The University of the State of New York

324TH HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Monday, June 20, 1955 — 9.15 a.m. to 12.15 p.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 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 four or five recitations a week for a school year.

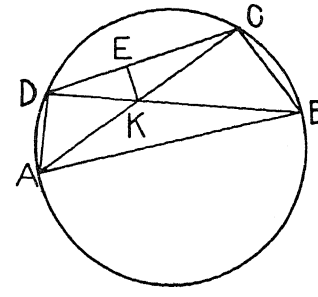
Part II

Answer three questions from this part.

26 Prove: The diameter perpendicular to a chord of a circle bisects the chord and its minor arc. [10]

27 In the figure at the right, $ABCD$ is a quadrilateral inscribed in a circle. AB is a diameter and diagonals AC and DB intersect at K. KE is perpendicular to DC.

Prove: $\frac{AB}{DK} = \frac{AC}{DE}$. [10]

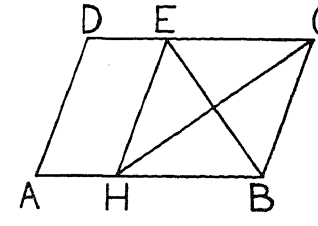


28 Prove: The area of a trapezoid is equal to one half the product of its altitude and the sum of its bases. [10]

29 In the accompanying figure, $ABCD$ is a parallelogram. The bisector of angle B meets CD in E; the bisector of angle C meets AB in H; and EH is drawn.

a Prove that $EC = BC$. [5]

b Prove that $BCEH$ is a parallelogram. [5]



30 $ABCD$ is a quadrilateral in which AD is greater than DC and AB is greater than BC. Prove that angle BCD is greater than angle DAB. [Hint: Draw AC.] [10]

Part III

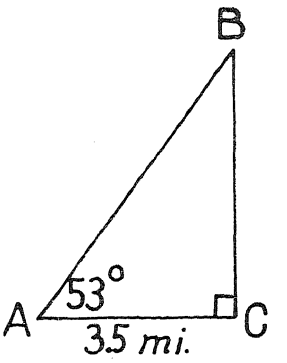
Answer two questions from this part. Show all work.

31 As represented by the diagram at the right, a boat sails on a triangular course from A due east to C and then due north to B and back to A. The angle between AB and AC is 53°. If the distance from A to C is 3.5 miles,

a find BC to the *nearest tenth* of a mile [3]

b find AB to the *nearest tenth* of a mile [5]

c find the length of the triangular course to the *nearest mile* [2]



32 $ABCDEF$ is a regular hexagon inscribed in a circle of radius 12. Diagonals AC and AD are drawn. [Answers involving radical expressions may be left in radical form.]

a Find the length of AB. [2]

b Find the length of AC. [4]

c Find the number of degrees in angle ACD. [2]

d Find the area of triangle ACD. [2]

33 In an isosceles trapezoid the length of the shorter base is x feet.

a If each leg is 1 foot more than twice the shorter base, express the length of a leg in terms of x. [1]

b If the longer base is 2 feet less than three times the shorter base, express the length of the longer base in terms of x. [1]

c If the perimeter of the trapezoid is 48 feet, find x. [3]

d Using the value of x found in part *c*, find the length of the longer base and the length of a leg of the trapezoid. [2]

e Find the length of the altitude of the trapezoid. [3]

34 A man has a flower garden in the shape of a *segment* of a circle. The arc of the *segment* is 90° and the radius of the circle is 20 feet. [3.14 may be used as the value of π.]

a Find to the *nearest foot* the number of feet of fencing required to enclose the garden. [5]

b Find the area of the garden to the *nearest square foot*. [5]

Fill in the following lines:

Name of pupil.....Name 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 area of a circle whose radius is 7. [Answer may be left in terms of π.] 1.....

2 Find the diagonal of a square whose side is 12. [Answer may be left in radical form.] 2.....

3 The vertex angle of an isosceles triangle contains 48°. Find the number of degrees in a base angle. 3.....

4 In circle O chords AB and CD intersect at E. If arc $BD = 30°$ and arc $AC = 70°$, find the number of degrees in angle AEC. 4.....

5 Two tangents to a circle from a point outside the circle intercept an arc of 100°. How many degrees are there in the angle formed by the two tangents? 5.....

6 The sum of four interior angles of a pentagon is 420°. Find the number of degrees in the fifth interior angle. 6.....

7 A side of a regular polygon of 9 sides is s and the apothem is a. Express the area of the polygon in terms of s and a. 7.....

8 A line parallel to side AB of triangle ABC intersects AC at D and BC at E. If $CD = 7$, $DA = 2$ and $BE = 5$, find CE. 8.....

9 The perimeters of two similar triangles are 24 and 72. If a side of the smaller triangle is 5, find the corresponding side of the larger triangle. 9.....

10 Find the area of an equilateral triangle whose side is 8. [Answer may be left in radical form.] 10.....

11 Sides AD and AB of parallelogram $ABCD$ meet at an angle of 30°. If $AD = 8$ and $AB = 10$, find the area of $ABCD$. 11.....

12 The diagonals of a rhombus are 5 and 14. Find the area of the rhombus. 12.....

13 A ladder 40 feet long is placed against the side of a building which is on level ground. The ladder makes an angle of 72° with the ground. What vertical distance on the side of the building can the top of the ladder reach? [Answer may be left to the *nearest foot.*] 13.....

14 Side BC of rectangle $ABCD$ is extended through C to point E. If angle $BDE = 90°$, $BC = 4$, and $CE = 9$, find DC. 14.....

15 In a circle of radius 18, find the length of an arc of 140°. [Answer may be left in terms of π.] 15.....

Directions (16–20): Indicate whether *each* statement is true or false by writing the word *true* or *false* on the line at the right.

16 If in triangle ABC angle $A = 70°$ and angle $B = 30°$, then the longest side of the triangle is BC. 16.....

17 If the areas of two similar triangles are in the ratio 4:9, corresponding altitudes of these triangles are in the ratio 2:3. 17.....

18 If quadrilateral $ABCD$ is inscribed in a circle, it is possible for angle A to equal 102° when angle C equals 79°. 18.....

19 If in triangle ABC angle $A = 44°$ and angle $B = 73°$, and in triangle DEF angle $D = 73°$ and angle $E = 63°$, then triangle ABC is similar to triangle DEF. 19.....

20 The locus of the centers of all circles tangent to a given line at a given point on the line is a line parallel to the given line. 20.....

Directions (21–23): Indicate the correct answer to *each* of the following by writing the letter *a*, *b* or *c* on the line at the right.

21 If the base of an isosceles triangle is 10, the length of each leg is
(*a*) less than 5 (*b*) equal to 5 (*c*) greater than 5 21.....

22 Which of the following statements is *not always* true?

a The diagonals of a rectangle are equal.

b The diagonals of an isosceles trapezoid are equal.

c The diagonals of a parallelogram bisect the angles of the parallelogram. 22.....

23 John is the strongest boy in the senior class at high school K. Which of the following statements expresses a conclusion that logically follows from the given statement?

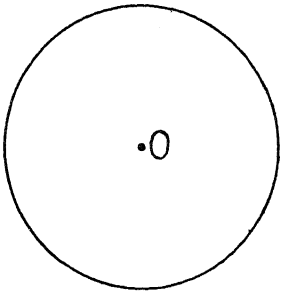
a If Fred is not so strong as John, Fred is a senior.

b Since Dick is a senior at high school K, he is not so strong as John.

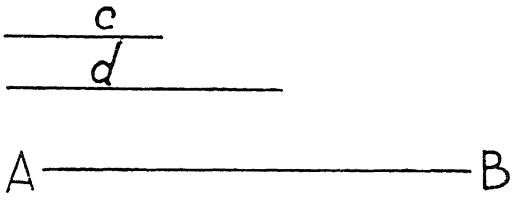
c Since Tom is a junior at high school K, he is not so strong as John. 23.....

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

24 Inscribe an equilateral triangle in circle O.



25 Divide the line segment AB in the ratio $c : d$.



FOR TEACHERS ONLY

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INSTRUCTIONS FOR RATING
PLANE GEOMETRY

Monday, June 20, 1955 — 9.15 a.m. to 12.15 p.m., only

Use only *red* ink or pencil in rating Regents papers. Do not attempt to *correct* the pupil's work by making insertions or changes of any kind. Use check marks to indicate pupil errors.

Unless otherwise specified, mathematically correct variations in the answers will be allowed. Units need not be given when the wording of the questions allows such omissions.

Part I

Allow 2 credits for each correct answer; allow no partial credit. For questions 21–23, allow credit if the pupil has written the correct answer instead of the letter *a*, *b* or *c*.

(1) 49π
(2) $12\sqrt{2}$
(3) 66
(4) 50
(5) 80
(6) 120
(7) $\frac{9}{2}as$
(8) $17\frac{1}{2}$
(9) 15
(10) $16\sqrt{3}$
(11) 40
(12) 35
(13) 38
(14) 6
(15) 14π
(16) false
(17) true
(18) false
(19) true
(20) false
(21) *c*
(22) *c*
(23) *b*