The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Friday, April 1, 1977 — 9:15 a.m. to 12:15 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.

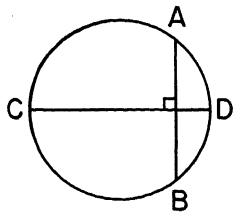
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN

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 lengths of the corresponding sides of two similar pentagons are in the ratio 2:5. If the perimeter of the smaller pentagon is 12, find the perimeter of the larger pentagon.

2 In the accompanying diagram, chord $\overline{AB}$ is perpendicular to diameter $\overline{CD}$. If $m\overset{\frown}{AD} = 50$, find $m\overset{\frown}{CB}$.



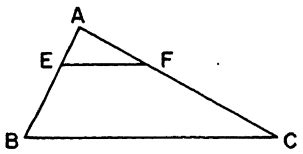
3 In parallelogram $ABCD$, $m\angle A = 3y - 25$ and $m\angle B = 2y + 10$. Find the value of y.

4 If in triangle ABC, $BC > AB$ and $m\angle A = 60$, which angle of the triangle has the greatest measure?

5 The bases of an isosceles trapezoid are 6 and 14, respectively, and the legs are 5. What is the length of the altitude of the trapezoid?

6 The area of a triangle is 36. If one side of the triangle has length 12, find the length of the altitude drawn to that side.

7 In the accompanying diagram, $\overline{EF} \parallel \overline{BC}$. If $AE = 3$, $AB = 9$, and $BC = 12$, find EF.



8 Given trapezoid $ABCD$ with bases $\overline{AB}$ and $\overline{DC}$ and median $\overline{EF}$. If $AB = 12$ and $EF = 9$, find DC.

9 If the length of the apothem of a regular hexagon is 5, find the length of the diameter of the circle that is *inscribed* in this regular hexagon.

10 In triangle ABC, $m\angle A = 42$, $m\angle C = 90$, and $AC = 10$. Find to the *nearest integer*, the length of $\overline{BC}$.

11 The area of a rhombus is 35. If the length of one diagonal is 10, find the length of the other diagonal.

Directions (12–29): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

12 In triangle ABC, angle C is a right angle, and $\overline{CD}$ is the median to hypotenuse $\overline{AB}$. If $AB = 8$, then CD equals

(1) 6 (3) 8
(2) 2 (4) 4

13 The base angles of an isosceles triangle each measure twice the number of degrees in the measure of the vertex angle. What is the measure, in degrees, of the vertex angle?

(1) 36 (3) 60
(2) 45 (4) 75

14 If line $\overleftrightarrow{AB}$ has a slope of $-\frac{1}{2}$, what is the slope of a line parallel to $\overleftrightarrow{AB}$?

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

15 Which figure can *not* always be inscribed in a circle?

(1) square (3) equilateral triangle
(2) parallelogram (4) rectangle

16 The coordinates of three of the vertices of a rectangle are $(0,0)$, $(0,a)$, and $(b,0)$. What are the coordinates of the fourth vertex?

(1) (b,a) (3) $(0,b)$
(2) $(a,0)$ (4) (a,b)

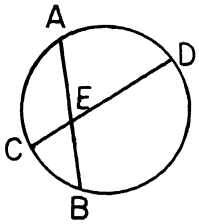
17 In $\triangle ABC$, $m\angle A = 60$, $m\angle B = 30$, and $m\angle C = 90$. If $AB = 40$, then the length of $\overline{CB}$ is

(1) 20 (3) $20\sqrt{3}$
(2) 40 (4) $40\sqrt{3}$

18 What is the total number of points equidistant from two intersecting lines and at a given distance from the point of intersection?

(1) 1 (3) 3
(2) 2 (4) 4

19 In the accompanying diagram, chords $\overline{AB}$ and $\overline{CD}$ of a circle intersect at point E. If $AE = 3$, $EB = 2$, and $DE = 4$, what is the length of $\overline{CE}$?



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

20 If two sides of a triangle have lengths of 7 and 11, then the length of the third side could be

(1) $1\frac{1}{2}$ (3) $18\frac{1}{4}$
(2) $6\frac{1}{3}$ (4) $20\frac{2}{3}$

21 What is the radius of a circle whose area is 36π?

(1) 6 (3) 18
(2) 6π (4) 18π

22 A square is best defined as a

(1) parallelogram with one right angle
(2) quadrilateral with four right angles
(3) quadrilateral with perpendicular diagonals
(4) rhombus with one right angle

23 If, in right triangle ABC, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$, then $\triangle ACD$ and $\triangle CBD$ are always

(1) congruent (3) equal in area
(2) similar (4) isosceles

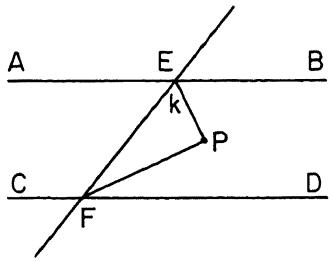
24 A circle whose center has coordinates (3,5) passes through the point (6,10). What is the length of the radius of the circle?

(1) $\sqrt{20}$ (3) 8
(2) $\sqrt{34}$ (4) $\sqrt{306}$

25 From external point P, tangents $\overline{PA}$ and $\overline{PB}$ are drawn to circle O at A and B, respectively. If $m\angle APB = 100$, what is the number of degrees in the measure of minor arc AB?

(1) 60 (3) 80
(2) 70 (4) 90

26 In the accompanying diagram, parallel lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are cut by transversal $\overleftrightarrow{EF}$ at E and F, respectively. The bisectors of $\angle BEF$ and $\angle DFE$ meet at P. If $m\angle FEP = k$, what is $m\angle EPF$?



(1) $90 - 2k$ (3) 90
(2) $90 - k$ (4) $180 - 2k$

27 If $\overline{AB}$ bisects $\overline{CD}$ at point E, then

(1) $\overline{AB} \cong \overline{CD}$ (3) $\overline{AE} \cong \overline{ED}$
(2) $\overline{CE} \cong \overline{DE}$ (4) $\overline{AE} \cong \overline{BE}$

28 Which is an equation of the locus of points whose abscissas are each $\frac{1}{2}$ of their ordinates?

(1) $x = \frac{1}{2}y$ (3) $\frac{1}{2}y + x = 0$
(2) $y = \frac{1}{2}x$ (4) $x + 2y = 0$

29 In rhombus $PQRS$, diagonals $\overline{PR}$ and $\overline{QS}$ intersect at point T. If $m\angle QPS = 98$, what is the measure of $\angle TSP$?

(1) 98 (3) 49
(2) 82 (4) 41

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

30 *On the answer sheet,* circumscribe a circle about square $ABCD$.

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.

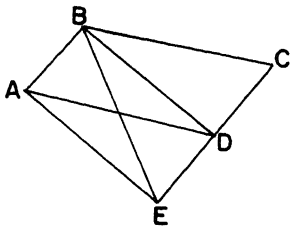
31 Prove *either a* or *b* but *not* both:

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

OR

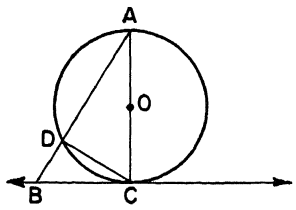
b The area of a trapezoid is equal to one-half the product of the length of the altitude and the sum of the lengths of the bases. [10]

32 Given: $ABCD$ is a parallelogram, $ABDE$ is a rectangle, and $\overline{EDC}$.



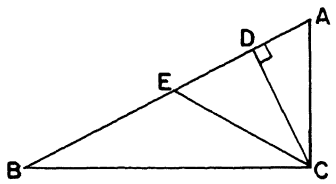
Prove: $\triangle EBC$ is isosceles. [10]

33 Given: circle O with diameter $\overline{AC}$, tangent $\overleftrightarrow{BC}$, chord $\overline{CD}$, secant $\overline{ADB}$, $\overline{CD} \perp \overline{AB}$.



Prove: $AB \times CD = AC \times BC$ [10]

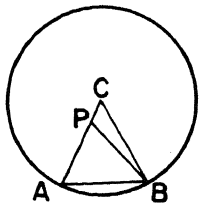
34 In the accompanying diagram, triangle ABC is a right triangle with right angle at C. Altitude $\overline{CD}$ and median $\overline{CE}$ are drawn to the hypotenuse $\overline{AB}$.



If $AD = 8$ and $BD = 18$, find

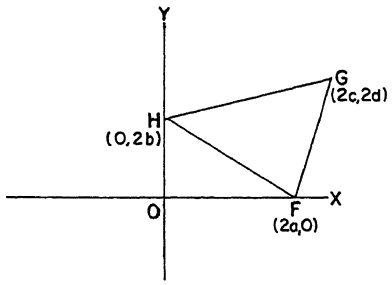
a the length of altitude $\overline{CD}$ [2]
b the length of $\overline{AC}$ in radical form [2]
c the length of median $\overline{CE}$ [2]
d the length of $\overline{DE}$ [1]
e m$\angle DEC$ to the *nearest degree* [3]

35 In circle C, radii $\overline{CA}$ and $\overline{CB}$ and chord $\overline{AB}$ are drawn. Point P is a point on $\overline{CA}$; $\overline{PB}$ is drawn.



Prove: $PB > PA$ [10]

36 In the accompanying diagram, the vertices of triangle FGH are $F(2a,0)$, $G(2c,2d)$, and $H(0,2b)$.



a Find the coordinates of M, the midpoint of $\overline{GF}$, and N, the midpoint of $\overline{GH}$. [4]
b Find the slope of $\overline{HF}$. [2]
c Show by means of coordinate geometry that $\overline{MN}$ is parallel to $\overline{HF}$, and state a reason for the conclusion. [4]

37 The coordinates of the vertices of a quadrilateral are $A(1,2)$, $B(8,3)$, $C(9,10)$, and $D(2,9)$.

a Show by means of coordinate geometry that $ABCD$ is a rhombus, and state a reason for the conclusion. [7]

b Write an equation of $\overleftrightarrow{AD}$. [3]

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	

FOR TEACHERS ONLY

10

SCORING KEY

TENTH YEAR MATHEMATICS

Friday, April 1, 1977 — 9:15 a.m. to 12:15 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 12–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 30

(2) 130

(3) 39

(4) $\angle B$ *or* B

(5) 3

(6) 6

(7) 4

(8) 6

(9) 10

(10) 9

(11) 7

(12) 4

(13) 1

(14) 1

(15) 2

(16) 1

(17) 3

(18) 4

(19) 3

(20) 2

(21) 1

(22) 4

(23) 2

(24) 2

(25) 3

(26) 3

(27) 2

(28) 1

(29) 4

[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* 12 [2]
b $\sqrt{208}$ [2]
c 13 [2]
d 5 [1]
e 67 [3]

(36) *a* $M((a+c),d)$ [2]
$N(c,(b+d))$ [2]
b $-\frac{b}{a}$ [2]

(37) *b* $7x - y = 5$
OR [3]
$y - 2 = 7(x - 1)$