The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Thursday, January 24, 1974 — 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.

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 vertex angle of an isosceles triangle measures 80°. How many degrees are there in the measure of a base angle?

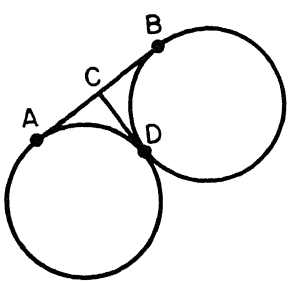
2 The measure of each side of an equilateral triangle is 10 inches. If the midpoints of the three sides are joined to form a second triangle, how many inches are there in the perimeter of the second triangle?

3 The area of sector AOB of circle O is one-fifth the area of circle O. Find the number of degrees in the measure of central angle AOB.

4 Two parallel lines are cut by a transversal. The measures of a pair of interior angles on the same side of the transversal are represented by $4x + 50$ and $3x - 10$. Find x.

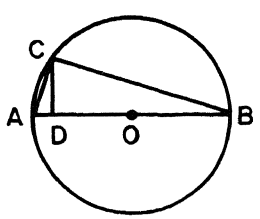
5 How many sides does a regular polygon have if the measure of one of its exterior angles is 45 degrees?

6 As shown in the accompanying figure, two circles are tangent at D. If $\overline{ACB}$, a common tangent, has a measure of 10, find the length of the tangent $\overline{CD}$.



7 Chords $\overline{CA}$ and $\overline{CB}$ are drawn from a point C on a circle. If $m\angle BCA = 40$, find $m\overset{\frown}{AB}$. [For uniqueness, $m\overset{\frown}{AB}$ refers to minor $\overset{\frown}{AB}$ only.]

8 In the accompanying diagram, $\overline{CD}$ is perpendicular to diameter $\overline{AOB}$ with C on circle O. If $AD = 1$ and $DB = 9$, find CD.



9 The measure of the minor arc of chord $\overline{AB}$ of a circle is 78 degrees. Find the number of degrees in the measure of the acute angle formed by $\overline{AB}$ and a line drawn tangent to the circle at A.

10 The endpoints of line segment $\overline{AB}$ are $A(-3,4)$ and $B(7,2)$. Find the coordinates of the midpoint of $\overline{AB}$.

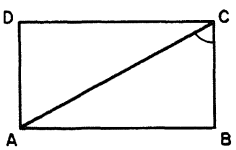
11 Find the distance between the points (2,4) and (5,0).

12 The measures of the sides of two similar hexagons are in a ratio of 1 : 3. What is the ratio of the area of the smaller hexagon to that of the larger?

13 Find the area of a square with a diagonal of length 8.

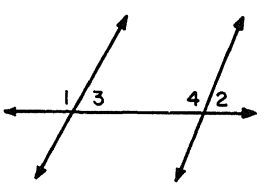
14 What is the length of a side of an equilateral triangle whose area is $36\sqrt{3}$?

15 In the accompanying figure, diagonal $\overline{AC}$ of rectangle $ABCD$ has length 40 and side $\overline{AB}$ has length 35. Find the measure of angle BCA to the nearest degree.



Directions (16–29): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

16 In the accompanying figure, two lines are intersected by a transversal so that $m\angle 1 > m\angle 2$. What conclusion can be made about angle 3 as compared with angle 4?



(1) $m\angle 4 > m\angle 3$
(2) $m\angle 3 > m\angle 4$
(3) $m\angle 3 = m\angle 4$
(4) $m\angle 3 \geqq m\angle 4$

17 In an isosceles triangle, the length of one of the legs is always
(1) equal to the length of the base
(2) equal to one-half of the length of the base
(3) greater than one-half of the length of the base
(4) less than one-half of the length of the base

18 In a 30–60–90 triangle, the length of the hypotenuse is represented by $6x$. The length of the side opposite the 30° angle, in terms of x, is

(1) $3x$ (3) $3x\sqrt{3}$

(2) $3x\sqrt{2}$ (4) $\sqrt{6x}$

19 In a given plane, the total number of points which are equidistant from two intersecting lines and also 5 inches from their point of intersection is

(1) 1 (3) 3

(2) 2 (4) 4

20 The length of each leg of an isosceles triangle is 13 and the length of the base is 10. The length of the altitude drawn to the base is

(1) 5 (3) 11½

(2) 6½ (4) 12

21 The three perpendicular bisectors of the sides of a triangle are concurrent in a point. If this point lies outside the triangle, the triangle must be

(1) acute (3) obtuse

(2) right (4) equiangular

22 What is the locus of the centers of all circles tangent to both of two parallel lines?

(1) a point (3) a line

(2) a circle (4) two lines

23 Quadrilateral $ABCD$ is inscribed in a circle. If $m\angle A = (90 - 2x)$, then $m\angle C$ can be expressed as

(1) $2x$ (3) $180 + 2x$

(2) $90 + 2x$ (4) $180 - 2x$

24 If quadrilateral $ABCD$ is a parallelogram, then which statement is *always* true?

(1) Diagonals $\overline{AC}$ and $\overline{DB}$ are congruent.

(2) Diagonals $\overline{AC}$ and $\overline{BD}$ are perpendicular.

(3) Diagonals $\overline{AC}$ and $\overline{BD}$ bisect each other.

(4) Diagonals $\overline{AC}$ and $\overline{BD}$ bisect the angles through which they pass.

25 The area of a trapezoid whose bases measure 6 and 14 is 80. What is the length of the altitude of the trapezoid?

(1) 8 (3) 10

(2) 2 (4) 4

26 Which is a converse of the statement, "If Rose is 18 years old, then she is eligible to vote"?

(1) If Rose is eligible to vote, then she is 18 years old.

(2) If Rose is not eligible to vote, then she is not 18 years old.

(3) If Rose is not 18 years old, then she is not eligible to vote.

(4) If Rose is 18 years old, then she is not eligible to vote.

27 Two chords intersect in the interior of a circle. The lengths of the segments of one chord are x and $x + 5$. The lengths of the segments of the other chord are 4 and 6. An equation that can be used to solve for x is

(1) $x(x + 5) = 24$

(2) $x + (x + 5) = 10$

(3) $\frac{x}{x + 5} = \frac{2}{3}$

(4) $\frac{x}{2x + 5} = \frac{4}{10}$

28 Angles A and B are supplementary, and angles B and C are complementary. If $m\angle A > 0$, $m\angle B > 0$, and $m\angle C > 0$, then $\angle A$ must be

(1) acute (3) right

(2) obtuse (4) straight

29 The slope of the line $y + 3x = 6$ is

(1) —6 (3) 3

(2) —3 (4) 6

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

30 *On the answer sheet*, construct an angle measuring 45°, having its vertex at point P.

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.

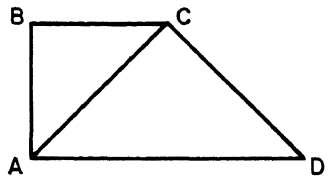
31 Prove *either a* or *b*, but *not* both: [10]

a The measure of an angle inscribed in a circle is equal to one-half the measure of its intercepted arc. [*Consider only the case where one side of the angle is a diameter.*]

OR

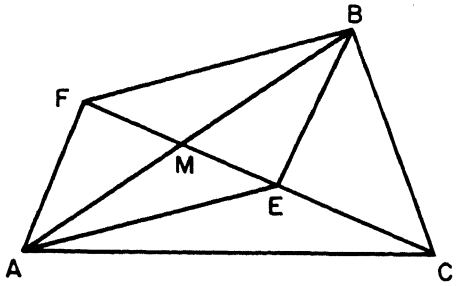
b The area of a triangle is equal to one-half the product of the length of one side and the length of the altitude drawn to that side.

32 Given: Quadrilateral $ABCD$, $\overline{AB} \perp \overline{BC}$, $\overline{AB} \perp \overline{AD}$, and $\overline{AC} \perp \overline{CD}$.



Prove: $BC \times AD = (AC)^2$ [10]

33 In the diagram below, $\overline{CM}$ is the median to side $\overline{AB}$ of triangle ABC, $\overline{CEMF}$, $\overline{BE} \perp \overline{CF}$ at E, $\overline{AF} \perp \overline{CF}$ at F, and $\overline{AE}$ and $\overline{BF}$ are drawn.



Prove: $AFBE$ is a parallelogram. [10]

34 The coordinates of the vertices of triangle ABC are $A(6,2)$, $B(-4,4)$, and $C(-2,-4)$.

a Find the coordinates of the midpoint D of side $\overline{AB}$ and the coordinates of the midpoint E of side $\overline{BC}$. [2]

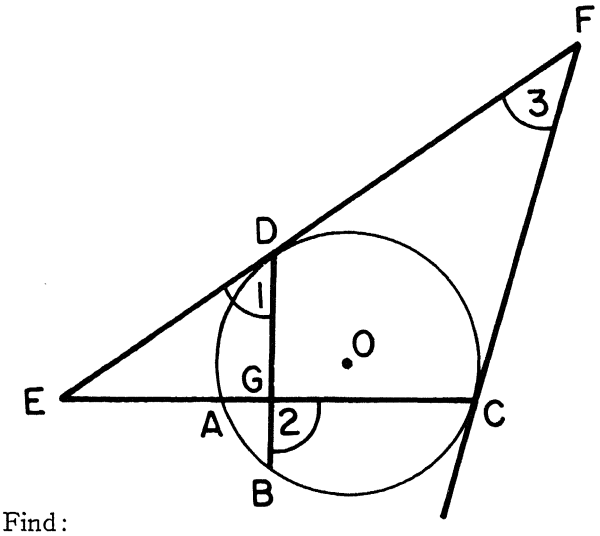
b By means of coordinate geometry show $\overline{DE} \parallel \overline{AC}$ and state a reason for your conclusion. [4]

c By means of coordinate geometry show that $DE = \frac{1}{2}AC$. [4]

35 In the diagram below, $\overleftrightarrow{FC}$ and $\overleftrightarrow{FD}$ are tangent to circle O at points C and D, respectively, and $\overline{FDE}$. Secant $\overline{EAC}$ intersects circle O at points A and C. Chords $\overline{AC}$ and $\overline{BD}$ intersect at G.

$m\overset{\frown}{AB} : m\overset{\frown}{BC} : m\overset{\frown}{CD} : m\overset{\frown}{DA} = 4:7:14:11$

[For uniqueness, $m\overset{\frown}{XY}$ refers to minor $\overset{\frown}{XY}$ only.]



Find:

a $m\overset{\frown}{AB}$, $m\overset{\frown}{BC}$, $m\overset{\frown}{CD}$, $m\overset{\frown}{DA}$ [4]
b $m\angle 1$ [2]
c $m\angle 2$ [2]
d $m\angle 3$ [2]

36 In triangle ABC, the bisector of angle B intersects $\overline{AC}$ at D. Prove that $BC > DC$. [10]

*37 In triangle ABC, the lengths of the sides opposite the angles A, B, and C are represented by a, b, and c, respectively.

a If $a = 8$, $b = 15$, and $m\angle C = 42$, using the formula area $= \frac{1}{2}a \cdot b \cdot \sin C$, find, to the *nearest integer*, the area of triangle ABC. [6]

b Find, to the *nearest integer*, the length of the altitude of triangle ABC drawn to side b. [4]

* 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	

Part I Score:
Rater's Initials:

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Thursday, January 24, 1974 — 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.

FOR TEACHERS ONLY

10 TENTH YEAR MATHEMATICS

Thursday, January 24, 1974 — 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 booklet, 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 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 16–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 50

(2) 15

(3) 72

(4) 20

(5) 8

(6) 5

(7) 80

(8) 3

(9) 39

(10) (2,3)

(11) 5

(12) 1:9 *or* $\frac{1}{9}$

(13) 32

(14) 12

(15) 61

(16) 1

(17) 3

(18) 1

(19) 4

(20) 4

(21) 3

(22) 3

(23) 2

(24) 3

(25) 1

(26) 1

(27) 1

(28) 2

(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.

(34) *a* $D(1,3)$
$E(-3,0)$ [2]

(35) *a* $m\widehat{AB} = 40$
$m\widehat{BC} = 70$
$m\widehat{CD} = 140$
$m\widehat{DA} = 110$ [4]

b 75 [2]

c 90 [2]

d 40 [2]

(37) *a* 40 [6]

b 5 [4]

DO YOU KNOW . . .

. . . that practically all objective questions used on the Regents examinations have been "pretested" on a representative sample of students in New York State schools?

Over 6,000 questions in 16 subject areas were tried out in May 1972. These questions were assembled into 267 pretest forms that could be administered in a single classroom period. Some 53,000 students in 355 schools throughout New York State participated in this pretesting of questions for possible use in future Regents examinations.