PLANE GEOMETRY

Wednesday, January 25, 1933 — 9.15 a. m. to 12.15 p. m., only

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Instructions

Do not open this sheet until the signal is given.

Answer all questions in part I; in part II, answer three questions from group I and two questions from group 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 place the answer to each question in the space provided; 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 in 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.

PLANE GEOMETRY

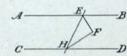### Wednesday, January 25, 1933

Fill in the following lines:

Name of school...Name of pupil...

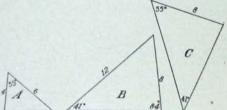**Detach this sheet and hand it in at the close of the one and one half hour period.**

Part I

Directions (questions 1–17) — Write on the dotted line at the right of each question the expression which when inserted in the corresponding blank will make the statement true.
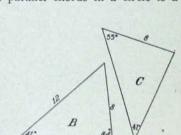
1 A statement in geometry may be (*a*) a proposition, (*b*) a definition or (*c*) an axiom. The statement *If the opposite sides of a quadrilateral are equal, the figure is a parallelogram* is . . . . [Answer *a*, *b* or *c*.]   Ans.............

2 In the group of theorems beginning *If two parallel lines are cut by a transversal*, the first pair of angles proved equal are the . . . angles.   Ans.............

3 If the sum of two angles of a triangle is greater than a right angle, the third angle is . . . than a right angle.   Ans.............

4 If the sides of a triangle *ABC* are *AB* = 5, *BC* = 9 and *AC* = 12, the largest angle is . . . . [Answer *A*, *B* or *C*.]   Ans.............

5 *AB* is parallel to *CD* and angles *BEH* and *EHD* are bisected. If angle *AEH* is 64°, the number of degrees in angle *F* is . . . .   Ans.............

6 A tangent *AX* meets a chord *AB* at an angle of 56°. The number of degrees in any angle inscribed in the minor arc *AB* is . . . .   Ans.............

7 The locus of the mid-points of all parallel chords in a circle is a . . . of the circle.   Ans.............

8 Triangles *A* and *B* at the right are . . . to each other.   Ans.............

9 Triangles *B* and *C* at the right are . . . . [Answer *congruent* or *not congruent*.]   Ans.............

10 The angle of elevation of the sun is 45° and at a point 60 feet from a pole the sun is observed to be in a line with the top of the pole. The height of the pole above the eye of the observer is . . . feet.   Ans.............

11 The base and altitude of a triangle are 6 and 4 respectively. If the base of a similar triangle is 9, the corresponding altitude is . . . .   Ans.............

12 Two concentric circles have radii of 5 and 13. The length of a chord of the larger circle tangent to the smaller circle is . . . .   Ans.............

[3]   [OVER]
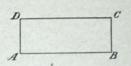
13 The bases of two triangles of equal areas are 12 and 18. If the altitude of the first triangle is 6, then the altitude of the second must be
. . . . .

Ans. . . . .

14 Two secants from an outside point to a circle are 20 and 32 feet; if the external segment of the first secant is 8 feet, the external segment of the second is . . . feet.

Ans. . . . .

15 One angle of a right triangle is 60°. If the hypotenuse is 10, the longer leg is . . . .

Ans. . . . .

16 The diameters of the front wheels of a gocart are half the diameters of the back wheels; in going a certain distance, the back wheels will turn . . . as many times as the front wheels.

Ans. . . . .

17 If the area of a circle is 30π, the radius is . . . .

Ans. . . . .

Directions (questions 18–20) — Leave all construction lines on the paper.
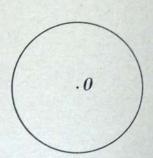
18 Circumscribe a circle about the rectangle *ABCD*.

19 Inscribe an equilateral triangle in the circle at the right.

20 Construct the locus of points equidistant from the parallel lines *AB* and *CD*.

A———————————B

C———————————D

PLANE GEOMETRY

Write at top of first page of answer paper (a) name of school where you have studied, (b) number of weeks and recitations a week in plane geometry.

The minimum time requirement is five recitations a week for a school year.

<u>Name the author of the textbook you have used in plane geometry.</u>

Part II

Answer five questions from part II, including three questions from group I and two questions from group II.

Group I

Answer three questions from this group.

21 Prove that an angle formed by two chords intersecting within a circle is measured by one half the sum of the intercepted arcs. [10]

22 *a* Prove that the median of a triangle divides the triangle into two triangles that are equal in area. [6]

   b Are the two triangles referred to in *a* always congruent? [Answer *Yes* or *No*.] [2]

   c Give reasons for your answer to *b*. [2]

23 In the triangle ABC, D and E are the mid-points of the sides AC and BC respectively. If line DE is produced its own length to F, and B and F joined, prove with the aid of congruent triangles that $ABFD$ is a parallelogram. [10]

24 A triangle ABC is inscribed in a circle. The bisector of angle B meets AC at F and the circle at E. Prove $BE \times FB = BC \times AB$ [10]

25 In accordance with the proof found in the textbook used in your class, answer the following:

   a State two theorems or corollaries used in proving the following theorem: The area of a parallelogram is equal to the product of its base and its altitude. [6]

   b State another theorem used in proving *one* of the two theorems given in answer to *a*, indicating to which one this refers. [4]

Group II

Answer two questions from this group.

Leave all work on the paper; merely writing the answers is not sufficient. Irrational results may be left in the form of π and radicals unless otherwise stated.

26 Find to the *nearest tenth* the difference between the area of a circle whose radius is 8 and the area of a regular hexagon inscribed in this circle. [Use π = 3.14 and $\sqrt{3}$ = 1.73] [10]

27 One leg of a right triangle is 20 and the altitude on the hypotenuse is 12; find the length of the hypotenuse and the length of the other leg. [10]

28 Find to the *nearest square inch* the area of a regular decagon (10-sided polygon) inscribed in a circle whose radius is 10 inches. [10] [Suggestion: Use numerical trigonometry.]