The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Wednesday, January 25, 1961 — 1:15 to 4:15 p.m., only

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

Name and author of textbook used.....

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Unless otherwise specified, answers may be left in terms of π or in radical form.

1 Find the area of an equilateral triangle whose side is 8. 1.....

2 Find the area of a rhombus whose diagonals are 4 and 9. 2.....

3 Find the apothem of a regular polygon whose perimeter is 20 and whose area is 25. 3.....

4 In triangle ABC, $AC = BC$. The number of degrees in an exterior angle at vertex C is represented by $5x + 10$. If angle $A = 40°$, find the value of x. 4.....

5 In circle O, chords AB and CD intersect at E. If angle $CEB = 40°$ and arc $CB = 20°$, find the number of degrees in minor arc AD. 5.....

6 From point C outside a circle, tangents CA and CB are drawn. If angle $C = 60°$ and chord $AB = 8$, find the length of the line segment CA. 6.....

7 In triangle ABC, C is a right angle and CD is the altitude to AB. If $AB = 9$ and $AC = 6$, find AD. 7.....

8 In triangle ABC, $AC = BC$, angle $A = 40°$ and side $AB = 20$. Find to the *nearest tenth* the length of the altitude from vertex C. 8.....

9 The sides of a right triangle are 5, 12 and 13. Find to the *nearest degree* the smaller acute angle of this triangle. 9.....

10 In circle O, diameter AB is perpendicular to chord CD at E. If $AB = 10$ and $AE = 2$, find the length of chord CD. 10.....

11 A regular pentagon $ABCDE$ is inscribed in a circle. Find the number of degrees in the acute angle formed by side AB and the tangent at B. 11.....

12 The base of a triangle is equal to a side of a square and their areas are equal. If a side of the square is 8, find the length of the altitude of the triangle. 12.....

13 In triangle ABC, a line parallel to AC intersects AB at D and CB at E. If $DE = 15$, $AD = 4$ and $DB = 8$, find the length of AC. 13.....

[OVER]

14 Find the number of inches in the diagonal of a square inscribed in a circle whose circumference is 80π inches. 14.....

15 The angle of a sector of a circle is 90° and the area of the sector is 16π. Find the radius of the circle. 15.....

16 AB is a diameter of the circle whose center is the point $(2, 0)$. If the coordinates of A are $(0, -2)$, find the coordinates of B. 16.....

17 In parallelogram $ABCD$, diagonal AC is perpendicular to side CD. If angle $ACB = 40°$, find the number of degrees in angle ADC. 17.....

18 The difference between two supplementary angles is 40°. Find the number of degrees in the larger of the two angles. 18.....

Directions (19–28): Write on the line at the right of *each* of the following the *number* preceding the expression that best completes the statement or answers the question.

19 Which statement is an example of a definition?
(1) If two lines intersect, the vertical angles are equal.
(2) Two angles whose sum is 90° are complementary.
(3) The whole is equal to the sum of its parts.
(4) The sum of the angles of a triangle is 180°. 19.....

20 If two sides of a triangle are 5 and 7, the third side may be
(1) 1 (2) 2 (3) 11 (4) 12 20.....

21 The length of the line segment joining the points whose coordinates are $(1, -4)$ and $(4, 2)$ is
(1) $3\sqrt{5}$ (2) $\sqrt{13}$ (3) 45 (4) 13 21.....

22 In triangle ABC, if an exterior angle at vertex C equals 75°, then it is true that
(1) the shortest side of the triangle may be AB
(2) the triangle may be isosceles
(3) the longest side of the triangle may be BC
(4) it is impossible to tell which is the longest side of the triangle 22.....

23 Which statement is *not* correct?
(1) Doubling the side of a square doubles the perimeter.
(2) Doubling the radius of a circle doubles the circumference.
(3) Doubling the radius of a circle doubles the area.
(4) Doubling the side of an equilateral triangle doubles the perimeter. 23.....

24 The vertices of triangle OAB are the points $(0, 0)$, $(a, 0)$ and $(0, a)$, respectively. The area of this triangle is 24.....

(1) $\frac{a^2}{2}$ (2) $\frac{a^2}{4}$ (3) a^2 (4) $a^2\sqrt{2}$

25 The locus of the centers of all circles which can be drawn tangent to a given line at a given point on the line is a set of points which lie on a
(1) circle
(2) line parallel to the given line
(3) pair of lines parallel to the given line
(4) line perpendicular to the given line 25.....

26 Parallel lines AB and CD are 6 inches apart and point P is on AB. The number of points in the plane of these two lines equidistant from them and, also, 6 inches from the point P is

(1)1 (2)2 (3)0 (4)4 26.....

27 The number of degrees in the angles of a triangle is represented by y, $y + 20$ and $2y$, respectively. The triangle is

(1) acute
(2) right
(3) obtuse
(4) equiangular 27.....

28 The contrapositive of a statement may be defined as the converse of the inverse of the statement. Given the statement: If a triangle has two equal medians, then the triangle is isosceles. Which is the contrapositive of the given statement?

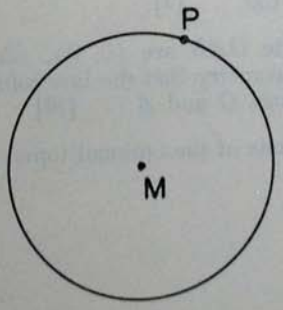
(1) If a triangle is isosceles, then the triangle has two equal medians.
(2) If a triangle does not have two equal medians, then the triangle is not isosceles.
(3) An isosceles triangle has two equal medians.
(4) If a triangle is not isosceles, then the triangle does not have two equal medians. 28.....

Directions (29–30): Leave all construction lines on the paper.

29 Construct an angle of 60° whose vertex is at point A.

A

30 Construct a line tangent to circle M at point P.



[OVER

Part II

Answer four questions from this part. Show all work unless otherwise directed.

31 Answer *either* *a* or *b*: [10]

a Prove: If two sides of a triangle are equal, the angles opposite these sides are equal.

OR

b Prove: The area of a trapezoid is equal to one-half the product of the altitude and the sum of the bases.

32 In triangle ABC, $AB = CB$. Side AC is extended through C to D and BD is drawn. Prove: $BD > AB$. [10]

33 In circle O, diameter AB is perpendicular to diameter CD and AM is any chord intersecting CD at P. Line segments MB and BP are drawn.

a Prove: $AP = BP$. [3]

b Prove: $\frac{OB}{MA} = \frac{OP}{MB}$ [7]

34 Given triangle RST with vertices $(-2, -3)$, $(4, 5)$ and $(-4, 1)$, respectively.

a Show by methods of coordinate geometry that triangle RST is a right triangle. [7]

b Show by methods of coordinate geometry that the median to the hypotenuse of triangle RST is equal to one-half the hypotenuse. [3]

35 Answer *either* *a* or *b*:

a From a point P outside a circle, tangent PA and secant PCB are drawn. $PA = 10\sqrt{3}$ and $BC = 20$.

(1) Represent the length of PC by x and write an equation that may be used to find the value of x. [4]

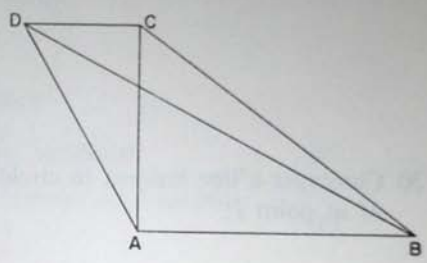
(2) Solve the equation written in answer to part *a* and state the length of PC. [6]

OR

b In the accompanying diagram, $ABCD$ is a quadrilateral with AB parallel to DC. Side $AB = 28.0$ inches and side $DC = 12.0$ inches. Diagonal AC is perpendicular to AB. The angle between diagonal DB and side AB is 24°.

(1) Find to the *nearest tenth of an inch* the length of line segment AC. [7]

(2) Find to the *nearest square inch* the area of quadrilateral $ABCD$. [3]



*36 The vertices of triangle OAB are $(0, 0)$, $(2a, 2b)$ and $(2c, 2d)$, respectively. Show by methods of coordinate geometry that the line joining the midpoints of OB and AB is parallel to the line through the points O and A. [10]

*This question is based on one of the optional topics in the syllabus.

FOR TEACHERS ONLY

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INSTRUCTIONS FOR RATING TENTH YEAR MATHEMATICS

Wednesday, January 25, 1961 — 1:15 to 4:15 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 checkmarks 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 19–28, allow credit if the pupil has written the correct answer instead of the number 1, 2, 3 or 4.

(1) $16\sqrt{3}$ *or* 27.7

(2) 18

(3) $2\frac{1}{2}$

(4) 14

(5) 60

(6) 8

(7) 4

(8) 8.4

(9) 23

(10) 8

(11) 36

(12) 16

(13) $22\frac{1}{2}$

(14) 80

(15) 8

(16) (4, 2)

(17) 50

(18) 110

(19) 2

(20) 3

(21) 1

(22) 2

(23) 3

(24) 1

(25) 4

(26) 2

(27) 1

(28) 4

[OVER]

Please refer to the Department's pamphlet *Suggestions on the Rating of Regents Examination Papers in Mathematics*. Care should be exercised in making deductions as to whether the error is purely a mechanical one or due to a violation of some principle. A mechanical error generally should receive a deduction of 10%, while an error due to a violation of some cardinal principle should receive a deduction ranging from 30 percent to 50 percent, depending on the relative importance of the principle in the solution of the problem.

Part II

(35) *a* (1) $\frac{20+x}{10\sqrt{3}} = \frac{10\sqrt{3}}{x}$ [4]

(2) $PC = 10$ [6]

b (1) $AC = 17.8°$ [7]

(2) Area of $ABCD = 356$ sq. in. [3]