The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Tuesday, January 25, 1977 — 1:15 to 4:15 p.m., only

The last page of the booklet is the answer sheet. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

On page 5 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 perforations, and tear it off also slowly and carefully.

When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer paper cannot be accepted if you fail to sign this declaration.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN

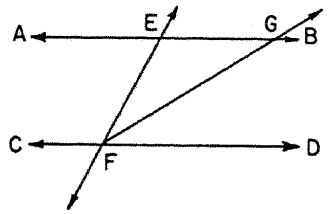
Part I

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 ratio of the circumferences of two circles is 1:9. If the radius of the smaller circle is 2, what is the radius of the *larger* circle?

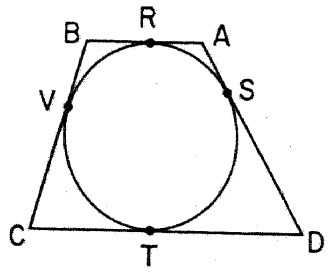
2 In square $ABCD$, point A has coordinates (3,4) and point C has coordinates (7,8). What are the coordinates of the center of the circle inscribed in this square?

3 In the accompanying diagram, $\overleftrightarrow{AB}$ is parallel to $\overleftrightarrow{CD}$ and $\overrightarrow{FG}$ bisects $\angle EFD$. If $m\angle EFG = x$ and $m\angle FEG = 4x$, find x.

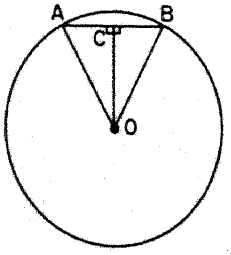


4 The lengths of the sides of a right triangle are 5, 12, and 13, respectively. Find, to the *nearest degree*, the measure of the *smallest* angle of the triangle.

5 In the accompanying diagram, $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, and $\overline{DA}$ are tangent to the circle at R, V, T, and S, respectively. If $VC = 8$ and $SD = 10$, find CD.



6 In the accompanying figure, $\overline{OC} \perp \overline{ACB}$ and radius AO of circle O is 10. If $OC = 8$, find AB.



7 If the lengths of the bases of a trapezoid are 10 and 16, what is the length of the median of the trapezoid?

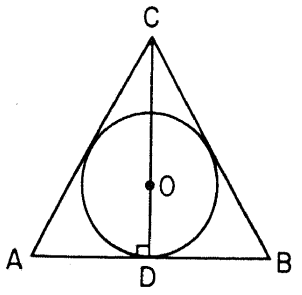
8 In ΔABC, $\overline{AC} \cong \overline{BC}$ and $\overline{BA}$ is extended through point A to point D. If $m\angle B = x$ and $m\angle CAD = (2x + 30)$, find x.

9 Tangents $\overrightarrow{PA}$ and $\overrightarrow{PB}$ are drawn to circle O from external point P and chord $\overline{AB}$ is drawn. If $m\angle APB = 80$, find $m\angle PAB$.

10 In ΔABC, $AB = 12$, $BC = 14$, and $AC = 10$. If D is the midpoint of $\overline{AB}$ and E is the midpoint of $\overline{AC}$, find DE.

11 A circle has its center at the point $(3,-2)$ and is tangent to the y-axis. Find the length of the radius of the circle.

12 In the accompanying figure, circle O is inscribed in equilateral triangle ABC. If altitude $CD = 6$, find the length of the radius of the inscribed circle.



13 Given that $\overleftrightarrow{AB}$ intersects $\overleftrightarrow{CD}$ at point E. If $m\angle AEC = 39$ and $m\angle DEB = (4a - 5)$, find a.

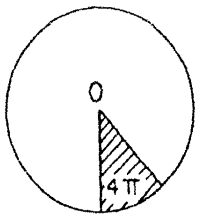
14 If the measure of an interior angle of a regular polygon is 108°, how many sides does the polygon have?

15 The length of the base $\overline{AB}$ of ΔABC and the length of a side of a square are each 8. If the area of the triangle is equal to the area of the square, find the length of the altitude drawn to $\overline{AB}$.

16 In parallelogram $ABCD$, $m\angle A = (2x + 13)$ and $m\angle C = (3x - 16)$. Find x.

17 If the lengths of the bases of an isosceles trapezoid are 16 and 10, and the length of each leg is 5, find the area of the trapezoid.

18 In the accompanying figure, the area of circle O is 36π and the area of a sector of the circle is 4π. Find the number of degrees in the measure of the central angle of the sector.

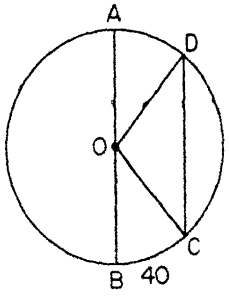


19 Find the area of a circle whose radius is 6. [*The answer may be left in terms of* π.]

Directions (20–29): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

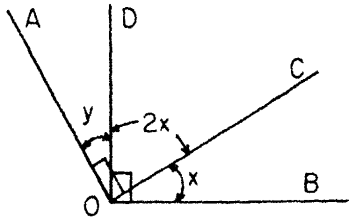
20 In the accompanying diagram, circle O has radii $\overline{OD}$ and $\overline{OC}$, and diameter $\overline{AB}$ parallel to chord $\overline{DC}$. If $m\overset{\frown}{BC} = 40$, then $m\overset{\frown}{DC}$ is

(1) 40
(2) 50
(3) 70
(4) 100



21 In the accompanying diagram, if $\overline{AO} \perp \overline{OC}$, $\overline{DO} \perp \overline{OB}$, $m\angle COB = x$, $m\angle DOC = 2x$, and $m\angle AOD = y$, which statement is true?

(1) $y = x$
(2) $2x - y = 90$
(3) $2y = 2x + x$
(4) $y = x - 30$



22 Which statement follows logically from the statement, "All registered voters have reached their 18th birthday"?

(1) All persons who have reached their 18th birthday are registered voters.
(2) If someone is not a registered voter, then he has not reached his 18th birthday.
(3) If someone has not reached his 18th birthday, then he is not a registered voter.
(4) If someone is 18 years old, then he is a registered voter.

23 The lengths of the diagonals of a rhombus are 12 and 16, respectively. The length of a side of the rhombus is

(1) 5
(2) 10
(3) $\sqrt{112}$
(4) 20

24 Which statement is *false*?

(1) A parallelogram is a quadrilateral.
(2) A rectangle is a parallelogram.
(3) A square is a rhombus.
(4) A rectangle is a square.

25 Given minor $\overset{\frown}{AC}$ of circle O whose radius is r. The locus of points at a distance r from point O is *not* $\overset{\frown}{AC}$ because

(1) there are points outside the circle at a distance r from O
(2) there are points inside the circle at a distance r from O
(3) not all points at a distance r from O lie on $\overset{\frown}{AC}$
(4) not all points of $\overset{\frown}{AC}$ are at a distance r from O

26 If the measure of the vertex angle of an isosceles triangle is more than 60°, then

(1) the legs of the triangle are each longer than the base
(2) the base is the longest side of the triangle
(3) the measure of an exterior angle at the base is less than 120°
(4) the base is equal in length to one leg

27 Which pair of polygons will *not* always be similar?

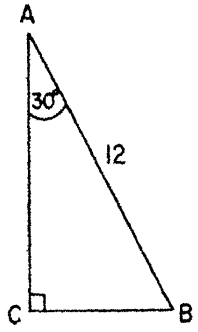
(1) any two rectangles
(2) any two squares
(3) any two regular octagons
(4) any two isosceles right triangles

28 In parallelogram $ABCD$, the coordinates of A are (2,3) and the coordinates of B are (4,8). The slope of $\overline{CD}$ is

(1) $\frac{2}{5}$
(2) $-\frac{2}{5}$
(3) $\frac{5}{2}$
(4) $-\frac{5}{2}$

29 In the accompanying figure, $m\angle C = 90$, $m\angle A = 30$, and $AB = 12$. What is the length of side $\overline{AC}$?

(1) $6\sqrt{3}$
(2) $6\sqrt{2}$
(3) $\frac{6}{\sqrt{3}}$
(4) $\frac{6}{\sqrt{2}}$



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

30 *On the answer sheet*, locate by construction those points on the given circle which are equidistant from points A and B.

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.

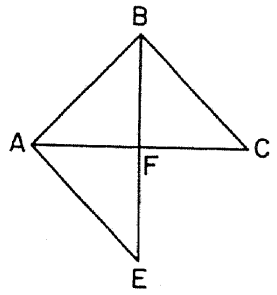
31 Prove *either* a or b, but *not* both.

a The sum of the measures of the angles of a triangle is 180 degrees. [10]

OR

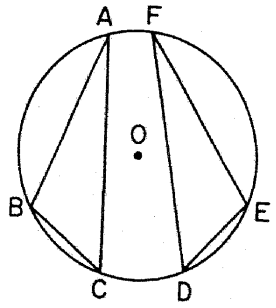
b The area of a parallelogram is equal to the product of the length of one side and the length of the altitude drawn to that side. [10]

32 Given: $\overline{BA} \cong \overline{BC}$, $\overline{AFC}$, $\overline{BC} \parallel \overline{AE}$, $\overline{BFE}$, $\overline{BE} \perp \overline{AC}$



Prove: $\overline{AB} \cong \overline{AE}$ [10]

33 Given: circle O with points A, B, C, D, E, F on the circle so that $\overline{AB} \cong \overline{FE}$ and $\overline{BC} \cong \overline{ED}$



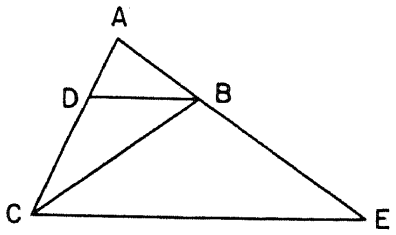
Prove: $\overline{AC} \cong \overline{FD}$ [10]

34 The vertices of quadrilateral $ABCD$ are $A(0,0)$, $B(s,0)$, $C(t+s,s)$, and $D(t,s)$. If $s > 0$ and $t > 0$, show by means of coordinate geometry, stating reasons for your conclusions, that

a $ABCD$ is a parallelogram [6]

b $ABCD$ is *not* a rhombus [4]

35 Given: $\triangle ABC$, $\overline{ABE}$, $\overline{ADC}$, $\overline{BD}$ bisects $\angle ABC$, $\overline{EC} \parallel \overline{BD}$



Prove:

a $\dfrac{AD}{DC} = \dfrac{AB}{BE}$ [3]

b $\dfrac{AD}{DC} = \dfrac{AB}{BC}$ [7]

36 Given: $\overleftrightarrow{AB}$ and point P on $\overleftrightarrow{AB}$

a Describe fully the locus of points d units from $\overleftrightarrow{AB}$. [2]

b Describe fully the locus of points t units from P. [2]

c How many points satisfy the conditions in both a and b if

(1) $t = d$ [2]
(2) $t < d$ [2]
(3) $t > d$ [2]

*37 The coordinates of the vertices of trapezoid $ABCD$ are $A(1,5)$, $B(7,k)$, $C(2,-4)$, and $D(-7,-1)$.

a If $\overline{AB}$ and $\overline{DC}$ are the bases of the trapezoid, find k. [5]

b Write the equation of $\overleftrightarrow{AB}$. [3]

c What is the slope of the altitude from A to $\overline{DC}$? [2]

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

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	

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Tuesday, January 25, 1977 — 1:15 to 4:15 p.m., only

Part I Score:	.....
Rater's Initials:	
	.....

ANSWER SHEET

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

School .....

Name and author of textbook used .....

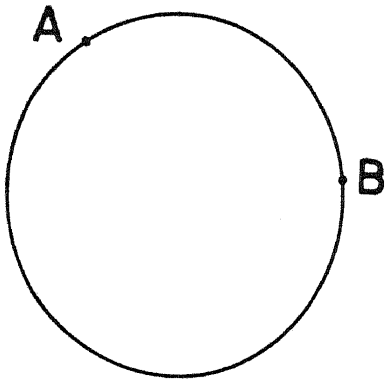
Your answers to Part I should be recorded on this answer sheet.

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	30 **Answer question 30 on the other side of this sheet.**

16



Your answers for Part II should be placed on paper provided by the school.

The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination, and that I have neither given nor received assistance in answering any of the questions during the examination.

Signature

FOR TEACHERS ONLY

10

SCORING KEY

TENTH YEAR MATHEMATICS

Tuesday, January 25, 1977—1:15 to 4:15 p.m., only

Use only *red* ink or *red* 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 20–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 18

(2) (5, 6) or $\begin{matrix} x = 5 \\ y = 6 \end{matrix}$

(3) 30

(4) 23

(5) 18

(6) 12

(7) 13

(8) 50

(9) 50

(10) 7

(11) 3

(12) 2

(13) 11

(14) 5

(15) 16

(16) 29

(17) 52

(18) 40

(19) 36π

(20) 4

(21) 1

(22) 3

(23) 2

(24) 4

(25) 3

(26) 2

(27) 1

(28) 3

(29) 1

[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.

(36) *a* Two lines parallel to $\overleftrightarrow{AB}$ and d units from it [2]

b A circle with center at P and radius t [2]

c (1) 2 [2]
(2) 0 [2]
(3) 4 [2]

(37) *a* 3 [5]

b $y - 5 = -\frac{1}{3}(x - 1)$
or [3]
$x + 3y = 16$

c 3 [2]