

The University of the State of New York

307TH HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Tuesday, August 23, 1949 — 8.30 to 11.30 a. m., only

Instructions

Part I is to be done first and the maximum time allowed for it is one and one half hours. At the end of that time, this part of the examination must be detached and will be collected by the teacher. If you finish part I before the signal to stop is given, you may begin part II.

Write at top of first page of answer paper to parts II, III and IV (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 1949 or number and length in minutes of lessons taken in the summer of 1949 under a tutor licensed in the subject and supervised by the principal of the school you last attended, (d) author of textbook used.

The minimum time requirement is four or 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 (four 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 1949 or an equivalent program of tutoring approved in advance by the Department is required.

Part II

Answer three questions from part II.

26 Prove that tangents drawn to a circle from an external point are equal. [10]

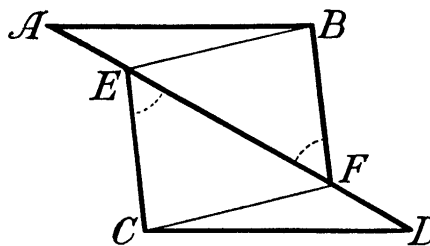
27 Prove that if one angle of a triangle is greater than a second angle, the side opposite the first angle is greater than the side opposite the second angle. [10]

28 In the figure, $AEFD$ is a straight line, $AB \parallel CD$, $AB = CD$, and $AE = FD$.

Prove: a $\triangle ABF \cong \triangle CDE$ [5]

b $\angle AFB = \angle CED$ [1]

c $EBFC$ is a parallelogram. [4]



29 Acute triangle ABC is inscribed in circle O . AD is an altitude of the triangle and AE a diameter of the circle. Prove: $AB \times AC = AD \times AE$ [10]

[1]

[OVER]



Part III

Answer one question from part III.

- 30 The bases AB and DC of trapezoid $ABCD$ are 20 and 12 respectively. When the legs are extended they meet at E forming triangle DCE whose area is 54.
 Find: a the altitude of triangle DCE [3]
 b the altitude of trapezoid $ABCD$ [5]
 c the area of trapezoid $ABCD$ [2]

- 31 In circle O , whose radius is 100 inches, chord AB is 34 inches.
 a Find angle AOB to the nearest degree. [6]
 b Find, to the nearest inch, the length of minor arc AB . [4]

Part IV

Answer one question from part IV.

- 32 For each of the following statements indicate whether you have been given too little information, just enough information, or more information than is needed to justify the conclusion.
- a If a regular polygon is inscribed in a circle, then the perpendicular bisectors of the sides pass through the center of the circle. [2]
 - b If two similar polygons are regular, then they can be divided into the same number of triangles, similar each to each and similarly placed. [2]
 - c If a pair of opposite angles of a quadrilateral are supplementary, then a circle can be circumscribed about the quadrilateral. [2]
 - d If a line is drawn from a vertex of a triangle perpendicular to the opposite side, then the two triangles thus formed are similar. [2]
 - e If the number of sides and the apothem of a regular polygon are given, then the area of the polygon can be found. [2]
- 33 Line segments b and h are the base and the altitude respectively of a parallelogram. A square equal in area to the parallelogram is to be constructed.
- a Representing a side of the square by x , write an equation in terms of x , b and h stating that the area of the square equals the area of the parallelogram. [2]
 - b Write as a proportion the equation given in answer to a . [2]
 - c Construct line segment x . [4]
 - d Construct the required square. [2]

Fill in the following lines:

Name of pupilName of school

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed.

- 1 Find the diagonal of a square whose side is 8. [Answer may be left in radical form.] 1.....
- 2 Find the altitude of an equilateral triangle whose side is 14. [Answer may be left in radical form.] 2.....
- 3 Diameter AB of circle O is 18. Chord AC meets AB at an angle of 60° . Find AC . 3.....
- 4 If in a circle arc PQ is 80° , how many degrees are there in the acute angle formed by chord PQ and the tangent at P ? 4.....
- 5 Two chords AB and CD intersect inside a circle at point E . Arc AC is 50° and arc BD is 70° . Find the number of degrees in angle AEC . 5.....
- 6 Two secants from point P outside circle O intercept arcs of 150° and 70° . Find the number of degrees in angle P . 6.....
- 7 An exterior angle at the base of an isosceles triangle is 140° . Find the number of degrees in the vertex angle. 7.....
- 8 The supplement of an angle is three times as large as the angle. How many degrees are there in the angle? 8.....
- 9 Find the number of degrees in the sum of the interior angles of a seven-sided polygon. 9.....
- 10 A point on a diameter of a circle divides the diameter into segments 3 and 8. Find the product of the segments of any other chord through this point. 10.....
- 11 A tangent and a secant are drawn to a circle from an external point. The secant is 20 and the tangent is 10. Find the external segment of the secant. 11.....
- 12 A chord 24 inches long is 5 inches from the center of a circle. Find the radius of the circle. 12.....
- 13 In a right triangle the altitude to the hypotenuse divides it into segments 3 and 27. Find the altitude. 13.....
- 14 Find the area of a circle whose radius is 5. [Answer may be left in terms of π .] 14.....
- 15 Find the area of a regular hexagon inscribed in a circle whose radius is 6. [Answer may be left in radical form.] 15.....
- 16 Find the area of a rhombus whose diagonals are 10 and 16. 16.....
- 17 Two television screens are in the form of similar rectangles. If the area of the larger screen is twice the area of the smaller, the dimensions of the larger screen are twice those of the smaller. Is this conclusion true? [Answer *yes* or *no*.] 17.....
- 18 How many points are there which are equidistant from two intersecting lines and a given distance from their point of intersection? 18.....
- 19 Is statement b the converse of statement a ? [Answer *yes* or *no*.]
 - a Chords equidistant from the center of a circle are equal.
 - b Chords of a circle are equal if they are equidistant from the center.
 19.....

PLANE GEOMETRY

Directions (questions 20–23) — Indicate the correct answer to *each* question by writing on the line at the right the letter *a*, *b* or *c*.

20 The radii of two circles are r and R and the distance between their centers is d . If $d = r + R$ the two circles have (a) one common tangent (b) three common tangents (c) four common tangents 20.....

21 The locus of the center of circles of radius r tangent to a given line is (a) a line parallel to the given line (b) two lines parallel to the given line (c) a line perpendicular to the given line 21.....

22 The diagonals of a rectangle are always equal and (a) bisect each other (b) bisect the angles through which they pass (c) perpendicular to each other 22.....

23 If one median of triangle ABC divides it into two isosceles triangles, triangle ABC is always (a) a right triangle (b) an isosceles triangle (c) an equilateral triangle 23.....

Directions (questions 24–25) — Leave all construction lines on the paper.

24 Construct an angle of 30 degrees.

25 Divide line segment AB into two parts which are in the ratio 2:1.

