The University of the State of New York

257TH HIGH SCHOOL EXAMINATION

PLANE TRIGONOMETRY

Thursday, June 22, 1933 — 9.15 a. m. to 12.15 p. m., only

Instructions

Do not open this sheet until the signal is given.

Answer all questions in part I and four questions from part II.

Part I is to be done first and the maximum time to be allowed for this part is one and one half hours. Merely write the answer to each question in the space at the right; no work need be shown.

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

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

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.

In both parts of this examination the use of the slide rule will be allowed for checking; in part II all computations with tables must be shown on the answer paper.

PLANE TRIGONOMETRY

Thursday, June 22, 1933

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.

Part I

Answer all questions in this part. Each question has 2½ credits assigned to it. Each answer must be reduced to its simplest form.

1 Find to the *nearest minute* the acute angle whose cosine is .4623 *Ans*.....

2 Express tan $(-195°)$ as the tangent of a positive angle less than 90°. *Ans*.....

3 Find log tan 35° 27′ *Ans*.....

4 Given log sin $A = 9.8370 - 10$; find to the *nearest minute* the value of A if A is a positive acute angle. *Ans*.....

5 If A is in the third quadrant and $A = \tan^{-1}(\frac{4}{3})$, find sin $2A$. *Ans*.....

6 What trigonometric function of an angle other than the secant is positive in the fourth quadrant? *Ans*.....

7 Express 17° in radian measure. [Answer may be left in terms of π.] *Ans*.....

8 The angle y is acute; express the value of tan y in terms of cos y. *Ans*.....

9 In an isosceles triangle one of the equal sides is 100 inches and the altitude is 87.6 inches; find the vertex angle correct to the *nearest minute*. *Ans*.....

10 As an angle increases from 0° to 90°, what function other than the cosine and cotangent decreases? *Ans*.....

11 In a triangle ABC, $b = 5$, $c = 4$, sin $C = .3420$; find sin B. *Ans*.....

12 What does $\frac{b-a}{b+a}$ equal in the formula called the law of tangents? *Ans*.....

13 Find the area of a triangle whose sides are 7, 8 and 9. [Answer may be left in radical form.] *Ans*.....

14 Find *two* values of x between 180° and 360° that satisfy the equation $4\cos^2 x = 3$ *Ans*.....

15 From a point 6 feet above the ground the angle of elevation of the top of a flagpole is observed to be 48° 40′. If the point of observation is 100 feet from the flagpole, how high is the flagpole? [Express answer correct to the *nearest foot*.] *Ans*.....

16 Express the area of triangle ABC in terms of a, c and B. *Ans*.....

17 How many different triangles may be formed in which $a = 6$, $b = 10$ and $A = 30°$? *Ans*.....

18 What is the length of a side of a regular 12-sided polygon inscribed in a circle whose radius is 50? [Express your answer correct to the *nearest integer*.] *Ans*.....

19 Find cos 50° 43′ *Ans*.....

20 What is the value of the square of the secant of an angle diminished by the square of the tangent of the same angle? *Ans*.....

2/2

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Write at top of first page of answer paper to part II (*a*) name of school where you have studied, (*b*) number of weeks and recitations a week in plane trigonometry.

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

Part II

Answer four questions from this part, selecting two questions from each group.

Group I

Answer two questions from this group.

21 An electric sign 50.7 feet high is put on top of a building. From a point on the ground the angles of elevation of the top and bottom of the sign are 42° 30′ and 35° 20′. How high is the building? [12½]

22 A triangular field is determined by three markers, A, B and C. The length of AC is 142 feet, the length of AB is 192 feet and angle CAB is 52° 10′. What is the perimeter of the field, correct to the *nearest foot*? [12½]

23 A vertical pole 17 feet high is set up on a slope. At two points, A and B, directly down the slope and in a straight line with the foot of the pole, the angles subtended by the pole are 20° and 12° respectively. If AB, measured along the slope, is 25 feet, what angle does the pole make with the slope? [12½]

Group II

Answer two questions from this group.

24 *a* Starting with the formula for $\cos 2x$, derive the formulas for the sine and cosine of $\frac{1}{2}x$. [8]

b From the formulas for $\sin \frac{1}{2}x$ and $\cos \frac{1}{2}x$ derive the formula $\tan \frac{1}{2}x = \frac{\sin x}{1 + \cos x}$ [4½]

25 *a* Solve for all values of x between 0° and 360° inclusive:

$$\tan x = 2 \sin x \qquad [7\tfrac{1}{2}]$$

b Prove the following identity:

$$\cos (30° - x) - \cos (30° + x) = \sin x \qquad [5]$$

26 Prove the formula $\sin (x + y) = \sin x \cos y + \cos x \sin y$ for the case in which x and y are acute angles and their sum is also an acute angle. [12½]

211