The University of the State of New York

230TH HIGH SCHOOL EXAMINATION

PLANE TRIGONOMETRY

Wednesday, January 23, 1924—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 plane trigonometry.

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

Answer seven questions, including three from group I and four from group II.

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 plane 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 Given $a = 123.6$, $b = 204.8$, $c = 215.2$; solve and check the triangle.　[15, 1]

2 Given $a = 36.5$, $b = 24.3$, $C = 105° \ 30'$; solve the triangle.　[16]

3 In making the map of a park, it is desired to locate a point P situated within an inclosure difficult of access. Outside the inclosure a reference line AB is 214.3 feet in length. The angle BAP is found to be $25° \ 15'$, the angle ABP is $32° \ 20'$. Find the length of AP and the distance from P to AB.　[16]

4 In the drawing given below, F is the top of a flagpole on a government building. To find the height of F above the level of the sidewalk the following measurements are taken:

Along the sidewalk on the opposite side of the street, a line AB is laid off 400 feet long.

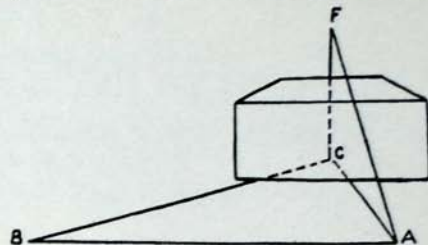At the point A, the angle of elevation of F is found to be $36° \ 15'$.

At A the horizontal angle between B and F, that is, angle BAC, is $42° \ 52'$.

At B the horizontal angle between A and F, that is, angle ABC, is $11° \ 5'$.

AC, AB and BC are level lines.

A is 4.68 feet above the level of the sidewalk.

Find the height of F above the level of the sidewalk.　[16]

Group II
Answer four questions from this group.

5 Prove geometrically that

$$\sin(x - y) = \sin x \cos y - \cos x \sin y, \text{ when } x \text{ and } y$$

are each less than $90°$.　[13]

6 Prove that

$$\frac{a - b}{a + b} = \frac{\tan\frac{1}{2}(A - B)}{\tan\frac{1}{2}(A + B)}$$

when a and b are the sides of a triangle and A and B are the opposite angles.　[13]

7 *a* Through how many radians does the minute hand of a clock move in 36 minutes?　[5]

b Express the following as functions of positive angles less than $45°$: $\sin 170°$, $\cos 240°$, $\tan 345°$, $\sec(-20°)$.　[2, 2, 2, 2]

8 Prove the following identities:

$$\tan^2 x = \sin^2 x + \sin^2 x \tan^2 x \quad [6]$$

$$\left(\sin\frac{x}{2} + \cos\frac{x}{2}\right)^2 = 1 + \sin x \quad [7]$$

9 Solve the following equation for values of x between $0°$ and $360°$ and check these values:

$$\cos 2x + \frac{2}{\sec x} = \frac{1}{2} \quad [11, 2]$$