PLANE GEOMETRY

Tuesday, January 25, 1938 — 9.15 a. m. to 12.15 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.

Groups II and III

Write at top of first page of answer paper to groups II and III (*a*) name of school where you have studied, (*b*) number of weeks and recitations a week in plane geometry, (*c*) author of textbook used.

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

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.

Directions (questions 1–12) — 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 The locus of points equidistant from the sides of an angle is the ... of that angle.

1................

2 The bisectors of two complementary adjacent angles form an angle of ... degrees.

2................

3 The sum of the interior angles of a polygon of *seven* sides is ... straight angles.

3................

4 An angle formed by a tangent and a secant intersecting outside the circle is measured by one half the ... of the intercepted arcs.

4................

5 If the areas of two similar triangles are in the ratio 1:25, corresponding sides of the triangles are in the ratio ....

5................

6 The bases of a trapezoid are 8 inches and 10 inches and the area is 54 square inches. The altitude of the trapezoid is ... inches.

6................

7 The segments of one of two chords intersecting within a circle are *r* and *s*. If one segment of the other chord is *m*, the length of the other segment in terms of *r*, *s*, and *m* is ....

7................

8 In the right triangle ABC, hypotenuse AB is 20 inches and angle A is 54°; the length of AC, correct to the *nearest inch*, is ... inches.

8................

9 If one angle of a right triangle is 60° and the hypotenuse is 2, the length of the side opposite the 60° angle is .... [Answer may be left in radical form.]

9................

10 If the diagonals of a rhombus are 10 and 24, a side of the rhombus is ....

10................

11 The centers of all circles tangent to the same line at the same point lie on a line which is (a) parallel to the given line or (b) perpendicular to the given line. The correct answer is .... [Answer a or b.]

11................

12 The diagonal d of a square is equal to the side s multiplied by (a) $\sqrt{2}$, (b) $\sqrt{3}$ or (c) 2. The correct answer is .... [Answer a, b or c.]

12................

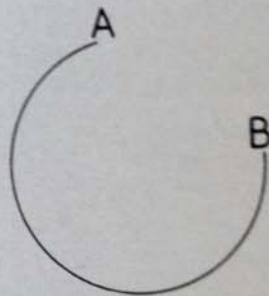[3]   [OVER]

Directions (questions 13–15) — Leave all construction lines on the paper.

13 If the angles A and B are two angles of a triangle, find by construction the third angle of the triangle.
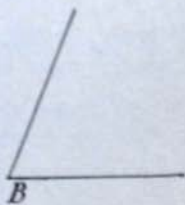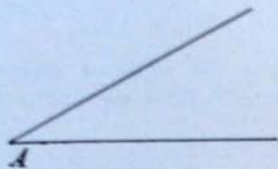
14 In the space below construct an angle of 30°.

15 Find by construction the center of the circle of which the arc AB is a part.

Directions (questions 16–20) — Indicate whether each of the following statements is *always* true, *sometimes* true or *never* true by writing the word *always, sometimes* or *never* on the dotted line at the right.

16 The diagonals of a rectangle are equal.

16.................

17 The opposite angles of a quadrilateral are supplementary.

17.................

18 If the radius of a circle is multiplied by k, the circumference is multiplied by k.

19 An equilateral polygon is a regular polygon.

18.................

19.................

20 The altitude upon any side of a triangle is greater than the median drawn to that side.

20.................

See instructions for groups II and III on page 1.
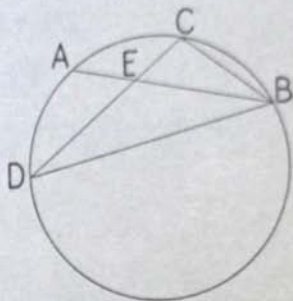
Group II

Answer three questions from this group.

21 Prove that if two sides of a quadrilateral are equal and parallel, the figure is a parallelogram. [10]

22 Prove that an angle formed by a tangent and a chord drawn from the point of contact is measured by one half the intercepted arc. [10]

23 Prove that the base angles of an isosceles trapezoid are equal. [10]

24 In the figure at the right, C is the midpoint of the arc AB. Chords AB and CD intersect in E and chords CB and BD are drawn. Prove that $CD \times CE = (CB)^2$ [10]

25 Given a right triangle whose legs are a and b; transform the triangle into a rectangle whose base is a given line segment m. [10]

Group III

Answer two questions from this group.

26 The bases of a trapezoid are 7 and 10 and the altitude is 6.
  a Find the altitude of the triangle formed by the shorter base and the nonparallel sides produced. [8]
  b Find the area of the triangle described in a. [2]

27 The figure at the right represents the cross section of a hexagonal nut. Assuming that the diameter of the circle and the side of the regular hexagon are each 2 inches, find, correct to the *nearest square inch,* the area of the cross section (the shaded portion). [10]
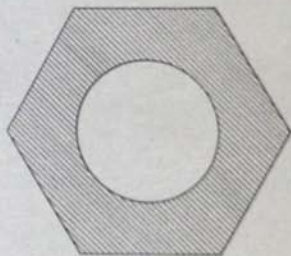
28 Given a parallelogram with two adjacent sides a and b and included angle C
  a What change takes place in the area of the parallelogram if a and b remain constant and angle C increases (1) from 0° to 90°, (2) from 90° to 180°? [1, 1]
  b Find, correct to the *nearest tenth,* the area of the parallelogram if $a = 4$, $b = 5$ and angle $C = 52°$ [8]

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[2]