The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Wednesday, August 14, 1985 — 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 measures of the angles of a triangle are in the ratio of 1:3:5. What is the number of degrees in the measure of the *smallest* angle?

2 In the accompanying figure, $\ell_1 \parallel \ell_2$ and $m\angle x = 122$. Determine $m\angle y$ so that $\ell_3 \parallel \ell_4$.
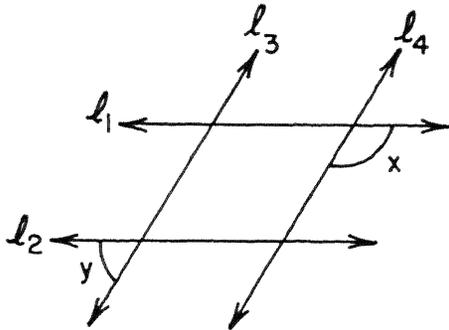
3 Two arcs of the same circle have central angles whose measures are 45° and 60°. What is the ratio of the length of the smaller arc to the length of the larger arc?

4 If the measure of an exterior angle of a regular polygon is 60°, find the number of sides of the polygon.

5 In the accompanying diagram of circle O, $\overline{OC}$ and $\overline{OD}$ are radii and chord $\overline{CD}$ is parallel to diameter $\overline{AB}$. If $m\overset{\frown}{AC} = 23$, find $m\angle COD$.
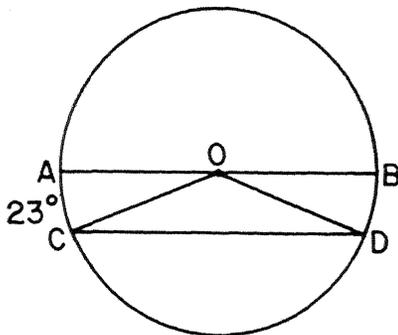
6 In parallelogram $ABCD$, $m\angle A = 2x - 30$ and $m\angle B = 3x + 10$. Find the value of x.

7 In the accompanying diagram of isosceles trapezoid $ABCD$, $\overline{AD} \parallel \overline{BC}$, $m\angle B = x + 15$, and $m\angle C = 3x - 5$. What is the value of x?
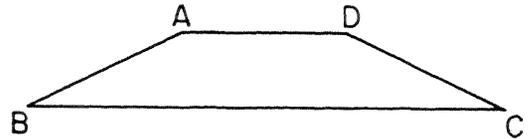
8 In parallelogram $ABCD$, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at E. If $AE = 2x + 10$ and $EC = 3x + 6$, find x.

9 In the accompanying figure, secant $\overline{PAB}$ and tangent $\overline{PC}$ are drawn to circle O from exterior point P. If $PC = 6$ and $PB = 9$, find PA.
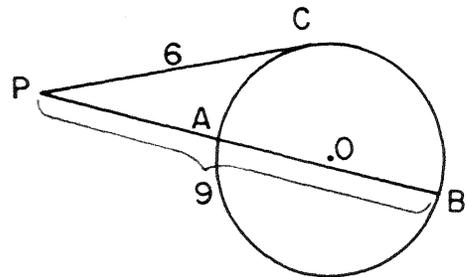
10 As shown in the accompanying diagram of $\triangle ABC$, $m\angle C = 90$. Altitude $\overline{CD}$ is drawn. If $AD = 3$ and $DB = 9$, find AC.
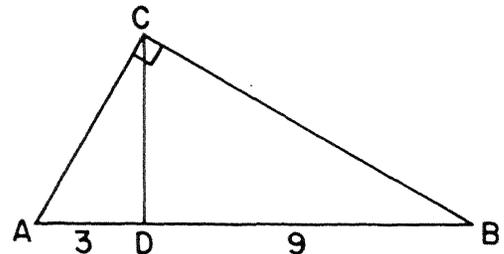
11 Find the perimeter of a rhombus with diagonals of lengths 12 and 16.

12 In the accompanying diagram of triangle *ABC*, medians $\overline{AE}$, $\overline{CD}$, and $\overline{BF}$ intersect at *G*. Which statement *must* be true?
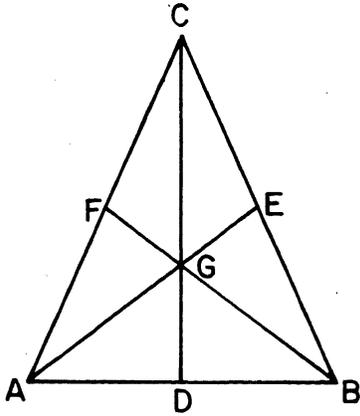
(1) $CE = EB$ (3) $FG > GB$
(2) $GC = GD$ (4) $AG < GE$

13 If cos *A* = .5162, what is the measure of angle *A* to the *nearest degree*?
(1) 27   (3) 58
(2) 31   (4) 59

14 In a circle, the central angle of a sector measures 90°. What is the area of the sector if the area of the circle is 48π?
(1) 12   (3) 48
(2) 12π (4) 48π

15 The coordinates of the vertices of $\triangle ABC$ are $A(8,2)$, $B(4,-6)$, and $C(4,2)$. The midpoint of side $\overline{AB}$ is
(1) (6,2)   (3) (6,-2)
(2) (-2,6)   (4) (4,-2)

16 What is the area of the triangle formed by joining the points whose coordinates are $A(0,0)$, $B(0,3)$, and $C(8,0)$?
(1) 11   (3) 24
(2) 12   (4) $\sqrt{73}$

17 In the accompanying diagram, *ABCD* is a square. If $\overline{EF} \parallel \overline{DC}$ and *E* is the midpoint of $\overline{AD}$, what type of triangle is $\triangle AEF$?
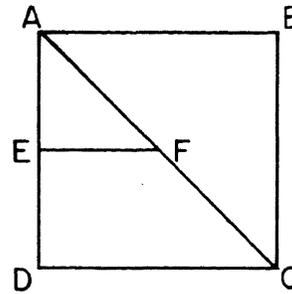
(1) equilateral triangle
(2) acute triangle
(3) isosceles right triangle
(4) scalene triangle

18 It is *not always* possible to circumscribe a circle about a
(1) rhombus   (3) rectangle
(2) square   (4) regular polygon

19 What is the length of the hypotenuse of an isosceles right triangle if the length of one of its legs is 5?
(1) 10   (3) $5\sqrt{2}$
(2) $5\sqrt{3}$ (4) 50

20 If two circles with radii 3 and 7 are internally tangent, the distance between their centers is
(1) 10   (3) 3
(2) 7   (4) 4

21 What is the length of a line segment whose endpoints are (-5,2) and (1,10)?
(1) 10   (3) $4\sqrt{10}$
(2) $4\sqrt{5}$ (4) $6\sqrt{5}$

22 An equation of the locus of all points equidistant from the lines whose equations are $x = 5$ and $x = -1$ is
(1) $x = -2$ (3) $y = 2$
(2) $x = 2$ (4) $y = -2$

23 What is the slope of the line that passes through the points (5,4) and (−7,8)?

(1) $\frac{1}{3}$ (3) 3

(2) $-\frac{1}{3}$ (4) −3

24 In a plane, what is the total number of points that are equidistant from two parallel lines and also equidistant from two distinct points on one of these lines?

(1) 1   (3) 3

(2) 2   (4) 4

25 In $\triangle ABC$, points D and E are located on sides $\overline{AC}$ and $\overline{BC}$, respectively, so that $\overline{DE} \parallel \overline{AB}$. If $DC = 10$, $AD = 2$, and $DE = 7$, what is the length of $\overline{AB}$?

(1) $1\frac{2}{5}$ (3) $8\frac{2}{5}$

(2) $2\frac{6}{7}$ (4) 11

26 In the accompanying diagram, $ABCD$ is a rhombus with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at E. Which statement is *not* true?
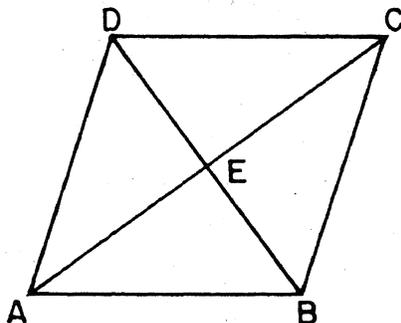
(1) $\triangle ADB \cong \triangle ABC$ (3) $\triangle AED \cong \triangle AEB$

(2) $\triangle AEB \cong \triangle DEC$ (4) $\triangle ADC \cong \triangle ABC$

27 Which is the converse of the statement, "If a man is short, then he cannot order from the RBM catalog"?

(1) If a man is not short, then he can order from the RBM catalog.

(2) If a man can order from the RBM catalog, then he is not short.

(3) If a man is short, then he cannot order from the RBM catalog.

(4) If a man cannot order from the RBM catalog, then he is short.

28 If the length of each side of a triangle is multiplied by 2, then its area is multiplied by

(1) 6   (3) 8

(2) 2   (4) 4

29 What is the area of the polygon in the accompanying diagram?
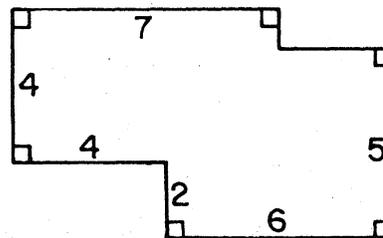
(1) 40   (3) 46

(2) 49   (4) 58

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

30 *On the answer sheet*, construct a line perpendicular to line ℓ at point P.

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 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 The area of a triangle is equal to one-half the product of the length of a side and the length of the altitude drawn to that side.   [10]

32 The coordinates of the vertices of quadrilateral *ABCD* are $A(-5,0)$, $B(-4,3)$, $C(0,3)$, and $D(-1,0)$.

  a Show, by means of coordinate geometry, that *ABCD* is a parallelogram and state a reason for your conclusion.   [8]

  b Find the area of parallelogram *ABCD*.   [2]

33 Given: trapezoid *ABCD* with bases $\overline{AB}$ and $\overline{DC}$, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at *E*, and $\overline{DE} \cong \overline{EC}$.
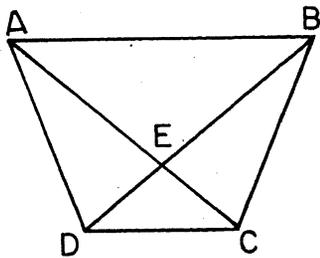
  Prove: $\triangle ACD \cong \triangle BDC$ [10]

34 Two lines $\overleftrightarrow{MN}$ and $\overleftrightarrow{HK}$ intersect at *E*. Point *P* is on $\overrightarrow{EPK}$.

  a Describe fully the locus of points in a plane equidistant from $\overleftrightarrow{HK}$ and $\overleftrightarrow{MN}$.   [3]

  b Describe fully the locus of points in a plane at a fixed distance *d* from *P.*   [3]

  c How many points satisfy the conditions of both parts *a* and *b* if

  (1) $d = EP$ [2]

  (2) $d > EP$ [2]

35 In the diagram below, a pentagon *ABCDE* is inscribed in a circle. Chords $\overline{AC}$ and $\overline{BD}$ intersect at *R*, $\overline{AB} \cong \overline{BC} \cong \overline{DE}$, $\overline{DE} \parallel \overline{AC}$, and $m\widehat{DE} = 80$.
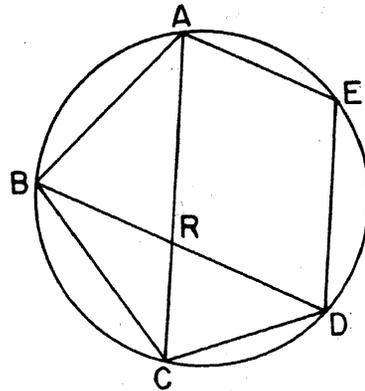
  a Find $m\widehat{CD}$.   [2]
  b Find $m\angle CAE$.   [2]
  c Find $m\angle ARD$.   [2]
  d Show that $\overline{AE} \parallel \overline{BD}$ and state a reason for your conclusion.   [4]

☞ GO RIGHT ON TO THE NEXT PAGE.

36 Given: circle O with chords $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, $\overline{AC}$, $\overline{AD}$, and m∠3 > m∠2.
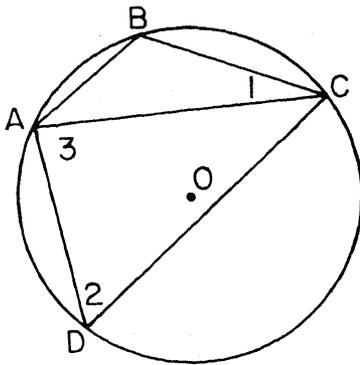
Prove: m∠3 > m∠1   [10]

37 In square $ABCD$, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at E. The length of a diagonal is $8\sqrt{2}$.

a Find the length of a side of $ABCD$.   [3]

b Find the area of $ABCD$.   [2]

c Find the length of the apothem o ABCD.   [3]

d Find the area of the circle inscribed ir ABCD. [*Answer may be left in terms of* π.]   [2]

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, August 14, 1985 — 8:30 to 11:30 a.m., only

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.

$$\xleftarrow{\hspace{3cm}} \underset{\ell}{\hspace{1cm}} \bullet \underset{P}{\hspace{2cm}} \xrightarrow{\hspace{2cm}}$$
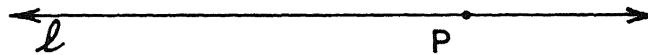
Your answers for Part II should be placed on paper provided by the school.

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, August 14, 1985 — 8:30 to 11:30 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) 20	(11) 40	(21) 1
(2) 58	(12) 1	(22) 2
(3) $\frac{3}{4}$ *or* 3:4	(13) 4	(23) 2
(4) 6	(14) 2	(24) 1
(5) 134	(15) 3	(25) 3
(6) 40	(16) 2	(26) 1
(7) 10	(17) 3	(27) 4
(8) 4	(18) 1	(28) 4
(9) 4	(19) 3	(29) 2
(10) 6	(20) 4	(30) construction

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.

(32) *b* 12   [2]

(34) *a* the pair of lines bisecting the angles formed by the given lines   [3]
 b a circle with center at P having a radius of d units   [3]
 c (1) 3   [2]
  (2) 4   [2]

(35) *a* 60   [2]
 b 70   [2]
 c 110   [2]

(37) *a* 8   [3]
 b 64   [2]
 c 4   [3]
 d 16π [2]