The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

B

TENTH YEAR MATHEMATICS

Thursday, June 23, 1977 — 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

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Part I

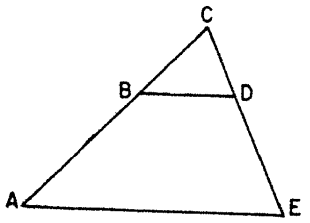
Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Unless otherwise specified, answers may be left in terms of π or in radical form. Write your answers in the spaces provided on the separate answer sheet.

1 The measures of the angles of triangle ABC are in the ratio 1:4:10. Find the number of degrees in the measure of the *smallest* angle.

2 The lengths of the sides of a triangle are 8, 10, and 14, respectively. Find the perimeter of the triangle formed by joining the midpoints of the sides of the triangle.

3 Three of the vertices of square $EFGH$ have coordinates $E(1,1)$, $F(5,1)$, and $G(5,5)$. Find the coordinates of point H.

4 In the accompanying diagram, $\overline{BD}$ is parallel to $\overline{AE}$. If $CB = 2$, $CD = 3$, and $CA = 6$, find the length of $\overline{CE}$.



5 In an isosceles right triangle, the length of the altitude to the hypotenuse is 2 centimeters. Find the number of centimeters in the length of the hypotenuse.

6 Find the area of a square that is inscribed in a circle whose diameter is 20.

7 The coordinates of the endpoints of a diameter of a circle are (4,5) and (8,−1), respectively. What are the coordinates of the center of the circle?

8 Find the number of degrees in the measure of each interior angle of a regular polygon of 8 sides.

9 The area of an equilateral triangle is $16\sqrt{3}$. Find the length of a side of the triangle.

10 The lengths of the bases of an isosceles trapezoid are 10 and 16. Each of the base angles measures 45°. Find the length of the altitude of the trapezoid.

11 Write an equation of the locus of points such that their abscissas exceed twice their ordinates by 3.

12 A tangent and a secant are drawn to a circle from an external point. If the length of the secant is 8 and the length of its external segment is 2, find the length of the tangent.

13 In right triangle ABC, $m\angle C = 90$ and $m\angle B = 30$. If $AB = 12$, find AC.

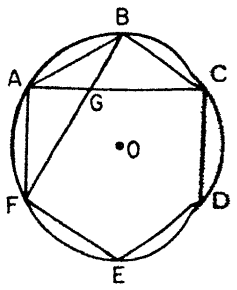
14 Quadrilateral $ABCD$ is inscribed in circle O. If $m\angle B = 4x - 5$ and $m\angle D = x + 10$, find x.

15 In circle O, the area of sector BOC is 20π and the measure of the angle of the sector is 72°. Find the length of the radius of the circle.

16 From an external point C, two lines are drawn tangent to circle O at points D and E. If $m\angle DCE = 80$, find the number of degrees in the measure of the minor arc $\overset{\frown}{DE}$.

17 From a point on level ground 10 meters from the foot of a vertical pole, the angle of elevation of the top of the pole measures 38°. Find the height of the pole to the *nearest meter*.

18 In the accompanying diagram, $ABCDEF$ is a regular hexagon inscribed in circle O with $\overline{AGC}$ and $\overline{FGB}$. Find $m\angle AGB$.



Directions (19–29): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

19 Two isosceles triangles with congruent vertex angles are always

(1) congruent
(2) equilateral
(3) similar
(4) right

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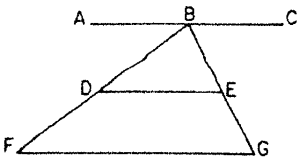
20 In the accompanying figure, if $\overline{AC} \parallel \overline{DE}$, $\overline{DE} \parallel \overline{FG}$, and $\overline{BD} \cong \overline{DF}$, which is true?



(1) $\overline{DE} \cong \overline{FG}$
(2) $\overline{DF} \cong \overline{EG}$
(3) $\overline{BD} \cong \overline{BE}$
(4) $\overline{BE} \cong \overline{EG}$

21 What is the length of $\overline{PQ}$ if point P has the coordinates $(3,-2)$ and point Q has the coordinates $(-2,-14)$?

(1) 17
(2) $\sqrt{17}$
(3) $\sqrt{145}$
(4) 13

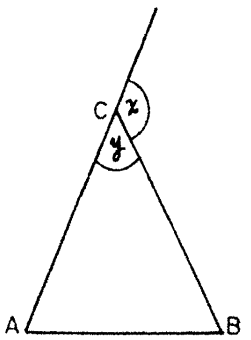
22 The ratio of the circumference of a circle to its diameter is *exactly* equal to

(1) π
(2) 2π
(3) 3.14
(4) $\frac{22}{7}$

23 In a given plane, the locus of points equidistant from the *three* vertices of a triangle is

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

24 In the accompanying figure, triangle ABC is isosceles with $\overline{AC} \cong \overline{BC}$. If y is the measure of the vertex angle C and x is the measure of the exterior angle at C, then what is the measure in degrees of each base angle of the triangle?



(1) $\frac{1}{2}x$
(2) $\frac{1}{2}y$
(3) $90 - x$
(4) $180 - y$

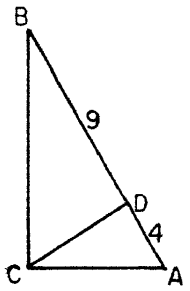
25 Which set of numbers can *not* be the lengths of the sides of a right triangle?

(1) $\{1,1,\sqrt{2}\}$
(2) $\{2,2,\sqrt{7}\}$
(3) $\{3,4,5\}$
(4) $\{1,2,\sqrt{5}\}$

26 An example of a quadrilateral whose diagonals are equal, but do *not* bisect each other, is

(1) a rhombus
(2) a rectangle
(3) an isosceles trapezoid
(4) a square

27 In the accompanying diagram, right $\triangle ABC$, $\angle C$ is a right angle, and $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $AD = 4$ and $BD = 9$, then what is the length of $\overline{CD}$?



(1) $2\sqrt{13}$
(2) $\sqrt{13}$
(3) 6
(4) 5

28 If each of the statements $AC < BD$ and $AC = BD$ leads to a contradiction, then $AC > BD$. This type of reasoning is referred to as

(1) direct
(2) indirect
(3) inductive
(4) circular

29 The circumference of a circle is increased from 40π centimeters to 60π centimeters. By how many centimeters is the length of the radius *increased*?

(1) 10
(2) 15
(3) 20
(4) 25

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

30 *On the answer sheet*, construct the altitude from A to side $\overline{CD}$ of given parallelogram $ABCD$.

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.

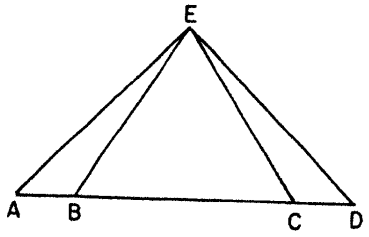
31 Prove *either a* or *b*, but *not* both:

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

OR

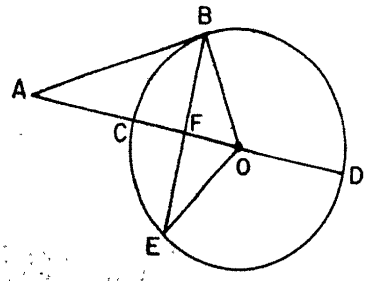
b An angle formed by two chords intersecting inside a circle is measured by one-half the sum of the intercepted arcs. [10]

32 Given: $\overline{ABCD}$ with $\overline{AB} \cong \overline{CD}$ and $\overline{BE} \cong \overline{CE}$



Prove: $\triangle EAD$ is an isosceles triangle. [10]

33 In the accompanying figure, $\overline{AB}$ is a tangent to circle O at point B. Secant $\overline{ACD}$ passes through the center O and is perpendicular to chord $\overline{BE}$ at F. Radii $\overline{OB}$ and $\overline{OE}$ are drawn.



Prove: $\dfrac{EF}{AB} = \dfrac{OE}{OA}$ [10]

34 Given quadrilateral $ABCD$ with vertices $A(0,-1)$, $B(8,-1)$, $C(6,9)$, and $D(0,5)$. If diagonal $\overline{BD}$ is drawn, find the

a length of $\overline{BD}$ [2]

b length of $\overline{AD}$ [1]

c measure of angle DBA to the *nearest degree* [2]

d area of quadrilateral $ABCD$ [5]

35 In rhombus $ABCD$, E is a point on $\overline{AB}$, and $\overline{ED}$ is drawn.

Prove:

a $AE + ED > AB$ [5]

b $ED > EB$ [5]

36 Point A is 5 units from $\overleftrightarrow{BC}$

a Describe fully the locus of points a distance of 3 units from $\overleftrightarrow{BC}$. [3]

b Describe fully the locus of points a distance of p units from A. [3]

c How many points are there which satisfy the conditions given in both *a* and *b*,

(1) if $p = 1$ [2]

(2) if $p = 8$ [2]

*37 The vertices of $\triangle ABC$ are $A(0,8)$, $B(8,0)$, and $C(7,7)$. The midpoint of $\overline{AB}$ is D. By the methods of coordinate geometry, show that

a triangle ABC is isosceles [4]

b $\overline{AB} \perp \overline{CD}$, and state a reason for your conclusion [6]

*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	

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Thursday, June 23, 1977 — 1:15 to 4:15 p.m., only

B

Part I Score: .....

Rater's Initials:

.....

ANSWER SHEET

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

School.....

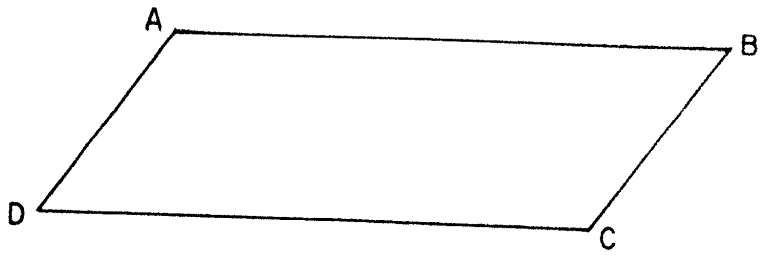
Name and author of textbook used.....

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.**



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, an that I have neither given nor received assistance in answering any of the questions during the examination.

Signature

FOR TEACHERS ONLY

10 B

SCORING KEY

TENTH YEAR MATHEMATICS

Thursday, June 23, 1977 — 1:15 to 4:15 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 19–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 12

(2) 16

(3) (1,5) *or* $\begin{matrix} x = 1 \\ y = 5 \end{matrix}$

(4) 9

(5) 4

(6) 200

(7) (6,2) *or* $\begin{matrix} x = 6 \\ y = 2 \end{matrix}$

(8) 135

(9) 8

(10) 3

(11) $x = 2y + 3$

(12) 4

(13) 6

(14) 35

(15) 10

(16) 100

(17) 8

(18) 120

(19) 3

(20) 4

(21) 4

(22) 1

(23) 2

(24) 1

(25) 2

(26) 3

(27) 3

(28) 2

(29) 1

[OVER]