The University of the State of New York

259TH HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Wednesday, January 24, 1934 — 9.15 a. m. to 12.15 p. m., only

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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 and one half hours. Merely place the answer to each question in the space provided; no work need be shown.

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 and one half 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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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.

Part I

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

Directions (questions 1–12) — 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 If the bisector of the right angle of a right isosceles triangle ABC is 6 inches in length, the hypotenuse of triangle ABC is ... inches. *Ans*.....

2 If the base of a rectangle remains fixed as to position and length, but the altitude of the rectangle increases, the locus of the intersection of the diagonals of the rectangle is a .... *Ans*.....

3 If line l_1 of the three lines l_1, l_2 and l_3 is parallel to l_3, and l_2 is perpendicular to l_1, then l_2 and l_3 are ... to each other. *Ans*.....

4 If one acute angle of a right triangle is double the other and the length of the longer leg is 3 feet, the length of the hypotenuse, in radical form, is ... feet. *Ans*.....

5 Two tangents to a circle intersect each other at right angles. The number of degrees in the larger of the two intercepted arcs is .... *Ans*.....

6 A rhombus whose diagonals are 4 inches and 15 inches is equal to a parallelogram whose base is 5 inches. The altitude of the parallelogram is ... inches. *Ans*.....

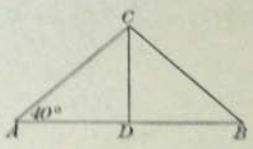
7 The areas of two similar triangles are in the ratio 4:9. If an altitude of the smaller triangle is 4 centimeters, the corresponding altitude of the larger triangle is ... centimeters. *Ans*.....

8 The cross section of an underground tunnel has the form of a trapezoid. If the bases of the trapezoid are 15 feet and 32 feet, and the height is 10 feet, the area of the cross section is ... square feet. *Ans*.....

9 Two building lots have the same shape. A side of one is 40 feet and the corresponding side of the other is 60 feet. If 250 feet of fencing are required to inclose the smaller lot, the number of feet of fencing required to inclose the larger lot is .... *Ans*.....

10 Triangle ABC is inscribed in a circle. If $AB = BC$ and angle $B = 35°$, then the number of degrees in the minor arc BC is .... *Ans*.....

11 The figure at the right illustrates the gable end of the roof of a house. If the width AB of the gable is 20.0 feet and the pitch of the roof is 40°, the height CD of the gable, correct to the *nearest tenth* of a foot, is ....



Ans.....

12 A concrete pavement makes a turn along a circular arc of 90°. If the radius of the inner curved edge is 560 feet, the length of this edge, correct to the *nearest foot*, is .... [Use $\pi = 3.14$] *Ans*.....

Directions (questions 13–17) — Some of these statements are *always* true, others are *sometimes* true and the rest are *never* true. Indicate your opinion in each case by writing the word *always*, *sometimes* or *never* on the dotted line at the right.

13 In the triangles ABC and $A'B'C'$, $AC \equiv A'C'$ and angle $A \equiv$ angle A'; the bisectors of angle A and angle A' meet the opposite sides in D and D' respectively. If $AD \equiv A'D'$, then angle $C \equiv$ angle C'. *Ans*.....

14 If two triangles have an angle of one equal to the corresponding angle of the other, the sides opposite these angles are unequal. *Ans*.....

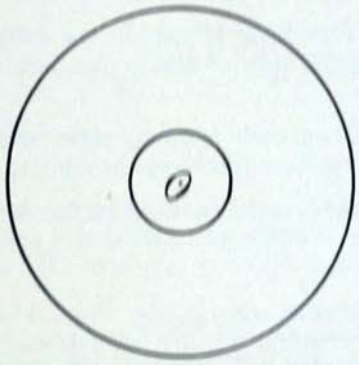
15 A circle may be inscribed in a quadrilateral. *Ans*.....

16 If the legs of a right triangle are a and b inches in length, the area in square inches of the square on the hypotenuse of the right triangle is $(a + b)^2$. *Ans*.....

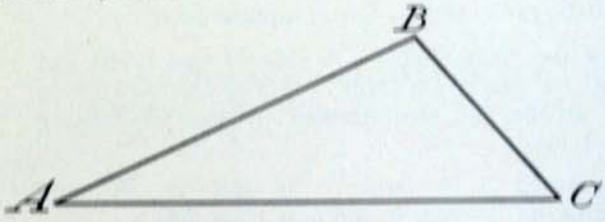
17 The medians of a triangle are concurrent at a point within the triangle. *Ans*.....

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

18 Construct the locus of the centers of circles that are tangent to the two given concentric circles whose common center is O.



19 Given the triangle ABC; locate on AC the center of a circle tangent to AB and BC.



20 Given the line segments a, b and c; construct a line segment x such that $ax \equiv bc$

a

b

c

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PLANE GEOMETRY

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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 angle formed by two secants intersecting outside a circle is measured by one half the difference of the intercepted arcs. [10]

22 *a* Prove: If in the same circle or in equal circles, two chords are equidistant from the center, they are equal. [8]

b State the converse of the theorem given in *a*. [2]

23 A quadrilateral $ABCD$, lettered consecutively, is inscribed in a circle. AB and DC are extended to meet at E and the chords AC and BD are drawn.
Prove that $AC \times DE = BD \times AE$ [10]

24 Prove that the line joining the vertex of an isosceles triangle and the point of intersection of the altitudes to the legs, bisects the vertex angle. [10]

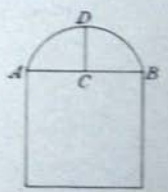
25 In a quadrilateral $ABCD$, lettered consecutively, angles ABC and BCD are obtuse, angle BCD is greater than angle ABC and side AB is less than side DC. Prove that angle ADC is less than angle BAD. [Suggestion: Extend AB and DC to meet at E.] [10]

Group II

Answer two questions from this group.

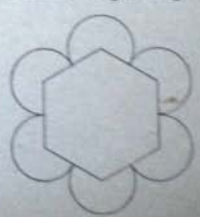
Leave all work on the paper; merely writing the answers is not sufficient. Irrational results may be left in the form of π and radicals unless otherwise stated.

26 A doorway has the form of a rectangle surmounted by the arc of a circle. The span AB of the arch is 8 feet and the height CD of the crown is 3 feet. Find the radius of the circular arc. [10]



27 A path 85 yards long extends diagonally from one corner of a rectangular park to the opposite corner, making an angle of 12° with the longer side. Find the dimensions of the park correct to the *nearest yard*. [In the solution of this problem neglect the width of the path.] [10]

28 A cathedral window has the form of a regular hexagon surmounted by congruent circular sectors. The side of the hexagon is 3 feet. Find the area of the window; that is, of the *entire* figure. [Answer may be left in terms of π and $\sqrt{3}$.] [10]



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