PLANE TRIGONOMETRY

Tuesday, August 23, 1938 — 3.30 to 6.30 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.

Group II

Write at top of first page of answer paper to group II (*a*) names of schools where you have studied, (*b*) number of weeks and recitations a week in plane trigonometry previous to entering summer high school, (*c*) number of recitations in this subject attended in summer high school of 1938.

The minimum time requirement is five recitations a week for half a school year, or the equivalent. The summer school session will be considered the equivalent of one semester's work during the regular session or five recitations a week for half a school year.

For admission to this examination attendance on at least 30 recitations in this subject in a registered summer high school in 1938 is required.

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.

See instructions for group II on page 1.

Group II
Answer question 21 and four of the others.

21 In triangle ABC, $a = 45.62$, $b = 36.79$ and $c = 39.25$; find A by copying and completing the following outline: [10]

$$\cos \frac{A}{2} = \sqrt{\frac{s\,(s-a)}{bc}} \qquad\qquad s = \tfrac{1}{2}\,(a + b + c)$$

$a + b + c = \ldots\ldots\ldots\ldots$

$s = \ldots\ldots\ldots\ldots$

$\log s = \ldots\ldots\ldots\ldots$

$\log\,(s - a) = \underline{\ldots\ldots\ldots\ldots}$

$\log\,b = \ldots\ldots\ldots\ldots$

$\log\,c = \underline{\ldots\ldots\ldots\ldots}$

$\log \dfrac{s\,(s-a)}{bc} = \ldots\ldots\ldots\ldots$

$\log\cos \dfrac{A}{2} = \ldots\ldots\ldots\ldots$

$\dfrac{A}{2} = \ldots\ldots\ldots\ldots$

$A = \ldots\ldots\ldots\ldots$

22 a Starting with the formulas for $\sin\,(x + y)$ and $\sin\,(x - y)$, derive the formula for $\sin A - \sin B$.   [8]

b Using the formula found in answer to a, express in radical form the value of $\sin 75° - \sin 15°$.   [2]

23 a Make a table of values of $y = \sin x$ from $x = 0°$ to $x = 360°$ in intervals of $30°$.   [3]

b Using these values, draw the graph of $y = \sin x$.   [7]

24 a Showing all work, express $\dfrac{\sin^2 x\,(1 - \tan^2 x)}{2\tan^2 x}$ in terms of $\cos 2x$.   [6]

b Solve $\cos x + 2\cos^2 x = 0$ for positive angles less than $360°$.   [4]

25 A child's slide 10 feet 6 inches long resting on level ground is inclined $30°\ 10'$ to the horizontal; a 6-foot ladder reaches from the ground behind the slide to its top. Find the angle which the ladder makes with the ground.   [10]

26 In triangle ABC, $a = 150$, $c = 125$ and $B = 40°$; find C correct to the *nearest minute*.   [10]

27 A plane is inclined $25°\ 22'$ to the horizontal. Find the magnitude of the force acting parallel to the plane which would be just sufficient to prevent a 400-pound weight from sliding down.   [10]

*28 a Find the modulus and the amplitude of the complex number $- 3 - 4\,i$ [5]

b The modulus of a complex number is 10 and its amplitude is $135°$. Express the number in the form $a + bi$.   [5]

*This question is based on one of the optional topics in the syllabus.

[2]

PLANE TRIGONOMETRY

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 in radical form the value of csc 45°. 1................

2 Find log tan 22° 42′. 2................

3 Find, correct to the *nearest minute*, the smallest positive angle whose sine is .8277 3................

4 Express sin 170° as a function of a positive acute angle. 4................

5 Express sec x in terms of tan x if x is a positive angle in the first quadrant. 5................

6 Express in radical form sin 240°. 6................

7 Find the value of sin² (tan⁻¹ 2). 7................

8 In which quadrant do the sine and cosine both decrease as a positive angle increases? 8................

9 Express cos $2x$ in terms of sin x. 9................

10 In a triangle, log tan $\dfrac{A}{2}$ = 9.9646—10; find A. 10................

11 In triangle ABC, $a = 9$, $b = 8$ and sin A = .8750; find sin B. 11................

12 In triangle ABC, $a = 11$, $b = 10$ and $c = 9$; find cos A. 12................

13 Find the area of triangle ABC in which $c = 6$, $b = 10$ and A = 24° 50′ 13................

14 In triangle ABC, tan ½ $(B + C)$ = 7, $c = 6$ and $b = 10$; find tan ½ $(B — C)$. 14................

15 How many degrees are there in one radian? [Answer may be given in terms of π.] 15................

16 Solve the equation tan x = cot x for a value of x between 90° and 180°. 16................

17 In triangle ABC, $a = 8$, $b = 7$ and $c = 9$; express tan ½ A in radical form. 17................

18 Solve for x in terms of a and b: log x = log a + log b. 18................

19 If ½ log x = .7739, find x. 19................

20 In triangle ABC, cos A = ½; find sin ½ A. 20................

[3]