The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Tuesday, August 19, 1986 — 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 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. [60]

1 The ratio of the area of a smaller triangle to the area of a larger triangle is 1:4. If the area of the smaller triangle is 30, find the area of the *larger* triangle.

2 Find the length of the median of a trapezoid whose bases are 11 and 17.

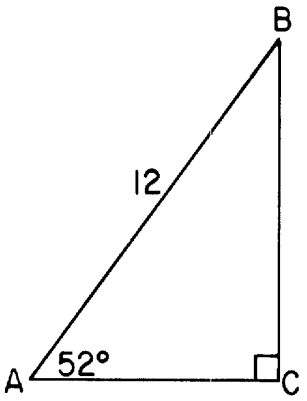
3 If the slope of $\overleftrightarrow{AB}$ is $\frac{3}{4}$, the slope of $\overleftrightarrow{CD}$ is $\frac{x-2}{12}$, and $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, find the value of x.

4 The measure of an exterior angle of a regular polygon is 72°. What is the total number of sides of the polygon?

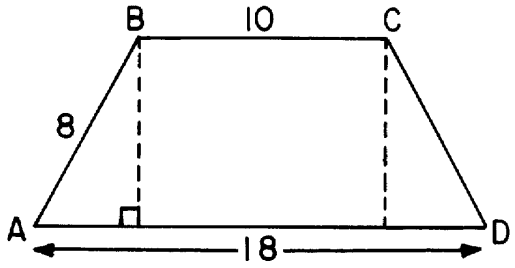
5 In $\triangle ABC$, side $\overline{AB}$ is extended through B to D. If $m\angle CBD = 100$ and $m\angle A = 60$, what is the shortest side of $\triangle ABC$?

6 The diagonal of a rectangle has length 15. If the base of the rectangle is 12, find the height.

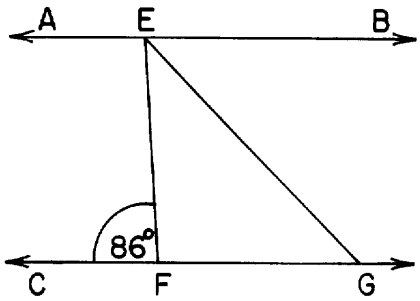
7 In the accompanying diagram of $\triangle ABC$, $\angle C$ is a right angle, $m\angle A = 52$, and $AB = 12$. Find BC to the *nearest integer*.



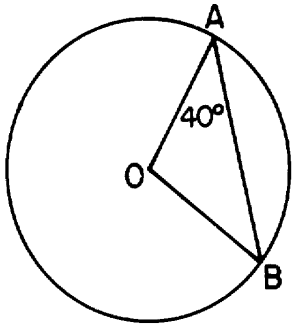
8 In the accompanying diagram, the bases of isosceles trapezoid $ABCD$ are 10 and 18 and the length of a leg is 8. Find $m\angle A$.



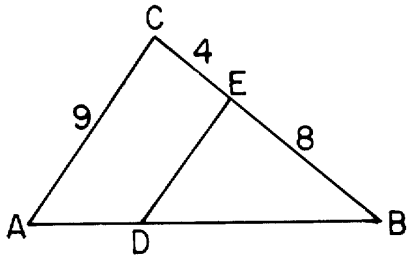
9 In the accompanying diagram $\overleftrightarrow{AEB} \parallel \overleftrightarrow{CFG}$, $\overline{EG}$ bisects $\angle BEF$, and $m\angle EFC = 86$. Find $m\angle EGF$.



10 In the accompanying diagram of circle O, $\angle AOB$ is a central angle and $m\angle OAB = 40$. Find $m\overset{\frown}{AB}$.

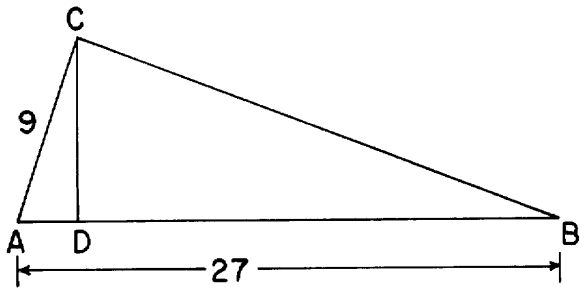


11 In the accompanying diagram of $\triangle ABC$, $\overline{BEC}$, $\overline{BDA}$, $\overline{DE} \parallel \overline{AC}$, $BE = 8$, $EC = 4$, and $AC = 9$. Find DE.



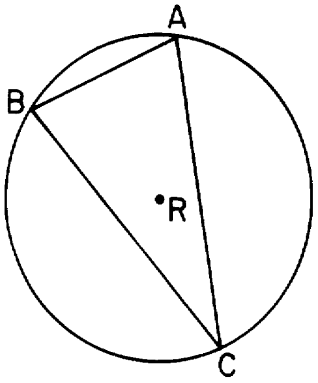
12 The altitude of an equilateral triangle is $3\sqrt{3}$. Find the length of a side of the triangle.

13 In the accompanying diagram of right triangle ABC, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $AC = 9$ and $AB = 27$, find AD.



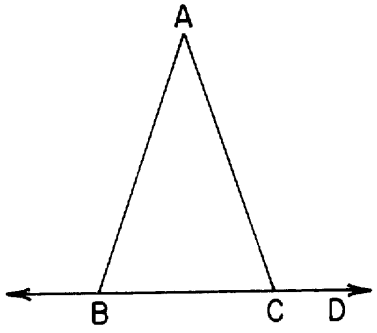
Directions (14–29): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

14 In the accompanying diagram, $\triangle ABC$ is inscribed in circle R. If $m\overset{\frown}{AB} = 2x$, $m\overset{\frown}{BC} = 5x$, and $m\overset{\frown}{AC} = 150$, which type of triangle is $\triangle ABC$?



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

15 In the accompanying diagram, $\overleftrightarrow{BCD}$, $\overline{AB} \cong \overline{AC}$, and $m\angle A = 40$. What is $m\angle ACD$?



(1) 80
(2) 70
(3) 110
(4) 40

16 In $\triangle ABC$, median $\overline{AM}$ is drawn. The ratio of the area of $\triangle ABM$ to the area of $\triangle ACM$ is
(1) 1:1
(2) 2:1
(3) 1:2
(4) 1:4

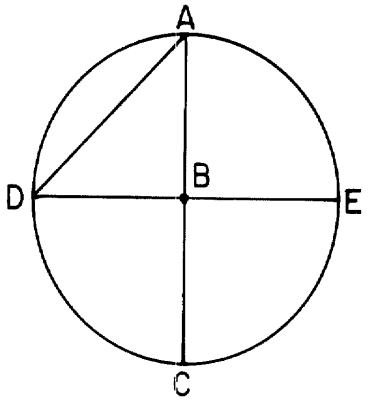
17 The coordinates of points C and D are $(-6,10)$ and $(12,-2)$, respectively. If $\overleftrightarrow{AB}$ bisects $\overline{CD}$ at E, what are the coordinates of point E?
(1) (0,6)
(2) (3,4)
(3) (6,8)
(4) (9,0)

18 Consider the statement: "Congruent triangles are similar." Which is correct?
(1) The statement and its converse are both true.
(2) The statement is true; the converse is false.
(3) The statement is false; the converse is true.
(4) The statement and its converse are both false.

19 If the diagonals of a quadrilateral are congruent but do not bisect each other, the quadrilateral may be
(1) a rectangle
(2) a square
(3) a rhombus
(4) an isosceles trapezoid

20 An equation of the locus of all points whose ordinates are 3 less than their abscissas is
(1) $x = y - 3$
(2) $y = 3 - x$
(3) $y = x - 3$
(4) $y = 3x$

21 In the accompanying diagram of circle B, diameter $\overline{AC}$ is perpendicular to diameter $\overline{DE}$. If chord $DA = 8\sqrt{2}$, what is DE?



(1) 32
(2) 16
(3) 8
(4) $4\sqrt{2}$

22 In circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E. If $AE = 4$, $EB = 6$, and $ED = 3$, then CE equals
(1) 1
(2) 2
(3) 7
(4) 8

23 The complement of every acute angle *must* be
(1) an acute angle
(2) a right angle
(3) an obtuse angle
(4) a straight angle

24 A circle is inscribed in a square whose area is 36. The circumference of this circle is
(1) 36π
(2) 18π
(3) 6π
(4) 12π

25 Two parallel lines, r and s, are 5 centimeters apart. Point A lies on line r. The total number of points equidistant from r and s and 5 centimeters from A is
(1) 1
(2) 2
(3) 3
(4) 4

26 The measures of the angles of a triangle are in the ratio 3:5:7. What is the measure of the largest angle of the triangle?
(1) 12°
(2) 36°
(3) 60°
(4) 84°

27 In a circle, the minor sector formed by two perpendicular radii has an area of 8π. The area of the circle is
(1) 64π
(2) 32π
(3) 16π
(4) 4π

28 The coordinates of the center of a circle are (4,3). If the circle passes through the origin, what is the length of the radius of the circle?
(1) 5
(2) 6
(3) 3
(4) 4

29 The lengths of the diagonals of a rhombus are 12 and 13. The area of the rhombus is
(1) 78
(2) 144
(3) 156
(4) 169

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

30 *On the answer sheet*, construct the locus of points equidistant from points M and N.

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. [40]

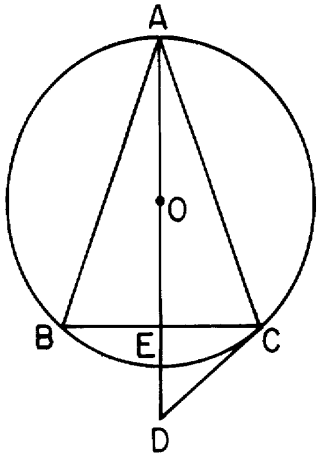
31 Prove either *a* or *b* but *not* both.

a Two right triangles are congruent if the hypotenuse and a leg of one are congruent to the corresponding parts of the other. [10]

OR

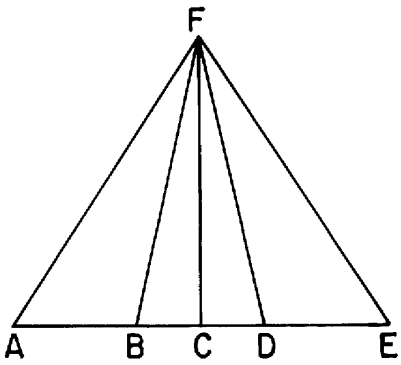
b The measure of an angle formed by two chords intersecting inside the circle is equal to one-half the sum of the measures of the intercepted arcs. [10]

32 Given: isosceles triangle ABC, with base $\overline{BEC}$, inscribed in circle O. Tangent $\overline{DC}$ is drawn, $\overline{AOED}$ bisects $\angle BAC$, and $m\angle B = 70$.



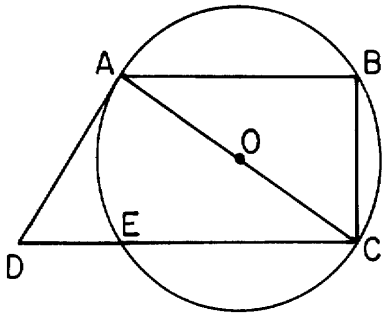
Find: *a* $m\overset{\frown}{BC}$ [2]
b $m\angle BCD$ [2]
c $m\angle BAD$ [2]
d $m\angle BED$ [2]
e $m\angle ADC$ [2]

33 Given: $\triangle AEF$, $\overline{ABCDE}$, $\overline{FC}$ is the perpendicular bisector of $\overline{BD}$, and $\overline{AC} \cong \overline{CE}$.



Prove: $\triangle ABF \cong \triangle EDF$ [10]

34 Given: circle O with chords $\overline{AOC}$, $\overline{AB}$, $\overline{CB}$, and $\overline{CE}$, secant $\overline{DEC}$, tangent $\overline{DA}$, and $\overline{AB} \parallel \overline{DC}$.



Prove: $(AC)^2 = BA \times CD$ [10]

☞ **GO RIGHT ON TO THE NEXT PAGE.**

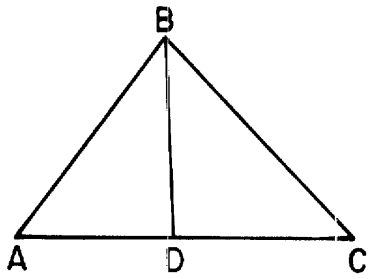
35 Given: square $ABCD$ inscribed in circle O and $AB = 6$.

a Find the radius of circle O. [*Answer may be left in radical form.*] [4]

b Find the area of circle O. [*Answer may be left in terms of* π.] [3]

c Find the area of minor sector AOB. [*Answer may be left in terms of* π.] [3]

36 Given: $\overline{BD}$ is the bisector of $\angle B$ of $\triangle ABC$.



Prove: $BC > CD$ [10]

37 The vertices of $\triangle ABC$ are $A(2,7)$, $B(8,9)$, and $C(6,3)$.

a Show, by means of coordinate geometry, that $\triangle ABC$ is an isosceles triangle and state a reason for your conclusion. [5]

b Find the area of $\triangle ABC$. [5]

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, August 19, 1986 – 8:30 to 11:30 a.m., only

Part I Score	
Part II Score	
Total	
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

Tuesday, August 19, 1986—8:30 to 11:30 a.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 14–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 120

(2) 14

(3) 11

(4) 5

(5) $\overline{AB}$ *or* AB *or* c

(6) 9

(7) 9

(8) 60

(9) 43

(10) 100

(11) 6

(12) 6

(13) 3

(14) 2

(15) 3

(16) 1

(17) 2

(18) 2

(19) 4

(20) 3

(21) 2

(22) 4

(23) 1

(24) 3

(25) 2

(26) 4

(27) 2

(28) 1

(29) 1

(30) construction

Part II

Please refer to the Department's pamphlet *Guide for Rating Regents Examinations 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.

(32) *a* 80 [2]
b 40 [2]
c 20 [2]
d 90 [2]
e 50 [2]

(35) *a* $\sqrt{18}$ *or* $3\sqrt{2}$ [4]
b 18π [3]
c $\frac{18\pi}{4}$ [3]

(37) *b* 16 [5]