The University of the State of New York

301ST HIGH SCHOOL EXAMINATION

TRIGONOMETRY

Thursday, August 21, 1947 — 12 m. to 3 p. m., only

Instructions

Part I is to be done first and the maximum time allowed for it is one and one half hours. At the end of that time, this part of the examination must be detached and will be collected by the teacher. If you finish part I before the signal to stop is given, you may begin part II.

Write at top of first page of answer paper to parts II, III and IV (*a*) names of schools where you have studied, (*b*) number of weeks and recitations a week in trigonometry previous to entering summer high school, (*c*) number of recitations in this subject attended in summer high school of 1947 or number and length in minutes of lessons taken in the summer of 1947 under a tutor licensed in the subject and supervised by the principal of the school you last attended.

The minimum time requirement is four or five recitations a week for half a school year. The summer school session will be considered the equivalent of one semester's work during the regular session (four or five recitations a week for half a school year).

For those who have met the time requirement, 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 1947 or an equivalent program of tutoring approved in advance by the Department is required.

Answer five questions from parts II, III and IV, including at least one question from each part.

Part II

Answer at least one question from part II.

21 For the equation $3\cos^2 x - 4\sin x + 1 = 0$, find, correct to the *nearest minute,* all values of x between 0° and 360°. [10]

22 *a* Using a unit circle, draw the lines representing the values of the six trigonometric functions of an angle in the fourth quadrant. [4]

b Indicate the line segment representing *each* function and state whether the line segment is positive or negative. [6]

23 *a* On the same set of axes, draw the graphs of $y = \cos 2x$ and $y = \sin x$ as x varies from 0 to π radians at intervals of $\frac{\pi}{6}$. [5, 3]

b By means of letters, indicate the points whose abscissas give solutions of the equation $\sin x = \cos 2x$ [2]

24 A tower stands on level ground. At a point on the ground, the tower subtends an angle a and a flagstaff of height m on top of the tower subtends an angle b. Show that the height of the tower is $\frac{m \sin a \cos (a + b)}{\sin b}$ [10]

[OVER]

Part III

Answer at least one question from part III.

25 In triangle ABC, $a = 105$, $b = 104$ and $c = 151$. Find angle C correct to the *nearest minute.* [10]

26 From a ship a lighthouse was observed to bear N 54° 20′ W. After the ship had sailed 5 miles due east, the bearing of the lighthouse was N 67° 10′ W. Find, correct to the *nearest tenth of a mile,* the distance from the lighthouse to the second position of the ship. [10]

27 In triangle ABC, $CA = 425$, $CB = 322$ and angle $C = 66° 40′$. Find angle B correct to the *nearest minute.* [10]

Part IV

Answer at least one question from part IV.

28 Given right spherical triangle ABC in which C is the right angle. If $A = 50° 20′$ and $B = 122° 40′$, find b correct to the *nearest minute.* [10]

29 In spherical triangle ABC, $a = 46° 30′$, $b = 62° 50′$ and $c = 83° 20′$. Find angle B correct to the *nearest minute.* [10]

Fill in the following lines:

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

Part I

Answer all questions in part I. Each correct answer will receive 2½ credits. No partial credit will be allowed. Each answer must be reduced to its simplest form.

1 Find the logarithm of 0.08756 1.....

2 Find, correct to the *nearest tenth,* the number whose logarithm is 2.6678 2.....

3 Find log cos 35° 16′ 3.....

4 Tan $x = 0.8560$. Find x correct to the *nearest minute.* 4.....

5 Express 220° in radians. [Answer may be left in terms of π.] 5.....

6 Express tan 350° as a function of a positive angle less than 45°. 6.....

7 Find the *positive* acute angle which satisfies the equation

$$\frac{1}{\sin^2 A} - 2 = 0$$ 7.....

8 If A is an angle in the first quadrant, express tan A in terms of cos A. 8.....

9 If $\sin x = \frac{4}{\sqrt{17}}$ and x is an angle in the first quadrant, find the value of sin $2x$. 9.....

10 Express $\tan^2 \frac{x}{2}$ in terms of cos x. 10.....

11 What is the greatest value of 3 cos $2x$? 11.....

12 In triangle ABC, if $a = 5$, $c = 6$ and $C = 30°$, find sin A. 12.....

13 In triangle ABC, $a = 3$, $c = 6$ and cos $B = \frac{1}{4}$. Find b. 13.....

14 In triangle ABC, $A = 60°$, $b = 6$ and $c = 8$. Find tan $\frac{1}{2}(C—B)$. [Answer may be left in radical form.] 14.....

15 In right spherical triangle ABC, in which C is the right angle, a and c are known. Write the formula that should be used to find b. 15.....

Directions (questions 16–20) — Indicate the correct answer to *each* question by writing the letter *a, b* or *c* on the line at the right.

16 If the two sides including the right angle of a right spherical triangle are both greater than 90°, then (*a*) the third side is in the first quadrant (*b*) the third side is in the second quadrant (*c*) you can not tell in which quadrant the third side lies 16.....

17 As x increases from 90° to 180°, csc x (*a*) increases from 0 to ∞ (*b*) decreases from —1 to $-\infty$ (*c*) increases from 1 to ∞ 17.....

18 The statement cos $(45° + x) = \sin (45° - x)$ is true (*a*) for all values of x (*b*) for only one value of x (*c*) for no value of x 18.....

19 As x varies from 0° to 360°, the graph of $y = \cos x$ intersects the graph of $y = 2$ (*a*) once (*b*) twice (*c*) not at all 19.....

20 The number of triangles that can be formed in which $A = 50°$, $a = 4$ and $b = 10$ is (*a*) one (*b*) two (*c*) none 20.....