The University of the State of New York

244TH HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Wednesday, January 23, 1929 — 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 hour.

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 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.

PLANE GEOMETRY

Wednesday, January 23, 1929

Fill in the following lines:

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

Detach this sheet and hand it in at the close of the one 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 1–16) — 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 two sides of a triangle are equal, the ... opposite are equal. *Ans*.....

2 If the opposite angles of a quadrilateral are ..., the quadrilateral is a parallelogram. *Ans*.....

3 The locus of points within an angle equidistant from the sides is the ... of the angle. *Ans*.....

4 In triangle ABC, $AC = BC$. If the exterior angle at $A = 110°$, then angle $C =$ ... *Ans*.....

5 If a line bisects two sides of a triangle, the area of the given triangle is ... times the area of the triangle cut off by the line. *Ans*.....

6 If the segments of the hypotenuse of a right triangle made by the altitude on the hypotenuse are 4 and 9, the altitude is ... *Ans*.....

7 The tangent to a circle at a vertex of an inscribed square makes an angle of ... degrees with one side. *Ans*.....

8 If a is the apothem of a regular polygon of n sides and each side is equal to s, the area of the polygon in terms of a, n and s is ... *Ans*.....

9 The length of a tangent from a point 4″ from a circle whose radius is 6″ is ... *Ans*.....

10 If AB and CD, two chords of a circle, intersect in E, then the product $AE \times EB$ equals the product ... × ... *Ans*.....

11 In triangle ABC if angle $A = 60°$ and angle $B = 50°$, then side AB is ... than side AC. *Ans*.....

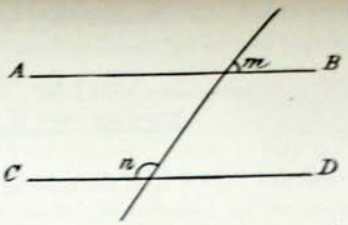
12 If one acute angle of a right triangle is 30°, the ratio of the shorter leg to the hypotenuse is ... *Ans*.....

13 If one side of an equilateral triangle is a, then the area in terms of a is ... *Ans*.....

14 An angle inscribed in a ... is always a right angle. *Ans*.....

[OVER]

15 If AB is parallel to CD and if angle $m = 55°$, then angle $n = \ldots$



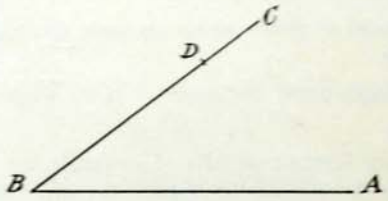
Ans.....

16 If the area of a circle is 36π, its circumference in terms of π is ... *Ans*.....

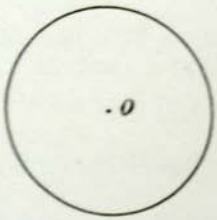
17 Which of the following sets of numbers can be used as the lengths of the sides of a triangle?
(*a*) 2", 3", 6"; (*b*) 5", 7", 8"; (*c*) 5", 4", 9" *Ans*.....

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

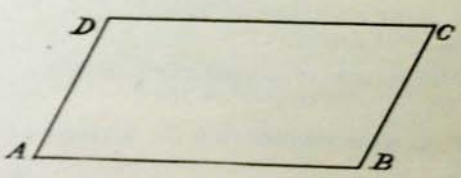
18 In line BA find by construction a point that is equidistant from both point B and point D.



19 Inscribe a regular hexagon in circle O.



20 Transform the parallelogram $ABCD$ into a triangle.



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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 sum of the angles of a triangle is a straight angle. [12]

22 PA and PB are two equal secants drawn from point P to a circle and cutting the circle at points C and D respectively; prove that chord AC equals chord BD. [12]

23 $ABCD$ is a parallelogram with DE and BF the perpendiculars from D and B to diagonal AC; prove that $EBFD$ is a parallelogram. [12]

24 M is the mid-point of side BC in triangle ABC and P is any point in side AB. If AM cuts CP in S, prove $AS:SM = AP:\frac{1}{2}PB$ [12]

[Suggestion: Draw MN parallel to CP and cutting AB in N.]

25 Prove that the locus of the centers of all circles tangent to a given line at a given point is the perpendicular to the given line through the given point. [6, 6]

Group II

Answer two questions from this group.

Irrational results may be left in the form of π and radicals unless otherwise stated.

26 Two sides of a parallelogram are 6 and 16 and the included angle is 60°.

a Find the area of the parallelogram. [Leave result in radical form.] [6]

b Find the length of the shorter diagonal. [6]

27 $ABCD$ is a quadrilateral inscribed in a circle; arc $AB = 120°$, arc $BC = 50°$ and arc $CD = 80°$.

a Find angle A. [4]

b Find *one* of the angles between diagonals AC and BD. [4]

c Find the angle between sides AB and DC produced to meet. [4]

28 AB, a diameter of a given circle, is 16″ long. C is a point on AB 12″ from A. On AC and CB as diameters, semicircles are constructed on opposite sides of AB. Find the ratio of the areas of the two parts into which the circle is divided by the semicircles. [12]

29 The base AB of a triangular sheet of paper ABC is 12″ long. The paper is folded down over the base, the crease being parallel to the base. The area of the part of the triangle that projects below the base is $\frac{4}{9}$ of the area of the triangle ABC. Find the length of the crease. [12]

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