

The University of the State of New York

281ST HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Tuesday, June 17, 1941 — 9.15 a. m. to 12.15 p. m., only

Instructions

Do not open this sheet until the signal is given.

Part I

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

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, 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.

Parts II, III and IV

Write at top of first page of answer paper to parts II, III and IV (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.

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 1-11) — 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 sum of an angle and its supplement is 1.....
- 2 The formula for the perimeter P of a regular polygon in terms of the number of sides n and the length of each side s is $P = \dots$ 2.....
- 3 The area of a rhombus whose diagonals are 5 inches and 12 inches is ... square inches. 3.....
- 4 In a right triangle the cosine of an acute angle is the ratio of the ... side to the hypotenuse. 4.....
- 5 Triangle ABC is inscribed in a circle. Side AB is a diameter of the circle and arc AC equals 100° . The acute angle formed by the tangent at B and side BC of the triangle contains ... degrees. 5.....
- 6 A line parallel to side AB of triangle ABC intersects CA at D and CB at E . If $CD = 4$, $DA = 2$ and $BC = 9$, then $CE = \dots$ 6.....
- 7 In the right triangle ABC , C is the right angle and CD is the altitude upon AB . If $AD = 4$ and $DB = 12$, then $AC = \dots$ 7.....
- 8 In triangle ABC , $AB = 10$ and angle $A = 30^\circ$; then the length of the altitude upon AC is 8.....
- 9 From a point P outside circle O , tangent PD and secant PCA are drawn. If tangent $PD = 8$ and $PC = 4$, then secant $PCA = \dots$ 9.....
- 10 If the areas of two similar triangles are in the ratio 1:25, then any two corresponding sides of the triangles are in the ratio 10.....
- 11 In the construction of a triangle congruent with a given triangle it is necessary to use three parts of the given triangle, one of which must be 11.....
- 12 Find the area of a trapezoid whose bases are 7 and 12 and whose altitude is 6. 12.....
- 13 Find, correct to the nearest tenth, the circumference of a circle whose radius is 4. [Use $\pi = 3.14$] 13.....

Directions (questions 14-18) — Indicate the correct answer to each of the questions by writing on the dotted line at the right the letter a , b or c .

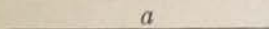
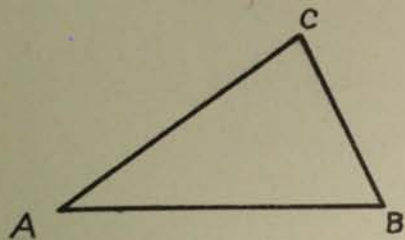
- 14 Two consecutive angles of a parallelogram are always (a) equal, (b) complementary or (c) supplementary. 14.....
- 15 The median of an equilateral triangle is (a) greater than the altitude, (b) equal to the altitude or (c) less than the altitude. 15.....
- 16 The expression for the area A of a circle in terms of its diameter d is (a) πd^2 , (b) $\frac{1}{4} \pi d^2$ or (c) $\frac{1}{2} \pi d^2$. 16.....
- 17 In triangle ABC , angle B is 60° and AB is greater than AC ; then angle C is (a) equal to angle A , (b) greater than angle A or (c) less than angle A . 17.....
- 18 The locus of the centers of equal circles passing through a given point is (a) a point, (b) a straight line or (c) a circle. 18.....

Directions (Questions 19-23) — Indicate whether each statement is *always true*, *sometimes true* or *never true* by writing on the line at the right the word *always*, *sometimes* or *never*.

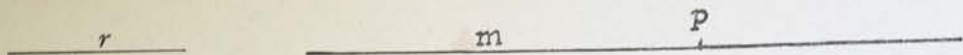
- 19 If the three altitudes of a triangle are equal, the triangle is equilateral. 19.....
- 20 Two polygons are congruent if their corresponding sides are equal. 20.....
- 21 If two chords of a circle are parallel, the minor arc of one chord is equal to the minor arc of the other. 21.....
- 22 When two parallel lines are cut by a transversal which is not perpendicular to them, all the acute angles formed are equal. 22.....
- 23 Two triangles are congruent if two sides and an angle of one are equal respectively to two sides and an angle of the other. 23.....

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

24 On line segment a corresponding to side AB of triangle ABC , construct a triangle similar to triangle ABC .



25 Construct a circle of given radius r which shall be tangent to the given line m at the given point P .



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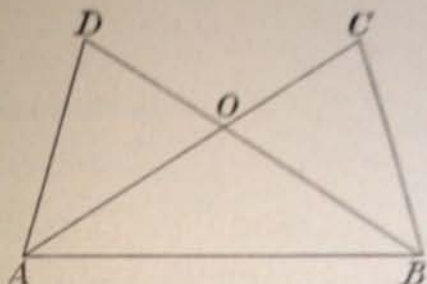


Part II

Answer two questions from this part.

26 Prove that if two chords intersect within a circle, the product of the segments of one is equal to the product of the segments of the other. [10]

27 In triangles ABC and ABD , $BC = AD$,
 $AC = BD$, and AC and BD intersect at O .
 Prove: $AO = BO$ [10]



- 28 An angle inscribed in a circle is measured by one half its intercepted arc.
- Prove the above theorem for the case in which one side of the angle is a diameter. [8]
 - Which one of the following axioms would be used in proving this theorem for the case in which the sides of the angle lie on opposite sides of the center? [2]
 - If equals are added to equals, the sums are equal.
 - If equals are subtracted from equals, the remainders are equal.

Part III

Answer two questions from this part.

- 29 In parallelogram $ABCD$, angle A is 45° , altitude DE on base AB is 8 and diagonal DB is 17.
- Find AE . [2]
 - Find EB . [4]
 - Find the area of the parallelogram. [4]
- 30 A circle is inscribed in a regular pentagon. If a side of the pentagon is 50, find, correct to the nearest integer, the radius of the circle. [10]
- 31 In trapezoid $ABCD$, AB is the lower base. The bisector of angle A intersects DC at P .
- Prove that triangle ADP is isosceles. [5]
 - If $AD = 8$ and the altitude of the trapezoid is 6, find the area of triangle ADP . [5]

Part IV

Answer one question from this part.

- 32 For each of the following statements write a converse and indicate whether the converse is true or false:
- If one of the altitudes of a triangle bisects the opposite side, the triangle is isosceles. [2, 1]
 - If a given polygon is regular, then a circle can be circumscribed about that polygon. [2, 1]
 - If the fathers of two boys are brothers, then the two boys are first cousins. [1, 1]
 - If in a certain school a pupil's average grade is at least 90 per cent, his name is placed on the scholastic honor roll. [1, 1]
- 33 Triangle ABC is inscribed in a circle and a tangent is drawn at A . A line parallel to the tangent intersects AB at R and AC at S . Prove: $AR \times AB = AC \times AS$ [10]