

The University of the State of New York

267TH HIGH SCHOOL EXAMINATION

PLANE TRIGONOMETRY

Tuesday, August 25, 1936 — 3.30 to 6.30 p. m., only

Instructions

Do not open this sheet until the signal is given.

Group I

This group is to be done first and the maximum time allowed for it is one and one half hours.

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

When the signal to stop is given at the close of the one and one half hour period, work on group 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.

Groups II and III

Write at top of first page of answer paper to groups II and III (*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 1936.

The minimum time requirement 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 1936 is required.

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.

The use of the slide rule will be allowed for checking but all computations with tables must be shown on the answer paper.

PLANE TRIGONOMETRY

See instructions for groups II and III on page 1.

Group II

Answer two questions from this group.

21 Two cliffs, A and B , on a seashore are $5\frac{1}{2}$ miles apart. A lighthouse, C , stands on an island. If angle BAC is 10° and angle ABC is 29° , how far is the lighthouse from the line AB ? [10]

22 Two sides of a triangle are 70 and 30 and they include an angle of 20° ; find the other two angles of the triangle. [10]

23 A straight, level highway 26.25 miles long runs east and west and connects two cities, A and B . A village, C , 20.25 miles from B and 15.50 miles from A , is north of this highway. Find angle CBA and state the bearing of C from B . [9, 1]

Group III

Answer three questions from this group.

24 *a* Derive the formula for the area of an oblique triangle in terms of two sides and the included angle. [7]

b Starting with the formula for $\sin(A + B)$, derive the formula for $\sin 2A$. [3]

25 *a* Solve for positive values of x less than 360° : $3 \cos x = 2 \sin^2 x$ [5]

b Prove the identity:

$$\frac{\tan x + \tan y}{\cot x + \cot y} = \tan x \tan y \quad [5]$$

26 *a* Make a table of values of $y = \sin x$ from $x = 0^\circ$ to $x = 360^\circ$ at intervals of 30° . [3]

b Using these values, draw the graph of $y = \sin x$ [6]

c What is the amplitude (greatest height) of the curve? [1]

27 *a* Prove that the area, K , of any right triangle ABC is $\frac{c^2}{4} \sin 2A$. [8]

b If c is constant and A varies, what is the maximum value of K ? [2]

*28 *a* Represent graphically the complex number $3 + 2i$. [2]

b Transform $3 + 2i$ into the form $r(\cos \theta + i \sin \theta)$. [8]

*This question is based on one of the optional topics in the syllabus.

PLANE TRIGONOMETRY

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.

Group I

Answer all questions in this group. 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.

- 1 Find the logarithm of .4563 Ans.....
 - 2 Find $\sin 15^\circ 12'$ Ans.....
 - 3 Find, correct to the *nearest minute*, the smallest positive angle whose cosine is .9186 Ans.....
 - 4 Find $\log \tan 16^\circ 22'$ Ans.....
 - 5 Find, correct to the *nearest minute*, the angle of elevation of the sun when a pole 14 feet high casts a shadow 3 feet long. Ans.....
 - 6 A man walked 200 feet up a slope of 20° . How high was he above the level of his starting point? Ans.....
 - 7 Express 2 radians in degrees. [Answer may be left in terms of π .] Ans.....
 - 8 Express $\tan \frac{2\pi}{3}$ as a function of a positive acute angle. Ans.....
 - 9 Find the cosine of 153° . Ans.....
 - 10 What is the magnitude of the resultant of a force of 30 pounds and a force of 40 pounds acting at right angles to each other? Ans.....
 - 11 Does 60° satisfy the equation $\sin x + \cos (90^\circ - x) = \sqrt{3}$? [Answer *Yes* or *No*.] Ans.....
 - 12 In which quadrant do both the sine and the cosine increase as the angle increases? Ans.....
 - 13 What is the value of $\csc 30^\circ + \cot 45^\circ - \sec 60^\circ$? Ans.....
 - 14 Solve for the two values of x between 0° and 360° : $\tan x - 1 = 0$ Ans.....
 - 15 What is the value of $2 \cos (\sin^{-1}1)$? Ans.....
 - 16 Express the tangent of an acute angle x in terms of $\sin x$. Ans.....
 - 17 In triangle ABC , AC and BC are in the ratio 2:3 and angle B contains 30° . Find $\sin A$. Ans.....
- Questions 18-20 refer to triangle ABC , in which sides a and b are 8 inches and 4 inches respectively and the included angle C is 60° .
- 18 Find the area of the triangle. Ans.....
 - 19 Find the third side. Ans.....
 - 20 What is the value of $\tan \frac{1}{2} (A - B)$? Ans.....