

The University of the State of New York
245TH HIGH SCHOOL EXAMINATION
PLANE TRIGONOMETRY
Wednesday, June 19, 1929 — 1.15 to 4.15 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

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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.

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| 1 Complete the statement: A function of an acute angle is equal to the ... of its complementary angle. | Ans..... |
| 2 Complete the statement: The secant is the reciprocal of the | Ans..... |
| 3 Express $\cos A$ in terms of $\sin A$. | Ans..... |
| 4 Complete the statement: The sines of 30° , 45° and 60° are respectively $\frac{1}{2}$, $\frac{\sqrt{2}}{2}$ and $\frac{\sqrt{3}}{2}$ divided by | Ans..... |
| 5 The sides of a right triangle are 8, 15 and 17; express the cosine of the smallest angle as a common fraction. | Ans..... |
| 6 How many degrees in $\frac{2}{3}\pi$ radians? | Ans..... |
| 7 As angle A increases from 270° to 360° , does $\cos A$ increase or decrease? | Ans..... |
| 8 Find to the nearest foot the height of a flagpole if the angle of elevation of the top of the pole is $38^\circ 20'$ at a point 70 feet from the base. | Ans..... |
| 9 The length of a kite string is 800 feet and the angle of elevation of the kite is $42^\circ 16'$. Find to the nearest foot the approximate height of the kite above the ground, assuming that the kite string is straight. | Ans..... |
| 10 The base of an isosceles triangle is 56.4 feet and the altitude on the base is 22 feet. Find to the nearest degree one of the equal angles. | Ans..... |
| 11 Find $\log \sin 36^\circ 22' 12''$ | Ans..... |
| 12 Given $\log \tan A = 9.65820 - 10$; find A in degrees, minutes and seconds if A is acute. | Ans..... |
| 13 Express $\sin 168^\circ$ as a function of a positive angle less than 90° . | Ans..... |
| 14 Given $\tan A = 1$; find the value of A between 90° and 360° . | Ans..... |
| 15 Complete the statement: The ... of a triangle are proportional to the sines of the opposite angles. | Ans..... |
| 16 Given $\sin A = \frac{3}{5}$ and A acute; express in radical form $\sin \frac{1}{2}A$. | Ans..... |
| 17 In triangle ABC , if $\sin A = 0.2$, $\sin B = 0.6$ and $a = 100$, find b . | Ans..... |
| 18 Two objects, A and B , are separated by a pond. Both are visible and accessible from a point C . The distance CA is 6 rods, the distance CB is 7 rods and $\cos ACB = \frac{1}{4}$. Find the distance AB , using the law of cosines. | Ans..... |
| 19 In a given triangle $a = 20$, $c = 70$ and angle $B = 42^\circ$; find the area of the triangle to the nearest tenth. | Ans..... |
| 20 If a and b are adjacent sides of a parallelogram and C the included angle, express the area of the parallelogram in terms of a , b and a function of C . | 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 AB is a tower 120 feet high situated on level ground. Two objects C and D are located on the ground on opposite sides of the tower and in a line with the base B . If the angles of depression of C and D at A are $27^\circ 43'$ and 35° respectively, find the distance CD . [12½]

22 The boys in a trigonometry class wished to find the distance from a point P near the edge of a ravine to an inaccessible point M in the same horizontal plane on the opposite edge. They measured off along the edge of the ravine a convenient distance $PD = 270$ feet and measured the angles DPM and PDM , which were 42° and $64^\circ 12'$ respectively.

a Find the distance PM . [8½]

b Find the approximate width of the ravine at the point M . [4]

23 The exact location of corners X and Y of a triangular lot is known but the stake that marked corner Z has been lost. In the deed XY is given 120 feet, YZ 150 feet and ZX 180 feet. At what angle with XY should a surveyor run the line through X which will pass through corner Z ? [12½]

Group II

Answer two questions from this group.

24 Derive the formulas for $\sin 2A$ and $\tan 2A$, starting with the formulas for $\sin (A + B)$ and $\tan (A + B)$ respectively. [6½, 6]

25 a Solve for the positive value of x less than 180° :

$$2 \sin^2 x + 7 \cos x = 2 \quad [6½]$$

b Prove the following identity:

$$\cot A - \tan A = 2 \cot 2A \quad [6]$$

26 Indicate whether each of the following statements is true or false: [Write the letters a, b, c, d, e in a column and then write the word *true* or *false* after each letter.]

a The angle of elevation of A at B is equal to the angle of depression of B at A . [2½]

b As an angle increases from 0° to 90° , its secant decreases. [2½]

c $\tan B \times \sin B + \cos B = \sec B$ is an identity. [2½]

d If $A = \sin^{-1} \frac{1}{8}$, then $\cos A = \frac{1}{8}$ [2½]

e A triangle is determined when any three of its parts are given. [2½]