PLANE GEOMETRY

Tuesday, August 25, 1936 — 8.30 to 11.30 a. 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.

Groups II and III

Write at top of first page of answer paper to groups II and III (*a*) names of schools where you have studied, (*b*) number of weeks and recitations a week in plane geometry previous to entering summer high school, (*c*) number of recitations in this subject attended in summer high school of 1936, (*d*) author of textbook used.

The minimum time requirement previous to entering summer high school is five recitations a week for a school year.

For those pupils who have met the time requirement previous to entering summer high school the minimum passing mark is 65 credits; for all others 75 credits.

For admission to this examination attendance on at least 30 recitations in this subject in a registered summer high school in 1936 is required.

See instructions for groups II and III on page 1.

Group II
Answer three questions from this group.

21 Prove that if in the same circle or in equal circles, two chords are equidistant from the center, they are equal. [10]

22 Prove that if from a point outside a circle a tangent and a secant are drawn to the circle, the tangent is the mean proportional between the secant and its external segment. [10]

23 In the parallelogram $ABCD$, E and F are points on the diagonal BD so that DE equals BF. EC and AF are drawn. Prove EC parallel to AF. [10]

24 In the regular hexagon $ABCDEF$, the diagonal BD meets the diagonals CA and CE in H and K respectively.
> a Prove that $BH = HC = HK$ [6]
> b Prove that triangles BHC and HKC are equal in area. [4]

25 Given one side of a square and the base of a rectangle of equal area; construct this rectangle. [10]

Group III
Answer two questions from this group.

26 Lines a and c on opposite sides of line b are parallel to b and 4 inches and 6 inches respectively from b. A transversal cuts these lines at an angle of 65°. Find the lengths of the segments of the transversal. [10]

27 In trapezoid $ABCD$ the lower base AB equals 15, the upper base DC equals 10, the altitude equals 6 and AD equals 8.
> a Find the area of the trapezoid $ABCD$. [3]
> b If the bisector of angle A cuts DC at P, find the area of triangle PAD. [7]

28 An equilateral triangle inscribed in a circle has an altitude of 21. Find, correct to the *nearest integer,* the difference between the circumference of the circle and the perimeter of the triangle. [Use $\pi = 3.14$ and $\sqrt{3} = 1.73$] [10]

[2]

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 $2\frac{1}{2}$ credits. No partial credit will be allowed. Each answer must be reduced to its simplest form.

1 If an exterior angle at A of triangle ABC contains 80°, which side of the triangle is the longest? *Ans*.............

2 The segments of the hypotenuse of a right triangle made by the altitude on the hypotenuse are 4 and 9. Find the length of the altitude. *Ans*.............

3 An exterior angle of a regular polygon is 72°; how many sides has the polygon? *Ans*.............

4 How far from the foot of a wall must a ladder 15 feet long be placed so that it will make an angle of 47° with the ground? [Find answer correct to the *nearest foot*.] *Ans*.............

5 Point D is 3 inches from the center of a circle whose radius is 5 inches. What is the product of the segments of any chord drawn through D? *Ans*.............

6 Two tangents to a circle from an external point form an angle of 40°. How many degrees are there in the minor intercepted arc? *Ans*.............

7 If the perimeter of a triangle is 12, then any one side of the triangle must be less than (*a*) 4, (*b*) 5 or (*c*) 6; which is correct, (*a*), (*b*) or (*c*)? *Ans*.............

8 Two circles have the same center. What is the locus of the centers of all circles tangent to both? *Ans*.............

9 How long is the median of an equilateral triangle whose inscribed circle has a radius of 1 inch? *Ans*.............

10 What is the area of a circle whose circumference is 14π? [Answer may be left in terms of π.] *Ans*.............

11 Two sides of a triangle are 6 and 8 and the angle between them is 60°. Find the length of the longer segment cut off by the altitude on side 8. *Ans*.............

12 If two opposite angles of any quadrilateral are bisected by a diagonal connecting their vertices, the quadrilateral is divided into two triangles that are (*a*) congruent, (*b*) equal but not congruent, or (*c*) similar. Which is correct, (*a*), (*b*) or (*c*)? *Ans*.............

13 If the bases of two similar triangles are 2 inches and 3 inches, what is the ratio of their areas? *Ans*.............

14 *ABCD* is a trapezoid inscribed in a circle with AB a diameter and DC intercepting an arc of 40°. How many degrees are there in arc AD? *Ans*.............

15 What is the name of the equilateral quadrilateral that is not a regular polygon? *Ans*.............

[3] [OVER]

16 Two tangents 8 inches long are drawn to a circle forming an angle of 60° with each other. If the chord of contact is drawn, what is the area of the triangle formed? [Answer may be left in radical form.]   *Ans*. . . . .
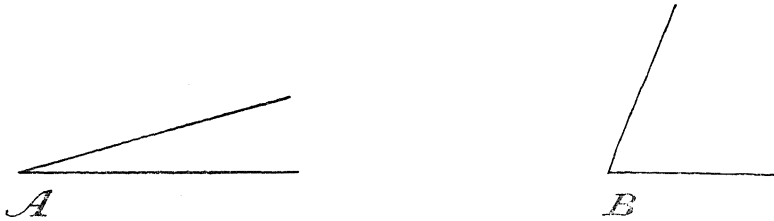
17 How far from the center of a circle is an 8″ chord if a 6″ chord of this circle is 4″ from the center?   *Ans*. . . . .

Directions (questions 18–20) — Leave all construction lines on the paper.

18 Angles *A* and *B* are two angles of triangle *ABC*. Construct angle *C*. ·

A   *B*

19 Construct a perpendicular to line *m* at point *p*.

m   p

20 Find by construction the center of the circle that can be circumscribed about triangle *ABC*.

C

A   *B*