

The University of the State of New York

316TH HIGH SCHOOL EXAMINATION

TRIGONOMETRY

Thursday, August 21, 1952 — 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 and III (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 1952 or number and length in minutes of lessons taken in the summer of 1952 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 pupils 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 1952 or an equivalent program of tutoring approved in advance by the Department is required.

Answer five questions from parts II and III, including at least two questions from each part.

Part II

Answer at least two questions from part II.

21 a Derive the law of cosines. Consider only the case in which the triangle is acute. [7]

b Prove the identity: $\tan^2 x - \sin^2 x = \tan^2 x \times \sin^2 x$ [3]

22 Find all values of x greater than 0° and less than 360° that satisfy the equation $3 \tan x - 1 = 4 \cot x$. [Express approximate values of x to the nearest degree.] [10]

23 a Sketch the graph of $y = 2 \sin x$ from 0 to 2π radians inclusive. [4]

b On the same set of axes as used in a, sketch the graph of $y = \cos 2x$. [4]

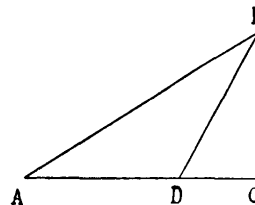
c From the graphs made in answer to a and b, determine the number of values of x between 0 and 2π radians which satisfy the equation $2 \sin x = \cos 2x$. [2]

24 In triangle ABC , angle $C = 90^\circ$ and BD bisects angle ABC .

If angle ABC is represented by $2x$,

a express AC in terms of AB and x [4]

b show that $AC = 2AD \cos^2 x$ [6]



[1]

[OVER]

TRIGONOMETRY

Part III

Answer at least two questions from part III.

25 In triangle ABC , $a = 43.6$, $b = 27.3$ and angle $C = 118^\circ 20'$. Find angle B to the *nearest minute*. [10]

26 Observers at A and B spot an enemy battery at point C . By measurement angle $ABC = 64^\circ 40'$ and angle $BAC = 81^\circ 20'$. Posts A and B are known to be 4200 yards apart. Find to the *nearest ten yards* the distance of the battery from A . [5, 5]

27 An airplane is flying in a straight horizontal line, 5000 feet above the ground. A man directly below the path of the plane observes the airplane just before it passes overhead. The angle of elevation is $81^\circ 30'$. One minute later its angle of elevation is $20^\circ 15'$. Find to the *nearest ten feet* the distance flown by the airplane in one minute. [6, 4]

28 A body is acted upon by a force of 34 pounds and by a second force of 42 pounds. The resultant force is 69 pounds. Find to the *nearest degree* the angle formed by the resultant and the greater force. [10]

TRIGONOMETRY

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.

- 1 Express in degrees an angle of $\frac{11\pi}{6}$ radians. 1.....
- 2 A circle has a radius of 100 inches. Find the number of radians in the central angle that has an arc 30 inches in length. 2.....
- 3 In which quadrant does an angle lie if its sine is positive and its tangent is negative? 3.....
- 4 If x is a positive acute angle, express $\sin 2x$ in terms of $\cos x$. 4.....
- 5 Find the positive value of $\sec \sin^{-1}(\frac{1}{2})$. 5.....
- 6 Find n if $\log n = 1.5167$ 6.....
- 7 Find $\log \cos 70^\circ 22'$ 7.....
- 8 Find to the *nearest minute* the positive acute angle whose tangent is 0.7461 8.....
- 9 If x is a positive acute angle, express $\tan \frac{x}{2}$ in terms of $\cos x$. 9.....
- 10 If $\cos x = a$, express $\cos 2x$ in terms of a . 10.....
- 11 In triangle ABC , if $c = 7$, $\sin B = 0.8$ and $\sin C = 0.4$, find b . 11.....
- 12 Express $\tan (x - y)$ in terms of $\tan x$ and $\tan y$. 12.....
- 13 Two sides of a parallelogram are 8 and 12 and the angle formed by these sides is 37° . Find to the *nearest integer* the area of the parallelogram. 13.....

001

TRIGONOMETRY

14 Using the data angle $A = 60^\circ$, $a = 10$, $c = 6\sqrt{3}$, is it possible to construct two different triangles? [Answer *yes* or *no*.] 14.....

15 Express $\cos(-100^\circ)$ as a function of a positive acute angle. 15.....

Directions (16–20): Indicate the correct completion for *each* of the following by writing on the line at the right the letter *a*, *b* or *c*.

16 If the sides of a triangle are 8, 9 and 12, the largest angle of the triangle is
(a) acute (b) right (c) obtuse 16.....

17 $\cot(180^\circ + x)$ is equal to (a) $\tan x$ (b) $\cot x$ (c) $-\cot x$ 17.....

18 $\sin 3x - \sin x$ is equal to (a) $\sin x \cos 2x$ (b) $\sin 2x$ (c) $2 \cos 2x \sin x$ 18.....

19 The statement $\sin^2 4x = \frac{1 - \cos 8x}{2}$ is true for (a) some values of x
(b) no values of x (c) all values of x 19.....

20 The maximum value of the function $3 \cos 2x$ is (a) 1 (b) 3 (c) 6 20.....