The University of the State of New York

226TH HIGH SCHOOL EXAMINATION

SPHERIC TRIGONOMETRY

Wednesday, January 18, 1922—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 one recitation a week for a school year.

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.

Credits: Group I, 15 each; group II, 15 each; group III, 20 each.

Group I

Answer three questions from this group.

1 Mention *five* fundamental trigonometric relations between the angles and the sides of any right spheric triangle. With the aid of a drawing give a geometric proof of *one* of these relations.

2 Show how a right spheric triangle may be used in the solution of problems involving (*a*) isosceles spheric triangles, (*b*) quadrantal triangles. What combination of parts must be given to be able to solve a right spheric triangle? Make a general statement concerning the check in the solution of any right spheric triangle.

3 If in any right spheric triangle p = the length of the great circle arc passing through the vertex of the right angle and perpendicular to the hypotenuse, m and n the segments of the hypotenuse made by this arc adjacent to the legs a and b respectively, prove:

a $\tan^2 a = \tan c \tan m$

b $\sin^2 p = \tan m \tan n$

4 In any oblique triangle prove that $\cos a = \cos b \cos c + \sin b \sin c \cos A$ where angle A is acute (Law of Cosines). Write down without proof the corresponding formulas for $\cos b$ and $\cos c$.

Group II

Answer one question from this group.

5 Solve the quadrantal triangle whose sides are as follows: $a = 174° 13'$, $b = 94° 8' 20''$, $c = 90°$

6 Each vertex angle of a regular pentagonal pyramid is 20°. Find the dihedral angle made by any two adjacent lateral faces.

Group III

Answer two questions from this group.

7 Given $b = 108° 30'$, $c = 40° 50'$, $C = 39° 50' 35''$; find B.

8 Find the shortest distance between New York (40° 42′ N., 73° 58′ W.) and Paris (48° 50′ N., 2° 20′ E.). [Length of 1° = 69 miles]

9 A ship starts from a point on the equator and sails in a direction N. 45° E. along a great circle. Find how much she has changed her longitude when she has reached latitude 26° 34′ N.