The University of the State of New York

221ST HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Thursday, June 19, 1919—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 at least two from group I, one from group II, one from group III and two from group IV, one of which must be question 14.

Assign 16 credits to question 14 and 12 credits to each of the others.

Group I

Answer at least two questions from this group.

1 Prove that if two lines are cut by a transversal, making a pair of alternate interior angles equal, the lines are parallel.

2 Prove that the bisector of an angle of a triangle divides the opposite side into segments which are proportional to the other two sides.

3 Prove that the areas of two similar triangles are to each other as the squares of any two homologous sides.

4 Prove that an angle formed by a tangent and a secant meeting without a circle is measured by one half the difference of the intercepted arcs.

Group II

Answer at least one question from this group.

5 *a* Construct x, if $x=\frac{a^2}{s}$, when a and s are given lines.

b Construct a tangent to a given circle, perpendicular to a given chord produced.

6 Given one side of a triangle, the median to that side and an altitude on another side; construct the triangle.

7 Construct a right triangle equivalent to the triangle ABC, making the hypotenuse of the right triangle equal to a given line m (m being taken sufficiently long).

Group III

Answer at least one question from this group.

8 The sides of a triangle are 10, 17 and 21; find *one* of the following: (*a*) the altitude on side 21, (*b*) the median on side 17, (*c*) the segments of side 21 made by the bisector of the opposite angle.

9 The side of a square is 12; find the area included between the square and the circumscribed circle.

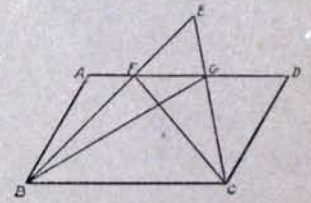
10 The bases of a trapezoid are 6 and 18 and each lower base angle is 60°; find the area of the trapezoid.

Group IV

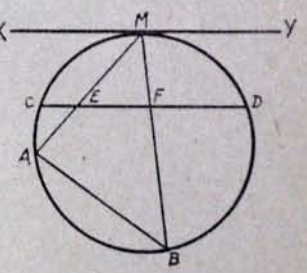
Answer question 14 and at least one other question from this group.

11 Prove that two triangles are equal in area if two sides and a median to one of these sides of one triangle are equal respectively to the corresponding parts of the other triangle.

12 If $ABCD$ is a parallelogram, prove that $\triangle EBG$ is equal to $\triangle EFC$ in area.

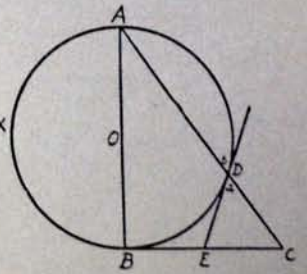


13 If chord CD is parallel to tangent XY, prove that $MA \cdot ME = MB \cdot MF$



14 In the figure, AOB is a diameter, and BC and ED are tangents. Prove: $BE=EC$

State the authority (reason) for *each* of the following statements:



1	$\angle C$ is measured by $\frac{1}{2}$ arc (AXB—BD)	[2]
2	Arc AXB = arc BDA	[1]
3	$\angle C$ is measured by $\frac{1}{2}$ arc (BDA—BD) *or* $\frac{1}{2}$ arc AD	[1]
4	$\angle b$ is measured by $\frac{1}{2}$ arc AD	[2]
5	$\therefore \angle C = \angle b$	[2]
6	$\angle b = \angle a$	[1]
7	$\angle C = \angle a$	[1]
8	EC = ED	[2]
9	BE = ED	[2]
10	BE = EC	[2]