The University of the State of New York
265TH HIGH SCHOOL EXAMINATION
PLANE TRIGONOMETRY
Thursday, January 23, 1936 — 9.15 a. m. to 12.15 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*) name of school where you have studied, (*b*) number of weeks and recitations a week in plane trigonometry.

The minimum time requirement is five recitations a week for half a school year, or the equivalent.

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.

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 2½ credits. No partial credit will be allowed. Each answer must be reduced to its simplest form.

1 Express $\frac{2}{3}\pi$ radians in degrees.

Ans.............

2 Find the logarithm of 34.72

Ans.............

3 Find the 4-place decimal whose logarithm is 9.6060—10

Ans.............

4 Find log tan 57° 33′

Ans.............

5 Given log cos $A = 9.8719$—10; find, correct to the *nearest minute,* the value of A if A is a positive acute angle.

Ans.............

6 Express sin 67° as a function of an acute angle less than 45°.

Ans.............

7 Find the numerical value of cos 342°

Ans.............

8 Is the equation $2\sin^2x + 5\sin x = 3$ satisfied for the value $x = 30°$?

Ans.............

9 In which quadrant does an angle lie if the tangent is positive and the secant negative?

Ans.............

10 Given sin $x =$ sec x; this statement is (a) always true, (b) sometimes true or (c) never true. Which is correct, (a), (b) or (c)?

Ans.............

11 Given cos $y = \frac{7}{25}$ and y a positive angle in the first quadrant; find cos $\frac{1}{2}y$.

Ans.............

12 If $x = \cos^{-1}\frac{8}{17}$ and x is in the first quadrant, find tan x.

Ans.............

13 In a regular polygon of 20 sides with each side 20 inches long, find the length of the apothem correct to the *nearest inch.*

Ans.............

14 In triangle ABC, $A = 30°$, $B = 45°$; find the numerical value of the ratio $a:b$.

Ans.............

15 Is the statement tan $x +$ tan $y =$ tan $(x + y)$ true for all values of x and y?

Ans.............

16 Is there any value of x for which sin $x =$ sin $3x$?

Ans.............

17 Express the tangent of x in terms of the cosine of x when x is an angle in the first quadrant.

Ans.............

18 Find the cosine of the largest angle of the triangle whose sides are 4, 5 and 6.

Ans.............

19 Two adjacent sides of a parallelogram are a and b and the included angle is C. Express the area of the parallelogram as a function of a, b and C.

Ans.............

20 As angle A increases from 90° to 180°, the cosecant of angle A (a) increases from 1 to ∞, (b) decreases from ∞ to 1 or (c) increases from 0 to ∞. Which is correct, (a), (b) or (c)?

Ans.............

Group II

Answer three questions from this group.

21 Derive the formula for $\cos (A + B)$, where A, B and $(A + B)$ are positive acute angles. [10]

22 *a* Prove the identity: $\dfrac{\sin x}{1 + \cos x} + \cot x = \csc x$ [5]

   b Solve the following equation for all values of x between $0°$ and $360°$:
   $\cot x \tan 2x = 3$ [5]

23 *a* Using the same set of axes, draw the graph of $y = \sin x$ and $y = \cos x$ as x varies from $0°$ to $360°$ in intervals of $90°$.   [8]

   b Between what values of x, as shown on the graph, is $\sin x$ greater than $\cos x$?   [2]

24 In triangle ABC, h is the altitude on side c; express h in terms of A, B and c.   [10]

*25 Using polar coordinates, draw the graph of the equation $r = 1 - \cos \theta$, letting θ vary from $0°$ to $360°$ in intervals of $30°$.   [10]

Group III

Answer two questions from this group.

26 In triangle ABC, $A = 66° 20'$, $B = 42° 40'$ and $c = 12$; find a and b.   [10]

27 In right triangle ABC with the right angle at C, CA is extended through A to D, and DB is drawn. If angle $BAC = 42° 10'$, angle $BDC = 14° 20'$ and $BC = 12.4$, find AD.   [10]

28 Forces of 410 pounds and 320 pounds act simultaneously upon a body. The angle between the directions in which the given forces act is $50°$. Find the magnitude and the direction of the resultant force.   [10]

   * This question is based on one of the optional topics in the syllabus and may be used in either group II or group III.