High School Department

159TH EXAMINATION

SPHERIC TRIGONOMETRY

Tuesday, June 13, 1899—1.15 to 4.15 p. m., only

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. Papers entitled to 75 or more credits will be accepted.*

1 If the angles of a spheric triangle are 65°, 80° and 110°, what are the sides of its polar triangle? If the sides of a spheric triangle are 30°, 40° and 50°, what are the angles of its polar triangle?

2 Prove that in any spheric right triangle the sine of the middle part is equal to the product of the tangents of the adjacent parts.

3 Write the *four* formulas known as Napier's analogies.

4–5 In a spheric right triangle $a = 128° 25'$, $b = 82° 18'$; find A, B and c, and check the work.

6–7 Prove that in any spheric triangle

$$\cos a = \cos b \cos c + \sin b \sin c \cos A$$

8–9 In an oblique spheric triangle given a, b and B, show how to find the remaining parts. Discuss the question of one solution, two solutions and no solution.

10–11 Given $A = 34° 15'$, $B = 42° 18'$, $c = 76° 35'$; find a, b and C.

12–13 Assuming the earth to be a sphere of 4000 miles radius, find (*a*) the shortest distance between New York, latitude 40° 30′ north, longitude 74° west, and New Orleans, latitude 30° north, longitude 90° west, (*b*) the bearing of New York from New Orleans.

14–15 A mariner in latitude 42° 20′ north observes that the altitude of the sun is 48° 23′ when its declination is 18° 45′ north; find the hour of the day.