200TH HIGH SCHOOL EXAMINATION

TRIGONOMETRY

Tuesday, January 18, 1910 — 9.15 a. m. to 12.15 p. m., only

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

One recitation a week for a school year (or two recitations a week for half a school year), in a recognized academic school, is the regular requirement for admission to the examination in plane trigonometry or spheric trigonometry, and any statement showing less or other than this should be accompanied by a satisfactory claim or explanation made by the candidate and certified by the principal; otherwise such paper will be returned.

For the purpose of marking answers, plane and spheric trigonometry will be regarded as two separate subjects. Candidates taking both at the same examination must attain a passing mark in each.

Candidates for plane trigonometry will answer five questions from groups I, II and III. Answers 20 credits each.

Candidates for spheric trigonometry will answer five questions from groups IV, V and VI. Answers 20 credits each.

Candidates for plane and spheric trigonometry will answer five questions, selecting one question from each group except group 3. Answers 20 credits each.

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

Give special attention to arrangement of work.

Group I   1 Prove the relation $\tan x + \sec^2 x = \dfrac{\sin 2x + 2}{2 \cos^2 x}$

2 Write the formulas for the sine and cosine of the difference of two angles and from these formulas derive the formula for the tangent of the difference of two angles.

Group II   3 Given $\cos x = \frac{3}{4}$; find by aid of formulas $\sin \frac{1}{2}x$ and $\cos \frac{1}{2}x$.

4 From a certain point on the level with the base of a staff the angle of elevation of the top of the staff is $a°$, while from a point r feet farther away on the same level the angle of elevation of the top is $b°$; find the hight of the staff in terms of what is given. Draw diagram.

Group III   5 In a plane triangle given $a = 443$, $b = 372$, $C = 71°$ 40′; find c.

6 In a plane triangle given $c = 23$, $A = 81° 30′$, $B = 39° 40′$; find a and the area of the triangle.

Group IV   7 Prove that in any spheric triangle the sines of the sides are proportional to the sines of the opposite angles.

8 Prove that in a right spheric triangle each oblique angle is in the same quadrant as the side opposite.

Group V   9 In a spheric triangle given $A=72°$, $B=83°$, $C=68°$; find a.

10 In a spheric triangle given $a=63°$, $b=80°$, $A=50°$; find c.

Group VI   11 In an oblique spheric triangle given a, b and C; write the formulas necessary for the solution of this triangle in order to find c and give a skeleton of the work required for the solution.

12 Given the latitude of the place of observation north 52°, the altitude of the sun west of the meridian 35°, its declination $+21°$; find the local apparent time.