

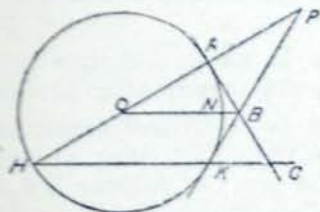
PLANE GEOMETRY

Thursday, January 25, 1917—1.15 to 4.15 p. m., only

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. Name the author of the textbook you have used in plane geometry.

Answer eight questions, including question 1.

Assign 16 credits to the first question and 12 credits to each of the others.



In the above figure O is the center of the circle, $AP=OA$, AC and PK are tangents.

Assign a reason for each of the following statements:

- 1 $\angle BOA$ is measured by arc AN
 $\angle KHP$ is measured by $\frac{1}{2}$ arc AK
- 2 Arc $AN = \frac{1}{2}$ arc AK
- 3 $OB \parallel HC$
- 4 $\angle OBK = \angle CKB$
- 5 $\angle ABO = \angle OBK$
- 6 $OB = BP$
- 7 $\angle ABO = \angle PBA$
- 8 $\angle ABO = \angle BCK$

2 Prove that the perpendicular is the shortest line that can be drawn from a given point to a given straight line.

3 Prove that two parallel chords of a circle intercept equal arcs.

4 Prove that if a straight line divides two sides of a triangle proportionally, it is parallel to the third side.

5 Prove that the areas of two similar triangles are to each other as the squares of any two corresponding sides.

6 Assuming the statements in question 1 to be true, prove that the triangle BKC is equilateral.

7 Prove that the median from the vertex of a triangle bisects any line parallel to the base and terminated by the sides.

8 For each of the following theorems (no proof required) draw the figure and state what is given and what is to be proved in terms of letters on the figure:

- a If perpendiculars are drawn from two vertices of a triangle to the opposite sides, the triangle cut off from the given triangle by the line joining the feet of the perpendiculars is similar to the original triangle.
- b If the angle included between the equal sides of an isosceles triangle is equal to an exterior angle of an equilateral triangle, the radius of the circumscribed circle is equal to one of the equal sides of the isosceles triangle.

9 In a triangle in which C is an obtuse angle, construct (without proof) (a) the median to AC , (b) the bisector of the angle C , (c) the altitude from the vertex A .

10 Two parallel chords of a circle are each 16 inches in length; the distance between them is 12 inches. Find the radius of the circle.

11 If two intersecting chords divide a circumference into parts whose lengths in order are 2 inches, 3 inches, 5 inches and 2 inches, how many degrees are there in the angles made by the chords?

12 A 6 inch pipe supplies only three quarters as much water in a given time as is needed; assuming that the flow is proportional to the area of the cross section, find the diameter of the smallest pipe that will supply the required amount if pipe is made in diameters of exact number of inches.

13 Define six of the following: (a) right angle, (b) parallelogram, (c) mean proportional between two lines, (d) regular polygon, (e) similar polygons, (f) parallel lines, (g) inscribed angle, (h) secant of a circle.