The University of the State of New York

248th High School Examination

# PLANE TRIGONOMETRY

**Wednesday,** June 18, 1930 — 1.15 to 4.15 p. m., only

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### 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.

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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 Express tan (— 263°) as the tangent of a positive angle less than 90°.   *Ans*...............

2 Find log tan 82° 17′ 41″   *Ans*...............

3 Find the value of cos 63° 20′ 24″   *Ans*...............

4 Given log cot $A = 9.67569 — 10$; find $A$ in degrees, minutes and seconds.   *Ans*...............

5 Given sin $B = .1686$; find $B$ in degrees and minutes.   *Ans*...............

6 If $A$ is in the first quadrant and $A = \tan^{-1} \tfrac{5}{3}$, find sin $2A$.   *Ans*...............

7 If cos $A$ is negative and tan $A$ is positive, may $A$ be an angle of a triangle? [Answer *yes* or *no*.]   *Ans*...............

8 Given tan $x = 2$ sin $x$; find *two* values of $x$ between 0° and 360°.   *Ans*...............

9 Which of the three values, 30°, 60°, 45°, is a solution of the equation $\sin^2 x — \cos x = \tfrac{1}{4}$?   *Ans*...............

10 Find the smallest positive value of $x$ for which $4^{\sin x} = 2$   *Ans*...............

11 Sine $x$ increases more rapidly as $x$ increases from 85° to 90° than when $x$ increases from 0° to 5°. [Mark *true* or *false*.]   *Ans*...............

12 How many angle degrees in $\tfrac{7\pi}{8}$ radians?   *Ans*...............

13 The sine is the reciprocal of what function?   *Ans*...............

14 Express cos $2x$ in terms of sin $x$.   *Ans*...............

15 How far from a tree 30 feet high must a person lie in order to see the top of the tree at an angle of elevation of 50°?   *Ans*...............

16 A rectangle with base 7.5 inches long has a diagonal 8.2 inches long; what angle does the diagonal make with the base?   *Ans*...............

17 How many different triangles may be formed in which $a = 80$, $b = 100$ and $A = 30°$?   *Ans*...............

18 In a parallelogram, the base is $b$, the acute angle at the base is $x$ and the area is $K$; find the side adjacent to $b$ in terms of $b$, $x$ and $K$.   *Ans*...............

19 What is the length of a side of a regular pentagon inscribed in a circle whose radius is 10?   *Ans*...............

20 Two sides of a triangle are 4 and 6 and the included angle is 60°; what is the third side? [Leave answer in radical form.]   *Ans*...............

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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 The length of a pond subtends at a certain point an angle of 40° 36′. The distances from this point to the two ends of the pond are 1228 feet and 1876 feet. Find the length of this pond. [12½]

22 A person on the bank of a river observes that the elevation of the top of a tree on the opposite bank is 47° 20′. He then walks back from the river 50 feet in a direct line from the tree and observes that the elevation of the top of the tree at this point is 44° 35′. How wide is the river? [12½]

23 *ABCD* is a parallelogram, side $AB = 329$, side $AD = 578$ and diagonal $AC = 627$; find angle *DAB*. [12½]

### Group II
### Answer two questions from this group.

24 *a* Starting with the law of sines for the triangle *ABC*, derive the law of tangents. [6½]

  *b* Prove that $\sin (30° + x) + \sin (30° - x) = \cos x$ [4]

  *c* Find the value of $\cos^{-1} \frac{1}{2} + \tan^{-1} 1$, when each angle is in the first quadrant. [2]

25 *a* Find to the *nearest minute* the positive acute angle that satisfies the equation
  $4 \cos 2x + 3 \cos x = 1$ [7½]

  *b* Prove: $\cos^4 x - \sin^4 x = \cos 2x$ [5]

26 *a* Construct a table of values for $2 \sin x$ for intervals of 30° as *x* varies from 0° to 360°. [4]

  *b* Plot the graph of $y = 2 \sin x$ [5]

  *c* Place on the graph a label *A* to indicate the point used in finding the value of *y* when $x = 20°$ [1]

  *d* From the graph made in answer to *b*, determine the values of *x* that will make *y* equal to 1.5. [2½]