to obtain the formulas for finding a, B and C of a quadrantal triangle when A and b are given and $c = 90°$.

10 What formulas should be used to find B, a and b of a right spheric triangle when A and c are given? What formula includes all the required parts?

11–12 Deduce the formulas for finding A, B and C of any spheric triangle when a, b and c are given.

13 Show what formulas must be used to find the length of a degree of longitude on the earth's surface for a place whose latitude is l, r representing the radius of the earth.

14–15 Given the sun's altitude a and its declination d; derive the formula to find t, the hour of the day, for a place whose latitude is l.