

The University of the State of New York

272<sup>D</sup> HIGH SCHOOL EXAMINATION

**PLANE GEOMETRY**

Tuesday, June 21, 1938 — 9.15 a. m. to 12.15 p. 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) name of school where you have studied, (b) number of weeks and recitations a week in plane geometry, (c) author of textbook used.

The minimum time requirement is five recitations a week for a school year.

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  $2\frac{1}{2}$  credits. No partial credit will be allowed. Each answer must be reduced to its simplest form.

Directions (questions 1-8) — 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 angle formed by two secants intersecting outside a circle is measured by one half the ... of the intercepted arcs. 1.....

2 The area of a circle is  $25\pi$  square inches. The radius of this circle is ... inches. 2.....

3 If the vertex angle of an isosceles triangle is  $40^\circ$ , the number of degrees in either of the exterior angles formed by extending the base is .... 3.....

4 If each exterior angle of a regular polygon contains  $45^\circ$ , the number of sides of the polygon is .... 4.....

5 In triangle  $ABC$  angle  $B = 30^\circ$  and side  $AB = 6$  inches. The length of the altitude  $AD$  upon side  $BC$  is ... inches. 5.....

6 A pair of corresponding altitudes of two similar triangles are 4 inches and 2 inches. The area of the larger triangle is ... times the area of the smaller. 6.....

7 The radius of a circle is 13 inches and a chord of this circle is 10 inches. The distance of this chord from the center of the circle is ... inches. 7.....

8 At a point 100 feet from the foot of a flagpole the angle of elevation of the top of the pole is  $31^\circ$ . The height of the flagpole, correct to the nearest foot, is ... feet. 8.....

Directions (questions 9-12) — Indicate the correct answer to each of the following questions by writing the letter  $a$  or  $b$  on the line at the right.

9 The area of a rhombus is equal to (a) the product of the two diagonals or (b) one half the product of the two diagonals. 9.....

10 An axiom is a statement which (a) is to be proved or (b) is accepted without proof. 10.....

11 The circumference of a circle whose radius is 4, is (a)  $8\pi$  or (b)  $16\pi$ . 11.....

12 The locus of the centers of all circles tangent to each of two parallel lines is (a) one straight line or (b) two straight lines. 12.....

Directions (questions 13-17) — 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.

13 When two straight lines are cut by a transversal, if the two interior angles on the same side of the transversal are supplementary, the two straight lines are parallel. 13.....

14 If two angles and a side of one triangle are equal to the corresponding parts of another triangle, then the triangles are congruent. 14.....

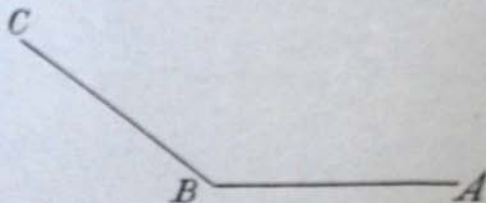
15 A triangle can be constructed having sides 8 inches, 12 inches and 3 inches. 15.....

16 If a theorem is true, a converse of the theorem is true. 16.....

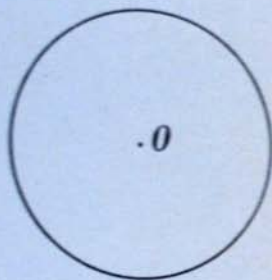
17 A median of a triangle divides it into two triangles which are equal in area. 17.....

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

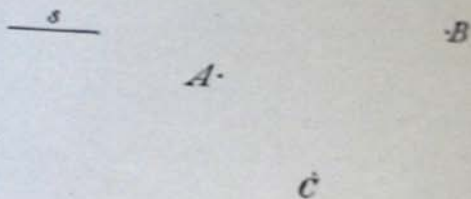
18 Construct the bisector of angle  $ABC$ .



19 Inscribe an equilateral triangle in circle  $O$ .



20 Find by construction the two points which are equidistant from points  $A$  and  $B$  and also at the given distance  $s$  from point  $C$ .



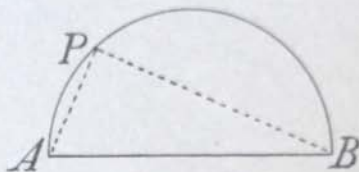
See instructions for groups II and III on page 1.

## Group II

Answer three questions from this group.

- 21 Prove that the diagonals of a parallelogram bisect each other. [10]
- 22 Prove that if from a point outside a circle a tangent and a secant are drawn to the circle, the tangent is the mean proportional between the secant and its external segment. [10]
- 23 Given triangle  $ABC$  with  $AB = AC$ ;  $D$  is any point between  $B$  and  $C$  in  $BC$  and line segment  $AD$  is drawn. Prove that  $AB > AD$ . [10]
- 24  $PA$  and  $PB$  are tangents drawn to a circle whose center is  $O$ ,  $A$  and  $B$  being the points of tangency. Line segment  $PO$  is drawn and extended to meet the circle at  $C$ . Prove that arc  $AC =$  arc  $BC$ . [The use of original exercises as reasons will not be allowed in this proof.] [10]

25 In the figure at the right,  $AB$  is the diameter of a semicircle. A point  $P$  moves along the arc from  $A$  to  $B$  and chords  $PA$  and  $PB$  are drawn.

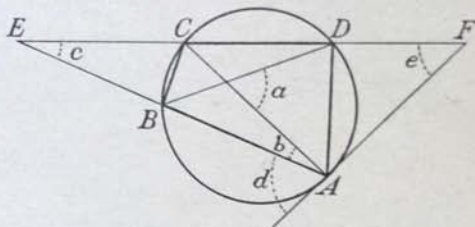


- a Using the expression *increases, decreases or remains the same*, indicate the change, if any, that takes place in (1) angle  $PAB$ , (2) angle  $APB$  and (3) angle  $PBA$ . [6]
- b At what position of  $P$  will the altitude of triangle  $APB$  on base  $AB$  be greatest? [2]
- c At what position of  $P$  will the area of triangle  $APB$  be greatest? [2]

## Group III

Answer two questions from this group.

26 In the drawing at the right,  $ABCD$  is a quadrilateral inscribed in a circle; arc  $AB = 135^\circ$ , arc  $BC = 40^\circ$  and arc  $CD = 100^\circ$ . Chords  $AC$  and  $BD$  are drawn; also chords  $AB$  and  $DC$  are extended to meet at  $E$  and the tangent at  $A$  meets  $CD$  extended at  $F$ . Find the number of degrees in angle  $a$ , angle  $b$ , angle  $c$ , angle  $d$  and angle  $e$ . [10]



- 27 Given two equal circles with a square inscribed in one and a regular hexagon in the other; if the radius of each circle is 14 inches, find, correct to the *nearest tenth of a square inch*, the difference in the areas of the regular hexagon and the square. [Use  $\sqrt{3} = 1.73$ ] [10]
- 28 The bases of an isosceles trapezoid are 8 and 28. One base angle is  $53^\circ$ .
- a Find, correct to the *nearest tenth*, the altitude of the trapezoid. [7]
- b Find, correct to the *nearest integer*, the area of the trapezoid. [3]