PLANE GEOMETRY

Tuesday, September 13, 1927 — 9.15 a. m. to 12.15 p. m., only

Answer eight questions. Irrational results may be left in the form of $\pi$ and radicals unless otherwise stated. Papers entitled to less than 75 credits will not be accepted.

1. Prove that the diameter perpendicular to a chord bisects the chord and the arcs which the chord subtends.

2. Prove that if through a point outside a circle a tangent and a secant are drawn, the tangent is the mean proportional between the whole secant and its external segment.

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

4. Construct a circle concentric with a given circle and having a given chord in the given circle as a tangent.

5. $CA$ and $CB$ are legs of an isosceles triangle. $AD$, a part of the first leg, is longer than $BE$, a part of the second leg. Prove that the angle $DEB$ is greater than the angle $EDA$.

6. Each of two sides of a scalene triangle is produced its own length through the vertex of the triangle. Prove that the line which joins the ends is parallel to the base.

7. Find the area of a triangle whose base is 10 inches and whose base angles are $120^\circ$ and $30^\circ$ respectively.

8. Construct a triangle that shall have a given line for its base and shall be equal to a given square.

9. An equilateral triangle inscribed in a circle has a side 6 inches long; find the area included between the two figures.

10. The bases of a trapezoid are 30 inches and 12 inches respectively and the altitude is 9 inches; find the altitudes of the two triangles formed by producing the legs of the trapezoid until they meet.