The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Wednesday, August 14, 1974 — 8:30 to 11:30 a.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 In the accompanying figure, $\triangle ABC$ is isosceles, $\overline{AB} \cong \overline{AC}$, and m $\angle A = 40$. Find the number of degrees in the measure of exterior angle ACD.
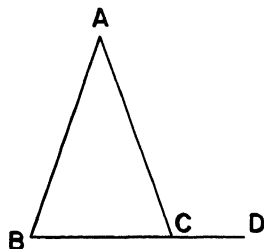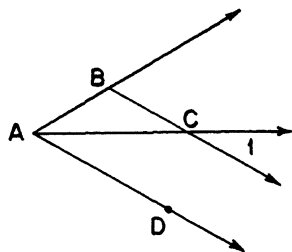
2 The coordinates of three vertices of a rectangle are $(0,0)$, $(-3,0)$, and $(-3,-4)$. Find the coordinates of the fourth vertex.

3 Two straight lines $\overset{\leftrightarrow}{RS}$ and $\overset{\leftrightarrow}{XY}$ intersect at point K. What is the total number of points that are 3 inches from point K and also equally distant from $\overset{\leftrightarrow}{RS}$ and $\overset{\leftrightarrow}{XY}$?

4 The length of the diameter $\overline{AOB}$ of circle O equals 8; C is any point on the circle except A and B. In triangle ABC, what is the maximum length of the altitude drawn from C to $\overline{AB}$ for the various permissible positions of C?

5 A quadrilateral is inscribed in a circle. The number of degrees in the measures of two opposite angles of the quadrilateral are represented by $3x$ and $7x$. Find x.

6 In the accompanying diagram, $\overset{\rightarrow}{AD} \parallel \overset{\rightarrow}{BC}$ and $\angle BAC \cong \angle DAC$. If m $\angle BAD = x$, express m $\angle 1$ in terms of x.

7 The coordinates of the opposite vertices of quadrilateral $ABCD$ are $A(0,0)$ and $C(k,0)$. If $AC = 10$, find the positive value of k.

8 In rhombus $ABCD$, the lengths of diagonals $\overline{AC}$ and $\overline{BD}$ are 6 and 8, respectively. What is the length of side $\overline{AB}$?

9 In the accompanying diagram, $\triangle ABD$ and $\triangle CBD$ have the angle measures indicated. Which is the *shortest* line segment?
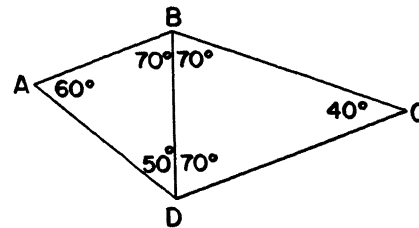
10 In $\triangle ABC$, D is a point on $\overline{AB}$, and E is a point on $\overline{AC}$ such that $\overline{DE}$ is parallel to $\overline{BC}$. If $AD = 6$, $AB = 9$, and $AE = 8$, find the length of $\overline{AC}$.

11 In the accompanying figure, $\overline{BA}$ is tangent to circle O at A and $\overline{BCD}$ is a secant. If m $\angle B = 40$ and m$\overset{\frown}{AC} = 40$, find m$\overset{\frown}{AD}$.
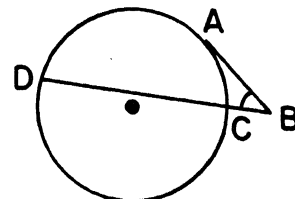
12 The lengths of the corresponding altitudes of two similar triangles are 6 and 8, respectively. If the area of the smaller triangle is 36, what is the area of the *larger* triangle?

13 A regular hexagon is inscribed in a circle whose radius has length 4. Find the perimeter of the hexagon.

14 Find the area of a circle whose circumference is 10π.

15 The lengths of the bases of a trapezoid are represented by $2x$ and $3x$, respectively. If the area of the trapezoid is 60 and its altitude measures 8, find x.

16 In circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at point E. If $AE = 3x$, $EB = x$, $ED = 12$, and $CE = 1$, find x.

17 In a right triangle, the length of the hypotenuse is 10. If the length of one leg is 6, find, to the *nearest degree*, the measure of the angle opposite this leg.

18 If the measure of an exterior angle of a regular polygon is greater than 50° and less than 55°, how many sides does the polygon have?

(1) 5   (3) 9
(2) 7   (4) 11

19 The graph of the equation $y = 4x - 6$ intersects the y-axis at the point

(1) $(0,-2)$ (3) $(0,-6)$
(2) $(0,-4)$ (4) $(0,6)$

20 If a side of an equilateral triangle has length 6, the length of an altitude of this triangle is

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

21 What is the measure, in degrees, of the complement of an angle whose measure is $(30 - x)$ degrees?

(1) $(60 + x)$ (3) 30
(2) $(60 - x)$ (4) 60

22 Given the proportion, $\dfrac{m}{a} = \dfrac{h}{k}$. If m, a, h, and k are all different positive numbers, then which is *not* true?

(1) $\dfrac{h}{m} = \dfrac{a}{k}$ (3) $ah = mk$

(2) $\dfrac{k}{h} = \dfrac{a}{m}$ (4) $\dfrac{m + a}{a} = \dfrac{h + k}{k}$

23 The diagonals of a quadrilateral always divide it into four nonoverlapping congruent triangles if the quadrilateral is a

(1) parallelogram   (3) trapezoid
(2) rectangle   (4) rhombus

24 If congruent circles O and O' intersect at points A and B, then triangle OAO' is always

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

25 Given the statement: "If two sides of a triangle are congruent, the angles opposite these sides are congruent." This statement is best classified as

(1) a theorem
(2) a definition
(3) a postulate
(4) an incorrect statement

26 When the statement, "If A, then B" is true, which other statement must also be true?

(1) "If B, then A."
(2) "If not A, then B."
(3) "If not B, then A."
(4) "If not B, then not A."

27 The length of a diagonal of a square is represented by $2x$. The area of the square, in terms of x, is

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

28 What is the slope of any line that is parallel to the line whose equation is $y = 6x + 7$?

(1) 6   (3) 7
(2) -6 (4) -7

29 In a circle with radius of length 8, the measure in degrees of central $\angle AOB$ is 45°. The length of minor $\overparen{AB}$ is

(1) π (3) 8π
(2) 2π (4) 4π

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

30 *On the answer sheet*, locate by construction the point P on circle O that is equidistant from the sides of inscribed angle 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.

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

31 a The measure of an angle formed by two chords intersecting inside the circle is equal to one-half the sum of the measures of the intercepted arcs.

OR

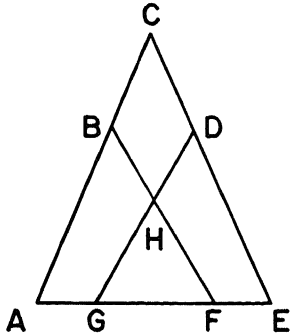b The square of the length of the hypotenuse of a right triangle is equal to the sum of the squares of the lengths of the legs.

32 The vertices of quadrilateral $ABCD$ are $A(-4,-1)$, $B(5,-2)$, $C(2,3)$, and $D(-7,4)$.
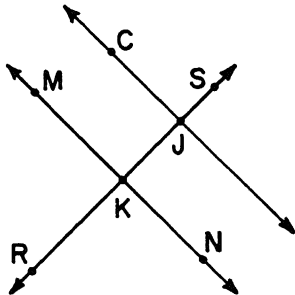
Using coordinate geometry, show:

a $\overline{AB} \parallel \overline{CD}$, stating a reason for the conclusion   [4]
b $AB = CD$ [3]
c $\overline{AC}$ and $\overline{BD}$ bisect each other   [3]

33 Given: $\overline{CBA} \cong \overline{CDE}$,

$\overline{CB} \cong \overline{CD}$,

$\overline{AF} \cong \overline{GE}$,

$\overline{AGFE}, \overline{BHF}, \overline{DHG}$

Prove: a $\overline{BF} \cong \overline{DG}$ [6]

b $\overline{BH} \cong \overline{HD}$ [4]

34 Given: Lines $\overleftrightarrow{MN}$ and $\overleftrightarrow{RS}$ are perpendicular and intersect at point K as shown in the figure. J is a point on $\overleftrightarrow{RS}$ such that $KJ = 2$ and $\overleftrightarrow{CJ}$ is drawn parallel to $\overleftrightarrow{MN}$.


a Describe fully: (1) the locus of points equidistant from $\overleftrightarrow{MN}$ and $\overleftrightarrow{RS}$ [4]

(2) the locus of points d units from $\overleftrightarrow{CJ}$ [4]

b How many points are there which satisfy the conditions in both 1 and 2 in part a if:

(1) $d = 1$ [1]

(2) $d = 2$ [1]

35 Given: Right $\triangle ABC$ with $\angle C$ the right angle and square $DEFH$ so that $\overline{ADEB}, \overline{CHA},$ and $\overline{CFB}$, as shown in the accompanying diagram.
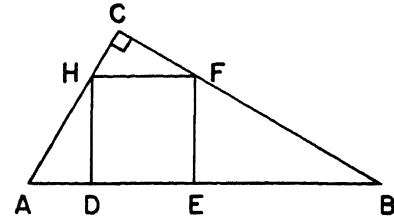
Prove: a $\dfrac{AD}{HC} = \dfrac{DH}{CF}$ [7]

b $\dfrac{AD}{HC} = \dfrac{EF}{CF}$ [3]

36 In the accompanying figure, $\overline{PCD}$ and $\overline{PBA}$ are secants from external point P to circle O. Chords $\overline{DA}, \overline{DB}, \overline{CA},$ and $\overline{CB}$ are drawn. $m\overset{\frown}{AB} = m\overset{\frown}{BC}$; $m\overset{\frown}{CD}$ is twice $m\overset{\frown}{BC}$; $m\overset{\frown}{DA}$ is 60 more than $m\overset{\frown}{CD}$.
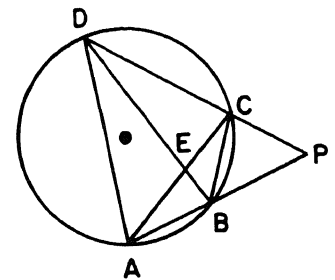
a If $m\overset{\frown}{AB} = x$, write an equation and solve for x. [4]

b Find: (1) $m\angle DAC$ [2]

(2) $m\angle CEB$ [2]

(3) $m\angle CPB$ [2]

*37 Parallelogram $ABCD$ has vertices $A(2,-1)$, $B(8,-1)$, and $D(4,k)$. The slope of $\overline{AD}$ is equal to 2.

a Find k. [3]

b Find the coordinates of C. [2]

c Write an equation of the line containing side $\overline{DC}$. [2]

d Write an equation of the line perpendicular to $\overline{AD}$ at A. [3]

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

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	

FOR TEACHERS ONLY

10 TENTH YEAR MATHEMATICS

Wednesday, August 14, 1974 — 8:30 to 11:30 a.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 18–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 110	(11) 120	(21) 1
(2) (0, —4)	(12) 64	(22) 1
(3) 4	(13) 24	(23) 4
(4) 4	(14) 25π	(24) 3
(5) 18	(15) 3	(25) 1
(6) $\dfrac{x}{2}$	(16) 2	(26) 4
(7) 10	(17) 37	(27) 2
(8) 5	(18) 2	(28) 1
(9) $\overline{AB}$	(19) 3	(29) 2
(10) 12	(20) 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* (1) two lines bisecting the four angles formed   [4]

      (2) two lines parallel to $\overleftrightarrow{CJ}$ and *d* units from it   [4]

  b (1) 4   [1]

      (2) 3   [1]

(36) *a* 50   [4]

  b (1) 50   [2]

      (2) 105   [2]

      (3) 55   [2]

(37) *a* 3   [3]

  b (10,3)   [2]

  c $y = 3$ [2]

  d $y + 1 = -\frac{1}{2}(x - 2)$

      or   [3]

      $2y + x = 0$