PLANE GEOMETRY

Wednesday, June 13, 1900 — 9:15 a.m. to 12:15 p.m., only

Answer eight questions but no more, including at least one from each of the three divisions. If more than eight are answered only the first eight answers will be considered. Draw carefully and neatly each figure in construction or proof, using letters instead of numerals. Arrange work logically. Each complete answer will receive 12½ credits. Papers entitled to 75 or more credits will be accepted.

First division
1. Define rhombus, corollary, diagonal, radius, chord.
2. Complete and demonstrate the following: the sum of the interior angles of any polygon is equal to . . .
3. Complete and demonstrate the following: an angle formed by a tangent and a chord meeting it at the point of contact is measured by . . .
4. Prove that triangles which have their corresponding sides proportional are similar.
5. Prove that the circumference of a circle may be circumscribed about any regular polygon.

Second division
6. Find the perimeter of an equilateral triangle whose area is 64 square feet.
7. The perpendicular from the vertex of a right triangle to the hypotenuse is 12 feet and the greater segment of the hypotenuse is 16 feet; find the length of each side of the triangle.
8. $ABC$ is a triangle; $D$ is the middle point of $AC$; $AB = 7$ feet, $AD = 6$ feet and $BD = 4\frac{1}{2}$ feet; find $BC$.
9. The angle between two tangents to a circle is $60^\circ$ and the length of the chord joining the points of contact is 8.66 feet; find the radius of the circle.
10. A rectangle whose base is twice its altitude is inscribed in a circle whose radius is 5 feet; find the area of the rectangle.

Third division
11. Two circles intersect in the points $A$ and $B$; from any point on the line $AB$ produced tangents are drawn to the given circles; prove that these tangents are equal.
12. $AB$ and $CD$ are two lines intersecting at $E$; $P$ is a point in the angle $CEB$; through $P$ draw two lines each of which shall make equal angles with $AB$ and $CD$. Give proof.
13. Given the middle points of the three sides of a triangle; show how to construct the triangle.
14. Given a line $a$; construct a line $x$ so that $x = a \sqrt{2}$.
15. Show, by applying the construction in 14, how to divide a given triangle into two equal parts by a line parallel to one of its sides.