PLANE TRIGONOMETRY

Thursday, June 18, 1931 — 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 18, 1931

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 1

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 tan 118° 25′   Ans................

2 Find log cot 23° 15′ 27″   Ans................

3 If log sin $A = 9.72650 - 10$, find A in degrees, minutes and seconds, if A is a positive acute angle.   Ans................

4 If cos $A = .6278$ and A is a positive acute angle, find A in degrees and minutes, computing the result to the *nearest minute*.   Ans................

5 Find the smallest positive value of x for which $2^{\tan^2 x} = 8$ Ans................

6 If csc $A = 4/3$, find cos A if A is a positive acute angle.   Ans................

7 Express cot 254° as a function of a positive angle less than 90°.   Ans................

8 What is the value of $\cos \frac{\pi}{4}$?   Ans................

9 Find the numerical value of tan 60° $+$ sin 90°   Ans................

10 A triangular building lot at the intersection of two streets has frontages of 40 yards and 50 yards. If the streets form an angle of 40°, find the area of the lot to the *nearest square yard*.   Ans................

11 If sin $A = \frac{1}{3}$ and A is in the second quadrant, find sin $2A$.   Ans................

12 If $A = \sin^{-1} .667$ and $B = \cos^{-1} .667$, A and B each being an acute angle, how many degrees in $(A + B)$?   Ans................

13 Two adjacent sides of a parallelogram are 6 and 10 and the included angle is 120°; find the length of the longer diagonal.   Ans................

14 Write the formula for cos $\frac{1}{2}A$ in terms of cos A.   Ans................

15 Express tan x in terms of sin x.   Ans................

16 Does sin $(60° + 30°) = $ sin 60° $+$ sin 30° ? [Answer yes or no.]   Ans................

17 A ship starts from a shore which runs north and south and sails N. N. E. (N. 22° 30′ E.). After sailing 150 miles how far is the ship from the shore? [Express answer correct to the *nearest mile*.]   Ans................

18 Which of the following numbers can *not* be the value of cos A?
$-\frac{1}{2}, 2.5, .07, 1$ Ans................

19 As angle x increases from 0° to 180°, for what value of x do the graphs of $y = \sin x$ and $y = \cos x$ intersect?   Ans................

20 In the right triangle ABC, if $a = 13$ and $b = 20$, find A to the nearest degree.   Ans................

[3]

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 Two lighthouses A and B are 22 miles apart, A being due north of B. A ship observed at B is N. 41° 10′ E. At the same time the ship observed at A is S. 52° 24′ E. What is the distance of the ship from the nearer lighthouse? [12½]

22 What angle does an object 72.3 feet long subtend if the eye of the observer is 56.9 feet from one end of the object and 81.6 feet from the other end? [12½]

23 Two sides of a triangular lot are 140.3 feet and 170.6 feet in length. The angle between these two sides is 40°. Find the length of the third side. [12½]

Group II

Answer two questions from this group.

24 a Derive the law of sines for an acute triangle. [7½]
   b Prove the following identity:
   $$(\sin x - \cos x)^2 = 1 - \sin 2x \quad [5]$$

25 a Solve for positive values of x less than 360°:
   $$2 \sin^2 x - \cos x = 1 \quad [6½]$$
   b Prove the following identity:
   $$\cos^4 x - \sin^4 x + 1 = 2 \cos^2 x \quad [6]$$

26 a Draw the graph of $y = \cos x$, using the following values of x: 0°, 10°, 30°, 50°, 70°, 90°, 110°, 130°, 150°, 170°, 180°. [10½]
   b On the graph made in answer to a draw the ordinate at the point that shows cos 40°. [2]