The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Wednesday, June 18, 1980 — 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 Trignometric 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 triangle ABC, the measure of angle B is twice the measure of angle A and an exterior angle at vertex C measures 120°. What is the measure in degrees of angle A?

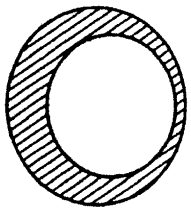
2 The length of the radius of a circle is 8. What is the length of a diagonal of a rectangle inscribed in the circle?

3 The sides of a triangle have lengths of 6, 8, and 10. What is the perimeter of the triangle formed by joining the midpoints of these sides?

4 What is the total number of points that are equidistant from two intersecting lines and are also a distance of 4 centimeters from the point of intersection of the lines?

5 What is the area of a right triangle that has sides of lengths 5, 12, and 13?

6 As shown in the accompanying diagram, a small circle lies in the interior of a larger circle. If the lengths of the radii of the two circles are 6 and 9, respectively, find the area of the shaded region. [*Answer may be left in terms of* π.]



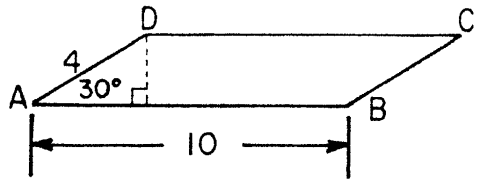
7 The coordinates of the center of a circle are (3,7). If the circle is tangent to the y-axis at point P, what are the coordinates of P?

8 The coordinates of the vertices of right triangle ABC are $A(0,4)$, $B(0,0)$, and $C(4,0)$. Find the length of hypotenuse $\overline{AC}$ in radical form.

9 The midpoint M of line segment $\overline{AB}$ has coordinates (4,9). If the coordinates of A are (2,8), what are the coordinates of B?

10 In isosceles trapezoid $DEFG$, $m\angle D$ is three times $m\angle F$. Find $m\angle F$.

11 In the accompanying figure of parallelogram $ABCD$, $m\angle A = 30$, $AB = 10$, and $AD = 4$. What is the area of the parallelogram?



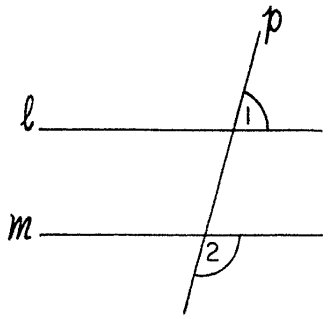
12 A vertical pole 20 meters tall casts a shadow 16 meters long on level ground. Find, to the *nearest degree*, the measure of the angle of elevation of the sun.

13 The measures of the three angles of a triangle are in the ratio 1:4:5. What is the number of degrees in the measure of the *smallest* angle?

14 Chords $\overline{AB}$ and $\overline{CD}$ of circle O intersect at E. If $AE = 4$, $EB = 5$, and $CE = 2$, find DE.

Directions (15–29): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

15 In the accompanying diagram, $\angle 1$ and $\angle 2$ are supplementary. Which is *always* true?



(1) $\ell \perp p$
(2) $\ell \perp m$
(3) $\ell \parallel m$
(4) $p \parallel m$

16 The lengths of the corresponding sides of two similar polygons are in the ratio 3:5. If the perimeter of the larger polygon is 100, the perimeter of the smaller polygon is

(1) 64
(2) 60
(3) 36
(4) 30

17 A rectangle has a diagonal of length 10 and one side of length 6. What is the perimeter of the rectangle?

(1) 14 (3) 28
(2) 21 (4) 48

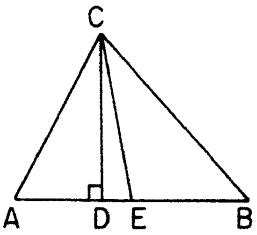
18 In equilateral triangle ABC, $\overline{AD}$ and $\overline{BE}$, the bisectors of angles A and B, respectively, intersect at point F. What is $m\angle AFB$?

(1) 60 (3) 120
(2) 90 (4) 150

19 The measure of an exterior angle of a regular polygon is 45°. What is the total number of sides of the polygon?

(1) 9 (3) 7
(2) 8 (4) 6

20 In the accompanying diagram of scalene triangle ABC, median $\overline{CE}$ and altitude $\overline{CD}$ are drawn to side $\overline{AB}$. If $CE = 6$, then the length of $\overline{CD}$ could be



(1) 8 (3) 6
(2) 7 (4) 5

21 What is the converse of the statement, "If it has green horns, then it is a fizzgig"?

(1) No fizzgig has green horns.
(2) If it is a fizzgig, then it has green horns.
(3) If it is not a fizzgig, then it does not have green horns.
(4) If it does not have green horns, then it is a fizzgig.

22 The altitude drawn to the hypotenuse of a right triangle divides the hypotenuse into two segments of lengths 3 and 12. What is the length of this altitude?

(1) 36 (3) 6
(2) 18 (4) 4

23 In isosceles triangle ABC, $\overline{AC} \cong \overline{BC}$ and D is a point lying between A and B on base $\overline{AB}$. If $\overline{CD}$ is drawn, then which is true?

(1) $AC > CD$ (3) $m\angle A > m\angle ADC$
(2) $CD > AC$ (4) $m\angle B > m\angle BDC$

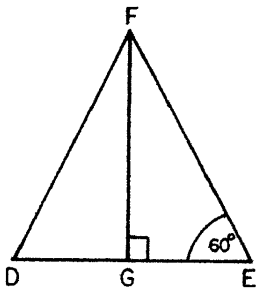
24 The area of a square whose perimeter is $8k$ is

(1) $8k^2$ (3) $4k^2\sqrt{2}$
(2) $4k\sqrt{2}$ (4) $4k^2$

25 If the diagonals of a rhombus have lengths of 6 and 12, the area of the rhombus is

(1) 72 (3) 30
(2) 36 (4) 18

26 In the accompanying figure, altitude $\overline{FG}$ is drawn in triangle DEF. If $DE = 8$, $DG = 4$, and $m\angle E = 60$, what is the length of $\overline{EF}$?



(1) $\frac{8\sqrt{3}}{3}$ (3) 8
(2) $8\sqrt{3}$ (4) $4\sqrt{3}$

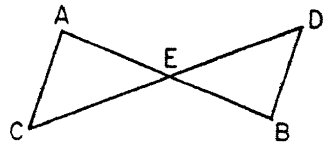
27 The lengths of the bases of a trapezoid are represented by $x + 2$ and $3x - 8$. In terms of x, the length of the median of the trapezoid is

(1) $x - 10$ (3) $4x - 6$
(2) $2x - 3$ (4) $4x - 10$

28 Which line is parallel to the line $y = 2x + 4$?

(1) $y = 2x + 6$ (3) $y = 4x - 2$
(2) $y = 4 - 2x$ (4) $2y = x - 2$

29 In the accompanying diagram, $\overline{AB}$ and $\overline{CD}$ intersect at E and $\angle A \cong \angle B$. Which additional information is needed to show that $\triangle ACE \cong \triangle DBE$?



(1) $\overline{AC} \cong \overline{BD}$ (3) $\overline{AC} \parallel \overline{BD}$
(2) $\overline{AB} \cong \overline{CD}$ (4) $\angle C \cong \angle D$

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

30 *On the answer sheet*, construct an equilateral triangle with one vertex at A.

GO RIGHT ON TO THE NEXT PAGE.

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.

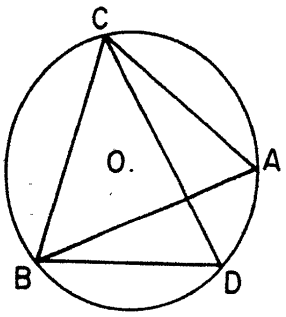
31 Prove *either a* or *b* but *not* both.

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: circle O, chords $\overline{AC}$, $\overline{BD}$, $\overline{BC}$, $\overline{CD}$, and $\overline{AB}$, $\overline{AC} \cong \overline{BD}$.



Prove: $\triangle CAB \cong \triangle BDC$ [10]

33 Points R and S are 4 units apart.

a Describe fully the locus of points equidistant from R and S. [3]

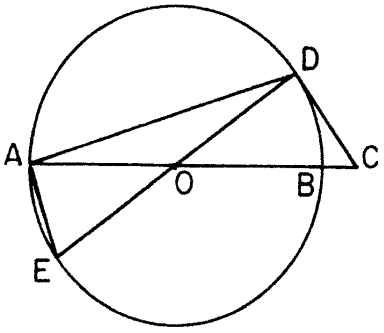
b Describe fully the locus of points d units from S. [3]

c How many points satisfy the conditions in parts *a* and *b* simultaneously for the following values of d?

(1) $d = 4$ [2]

(2) $d = 2$ [2]

34 In circle O, diameter $\overline{AB}$ is extended to point C, $\overline{CD}$ is tangent to the circle at D, diameter $\overline{DE}$ has length 20, and $m\overset{\frown}{BD}:m\overset{\frown}{AD} = 1:4$. Chords $\overline{AE}$ and $\overline{AD}$ are drawn.



Find:

a $m\overset{\frown}{BD}$ [2]

b $m\angle E$ [2]

c $m\angle C$ [2]

d CD to the *nearest tenth* [4]

35 The vertices of quadrilateral $ABCD$ are $A(3,2)$, $B(7,4)$, $C(9,8)$, and $D(5,6)$.

Show by means of coordinate geometry, and state reasons for your conclusions:

a $\overline{AC}$ and $\overline{BD}$ bisect each other [6]

b $ABCD$ is a rhombus [4]

36 Prove: An altitude of an acute scalene triangle can *not* bisect the angle from whose vertex it is drawn. [10]

*37 Given: points $A(1,-1)$, $B(5,7)$, $C(0,4)$, and $D(3,k)$.

a Find the slope of $\overleftrightarrow{AB}$. [2]

b Express the slope of $\overleftrightarrow{CD}$ in terms of k. [3]

c If $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, find k. [2]

d Write an equation of $\overleftrightarrow{CD}$. [3]

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

THE UNIVERSITY OF THE STATE OF NEW YORK

THE STATE EDUCATION DEPARTMENT

DIVISION OF 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

Wednesday, June 18, 1980 — 9:15 a.m. to 12:15 p.m., only

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

ANSWER SHEET

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

School.....

Name and author of textbook used.....

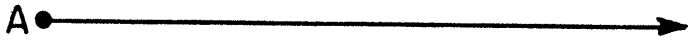
Your answers to Part I should be recorded on this answer sheet.

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.**

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

FOR TEACHERS ONLY

10

SCORING KEY

TENTH YEAR MATHEMATICS

Wednesday, June 18, 1980 — 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 15–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 40

(2) 16

(3) 12

(4) 4

(5) 30

(6) 45π

(7) (0,7) *or* $\begin{matrix} x = 0 \\ y = 7 \end{matrix}$

(8) $4\sqrt{2}$ *or* $\sqrt{32}$

(9) (6,10) *or* $\begin{matrix} x = 6 \\ y = 10 \end{matrix}$

(10) 45

(11) 20

(12) 51

(13) 18

(14) 10

(15) 3

(16) 2

(17) 3

(18) 3

(19) 2

(20) 4

(21) 2

(22) 3

(23) 1

(24) 4

(25) 2

(26) 3

(27) 2

(28) 1

(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.

(33) *a* the perpendicular bisector of $\overline{RS}$ [3]

b a circle with center at S and radius d [3]

c (1) 2 [2]
(2) 1 [2]

(34) *a* 36 [2]

b 72 [2]

c 54 [2]

d 7.3 [4]

(37) *a* 2 [2]

b $\frac{k-4}{3}$ [3]

c 10 [2]

d $y = 2x + 4$ [3]