The University of the State of New York

228TH HIGH SCHOOL EXAMINATION

SPHERIC TRIGONOMETRY

Wednesday, January 24, 1923—1.15 to 4.15 p. m., only

Write at top of first page of answer paper (*a*) name of school where you have studied, (*b*) number of weeks and recitations a week in spheric trigonometry.

The minimum time requirement for spheric trigonometry is two recitations a week for half a school year, or the equivalent.

Answer six questions, including three from group I, one from group II and two from group III.

A, B and C represent the angles of a triangle ABC; a, b and c represent the respective opposite sides. In a right triangle, C represents the right angle.

Give special attention to neatness and arrangement of work.

In the examination in spheric trigonometry the use of the slide rule will be allowed for checking, provided all computations with tables are shown on the answer paper.

Group I

Answer three questions from this group.

1 Prove geometrically that in any right spheric triangle in which all parts except the right angle are less than 90°

$$\cos A = \tan b \cot c$$
$$\sin b = \tan a \cot A \qquad [15]$$

2 State Napier's rules concerning a right spheric triangle. Using these rules, give *two* values for sin *a*. [15]

3 Prove that in any spheric triangle the sines of the sides are to each other as the sines of the opposite angles. [15]

4 Starting with the formula

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

derive the formula

$$\cos \tfrac{1}{2}A = \sqrt{\frac{\sin s \sin (s-a)}{\sin b \sin c}} \qquad [15]$$

Group II

Answer one question from this group.

5 Solve and check the quadrantal spheric triangle in which
$a = 66° 32', b = 59° 43', c = 90°$ [12, 3]

6 Solve and check the isosceles spheric triangle in which
$b = 81° 24', c = 81° 24', A = 72° 40'$ [11, 4]

Group III

Answer two questions from this group.

7 Solve the spheric triangle in which
$a = 72° 16', b = 80° 44', c = 41° 18'$ [20]

8 A ship starts from a point on the equator and sails in a direction N. 48° E. along a great circle. Find how much she has changed her longitude when she first reaches latitude 27° 30′. [20]

9 Find the shortest distance in nautical miles from New Orleans (latitude 29° 58′ N., longitude 90° 5′ W.) to Rome (latitude 41° 54′ N., longitude 12° 29′ E.). [A nautical mile is the length of 1′ of the arc of a great circle on the earth's surface.] [20]