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.

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PLANE GEOMETRY

Wednesday, June 17, 1931

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. *Ans*.....

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 . . . . *Ans*.....

17 The circumference of a circle is 24π; its radius is . . . . *Ans*.....

18 If a sector of a circle whose angle is 30° has an area of 3π, then the radius of the circle is . . . . *Ans*.....

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

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

A ——————————— B

20 Construct a perpendicular to line AB from point C.

. C

A ——————————— B

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 BE and BF 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 π 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 $\sqrt{3} = 1.73$]