

The University of the State of New York

304TH HIGH SCHOOL EXAMINATION

TRIGONOMETRY

Wednesday, August 25, 1948 — 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 1948 or number and length in minutes of lessons taken in the summer of 1948 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 1948 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 a Solve the equation $\cos^2 x + 2 \sin x + 2 = 0$ for x between 0° and 360° . [8]

b Is the equation $2 \sin^2 2x = 1 - \cos 4x$ true for all values of x ? [Answer *yes* or *no*.] [2]

22 Derive the law of cosines for plane triangles. Consider only the case in which the triangle is acute. [10]

23 a Sketch the graph of $y = \cos x$ from $-\pi$ to $+\pi$. [5]

b On the set of axes used in answer to a, sketch the graph of $y = \tan x$ from $-\pi$ to $+\pi$. [4]

c On the graphs made in answer to a and b, mark the points whose abscissas are solutions of the equation $\tan x - \cos x = 0$ [1]

24 a Given an isosceles triangle one of whose equal sides is s and one of whose base angles is A . Show that the area of the triangle is $\frac{1}{2}s^2 \sin 2A$. [8]

b If s is a constant, for what value of A will the area of the triangle given in a be a maximum? [2]

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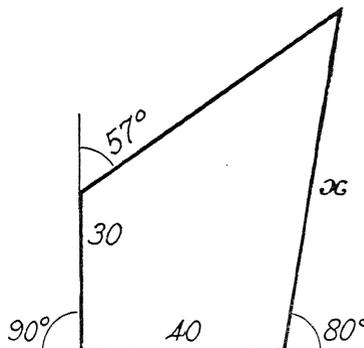
Part III

Answer at least one question from part III.

25 Two forces of 29.5 lb and 54.2 lb act on a body. The angle between the lines of action of the forces is $95^\circ 40'$. Find to the *nearest minute* the angle that the resultant makes with the larger force. [10]

26 Find to the *nearest square foot* the area of a triangular plot of ground whose sides are 22.3 ft, 40.5 ft and 32.8 ft. [10]

27 Using the values indicated in the figure, solve for x to the *nearest integer*. [10]



Part IV

Answer at least one question from part IV.

28 Find to the *nearest 10 nautical miles* the distance from Greenwich (Lat. $51^\circ 29' N$, Long. $0^\circ W$), to Galapagos Islands (Lat. $1^\circ N$, Long. $90^\circ W$). [10]

29 Given spherical triangle ABC in which $b = 48^\circ 20'$, $c = 82^\circ 30'$, $A = 54^\circ 20'$. Find a to the *nearest 10 minutes*. [10]

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Fill in the following lines:

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

Part I

Answer all questions in part I. Each correct answer will receive $2\frac{1}{2}$ credits. No partial credit will be allowed. Each answer must be reduced to its simplest form.

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|---|---------|
| 1 Find the logarithm of 2.718 | 1..... |
| 2 Find $\log \cos 59^\circ 13'$ | 2..... |
| 3 Find to the <i>nearest minute</i> the acute angle A if $\tan A = 1.9375$ | 3..... |
| 4 Find the value of $\sin \frac{11\pi}{6}$ | 4..... |
| 5 Express $\tan x$ in terms of $\cos x$ if x is an angle in the first quadrant. | 5..... |
| 6 Express $\tan (x - 45^\circ)$ in terms of a if $\tan x = a$ | 6..... |
| 7 Express $\cos (x + 30^\circ)$ in terms of $\sin x$ and $\cos x$. | 7..... |
| 8 Find the positive value of $\sin \frac{x}{2}$ if $\cos x = \frac{1}{5}$ | 8..... |
| 9 Express $\log \cot x$ in terms of $\log \sin x$ and $\log \cos x$. | 9..... |
| 10 In triangle ABC , $A = 30^\circ$ and $B = 45^\circ$. What is the value of the ratio $a : b$? [Answer may be left in radical form.] | 10..... |
| 11 In triangle ABC , $A = 75^\circ$ and $B = 15^\circ$. What is the value of the ratio $(a - b) : (a + b)$? [Answer may be left in radical form.] | 11..... |
| 12 In triangle ABC , $a = 2$, $b = 3$, $c = 4$. What is the value of $\cos B$? | 12..... |
| 13 Point B bears $N 60^\circ E$ from point A , and distance AB is 2 miles. How far north is B from A ? | 13..... |

Directions (questions 14-17) — Indicate the correct answer to *each* question by writing on the line at the right the letter a , b or c .

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|--|---------|
| 14 The number of degrees in one radian is (a) less than 60 (b) equal to 60 (c) greater than 60 | 14..... |
| 15 Using the data $a = 5$, $b = 8$ and $A = 50^\circ$, it is possible to construct (a) two triangles (b) only one triangle (c) no triangle | 15..... |
| 16 In spherical triangle ABC in which C equals 90° and c is greater than 90° (a) both a and b are greater than 90° (b) both a and b are less than 90° (c) either a or b is greater than 90° | 16..... |
| 17 The maximum value of $2 \sin 3x$ is (a) 2 (b) 3 (c) 6 | 17..... |
| 18 Find the value of the positive acute angle which satisfies the equation $4 \cos^2 x - 3 = 0$ | 18..... |
| 19 If $\sin x$ is positive and decreases as x increases, then $\cos x$ decreases. [Answer <i>true</i> or <i>false</i> .] | 19..... |
| 20 Given spherical triangle ABC , in which C is 90° , a and b are known and A is to be found; write the formula involving a , b and A . | 20..... |