The University of the State of New York

249TH HIGH SCHOOL EXAMINATION

PLANE TRIGONOMETRY

Wednesday, August 20, 1930 — 3.30 to 6.30 p. m., only

Instructions

Do not open this sheet until the signal is given.

Answer all questions in part I and four questions from part II.

Part I is to be done first and the maximum time to be allowed for this part is one and one half hours. Merely write the answer to each question in the space at the right; no work need be shown.

If you finish part I before the signal to stop is given you may begin part II. However, it is advisable to look your work over carefully before proceeding to part II, since *no credit will be given any answer in part I which is not correct and reduced to its simplest form.*

When the signal to stop is given at the close of the one and one half hour period, work on part I must cease and this sheet of the question paper must be detached. The sheets will then be collected and you should continue with the remainder of the examination.

In this examination the customary lettering is used. 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 both parts of this examination the use of the slide rule will be allowed for checking; in part II all computations with tables must be shown on the answer paper.

PLANE TRIGONOMETRY

Wednesday, August 20, 1930

Fill in the following lines:

Name of school.....Name of pupil.....

Detach this sheet and hand it in at the close of the one and one half hour period.

Part I

Answer all questions in this part. Each question has 2½ credits assigned to it. Each answer must be reduced to its simplest form.

1 What kind of triangle is ABC if the cosine of one of its angles is negative? *Ans*.....

2 In a right triangle ABC, sec $A = y$; express csc B in terms of y. *Ans*.....

3 What does $\frac{c-b}{c+b}$ equal in terms of angles C and B in the formula that expresses the law of tangents? *Ans*.....

4 Find the value of $\sin(-135°) + \cos 45°$ *Ans*.....

5 Find a positive value of x less than 360° that satisfies the equation $1 + \cos^2 x = \sin x$ *Ans*.....

6 Express sin 255° as a function of a positive angle less than 90°. *Ans*.....

7 If $\cot A = -\frac{1}{5}\sqrt{2}$ and A is an angle of a triangle, find $\cos A$. *Ans*.....

8 In an isosceles triangle the base is 4 and each of the equal sides is 8; find to the *nearest minute* one of the equal angles. *Ans*.....

9 Reduce 33° 20′ to radians. [Leave answer in terms of π.] *Ans*.....

10 Write $\sin A + \sin B$ in an equivalent product form. *Ans*.....

11 In a right triangle, sec $A = 3$; find tan A. *Ans*.....

12 In the right triangle ABC, if $A = \cos^{-1}\frac{3}{13}$, find tan A. *Ans*.....

13 In a right triangle, cot $A = \frac{4}{9}$ and $b = 16$; find a. *Ans*.....

14 Given $\sqrt{\sin A} = \frac{1}{2}$; solve for the positive value of A less than 90°. *Ans*.....

15 Given $\tan x = 1.3108$; find the value of x to the *nearest minute*. *Ans*.....

16 What is the area of triangle ABC in terms of b, c and angle A? *Ans*.....

17 From a balloon that is directly over a certain point the angle of depression of another point 10 miles distant in the same horizontal plane is 14° 20′; find the height of the balloon. *Ans*.....

18 Find $\log \sin 62° 41′ 24″$ *Ans*.....

19 Given $\log \cos A = 9.91975 - 10$; find A correct to the *nearest minute*. *Ans*.....

20 Find the area of a triangle whose sides are 2, 3 and 4. *Ans*.....

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Write at top of first page of answer paper (*a*) names of schools where you have studied, (*b*) number of weeks and recitations a week in plane trigonometry previous to entering summer high school, (*c*) number of recitations in this subject attended in summer high school of 1930.

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

For those pupils who have met the time requirement previous to entering summer high school the minimum passing mark is 65 credits; for all others 75 credits.

For admission to this examination attendance on at least 30 recitations in this subject in a registered summer high school in 1930 is required.

Part II

Answer four questions from this part, selecting two questions from each group.

Group I

Answer two questions from this group.

21 A lighthouse was observed N. 73° E. of a ship. After the ship had steamed due east 4½ miles, the lighthouse was observed to be N. 57° 40′ E. of the ship. If the ship continues its course in the same direction, how close will it come to the lighthouse? [12½]

22 Two objects, A and B, each visible and accessible from C, are separated by a building. AC is 307 feet, BC is 282 feet and angle ACB is 42° 31′. Find distance AB. [12½]

23 Find the angle subtended at the observer's eye by a rod 14.2 feet long, one end of which is 9.8 feet from the eye and the other 15.4 feet from the eye. [12½]

Group II

Answer two questions from this group.

24 *a* Derive the formula for $\sin(x - y)$ when x and y are each acute. [8]

b If $\tan A = \frac{4}{3}$ and A is in the third quadrant, find the value of $\tan \frac{1}{2}A$. [4½]

25 *a* Prove the following identity: $\sin 2x = \dfrac{2 \tan x}{1 + \tan^2 x}$ [6]

b Solve the following for positive values less than 360°: $\sin x = \cos 2x$ [6½]

26 On the same set of axes plot the graphs of $y = \sin x$ and $y = \sin \frac{1}{2}x$ for values of x at intervals of 30° from 0° to 360° inclusive [5, 5]. Indicate on the y-axis the position that will represent the positive value of y for which $\sin x = \sin \frac{x}{2}$. [2½]