The University of the State of New York 136

EXAMINATION FOR QUALIFYING CERTIFICATES

PLANE GEOMETRY

Tuesday, September 12, 1922—9.15 a. m. to 12.15 p. m., only

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

1 Prove that if the opposite sides of a quadrilateral are equal, the figure is a parallelogram.

2 Prove that an angle formed by a tangent and a chord through the point of contact is measured by one half the intercepted arc.

3 Prove that the area of a trapezoid is equal to the product of its altitude and half the sum of its parallel sides.

4 With a side and two diagonals given, construct a parallelogram.

5 Prove that the bisector of an exterior angle of an isosceles triangle, formed by producing one of the legs through the vertex, is parallel to the base.

6 Prove that the tangents to two intersecting circles, drawn from any point in their common chord produced, are equal.

7 *a* Find by construction a point X equidistant from two given points and at a given distance from a third given point.

b Construct the mean proportional between two given straight lines.

8 The base of a triangle is 15 feet and its altitude is 8 feet. Find the perimeter of an equivalent rhombus if its altitude is 6 feet.

9 Prove that an interior common tangent of two non-tangent circles divides the line joining their centers into segments proportional to the radii.

10 Find the difference between the areas of a circle and a square, each of whose perimeters is 22 feet. [Use $\pi = \frac{22}{7}$]