The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Tuesday, January 27, 1987 — 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 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.

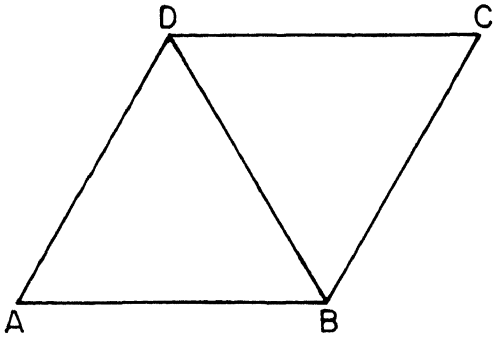
When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during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

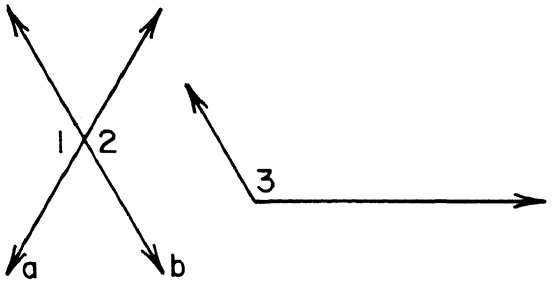
Part I

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 In the accompanying diagram, $ABCD$ is a rhombus and $\angle DAB \cong \angle DBA$. If $DB = 6$, find the length of a side of the rhombus.

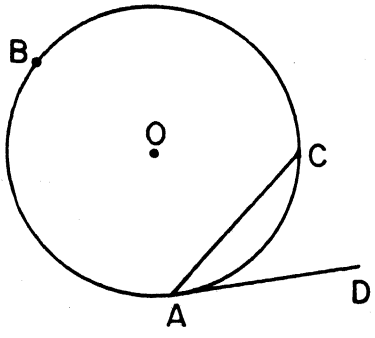


2 In the accompanying diagram, lines a and b intersect. If $\angle 1 \cong \angle 3$, $m\angle 2 = 8x$, and $m\angle 3 = 10x - 30$, find the value of x.

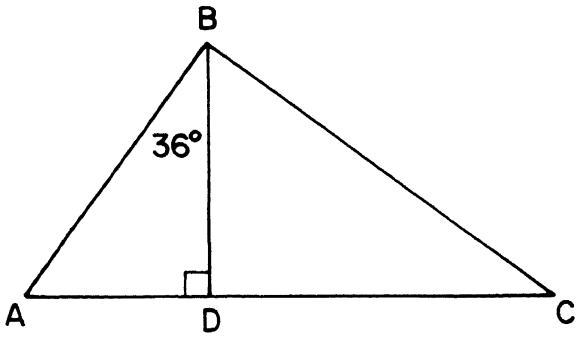


3 In $\triangle ABC$, D is the midpoint of $\overline{AB}$ and E is the midpoint of $\overline{AC}$. If $DE = 6$, find BC.

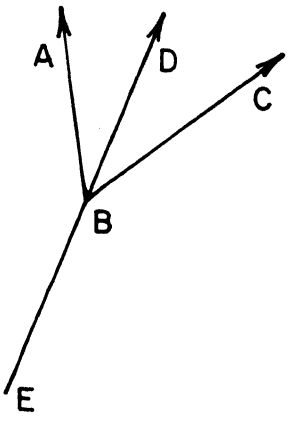
4 In the accompanying diagram, $\overline{DA}$ is tangent to circle O at A and $\overline{CA}$ is a chord. If $m\overset{\frown}{ABC} = 280$, find $m\angle CAD$.



5 In the accompanying diagram of right triangle ABC, $\overline{BD}$ is the altitude to hypotenuse $\overline{AC}$. If $m\angle ABD = 36$, find $m\angle C$.



6 In the accompanying diagram, $\overleftrightarrow{EBD}$ bisects $\angle ABC$. If $m\angle ABC = 8x + 4$ and $m\angle CBE = 21x + 3$, find the value of x.



7 The area of a rhombus is 20. If the length of one of its diagonals is 8, find the length of the other diagonal.

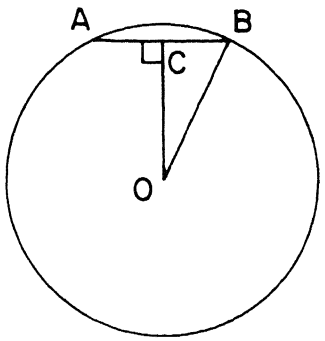
8 The coordinates of the endpoints of $\overline{RS}$ are $R(5,7)$ and $S(-7,2)$. Find the length of $\overline{RS}$.

9 The area of a trapezoid is 78. If the length of one base is 10 and the altitude is 6, find the length of the other base.

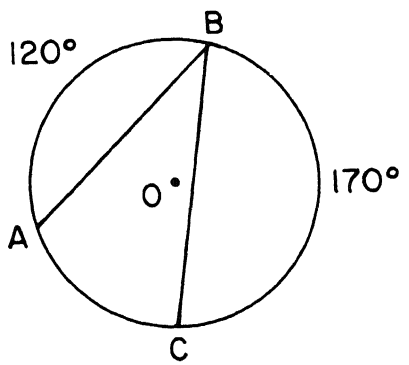
10 The areas of two similar polygons are in the ratio 4:25. What is the ratio of the perimeters of the polygons?

11 Find the number of sides of a regular polygon if the measure of each of its exterior angles is 36°.

12 In the accompanying diagram, the length of the radius of circle O is 13 and the length of chord $\overline{ACB}$ is 10. If $\overline{CO}$ is perpendicular to $\overline{AB}$, find CO.



13 In the accompanying diagram, $m\overset{\frown}{AB} = 120$ and $m\overset{\frown}{BC} = 170$. Find $m\angle ABC$.

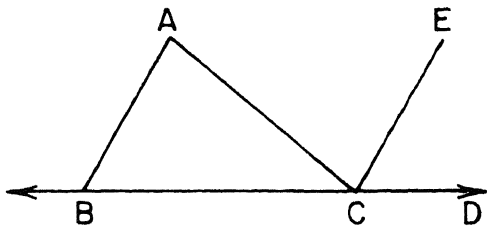


Directions (14–29): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

14 Which statement is the converse of "If a number is composite, then it has more than two factors"?

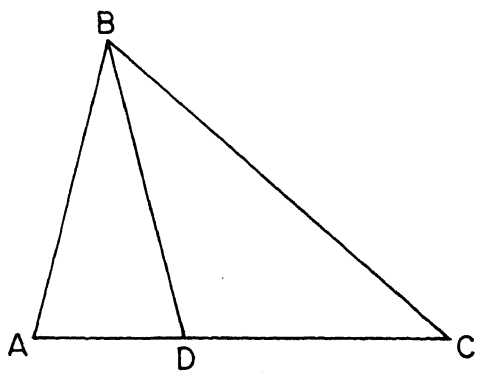
(1) If a number has more than two factors, then it is composite.
(2) If a number does not have more than two factors, then it is not composite.
(3) If a number is not composite, then it is prime.
(4) If a number has more than two factors, then it is not composite.

15 In the accompanying diagram, $\overleftrightarrow{BCD}$, $\overline{AB} \parallel \overline{EC}$, $m\angle ABC = 60$, and $m\angle ACE = 80$. What is $m\angle ACB$?



(1) 20
(2) 40
(3) 60
(4) 80

16 In the accompanying diagram of $\triangle ABC$, $BC > AB$, and $\overline{AB} \cong \overline{BD}$. Which statement is true?



(1) $BC > BD$
(2) $AB > BC$
(3) $m\angle BDA > m\angle BAD$
(4) $m\angle BDA < m\angle BCA$

17 Point $M(-1,4)$ is the midpoint of $\overline{AB}$. If the coordinates of A are (3,8), what are the coordinates of B?

(1) (1,6)
(2) (2,2)
(3) (−5,0)
(4) (0,−5)

18 The circumference of a circle is 36π. The length of the radius of the circle is

(1) between 11 and 12
(2) exactly 12
(3) between 12 and 13
(4) exactly 18

19 If the three altitudes of a triangle are extended to intersect at a point outside the triangle, then the triangle must be

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

20 Which figure does *not* have diagonals that bisect each other?

(1) rectangle
(2) rhombus
(3) parallelogram
(4) isosceles trapezoid

21 Two tangents are drawn to a circle from the same external point. If the minor arc intercepted by the tangents has a measure of 100°, the measure of the angle formed by the tangents is

(1) 80°
(2) 100°
(3) 120°
(4) 160°

22 The slope of the line passing through the points (−7,2) and (−2,−5) is

(1) $-\frac{3}{5}$
(2) $\frac{5}{7}$
(3) $\frac{7}{9}$
(4) $-\frac{7}{5}$

23 In circle O, chords $\overline{PQ}$ and $\overline{RS}$ intersect at T. If $PT = 4$, $TQ = 4$, and $ST = 8$, what is TR?

(1) 16
(2) 2
(3) 8
(4) 4

24 In right triangle ABC, $\angle C$ is a right angle. If $AB = 5$ and $AC = 3$, then the value of $\sin A$ is

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

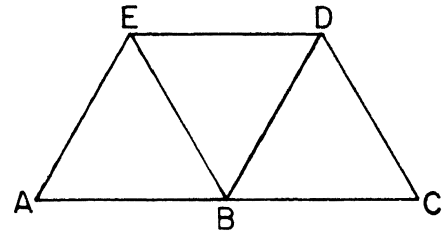
25 In triangle ABC, $m\angle A = 30$, $m\angle C = 90$, and $AB = 20$. What is AC?

(1) 10
(2) $20\sqrt{2}$
(3) $10\sqrt{3}$
(4) $10\sqrt{2}$

26 Which is an equation of the line that passes through the point (−2,5) and is perpendicular to the x-axis?

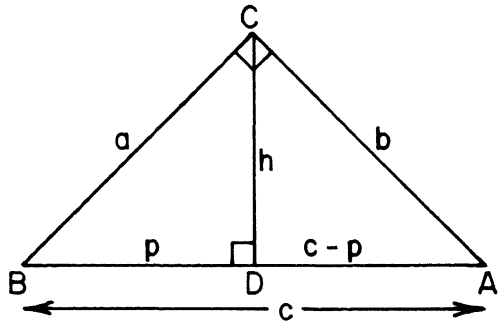
(1) $y = -2$
(2) $x = -2$
(3) $x = 5$
(4) $y = 5$

27 In the accompanying diagram, triangles AEB, EBD, and BDC are equilateral. If the perimeter of $ACDE$ is 20, then what is the area of $ACDE$?



(1) $4\sqrt{3}$
(2) $12\sqrt{3}$
(3) 60
(4) 100

28 In the accompanying diagram of right triangle ABC, altitude $\overline{CD}$ is drawn to the hypotenuse $\overline{AB}$. Which equation is *not* true?



(1) $a^2 = p^2 + h^2$
(2) $\frac{p}{h} = \frac{h}{c-p}$
(3) $\frac{p}{a} = \frac{a}{c-p}$
(4) $\frac{c-p}{b} = \frac{b}{c}$

29 The locus of points equidistant from two intersecting lines is

(1) a point
(2) a line
(3) a circle
(4) two lines

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

30 *On the answer sheet*, construct a line that is tangent to circle O at point T.

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 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]

OR

b If two angles of a triangle are congruent, the sides opposite these angles are congruent. [10]

32 One angle of a rhombus measures 42° and the shorter diagonal has length 12.

a Find the length of the other diagonal to the *nearest integer*. [4]

b Using the result from part *a*, find the area of the rhombus. [2]

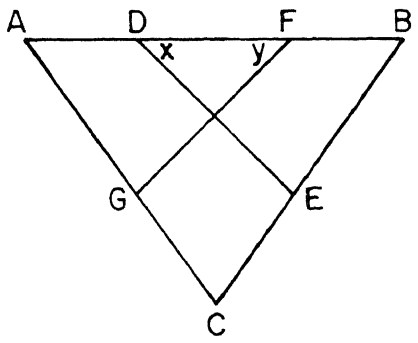
c Find the length of a side of the rhombus to the *nearest integer*. [4]

33 The coordinates of the vertices of quadrilateral *ABCD* are *A*(0,–2), *B*(8,6), *C*(2,8), and *D*(–2,4).

a Show, by means of coordinate geometry, that quadrilateral *ABCD* is a trapezoid and state a reason for your conclusion. [7]

b Show, by means of coordinate geometry, that trapezoid *ABCD* is isosceles. [3]

34 Given: $\overline{ADFB}$, $\overline{AGC}$, $\overline{BEC}$, $\overline{AD} \cong \overline{BF}$, $\angle x \cong \angle y$, and $\angle A \cong \angle B$.



Prove: *a* $\triangle AFG \cong \triangle BDE$ [4]

b $\overline{GC} \cong \overline{EC}$ [6]

35 Lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are parallel and 4 units apart. Point *P* is on $\overleftrightarrow{AB}$.

a Describe fully the locus of points equidistant from $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$. [3]

b Describe fully the locus of points at a distance *k* units from *P*. [3]

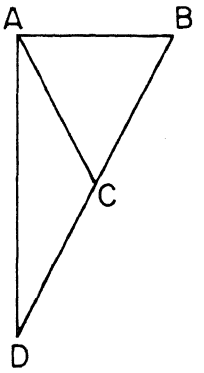
c How many points will satisfy the conditions of both parts *a* and *b* if

(1) $k = 2$ [2]

(2) $k = 4$ [2]

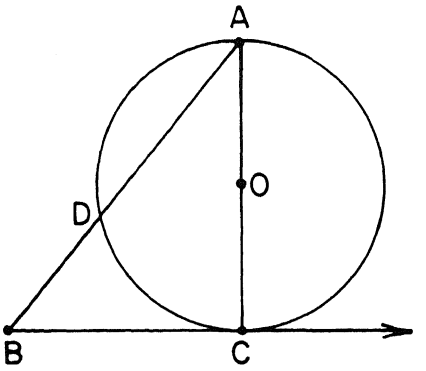
☞ **GO RIGHT ON TO THE NEXT PAGE.**

36 Given: $\triangle ABD$, $\overline{BCD}$, $m\angle B = m\angle BAC$, and $BC > AB$.



Prove: $m\angle B > m\angle D$ [10]

37 Given: $\overline{AC}$ is a diameter of circle O, $\overrightarrow{BC}$ is tangent to circle O, and $\overline{BDA}$ is a secant.



Prove: $AB \times AD = (AC)^2$ [10]

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, January 27, 1987 — 9:15 a.m. to 12:15 p.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.

FOR TEACHERS ONLY

10

SCORING KEY

TENTH YEAR MATHEMATICS

Tuesday, January 27, 1987—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 14–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 6

(2) 15

(3) 12

(4) 40

(5) 36

(6) 7

(7) 5

(8) 13 *or* $\sqrt{169}$

(9) 16

(10) 2:5 *or* $\frac{2}{5}$

(11) 10

(12) 12

(13) 35

(14) 1

(15) 2

(16) 1

(17) 3

(18) 4

(19) 3

(20) 4

(21) 1

(22) 4

(23) 2

(24) 1

(25) 3

(26) 2

(27) 2

(28) 3

(29) 4

(30) construction

[OVER]

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* 31 [4]
b 186 [2]
c 17 [4]

(35) *a* a line parallel to $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ and halfway between them [3]
b a circle with center at P and with radius k [3]
c (1) 1 [2]
(2) 2 [2]