PLANE GEOMETRY

Thursday, January 23, 1919 — 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 question 13 and seven of the others.

Assign 16 credits to question 13 and 12 credits to each of the others.

1 Prove that if one angle of a triangle is greater than a second angle, the side opposite the first angle is greater than the side opposite the second angle.

2 Prove that the area of a regular polygon is equal to half the product of its perimeter and its apothem.

3 Prove that the diagonals of a parallelogram bisect each other.

4 Prove that if in the same circle, or in equal circles, two chords are equal, they are equally distant from the center.

5 Prove that if a circle drawn with one side of a triangle for a diameter cuts the other two sides and the points of intersection are joined, the triangle cut off is similar to the given triangle.

6 Two lines are tangent to a circle from an external point. Draw a diameter from one point of tangency and join its other extremity with the other point of tangency. Prove that this line is parallel to the line joining the external point with the center of the circle.

7 *a* In the triangle ABC, $\angle A=60°$, $\angle B>\angle C$. Which is the greatest side of the triangle?

   b Can the congruence of two triangles be tested by comparing the sides only or the angles only? Give reasons for your answer.

   c The sum of the angles of a triangle is equal to two right angles. State the corresponding theorem for any polygon.

8 Prove that the line joining the points indicating 6 and 9 on the clock face is perpendicular to the line joining the points indicating 2 and 7.

9 AB is a straight line and BH is drawn perpendicular to AB. AX is drawn making the angle BAX 25° and meeting BH in X. XP is drawn making the angle AXP 30° and meeting AB at P. Draw the figure and mark the values of all the angles in the figure, giving reasons.

10 From a point 24″ distant from the center of a circle whose diameter is 20″, a secant and a tangent are drawn. The secant is 6″ distant from the center. Find the length of the tangent and the length of the external portion of the secant.

11 A village has two standpipes each 50 feet high, one 10 feet in diameter and the other 16 feet in diameter. These two standpipes are to be replaced by one of the same height and capacity. Find the diameter of the new standpipe.

12 A swimming pool is 60 feet long, 20 feet wide, 3 feet deep at one end and 8 feet deep at the other; find the number of square feet in the bottom of the pool.

13
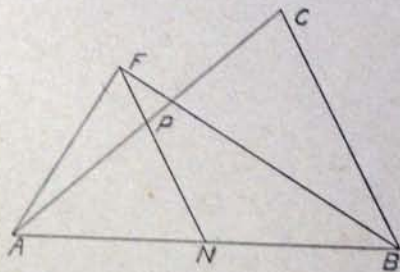
In the $\triangle ABC$, the line AF is drawn $\perp$ to the bisector of the $\angle B$. FN is drawn $\parallel CB$. Prove that $AP=PC$.

Assign a reason for *each* of the following statements:

1	$\angle NFB = \angle FBC$	[2]
2	$\angle NBF = \angle FBC$	[1]
3	$\angle NFB = \angle NBF$	[1]
4	$NB = NF$	[2]
5	$\angle AFN$ is the complement of $\angle NFB$.	[2]
6	$\angle FAN$ is the complement of $\angle NBF$.	[2]
7	$\angle AFN = \angle FAN$	[2]
8	$AN = NF$	[1]
9	$AN = NB$	[1]
10	$AP = PC$	[2]