

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Tuesday, June 16, 1981 — 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 9 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.

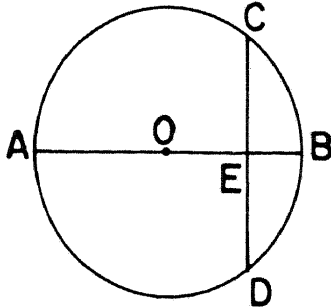
When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during 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

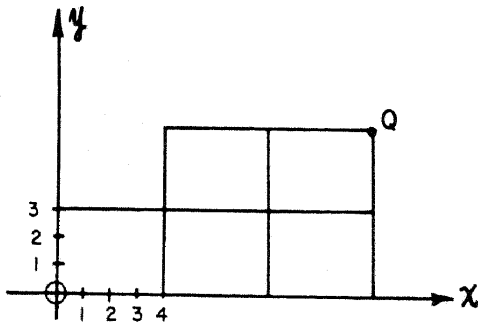
Part I

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.

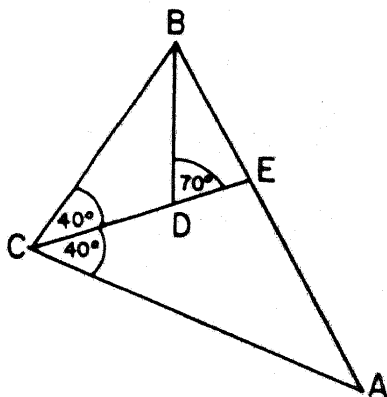
- 1 In the accompanying diagram of circle O , diameter \overline{AB} is perpendicular to chord \overline{CD} at E , and $CD = 14$. Find CE .



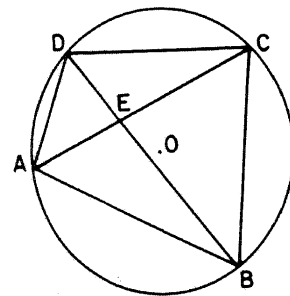
- 2 As shown in the accompanying diagram, the dimensions of each congruent rectangle are 4 by 3. What are the coordinates of point Q ?



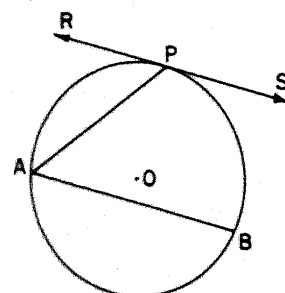
- 3 If the perimeter of a square is 36, what is the area of the square?
- 4 In the accompanying diagram of triangle ABC , \overline{BD} bisects $\angle ABC$ and \overline{CE} bisects $\angle ACB$. If $m\angle BDE = 70$ and $m\angle BCE = 40$, find $m\angle A$.



- 5 What is the length of the radius of a circle whose area is 144π ?
- 6 In right triangle PQR , the length of hypotenuse \overline{PR} is 20. What is the length of the median drawn to \overline{PR} from vertex Q ?
- 7 If the measure of each exterior angle of a regular polygon is 40° , what is the total number of sides of the polygon?
- 8 As shown in the accompanying diagram, quadrilateral $ABCD$ is inscribed in circle O , and diagonals \overline{AC} and \overline{DB} intersect at E . If $m\widehat{AD} = 50$, $m\widehat{BC} = 100$, and $m\widehat{AB} = 120$, find $m\angle DBC$.

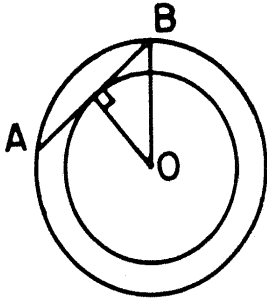


- 9 The length of a diagonal of a square is $5\sqrt{2}$. What is the length of a side of the square?
- 10 Express in radical form the area of an equilateral triangle whose side has length 4.
- 11 What is the area of a rhombus if the lengths of its diagonals are 8 and 18?
- 12 In the accompanying diagram, \overleftrightarrow{RS} is tangent to circle O at point P , chord $\overline{AB} \parallel \overleftrightarrow{RS}$, and \overline{PA} is drawn. If $m\angle PAB = 50$, find $m\widehat{AP}$.



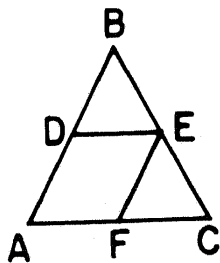
13 The lengths of the bases of a trapezoid are 9 meters and 17 meters, and the distance between them is 6 meters. What is the area, in square meters, of the trapezoid?

14 In the accompanying diagram, the lengths of the radii of two concentric circles are 4 and 5. Chord \overline{AB} of the larger circle is tangent to the smaller circle. Find AB .



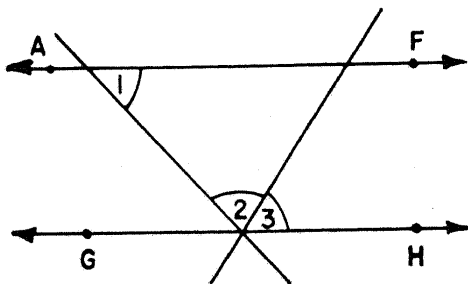
Directions (15–29): Write in the space provided on the separate answer sheet the numeral preceding the expression that best completes each statement or answers each question.

15 In the accompanying figure, point D is the midpoint of \overline{AB} , triangle ABC is an equilateral triangle, and $ADEF$ is a rhombus. If the perimeter of triangle ABC is 12, then what is the perimeter of $ADEF$?



- (1) 11
- (2) 10
- (3) 9
- (4) 8

16 In the accompanying diagram, $\overleftrightarrow{AF} \parallel \overleftrightarrow{GH}$, $m\angle 1 = 45$, and $m\angle 2 = 80$. What is $m\angle 3$?



- (1) 35
- (2) 55
- (3) 100
- (4) 135

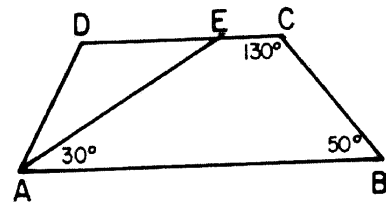
17 The difference in degrees between the supplement and the complement of an acute angle is
 (1) 30 (2) 60 (3) 90 (4) 150

18 If the measure of one angle of a triangle is equal to the sum of the measures of the other two angles, then the triangle is *always*
 (1) right (2) isosceles (3) acute (4) obtuse

19 The coordinates of the vertices of parallelogram $ABCD$ are $A(0,0)$, $B(5,0)$, $C(8,1)$, and $D(x,1)$. The numerical value of x is
 (1) 1 (2) 2 (3) 3 (4) 4

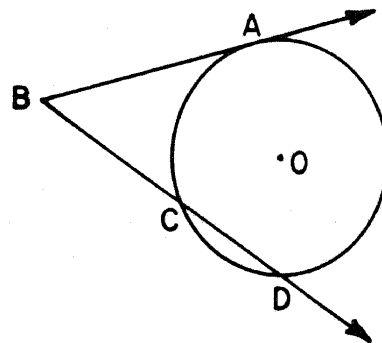
20 It is *not always* possible to circumscribe a circle about a
 (1) parallelogram (2) rectangle (3) square (4) triangle

21 In the accompanying figure, E is a point on \overline{DC} such that \overline{AE} bisects $\angle DAB$. If $m\angle EAB = 30$, $m\angle ABC = 50$, and $m\angle BCD = 130$, what is $m\angle ADC$?



- (1) 30
- (2) 60
- (3) 120
- (4) 150

22 In the accompanying diagram, \overrightarrow{BA} is tangent to circle O at point A and \overline{BCD} is a secant. If $AB = 12$ and $BC = 9$, what is BD ?



- (1) 7
- (2) 9
- (3) 16
- (4) 108

23 Which is the converse of the statement, "If it is a goldfish, then it is a tropical fish"?

- (1) If it is not a goldfish, then it is not a tropical fish.
- (2) If it is not a tropical fish, then it is not a goldfish.
- (3) If it is not a goldfish, then it is a tropical fish.
- (4) If it is a tropical fish, then it is a goldfish.

24 The length of one leg of a right triangle is 5 and the length of the hypotenuse is $\sqrt{29}$. What is the length of the other leg?

- (1) 24
- (2) 2
- (3) $\sqrt{24}$
- (4) $\sqrt{54}$

25 If the ratio of the corresponding diagonals of two similar figures is 4:9, then the ratio of their perimeters is

- (1) 2:3
- (2) 4:9
- (3) 8:27
- (4) 16:81

26 What is the slope of a line that passes through the points $A(2,3)$ and $B(-10,8)$?

- (1) $-\frac{5}{12}$
- (2) $\frac{5}{12}$
- (3) $\frac{12}{5}$
- (4) $-\frac{12}{5}$

27 Two secants drawn to a circle from the same external point intercept arcs with measures of 60° and 100° . The measure in degrees of the angle formed by the two secants is

- (1) 20
- (2) 30
- (3) 40
- (4) 80

28 In circle O , chord \overline{CD} intersects chord \overline{AB} at E . If $AE = 6$, $EB = 6$, and $ED = 3$, then CE is equal to

- (1) 36
- (2) 12
- (3) 9
- (4) 4

29 The length of the line segment joining points A and B is 10. There will be only one point equidistant from both A and B and also at a distance q from A if

- (1) $q = 10$
- (2) $q > 10$
- (3) $q = 5$
- (4) $5 < q < 10$

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

30 *On the answer sheet*, construct a triangle whose sides are equal in length to a , b , and c .

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.

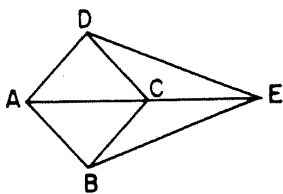
31 Prove either *a* or *b* but not both.

a The 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.] [10]

OR

b If in a right triangle the altitude is drawn upon the hypotenuse, the two triangles thus formed are similar to the given triangle and similar to each other. [10]

32 Given: quadrilateral $ABCD$ with diagonal \overline{AC} extended to point E , \overline{DE} and \overline{BE} are drawn, \overline{AC} bisects $\angle DAB$, $\angle ADC \cong \angle ABC$.



Prove: $\overline{BE} \cong \overline{DE}$ [10]

33 The coordinates of the vertices of trapezoid $ABCD$ are $A(3,0)$, $B(7,0)$, $C(7,11)$, and $D(3,8)$.

Find:

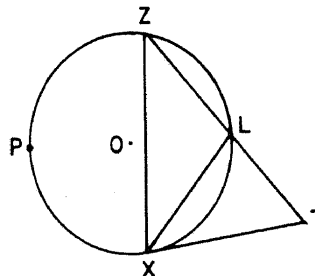
a the area of the trapezoid [3]

b the perimeter of the trapezoid [3]

c the slope of diagonal \overline{BD} [2]

d the coordinates of the midpoint of diagonal \overline{BD} [2]

34 Given: circle O , tangent \overline{TX} , secant \overline{TLZ} , chords \overline{ZX} and \overline{XL} , $m\widehat{XL}:m\widehat{LZ}:m\widehat{XPZ} = 2:2:5$.



Find: *a* $m\widehat{XL}$ [2]

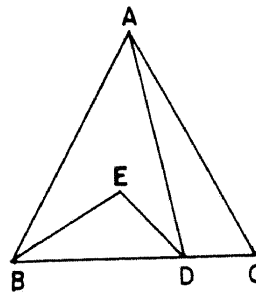
b $m\angle Z$ [2]

c $m\angle T$ [2]

d $m\angle ZXT$ [2]

e $m\angle XLT$ [2]

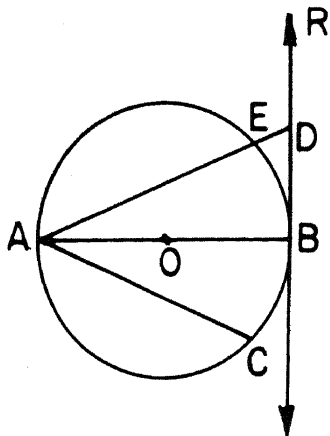
35 Given: isosceles triangle ABC with $\overline{AB} \cong \overline{AC}$, D is a point on \overline{BC} , and \overline{AD} is drawn. The bisectors of $\angle ABC$ and $\angle ADB$ meet at E .



Prove: $BE > DE$ [10]

➡ GO RIGHT ON TO THE NEXT PAGE.

- 36 Given: diameter \overline{AB} of circle O , \overleftrightarrow{RB} is tangent to O at B , chords \overline{AE} and \overline{AC} are drawn. \overline{AE} is extended to meet \overleftrightarrow{RB} at D , and $\widehat{BE} \cong \widehat{BC}$.



Prove: $\frac{AD}{AB} = \frac{AB}{AC}$ [10]

- *37 The vertices of triangle RST have coordinates $R(3,4)$, $S(0,0)$, and $T(12,-9)$.

a Find the slope of each line: [4]

(1) \overleftrightarrow{RS}

(2) \overleftrightarrow{ST}

b Find the length of each segment: [3]

(1) \overline{RS}

(2) \overline{ST}

(3) \overline{RT}

c Using the results obtained from parts a or b, show that $\triangle RST$ is a right triangle and state a reason for your conclusion. [3]

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

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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

Tuesday, June 16, 1981 — 1:15 to 4:15 p.m., only

Part I Score:

Rater's Initials:
.....

ANSWER SHEET

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

School.....

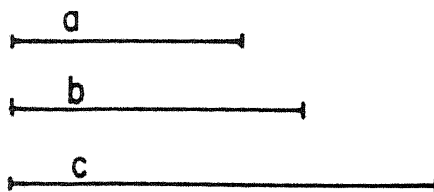
Name and author of textbook used.....

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. |



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

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SCORING KEY TENTH YEAR MATHEMATICS

Tuesday, June 16, 1981 — 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 15–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

- | | | |
|---|----------|--------|
| (1) 7 | (11) 72 | (21) 3 |
| (2) (12,6) or $\begin{matrix} x = 12 \\ y = 6 \end{matrix}$ | (12) 100 | (22) 3 |
| (3) 81 | (13) 78 | (23) 4 |
| (4) 40 | (14) 6 | (24) 2 |
| (5) 12 | (15) 4 | (25) 2 |
| (6) 10 | (16) 2 | (26) 1 |
| (7) 9 | (17) 3 | (27) 1 |
| (8) 45 | (18) 1 | (28) 2 |
| (9) 5 | (19) 3 | (29) 3 |
| (10) $4\sqrt{3}$ | (20) 1 | |

[OVER]

TENTH YEAR MATHEMATICS — *concluded*

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 38 [3]

b 28 [3]

c -2 [2]

d (5.4) or $\frac{x}{y} = \frac{5}{4}$ [2]

(37) a (1) $\frac{4}{3}$ [2]

(2) $-\frac{3}{4}$ [2]

b (1) 5 [1]

(2) 15 [1]

(3) $5\sqrt{10}$ [1]

(34) a 80 [2]

b 40 [2]

c 60 [2]

d 80 [2]

e 80 [2]