The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Tuesday, January 25, 1972—1:15 to 4:15 p.m., only

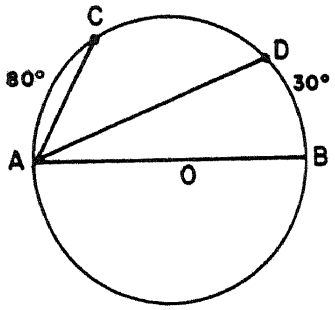
The last page of the booklet is the answer sheet, which is perforated. Fold the last page along the perforation and then, slowly and carefully, tear off the answer sheet. Now fill in the heading of your answer sheet. On page 5, which is perforated, you will find the "Tables of Natural Trigonometric Functions," which you may need to answer some questions in this examination. Fold this page along the perforation, and tear it off. When you have torn off these two pages and finished the heading, you may begin the examination immediately.

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. Write your answers in the spaces provided on the separate answer sheet.

1 The measures of the angles of a triangle are represented by $2k$, $3k$, and $7k$. How many degrees are in the measure of the smallest angle of the triangle?

2 In the diagram below, points C and D lie on circle O on the same side of diameter $\overline{AB}$ so that $m\overset{\frown}{AC} = 80$ and $m\overset{\frown}{BD} = 30$. Find $m\angle CAD$.



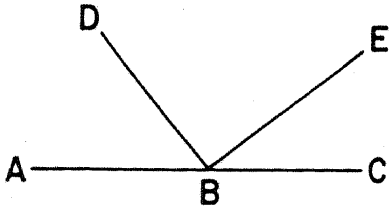
3 Two parallel lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are d units apart. Express, in terms of d, the length of the radius of a circle that is tangent to both $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$.

4 The coordinates of A are $(0,0)$, and the coordinates of B are $(2,5)$. Find the length of $\overline{AB}$.

5 Two sides of an isosceles triangle have lengths 3 and 12, respectively. Find the length of the third side.

6 In triangle ABC, a line joins D and E, the midpoints of $\overline{AB}$ and $\overline{BC}$, respectively. If $m\angle A = 40$, find $m\angle ADE$.

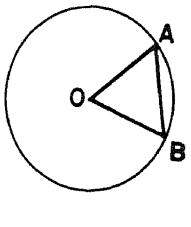
7 In the figure below, point B is between A and C, $m\angle ABD = 2x$, $m\angle DBE = (3x + 20)$, and $m\angle EBC = (3x - 40)$. Find x.



8 A pair of corresponding sides in two similar triangles are 5 inches and 6 inches, respectively. What is the ratio of the perimeter of the smaller triangle to that of the larger?

9 If the length of a diagonal of a square is $5\sqrt{2}$, find the area of the square.

10 In the figure below, the radius of circle O is 6 and $m\angle AOB = 60$.



Express in radical form the area of $\triangle AOB$.

11 In trapezoid $ABCD$, the length of base $\overline{AB}$ is twice the length of base $\overline{DC}$. The altitude of the trapezoid is 4 and its area is 42. Find DC.

12 In isosceles triangle RST, vertex angle RTS measures 120° and side $TS = 8$. Find the length of the altitude from vertex T to side $\overline{RS}$.

13 From external point A, two tangents $\overline{AB}$ and $\overline{AC}$ are drawn to circle O. If $AB = 6$ inches and $m\angle A = 60$, find the number of inches in the perimeter of triangle ABC.

14 The lengths of the bases of an isosceles trapezoid are 10 and 22, and the length of the altitude is 8. Find the length of a leg.

15 In circle O, diameter $\overline{CD}$ is perpendicular to chord $\overline{AB}$ and $m\overset{\frown}{AC} = 70$. Find $m\overset{\frown}{BD}$.

16 In a circle a central angle which measures 45° intercepts an arc 10 inches long. Find, in inches, the circumference of the circle.

17 The coordinates of the vertices of triangle ABC are $(0,0)$, $(4,0)$, and $(0,3)$. Find the area of triangle ABC.

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18 An isosceles triangle is inscribed in a circle. Each base angle measures 50°. Find the number of degrees in the minor arc cut off by the base of the triangle.

19 In rectangle $ABCD$, E is the midpoint of diagonal $\overline{AC}$. If $AC = 18$, what is the distance from point E to vertex B of the rectangle?

Directions (20–29): For *each* statement or question, write on the separate answer sheet the *numeral* preceding the word or expression that, of those given, best completes the statement or answers the question.

20 Consider the following statement for all triangles: "If two triangles are congruent, then the two triangles are similar."
(1) The statement is false but its converse is true.
(2) The statement is false and its converse is false.
(3) The statement is true but its converse is false.
(4) The statement is true and its converse is true.

21 Which set of numbers can be the lengths of the sides of a triangle?
(1) {1,2,3}
(2) {3,4,6}
(3) {2,3,5}
(4) {2,4,7}

22 Which is an example of valid reasoning?
(1) All Martians are green. Tom is a Martian. Therefore Tom is green.
(2) All Martians are green. Tom is green. Therefore Tom is a Martian.
(3) All Martians are green. George is not a Martian. Therefore George is not green.
(4) All Martians are green. George is not a Martian. Therefore George is blue.

23 If two parallel lines are cut by two distinct parallel transversals, the quadrilateral formed by the included segments must be a
(1) square
(2) rhombus
(3) rectangle
(4) parallelogram

24 The regular polygon the length of whose apothem is one-half the length of a side is
(1) an equilateral triangle
(2) a square
(3) a pentagon
(4) a hexagon

25 Find the length of the diagonal of a rectangle whose sides are 5 and 7.
(1) $\sqrt{24}$
(2) 5
(3) $\sqrt{74}$
(4) 8

26 Two polygons are always similar if both are
(1) squares
(2) pentagons
(3) triangles
(4) rhombi

27 If the vertex of an angle lies outside a circle and both sides of the angle intersect the circle, then the measure of the angle is equal to
(1) one-half the difference of the intercepted arcs
(2) one-half the sum of the intercepted arcs
(3) the difference of the intercepted arcs
(4) the sum of the intercepted arcs

28 Two chords intersect in a circle whose radius is 8. The product of the lengths of the segments of one of the chords can *not* be
(1) 80
(2) 48
(3) 32
(4) 16

29 The number of points at a given distance from a given line and also equally distant from two points on the given line is
(1) 1
(2) 2
(3) 3
(4) 4

Directions (30): Leave all construction lines on the answer sheet.

30 *On the answer sheet,* circumscribe a circle about triangle ABC.

Answers to the following questions are to be written on paper provided by the school.

Part II

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

31 Prove *either* *a* or *b* but *not* both: [10]

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

OR

b A diameter perpendicular to a chord of a circle bisects the chord and its arcs.

32 In right triangle ABC, $\overline{CD}$ is the median to hypotenuse $\overline{AB}$. If $\overline{CD}$ is extended its own length through D to E and $\overline{EA}$ and $\overline{EB}$ are drawn, prove that $AEBC$ is a rectangle. [10]

33 Triangle ABC has vertices A (0,0), B (25,0), and C (9,12).

a Find the length of each side. [3]

b Show that triangle ABC is a right triangle and state a reason for your conclusion. [5]

c Find the area of triangle ABC. [2]

34 Given $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersecting at point E and point P between E and B.

a Describe fully the locus of points equidistant from $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$. [3]

b Describe fully the locus of points at a given distance d from P. [3]

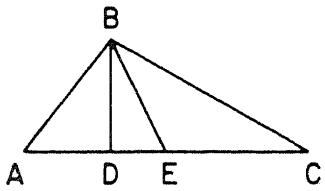
c How many points are there that satisfy both conditions given in parts *a* and *b* if:

(1) $d > EP$ [2]

(2) $d = EP$ [2]

35 In circle O, $\overline{OA}$ and $\overline{OB}$ are radii. Point P lies between O and A. Line segment $\overline{PB}$ and chord $\overline{AB}$ are drawn. Prove $PB > PA$. [10]

36 In the accompanying figure, triangle ABC is a scalene triangle, $\overline{BD}$ is the altitude and $\overline{BE}$ is the median to side $\overline{AC}$. $AC = 36$ inches, $AB = 15$ inches, and $m\angle A = 48$.



a Find, *to the nearest inch*, the length of $\overline{AD}$. [4]

b Find, *to the nearest inch*, the length of $\overline{BD}$. [4]

c Using the result obtained in part *b*, find the area of triangle BEC. [2]

*37 Given the points A (1,1), B (10,4), C (7,7), D (7,3), and E (5,5).

a Write an equation of $\overleftrightarrow{AC}$. [3]

b Show that the coordinates of point E satisfy the equation of $\overleftrightarrow{AC}$. [2]

c Show that points A, B, and D are collinear. [5]

* This question is based on an optional topic in the syllabus.

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THE UNIVERSITY OF THE STATE OF NEW YORK

THE STATE EDUCATION DEPARTMENT

BUREAU OF ELEMENTARY AND SECONDARY EDUCATIONAL TESTING

Tables of Natural Trigonometric Functions

(For use with 9th and 10th Year Mathematics Regents Examinations)

Angle	Sine	Cosine	Tangent	Angle	Sine	Cosine	Tangent
1°	.0175	.9998	.0175	46°	.7193	.6947	1.0355
2°	.0349	.9994	.0349	47°	.7314	.6820	1.0724
3°	.0523	.9986	.0524	48°	.7431	.6691	1.1106
4°	.0698	.9976	.0699	49°	.7547	.6561	1.1504
5°	.0872	.9962	.0875	50°	.7660	.6428	1.1918
6°	.1045	.9945	.1051	51°	.7771	.6293	1.2349
7°	.1219	.9925	.1228	52°	.7880	.6157	1.2799
8°	.1392	.9903	.1405	53°	.7986	.6018	1.3270
9°	.1564	.9877	.1584	54°	.8090	.5878	1.3764
10°	.1736	.9848	.1763	55°	.8192	.5736	1.4281
11°	.1908	.9816	.1944	56°	.8290	.5592	1.4826
12°	.2079	.9781	.2126	57°	.8387	.5446	1.5399
13°	.2250	.9744	.2309	58°	.8480	.5299	1.6003
14°	.2419	.9703	.2493	59°	.8572	.5150	1.6643
15°	.2588	.9659	.2679	60°	.8660	.5000	1.7321
16°	.2756	.9613	.2867	61°	.8746	.4848	1.8040
17°	.2924	.9563	.3057	62°	.8829	.4695	1.8807
18°	.3090	.9511	.3249	63°	.8910	.4540	1.9626
19°	.3256	.9455	.3443	64°	.8988	.4384	2.0503
20°	.3420	.9397	.3640	65°	.9063	.4226	2.1445
21°	.3584	.9336	.3839	66°	.9135	.4067	2.2460
22°	.3746	.9272	.4040	67°	.9205	.3907	2.3559
23°	.3907	.9205	.4245	68°	.9272	.3746	2.4751
24°	.4067	.9135	.4452	69°	.9336	.3584	2.6051
25°	.4226	.9063	.4663	70°	.9397	.3420	2.7475
26°	.4384	.8988	.4877	71°	.9455	.3256	2.9042
27°	.4540	.8910	.5095	72°	.9511	.3090	3.0777
28°	.4695	.8829	.5317	73°	.9563	.2924	3.2709
29°	.4848	.8746	.5543	74°	.9613	.2756	3.4874
30°	.5000	.8660	.5774	75°	.9659	.2588	3.7321
31°	.5150	.8572	.6009	76°	.9703	.2419	4.0108
32°	.5299	.8480	.6249	77°	.9744	.2250	4.3315
33°	.5446	.8387	.6494	78°	.9781	.2079	4.7046
34°	.5592	.8290	.6745	79°	.9816	.1908	5.1446
35°	.5736	.8192	.7002	80°	.9848	.1736	5.6713
36°	.5878	.8090	.7265	81°	.9877	.1564	6.3138
37°	.6018	.7986	.7536	82°	.9903	.1392	7.1154
38°	.6157	.7880	.7813	83°	.9925	.1219	8.1443
39°	.6293	.7771	.8098	84°	.9945	.1045	9.5144
40°	.6428	.7660	.8391	85°	.9962	.0872	11.4301
41°	.6561	.7547	.8693	86°	.9976	.0698	14.3007
42°	.6691	.7431	.9004	87°	.9986	.0523	19.0811
43°	.6820	.7314	.9325	88°	.9994	.0349	28.6363
44°	.6947	.7193	.9657	89°	.9998	.0175	57.2900
45°	.7071	.7071	1.0000	90°	1.0000	.0000	

[OVER]

Part I Score:.....

Rater's Initials:

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Tuesday, January 25, 1972—1:15 to 4:15 p.m., only

ANSWER SHEET

Pupil.....Teacher.....

School.....

Name and author of textbook used.....

Your answers to Part I should be recorded on this answer sheet.

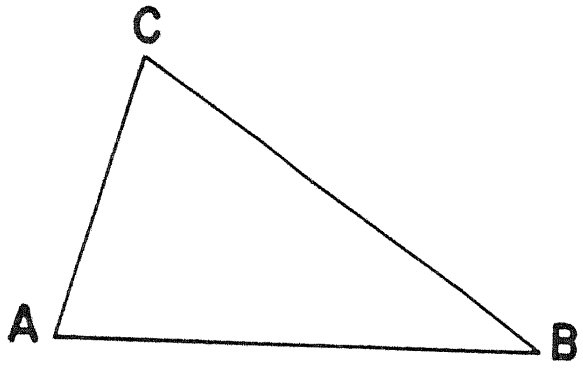
Part I

Answer all questions in this part.

1.....	11.....	21.....
2.....	12.....	22.....
3.....	13.....	23.....
4.....	14.....	24.....
5.....	15.....	25.....
6.....	16.....	26.....
7.....	17.....	27.....
8.....	18.....	28.....
9.....	19.....	29.....
10.....	20.....	

Answer question 30 on the back of this page.

30



FOR TEACHERS ONLY

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SCORING KEY

TENTH YEAR MATHEMATICS

Tuesday, January 25, 1972—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 18–29, allow credit if the pupil has written the correct answer instead of the number 1, 2, 3, or 4.

(1) 30

(2) 35

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

(4) $\sqrt{29}$

(5) 12

(6) 140

(7) 25

(8) $\frac{5}{6}$

(9) 25

(10) $9\sqrt{3}$

(11) 7

(12) 4

(13) 18

(14) 10

(15) 110

(16) 80

(17) 6

(18) 160

(19) 9

(20) 3

(21) 2

(22) 1

(23) 4

(24) 2

(25) 3

(26) 1

(27) 1

(28) 1

(29) 2

[OVER]

Part II

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 percent, 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.

(33) *a* $AB = 25$ [1]
$AC = 15$ [1]
$CB = 20$ [1]

c 150 [2]

(34) Phrases such as the following should be allowed credit as indicated:

a The pair of lines bisecting the angles formed by $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ [3]

b A circle with P as center and d as radius [3]

c (1) 4 [2]
(2) 3 [2]

(36) *a* 10 [4]
b 11 [4]
c 99 [2]

*(37) *a* $y = x$ [3]

DO YOU KNOW...

...that classroom teachers returned over 3,700 Regents examination evaluation forms to the Education Department last year? The comments and suggestions made by these teachers were carefully reviewed by the Department subject-matter and testing specialists and by the teachers who prepared this year's examinations.

Be sure to fill out the Evaluation Form and give it to your principal for return in the Regents box. Your comments about the Regents examinations are important! They will be taken into consideration when future examinations are prepared.