The University of the State of New York

EXAMINATION FOR QUALIFYING CERTIFICATES

PLANE GEOMETRY

Tuesday, September 9, 1919—9.15 a. m. to 12.15 p. m., only

Answer eight questions. 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 two parallel chords of a circle intercept equal arcs.

3 Prove that if the angles of two triangles are respectively equal to each other, the triangles are similar.

4 Prove that the area of a triangle is equal to half the product of its base and its altitude.

5 Prove that two regular polygons of the same number of sides are similar.

6 From the point in which the altitudes drawn to the legs of an isosceles triangle intersect, a line is drawn to the vertex. Prove that the line bisects the angle at the vertex.

7 A triangle ABC is inscribed in a circle; the angle B is 35° and the minor arc AB is 120°. A tangent drawn at A meets BC produced at D. Draw the figure and mark the value of all the angles in the figure.

8 Construct a circle which shall be tangent to a given line AB at M and shall pass through a given point P.

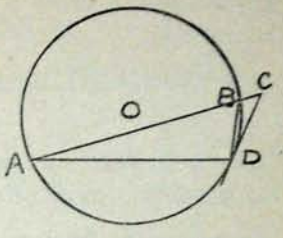
9 The upper base of an isosceles trapezoid is 8″, each leg is 5″ and the projection of each leg on the base is 4″. If the legs of the trapezoid are produced till they meet, find the altitudes of the two triangles thus formed.

10 Given AB a diameter of a circle, and AD and BC tangents, AC and BD intersecting at a point F on the circle. Prove that AB is the mean proportional between the lines AD and BC.

11 A semicircular field has an area of 77 square yards; find the perimeter of the field.

PLANE GEOMETRY—*concluded*

8 In the figure, CD is tangent to the circle, angle C=42°, arc BD=32°. Find in degrees the value of *each* of the angles of the triangle ABD. [12½]



9 The diagonals of an equilateral parallelogram (rhombus) are 24 inches and 70 inches. Find (*a*) the area, (*b*) the perimeter, (*c*) the altitude. [12½]

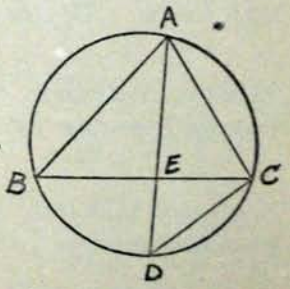
10 Given a, b and c, lines of unequal length. Construct a fourth line x such that $x=\frac{ac}{b}$. Give proof. [12½]

11 *a* Construct a quadrilateral three of whose angles are 150°, 90° and 60°. [10½]

b How many degrees are there in the remaining angle? Why? [2]

12 Given a circle circumscribed about triangle ABC. D is the mid point of arc BC. AD and DC are drawn.

To prove $AB\times AC=\overline{AE}^2+BE\times EC$



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

1	∠BAD is measured by ½ arc BD ∠CAD is measured by ½ arc CD	[1]
2	∠BAD = ∠CAD	[½]
3	∠B = ∠D	[2]
4	△BAE is similar to △DAC	[2]
5	$\frac{AB}{AE+ED}=\frac{AE}{AC}$	[2]
6	$AB\times AC=\overline{AE}^2+AE\times ED$	[1]
7	$AE\times ED=BE\times EC$	[2]
8	$AB\times AC=\overline{AE}^2+BE\times EC$	[2]