The University of the State of New York

245TH HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Wednesday, June 19, 1929 — 9.15 a. m. to 12.15 p. m., only

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, June 19, 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.

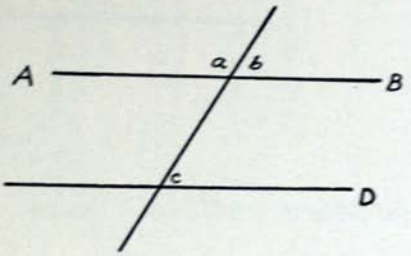
PART I

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 1–17) — 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 A quadrilateral is a parallelogram if the opposite sides are .... *Ans*.....

2 If AB is parallel to CD and if angle a is twice angle b, then the number of degrees in angle c is ....



Ans.....

3 In triangle ABC, $AC = BC$. If angle $C = 40°$, then the exterior angle at $A =$ .... *Ans*.....

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

5 AB is a diameter of circle O whose radius is 10″. At point C on AB 8″ from O, a perpendicular is drawn to AB terminating in the circle. The length of this perpendicular is .... *Ans*.....

6 If chord CD is the perpendicular bisector of chord AB, then CD is a .... *Ans*.....

7 PA and PB are tangents to circle O from point P. If angle $APB = 60°$ and $PA = 8$, the length of chord AB is .... *Ans*.....

8 Two chords, AB and AC, and two radii, OB and OC, intercept the same arc BC. If angle $A = 33°$, then angle $COB =$ .... *Ans*.....

9 In a circle whose radius is 10, a central angle of 120° intercepts an arc whose length in terms of π is .... *Ans*.....

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

11 A line 3″ long joins the mid-points of two sides of a triangle; the length of the third side is .... *Ans*.....

12 Finding a point in a triangle equidistant from the three vertices involves bisecting two .... *Ans*.....

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13 A point D is 3" from the center of a circle whose radius is 5". The product of the segments of any chord through D is .... Ans.....

14 The area of a right triangle whose sides are 6, 8 and 10 is .... Ans.....

15 If one side of a regular hexagon is 6, its area expressed in radical form is .... Ans.....

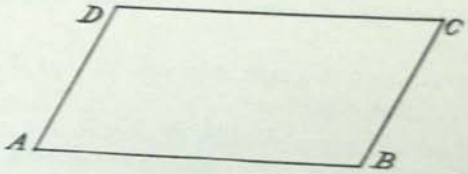
16 The corresponding bases of two similar triangles are 3" and 5". The ratio of their areas is .... Ans.....

17 One angle of a right triangle is 60°; if the hypotenuse is 10, the shortest side is .... Ans.....

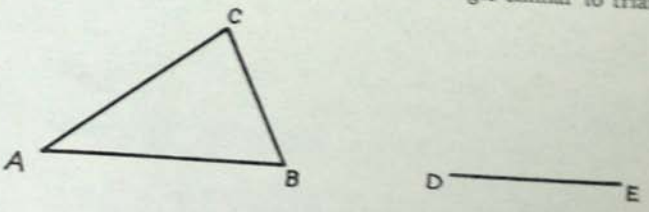
Directions (questions 18–20) — Leave all construction lines on the paper.

18 Divide the line AB into *three* equal parts.

19 Transform the parallelogram $ABCD$ into a triangle.



20 On line DE corresponding to side AB, construct a triangle similar to triangle ABC.



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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 if two triangles have an angle of one equal to an angle of the other and the sides including these angles proportional, the triangles are similar. [12]

22 ADE and BCF are equilateral triangles constructed on sides AD and BC of square $ABCD$ outside the square. If lines EB and DF are drawn, prove that $ED = BF$ and $EB = DF$ [3, 9]

23 Through any point A on a circle, a tangent is drawn and two unequal chords AB and AC. A chord parallel to the tangent cuts AB and AC in D and E respectively. Prove that $AB : AE = AC : AD$ [12]

24 Diagonal AC of quadrilateral $ABCD$ divides the figure into two triangles equal in area but not congruent.

a Prove that points D and B are equidistant from AC. [6]

b If diagonal BD is drawn, prove that AC bisects BD. [6]

25 ABC is an isosceles triangle and the bisectors of the equal angles A and B meet in O. Prove that AB is greater than AO. [12]

Group II

Answer two questions from this group.

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

26 $ABCD$ is a trapezoid with bases AB and DC. Diagonals AC and BD intersect in O. If $AB = 20$, $DC = 4$ and the altitude of $ABCD = 6$, find the length of the perpendicular from O to AB. [12]

27 ABC is a triangle circumscribing a circle O. Angle $A = 60°$ and angle $B = 40°$. Find the angles of the triangle formed by joining the points of tangency. [12]

28 ABC is a right triangle with the right angle at C. On AB an equilateral triangle DAB is constructed outside the given triangle, and line DC is drawn. If angle $ABC = 30°$ and $AB = 4$, find the length of CD. [Leave answer in radical form.] [12]

29 A wheel has been broken so that only a portion of the rim remains. In order to find the radius of the wheel the following measurements are made: Three points A, B and C are marked on the rim so that chord AB = chord AC. The chords are then measured, and $AB = 15''$, $AC = 15''$, $BC = 24''$. Find the radius of the wheel and the length of the rim to the *nearest inch*. [Use $\pi = 3.14$] [12]