The University of the State of New York

251st HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Wednesday, June 17, 1931—9.15 a. m. to 12.15 p. m., only

Instructions

Do not open this sheet until the signal is given.

Answer all questions in part I; in part II, answer three questions from group I and two questions from group II.

Part I is to be done first and the maximum time to be allowed for this part is one hour.

If you finish part I before the signal to stop is given you may begin part II. However, it is advisable to look your work over carefully before proceeding to part II, since no credit will be given any answer in part I which is not correct and in its simplest form.

When the signal to stop is given at the close of the one hour period, work on part I must cease and this sheet of the question paper must be detached. The sheets will then be collected and you should continue with the remainder of the examination.
PLANE GEOMETRY

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Fill in the following lines:

Name of school........................................... Name of pupil...........................................

Detach this sheet and hand it in at the close of the one hour period.

PART I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Each answer must be reduced to its simplest form.

Directions (questions 1-18) — Write on the dotted line at the right of each question the expression which when inserted in the corresponding blank will make the statement true.

1 Any polygon that has just four sides is called a . . . . . Ans.

2 Two triangles are not necessarily congruent if the three . . . . of one triangle equal the three corresponding parts of the other. Ans.

3 If two lines are cut by a transversal so that a pair of corresponding angles are equal, the interior angles on the same side of a transversal are . . . . . Ans.

4 The sum of the angles of a trapezoid is . . . . degrees. Ans.

5 The diagonals of any equilateral parallelogram are . . . . to each other. Ans.

6 If the perpendiculars from the center of a circle to all of the sides of an inscribed pentagon are equal, the pentagon is . . . . Ans.

7 $AB$ is a diameter of a circle, $AC$ is a chord, and arc $AC$ contains 110 degrees; then angle $BAC$ contains . . . . degrees. Ans.

8 A tangent and a secant are drawn to a circle from the same external point. If the tangent is 6 inches long and the external segment of the secant is 2 inches, then the length of the secant is . . . . inches. Ans.

9 The locus of points inside a circle and equally distant from two given points on the circle is a . . . . of the circle. Ans.

10 The line segment joining the middle points of two sides of a triangle equals . . . . the third side. Ans.

11 A chord $ABC$ turns around a given point $B$ which is inside a given circle. If the segment $AB$ is increasing, then the segment $BC$ is . . . . Ans.

12 The sides of a triangle are 6, 8 and 9. A line segment whose length is 3, parallel to the longest side, ends in the other two sides. The shorter segment of side 8 is . . . . Ans.

13 In a right triangle, the altitude on the hypotenuse divides it into segments 18 and 32. The shorter leg of the given triangle is . . . . Ans.

14 If a building casts a shadow 15 feet long at the same time that a yardstick held vertically casts a shadow 1 foot long, the building is . . . . feet high. Ans.
15 Two poles are 12 feet apart; if the heights of the poles are 10 feet and 15 feet, then the distance between the tops of the poles is . . . feet.

16 In the triangles $ABC$ and $DEF$, angle $A = \angle D$ and angle $B = \angle E$. If $AB = 5$, $DE = 15$ and the area of triangle $ABC = 14$, then the area of triangle $DEF$ is . . . .

17 The circumference of a circle is $24\pi$; its radius is . . . .

18 If a sector of a circle whose angle is $30^\circ$ has an area of $3\pi$, then the radius of the circle is . . . .

Directions (questions 19–20) — Leave all construction lines on the paper.

19 Divide line segment $AB$ into three equal parts.

20 Construct a perpendicular to line $AB$ from point $C$. 
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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.

PART II

Answer five questions from part II, including three questions from group I and two questions from group II.

Group I

Answer three questions from this group.

21 Prove that the diameter perpendicular to a chord of a circle bisects the chord and the arcs determined by the chord. [12]

22 Prove that the area of a parallelogram is equal to the product of its base and its altitude. [12]

23 In the regular hexagon ABCDEF, diagonals BF and CE are drawn; prove that BCEF is a rectangle. [12]

24 In triangle ABC, medians BE and CD intersect in F and DE is drawn. Prove that triangle DEF is similar to triangle BFC. [12]

25 In parallelogram ABCD, $E$ is the mid-point of $CD$ and $F$ is the mid-point of $AD$. If $BF$ and $BE$ are drawn, prove that triangles $BCE$ and $ABF$ have equal areas. [12]

Group II

Answer two questions from this group.

Leave all work on the paper; merely writing the answers is not sufficient. Irrational results may be left in the form of $\pi$ and radicals unless otherwise stated.

26 Given two parallel lines and a transversal cutting the two parallels; find by construction a point equidistant from all three lines. How many such points are there? [10, 2]

27 Construct a triangle equal in area to a given pentagon. [12]

28 Two sides of a parallelogram are 8 and 15 and the included angle is 60°; find the length of the shorter diagonal. [12]

29 An equilateral triangle inscribed in a circle has an altitude of 21; find to the nearest integer the difference between the circumference of the circle and the perimeter of the triangle. [12] [Use $\pi = 3.14$ and $\sqrt{3} = 1.73$]