The University of the State of New York

217TH HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Thursday, June 21, 1917—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 eight questions, including question 12.

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

1 Prove that the opposite sides of a parallelogram are equal and that the opposite angles are equal.

2 Prove that an angle inscribed in a circle is measured by one half its intercepted arc. [Prove only the case in which one side is a diameter.]

3 Prove that if in a right triangle a perpendicular is drawn from the vertex of the right angle to the hypotenuse, the perpendicular is the mean proportional between the segments of the hypotenuse.

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

5 Answer *four* of the following:

a How many parts of a triangle must be known in order to construct the triangle?

b If the area of a polygon is four times that of a similar polygon, find the ratio of two corresponding sides.

c Given the following series of figures: square, triangle, circle, rectangle, equilateral triangle, isosceles triangle, parallelogram, trapezoid. In which of these figures is it possible to find the area if the perimeter is known?

d How many altitudes has a triangle?

e If a right triangle is isosceles, how many degrees are there in each angle?

f What is the locus of points in a plane one inch from a given point? from a given line?

g How many acute angles must every triangle have?

6 $ABCD$ and $ABEF$ are two parallelograms. Prove that $CE = DF$

7 Find how far a man is from his starting point if he first walks five miles north, then three miles east and then two miles north.

PLANE GEOMETRY—*concluded*

8 If the diameter of a locomotive wheel is 76 inches, find the number of revolutions per minute made by the wheel when the locomotive is going 54 miles per hour. [1 mile = 5280 feet]

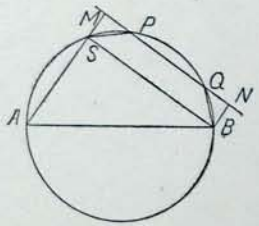
9 On the base of a given triangle construct an isosceles triangle equal in area to the given triangle. [Show all construction lines.]

10 For *each* of the following theorems (no proof required) draw the figure and state what is given and what is to be proved *in terms of the letters on the figure:*

a If two circles intersect, the segments of the two tangents drawn at one of the points of intersection of the circles and cut off by the circles are proportional to the radii of the circles.

b If on the sides of any triangle equilateral triangles are constructed, all lying without the given triangle, the lines joining the outer vertices of these equilateral triangles to the opposite vertices of the given triangle are equal.

11 Prove that if two exterior angles of a triangle are bisected and from the point of intersection of the bisectors a line is drawn to the vertex of the third angle, this line bisects that angle.



12 In the above figure AB is a diameter of the circle, MN is any secant. AM and BN are perpendicular to MN. SB, SP and QB are drawn.

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

1 $BS \perp AM$

2 $BS \parallel MN$

3 SBNM is a rectangle

4 $SM = BN$

5 $\overset{\frown}{SP} = \overset{\frown}{QB}$

6 $\angle PSB = \angle QBS$

7 $\angle PSM = \angle QBN$

8 $\triangle SPM = \triangle BQN$