TRIGONOMETRY

Thursday, June 20, 1918 — 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 trigonometry.

The minimum time requirement for plane trigonometry is two recitations a week for a school year; for plane and spheric trigonometry three recitations a week for a school year.

Students taking this examination may use textbooks and notes prepared previous to the examination, but there must be no communication among students after the examination has begun.

Candidates for plane trigonometry should answer six questions, including three from group I and three from group II.

Candidates for plane and spheric trigonometry should answer six questions, including two from group I, two from group II and two from group III.

Candidates for spheric trigonometry who have previously passed plane trigonometry should answer three questions 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.

Group I

1 Prove that in any circle the chord which subtends at the center an angle of $108°$ is equal to the sum of the two chords which subtend at the center angles of $36°$ and $60°$ respectively.

2 Given $\sin A = \frac{1}{4}$, find the value of $\cos A$; of $\tan A$; of $\cot A$; of $\sec A$; of $\csc A$.

3 Solve $\sin 4A - \sin 2A = \cos 3A$

4 Prove that $\sin 2x = \dfrac{2 \tan x}{1 + \tan^2 x}$

5 Without the use of tables, show that $\cos 20° \cos 40° \cos 80° = .125$

Group II

6 Two sides of a parallelogram are 5 inches and 7 inches respectively and their included angle is $75°$; find the area of the parallelogram.

7 In the triangle ABC, $B = 50°$, $C = 120° \, 40'$, $BC = 148$ feet; find c and b.

8 In order to find the distance between two objects, A and B, a point C is selected and the distance CA is found to be 380 feet, CB to be 340 feet and angle C to be $61° \, 35'$; find the distance AB.

9 The three sides of a triangle are 56 feet, 72 feet and 90 feet respectively; find the size of the largest angle.

Group III

10 Without using Napier's law, prove that in a spheric triangle $\cos B = \tan a \cot c$

11 In a right spheric triangle, $a = 86° \, 40'$ and $A = 88° \, 11'$; solve the triangle completely.

12 In an oblique spheric triangle, $a = 95°$, $b = 58°$, $c = 42°$; find the size of angle A.

13 Assuming the radius of the earth to be 4000 miles, find the number of miles on a great circle from a point on the equator in longitude $50°$ W. to a point on the prime meridian in latitude $38°$ N.