The University of the State of New York

273D HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Tuesday, August 23, 1938 — 8.30 to 11.30 a. m., only

Instructions

Do not open this sheet until the signal is given.

Group I

This group is to be done first and the maximum time allowed for it is one and one half hours.

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

When the signal to stop is given at the close of the one and one half hour period, work on group 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.

Groups II and III

Write at top of first page of answer paper to groups II and III (*a*) names of schools where you have studied, (*b*) number of weeks and recitations a week in plane geometry previous to entering summer high school, (*c*) number of recitations in this subject attended in summer high school of 1938, (*d*) author of textbook used.

The minimum time requirement is five recitations a week for a school year. The summer school session will be considered the equivalent of one semester's work during the regular session or five recitations a week for half a school year.

For those pupils who have met the time requirement the minimum passing mark is 65 credits; for all others 75 credits.

For admission to this examination attendance on at least 30 recitations in this subject in a registered summer high school in 1938 is required.

See instructions for groups II and III on page 1.

Group II

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. [10]

22 Prove that the areas of two similar triangles are to each other as the squares of any two corresponding sides. [10]

23 Given isosceles triangle ABC with AB and AC the equal sides and AF the altitude on BC; a line perpendicular to AB at a point D meets BC, extended if necessary, at E.

Prove $\frac{FC}{BD} = \frac{AC}{BE}$ [10]

24 In a certain quadrilateral, one of the diagonals and the line joining the mid-points of a pair of opposite sides bisect each other. Prove that the quadrilateral must be a parallelogram. [10]

25 A right triangle ABC with right angle at B is inscribed in a circle and a tangent to the circle is drawn at A. The bisector of angle ACB meets AB at D and the tangent at E. Prove that angle AED equals angle ADE. [10]

Group III

Answer two questions from this group.

26 ABC is a right triangle with CD the altitude on the hypotenuse AB. If $AC = 20$ and $CD = 12$, find the length of AD, AB and BC. [10]

27 An equilateral triangle is equal in area to an isosceles trapezoid whose bases are 12 and 20 and whose lower base angles are each 60°. Find a side of the triangle. [10]

28 *a* In a certain circle, chord AB cuts off a minor arc of 40°. Find the length of the chord correct to the *nearest tenth*, if its distance from the center of the circle is 6. [9]

b What change takes place in the length of a chord as its distance from the center of the circle increases? [1]

Fill in the following lines:

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

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

Group I

Answer all questions in this group. Each correct answer will receive 2½ credits. No partial credit will be allowed. Each answer must be reduced to its simplest form.

Directions (questions 1–9) — 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 The adjacent angles of a parallelogram are .... 1.....

2 In any triangle, the line drawn from a vertex to the mid-point of the opposite side is called a ... of the triangle. 2.....

3 If one side of an equilateral triangle is 8, its altitude expressed in radical form is .... 3.....

4 In triangle ABC, D and E are the mid-points of the sides AC and BC, and DE is drawn. If $AB = 18$, then $DE =$ .... 4.....

5 Diameter BC of a circle is extended through C to point A and a tangent AD is drawn. If $BC = 8$ and $CA = 1$, the length of the tangent AD is .... 5.....

6 Two chords AB and CD intersect in O. If $AO = 6$, $OB = 4$ and $OC = 2$, then $OD =$ .... 6.....

7 In triangle ABC, angle $C = 90°$, $AB = 15$, angle $A = 38°$. AC correct to the *nearest tenth* is .... 7.....

8 If the circumference of a circle is 12π, the area of the circle in terms of π is .... 8.....

9 In triangle ABC, AB is greater than AC, and the bisector of angle A meets BC in D; then angle BDA is ... than angle CDA. 9.....

Directions (questions 10–13) — Indicate the correct answer to each of the following questions by writing on the dotted line at the right the letter (a), (b) or (c):

10 If the area of a rhombus is 16, the product of its diagonals is (a) 32, (b) 16 or (c) 8. 10.....

11 The locus of the centers of all circles which touch a given circle at a given point is (a) a circle, (b) two circles or (c) a straight line. 11.....

12 As the number of sides of a regular polygon increases, each exterior angle (a) increases, (b) decreases or (c) remains the same. 12.....

13 If a point is equidistant from the sides of a triangle, it must be the intersection of the three (a) altitudes, (b) medians or (c) angle bisectors. 13.....

[OVER]

Directions (questions 14–17) — Indicate whether each of the following statements is *always true, sometimes true* or *never true* by writing the word *always, sometimes* or *never* on the dotted line at the right.

14 Similar triangles are congruent triangles. 14.....

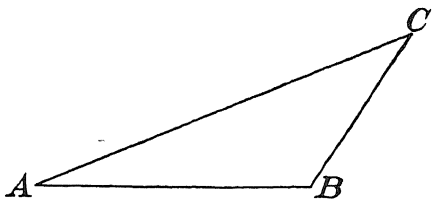
15 A circle can be circumscribed about any rectangle. 15.....

16 If two triangles ABC and $A'B'C'$ have AB equal to $A'B'$ and BC equal to $B'C'$, then AC equals $A'C'$. 16.....

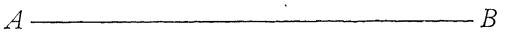
17 An angle which is less than its supplement is an obtuse angle. 17.....

Directions (questions 18–20) — Leave all construction lines on the paper.

18 Find by construction the center of the circle that can be circumscribed about triangle ABC.



19 Divide the line AB into three equal parts.



20 Construct a perpendicular to line AB from point C.