The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Monday, January 27, 1975 — 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.

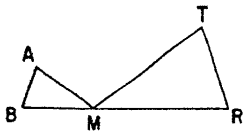
When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during 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

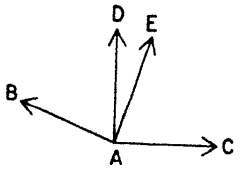
Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Unless otherwise specified, answers may be left in terms of π or in radical form. Write your answers in the spaces provided on the separate answer sheet.

1 In the accompanying figure, $\triangle ABM \sim \triangle TRM$, with $\angle A \cong \angle T$ and $\angle B \cong \angle R$. If $AB = 5$, $BM = 6$, and $RM = 18$, find TR.

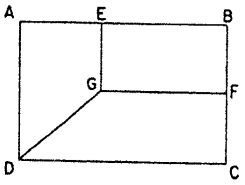


2 In parallelogram $ABCD$, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at E. If $AE = 4x - 3$ and $EC = 17 - x$, find x.

3 In the accompanying figure, $\overrightarrow{AB} \perp \overrightarrow{AE}$ and $\overrightarrow{AD} \perp \overrightarrow{AC}$. If $m\angle BAC = 160$, find $m\angle DAE$.



4 In the accompanying figure, $ABCD$ and $EBFG$ are rectangles such that $\overline{AEB}$ and $\overline{BFC}$. If $AB = 10$, $EB = 6$, $BC = 6$, and $BF = 3$, find the length of $\overline{DG}$.

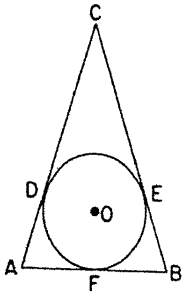


5 The length of the line segment joining the midpoints of two sides of an equilateral triangle is 6. Find the perimeter of the *original* triangle.

6 Two parallel lines are intersected by a transversal. If the measures of two interior angles on the same side of the transversal are $(3x - 10)$ degrees and $(x + 30)$ degrees, find x.

7 In triangle ABC, $m\angle A = 50$ and $m\angle B = 64$. Which is the *longest* side of the triangle?

8 In the accompanying diagram, circle O is inscribed in triangle ABC so that the circle is tangent to $\overline{AB}$ at F, to $\overline{BC}$ at E, and to $\overline{AC}$ at D. If $AF = FB = 4$ and $DC = 6$, find the perimeter of triangle ABC.



9 A circle is circumscribed about a regular hexagon. If the length of one side of the regular hexagon is 12, find the length of the radius of the circumscribed circle.

10 In circle O, the endpoints of chord $\overline{AB}$ are $A(1,2)$ and $B(5,10)$. If radius $\overline{OC}$ is perpendicular to $\overline{AB}$ at D, what are the coordinates of D?

11 If the lengths of two sides of an isosceles triangle are 10 and 4, respectively, what must be the length of the third side of the triangle?

12 In rectangle $ABCD$, the length of diagonal $\overline{AC}$ is 20 and the measure of $\angle CAB$ is 25°. Find, to the *nearest integer*, the length of side $\overline{AB}$.

13 The coordinates of the vertices of triangle ABC are $A(1,2)$, $B(5,4)$, and $C(3,9)$. Find the slope of side $\overline{AB}$.

14 A tangent and a secant are drawn to a circle from the same external point. If the length of the whole secant is 4 and the length of the external segment of the secant is 1, find the length of the tangent.

15 In $\triangle ABC$, $m\angle C = 90$ and $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $CD = 12$ and $AD = 6$, find the length of $\overline{DB}$.

16 In a circle with radius of length 10, what is the area of a sector with a central angle measuring 36°? [*Answer may be left in terms of* π.]

Directions (17–30): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

17 What is the area of an equilateral triangle the length of whose side is 4?

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

18 Which pair of points will determine a line parallel to the y-axis?

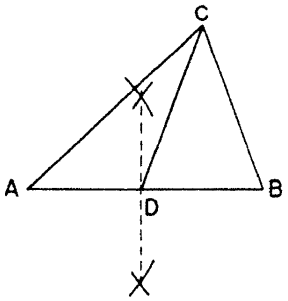
(1) (1,1) (2,3)
(2) (1,1) (3,3)
(3) (2,3) (2,5)
(4) (2,5) (4,5)

19 If the measures, in degrees, of the three angles of a triangle are x, $(2x - 20)$, and $(3x - 10)$, respectively, then the triangle is

(1) right
(2) obtuse
(3) isosceles
(4) equilateral

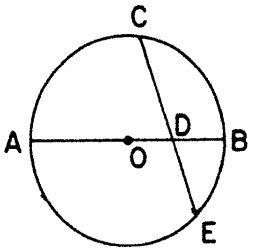
20 In the accompanying figure, triangle ABC is scalene. The construction shows that $\overline{CD}$ is the

(1) median to side $\overline{AB}$
(2) bisector of angle C
(3) altitude to side $\overline{AB}$
(4) perpendicular bisector of side $\overline{AB}$



21 In the accompanying diagram, diameter $\overline{AOB}$ intersects chord $\overline{CE}$ at point D. If $AD = 8$, $DB = 3$, and $DE = 4$, then the length of $\overline{CD}$ is

(1) $1\frac{1}{2}$
(2) 6
(3) 7
(4) 4



22 The length of the line segment connecting the points whose coordinates are (3,—1) and (6,5) is

(1) $\sqrt{45}$
(2) 5
(3) 3
(4) $\sqrt{97}$

23 The locus of points equidistant from two intersecting lines is

(1) one point
(2) one line
(3) two points
(4) two lines

24 The vertices of triangle ABC are $A(-4,0)$, $B(2,4)$, and $C(4,0)$. What is the area of the triangle?

(1) 8
(2) 16
(3) 32
(4) 64

25 Which one of the following statements is a correct definition?

(1) A square is a parallelogram with a right angle.
(2) An altitude of a triangle is a line perpendicular to a side.
(3) A rhombus is a quadrilateral with two adjacent sides congruent.
(4) An angle formed by two radii of a circle is a central angle.

26 What is the sum of the measures of the exterior angles of an octagon?

(1) 135°
(2) 360°
(3) 1,080°
(4) 1,440°

27 Two tangents to a circle from the same external point intercept a major arc whose measure is 210°. What is the measure of the angle formed by the tangents?

(1) 30°
(2) 75°
(3) 90°
(4) 150°

28 The lengths of the diagonals of a rhombus are represented by n and $(n - 6)$. The area of the rhombus, expressed in terms of n, is

(1) $n - 3$
(2) $2n - 6$
(3) $\frac{n^2 - 6n}{2}$
(4) $n^2 - 6n$

29 If in triangle ABC the measure, in degrees, of an exterior angle at B is x, then $m\angle A + m\angle C$ equals

(1) x
(2) $2x$
(3) $180 - x$
(4) $180 - 2x$

30 What is the converse of the statement, "Vertical angles are congruent"?

(1) If the angles are vertical angles, they are congruent.
(2) Noncongruent angles are not vertical angles.
(3) If the angles are congruent, they are vertical angles.
(4) If the angles are not vertical angles, they are not congruent.

☞ GO RIGHT ON TO THE NEXT PAGE.

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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.

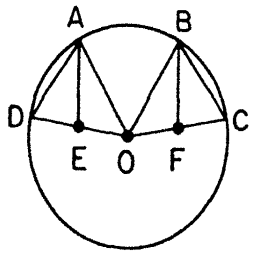
31 Prove *either a* or *b*, but *not* both. [10]

a Two right triangles are congruent if the hypotenuse and a leg of one are congruent to the corresponding parts of the other.

OR

b The area of a triangle is equal to one-half the product of the length of a side and the length of the altitude drawn to that side.

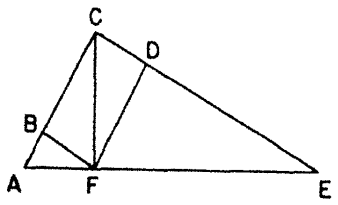
32 In the accompanying figure, $\overline{OA}$, $\overline{OB}$, $\overline{OC}$, and $\overline{OD}$ are radii of circle O. Chords $\overline{AD}$ and $\overline{BC}$ are drawn. Points E and F are midpoints of radii $\overline{OD}$ and $\overline{OC}$, respectively, and $\overset{\frown}{AD} \cong \overset{\frown}{BC}$.



Prove: *a* $\triangle AOE \cong \triangle BOF$ [6]

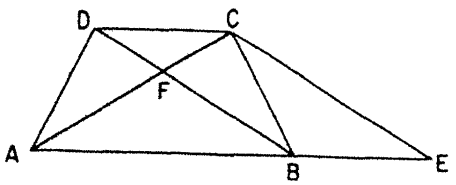
b $\angle DAE \cong \angle CBF$ [4]

33 Given: $\triangle ACE$ with $\overline{ABC}$, $\overline{CDE}$, and $\overline{AFE}$; $BCDF$ is a rectangle and $\overline{CF} \perp \overline{AFE}$



Prove: $AF \times CD = CF \times AB$ [10]

34 In the accompanying diagram, $ABCD$ is a trapezoid with diagonal $\overline{AFC} \cong$ diagonal $\overline{BFD}$. Through C a line is drawn parallel to $\overline{BD}$ and intersecting $\overleftrightarrow{AB}$ at E.



Prove: *a* $BECD$ is a parallelogram [2]

b $\overline{AC} \cong \overline{CE}$ [3]

c $\triangle AFB$ is isosceles [5]

35 Isosceles trapezoid $ABCD$ has bases $\overline{AB}$ and $\overline{DC}$, with $AB > DC$. Each leg of the trapezoid has length 14, and $\overline{AB}$ and $\overline{DC}$ have lengths of 20 and 12, respectively.

a Find the measure of $\angle A$ correct to the *nearest degree*. [4]

b Find the length of the altitude of the trapezoid correct to the *nearest integer*. [2]

c Using the result found in part *b*, find the area of the trapezoid. [2]

d Sides $\overline{AD}$ and $\overline{CB}$ are extended through $\overline{DC}$ to intersect at E. If DE is represented by x, write a proportion that may be used to solve for x. [2]

36 Triangle PQR has vertices $P(-1,-1)$, $Q(1,-2)$, and $R(3,2)$.

a Using graph paper, draw $\triangle$PQR. [1]

b Show that $\triangle PQR$ is a right triangle and state a reason for the conclusion. [6]

c Find the area of $\triangle PQR$. [3]

*37 In $\triangle ABC$, the coordinates of A are $(-6,-8)$, of B are $(6,4)$, and of C are $(-6,10)$.

a Write an equation of the altitude of $\triangle ABC$ from C to $\overline{AB}$. [4]

b Write an equation of the altitude of $\triangle ABC$ from B to $\overline{AC}$. [2]

c Find the x-coordinate of the point of intersection of the two altitudes in parts *a* and *b*. [2]

d Write an equation of the circle whose center is at the origin and which is tangent to the altitude in part *b*. [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	

Pupil...

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Monday, January 27, 1975 — 1:15 to 4:15 p.m., only

ANSWER SHEET

Part I Score:.....

Rater's Initials:

.....

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.....

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

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FOR TEACHERS ONLY

10 TENTH YEAR MATHEMATICS

Monday, January 27, 1975 — 1:15 to 4:15 p.m., only

Just before the start of the examination period, distribute one examination booklet, face up, to each pupil. Instruct the pupils to read the directions on the cover of the examination booklets, detach the answer sheet and reference tables, and fill in the heading on their answer sheet. When each pupil has received a booklet and finished filling in the heading of the answer sheet, instruct the pupils to open their examination booklets and begin work.

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.

SCORING KEY

Part I

Allow 2 credits for each correct answer; allow no partial credit. For questions 17–30, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 15

(2) 4

(3) 20

(4) 5

(5) 36

(6) 40

(7) $\overline{AB}$ or AB or c

(8) 28

(9) 12

(10) (3,6)

(11) 10

(12) 18

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

(14) 2

(15) 24

(16) 10π

(17) 3

(18) 3

(19) 2

(20) 1

(21) 2

(22) 1

(23) 4

(24) 2

(25) 4

(26) 2

(27) 1

(28) 3

(29) 1

(30) 3

[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.

(35) *a* 73 [4]

b 13 [2]

c 208 [2]

d $\frac{x}{x+14} = \frac{12}{20}$ [2]

(36) *c* 5 [3]

(37) *a* $y - 10 = -1(x + 6)$

or [4]

$x + y = 4$

b $y = 4$ [2]

c 0 [2]

d $x^2 + y^2 = 16$ [2]