The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Monday, June 23, 1986—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.

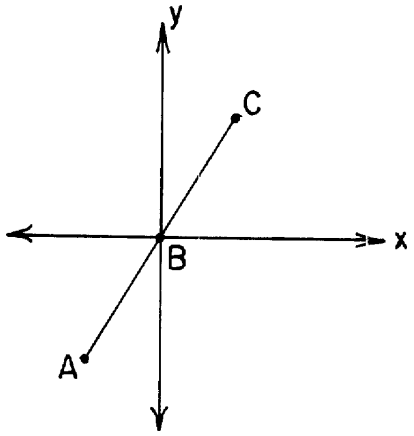
When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during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

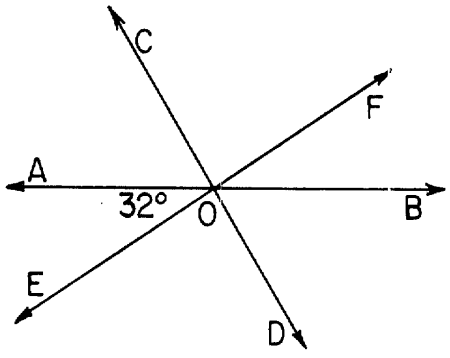
Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Unless otherwise specified, answers may be left in terms of π or in radical form. Write your answers in the spaces provided on the separate answer sheet. [60]

1 In the accompanying diagram, $\overline{ABC}$ and $\overline{AB} \cong \overline{BC}$. If the coordinates of C are (2,3) and the coordinates of B are (0,0), find the coordinates of A.



2 The ratio of the circumferences of two circles is 4:9, and the diameter of the larger circle is 18. Find the diameter of the smaller circle.

3 In the accompanying diagram, $\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$, and $\overleftrightarrow{EF}$ intersect at O. If $\overleftrightarrow{CD} \perp \overleftrightarrow{EF}$ and $m\angle AOE = 32$, find $m\angle AOF$.

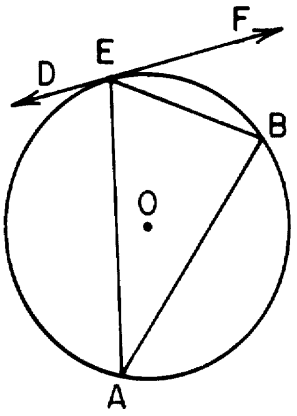


4 Find the area of a right triangle whose legs have lengths 7 and 10.

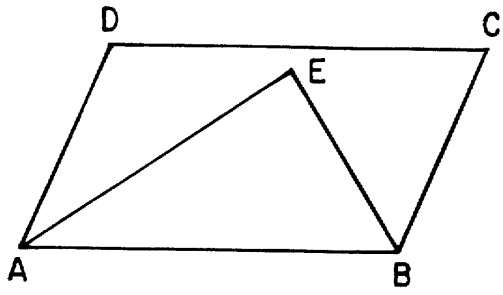
5 In equilateral triangle DEF, the length of the line segment joining the midpoints of any two sides of the triangle is 8. Find the perimeter of triangle DEF.

6 How many degrees are in the measure of an exterior angle of a regular 12-sided polygon?

7 In the accompanying diagram, $\overleftrightarrow{DF}$ is tangent to circle O at E; $\overline{AE}$, $\overline{AB}$, and $\overline{EB}$ are chords; and $m\angle EAB = 35$. Find $m\angle FEB$.



8 In the accompanying diagram of parallelogram $ABCD$, the bisectors of $\angle A$ and $\angle B$ intersect at point E. Find the sum of $m\angle EAB$ and $m\angle EBA$.

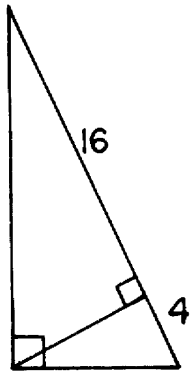


9 The length of a diagonal of a square is $6\sqrt{2}$. Find the length of a side of the square.

10 In $\triangle ABC$, $\overline{AB} \perp \overline{BC}$ and $m\angle CAB = 30$. If $AC = 12$, find AB in radical form.

11 Find the slope of the line which passes through the points (−2,3) and (−4,5).

12 In the accompanying diagram, the altitude drawn to the hypotenuse of a right triangle divides the hypotenuse into two parts whose lengths are 4 and 16. What is the length of the altitude?



13 Right triangle ABC has vertices $A(2,1)$, $B(2,4)$, and $C(6,1)$. Find the length of the hypotenuse.

14 Find the length of the median of a trapezoid whose altitude is 6 and whose area is 48.

15 If the vertex angle of an isosceles triangle measures 40°, find the number of degrees in the measure of an exterior angle at the base of the triangle.

Directions (16 – 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.

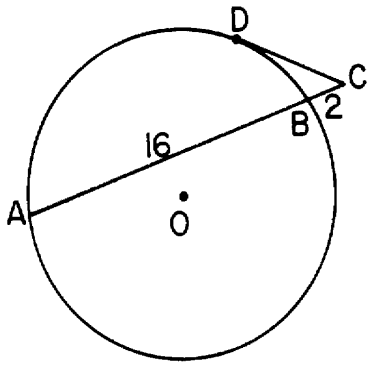
16 In $\triangle ABC$, D is a point on $\overline{AC}$ such that $\overline{BD}$ bisects $\angle ABC$. If $m\angle ABC = 60$ and $m\angle C = 70$, then

(1) $AD > AB$
(2) $BD > BC$
(3) $AD > BD$
(4) $AB > AD$

17 Two arcs in the same circle have central angles with measures in the ratio of 2:3. The lengths of the arcs are in the ratio of

(1) 1:9
(2) 2:3
(3) 2:9
(4) 4:9

18 In the accompanying diagram, $\overline{CD}$ is tangent to circle O at D and $\overline{CBA}$ is a secant. If $AB = 16$ and $BC = 2$, what is CD?



(1) 6
(2) 8
(3) 14
(4) 16

19 The measures of two complementary angles are represented by $(2x)°$ and $(3x - 10)°$. What is the value of x?

(1) 10
(2) 2
(3) 20
(4) 38

20 In quadrilateral $ABCD$, $\overline{AB} \cong \overline{DC}$ and $\overline{AB} \parallel \overline{DC}$. Which statement *must* be true?

(1) $\overline{BD} \cong \overline{AC}$
(2) $\overline{AB} \cong \overline{BC}$
(3) $\overline{AC} \cong \overline{AD}$
(4) $\overline{AD} \cong \overline{BC}$

21 In rhombus $ABCD$, diagonals $\overline{AC}$ and $\overline{DB}$ intersect at E. What kind of angle is $\angle DAE$?

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

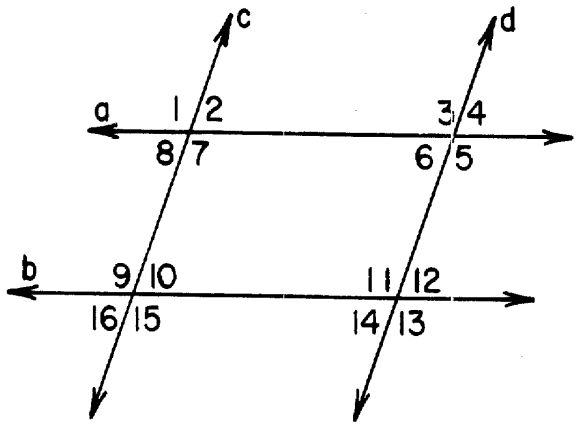
22 If the perimeter of a square is $20a$, the area of the square is

(1) $20a^2$
(2) $25a^2$
(3) $20a\sqrt{2}$
(4) $5a\sqrt{2}$

23 Which statement is the converse of "If two angles are right angles, they are congruent"?

(1) If two angles are not right angles, they are not congruent.
(2) If two angles are right angles, they are not congruent.
(3) If two angles are congruent, they are right angles.
(4) If two angles are not congruent, they are not right angles.

24 In the accompanying figure, parallel lines a and b intersect parallel lines c and d. Which pair of angles must be supplementary?



(1) $\angle 1$ and $\angle 7$
(2) $\angle 2$ and $\angle 11$
(3) $\angle 10$ and $\angle 4$
(4) $\angle 16$ and $\angle 4$

25 Points A and B are 8 centimeters apart. How many points are equidistant from A and B and also 4 centimeters from B?

(1) 1
(2) 2
(3) 0
(4) 4

26 What are the coordinates of the point on the y-axis that is equidistant from the two lines whose equations are $y = 4$ and $y = -2$?

(1) (0,4)
(2) (0,1)
(3) (1,0)
(4) (0,–2)

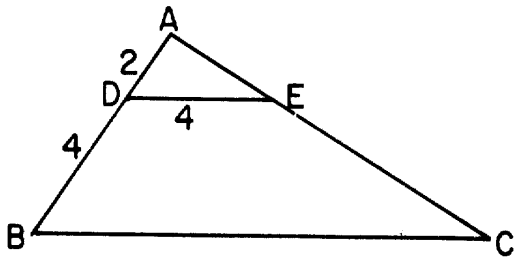
27 If two circles have exactly one common tangent, then the circles *must* be

(1) concentric
(2) congruent
(3) internally tangent
(4) externally tangent

28 The sides of a right triangle have lengths of 10, 24, and 26. Expressed as a fraction, the cosine of the larger acute angle is

(1) $\frac{5}{12}$
(2) $\frac{5}{13}$
(3) $\frac{12}{5}$
(4) $\frac{12}{13}$

29 In the accompanying diagram of $\triangle ABC$, $\overline{ADB}$, $\overline{AEC}$, $\overline{DE}$ is parallel to $\overline{BC}$, $AD = 2$, $DB = 4$, and $DE = 4$. What is BC?



(1) 8
(2) 16
(3) 10
(4) 12

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

30 *On the answer sheet*, locate by construction the center of the given circle.

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]

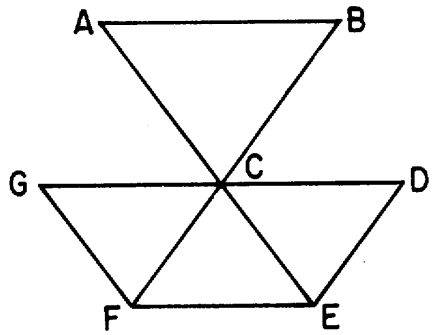
31 Prove either *a* or *b* but *not* both.

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

OR

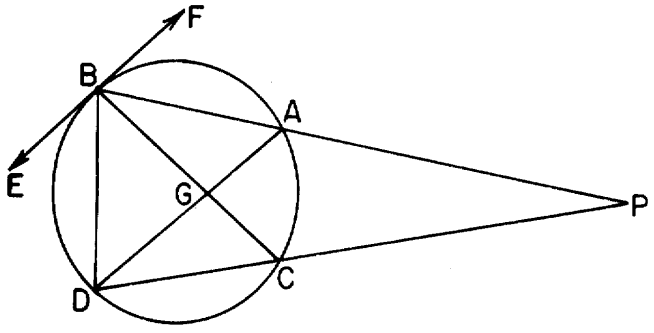
b A diameter perpendicular to a chord of a circle bisects the chord and its arcs. [10]

32 Given: $\overline{AB} \parallel \overline{GCD} \parallel \overline{FE}$ with transversals $\overline{ACE}$ and $\overline{BCF}$, $\overline{AC} \cong \overline{BC}$, and C is the midpoint of $\overline{GD}$.



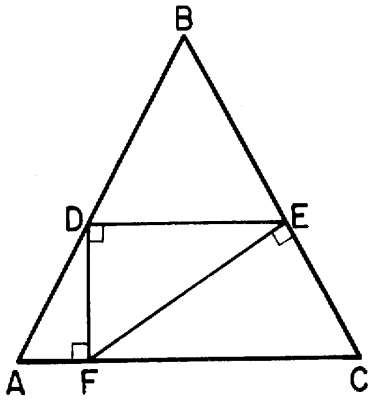
Prove: $\overline{GF} \cong \overline{DE}$ [10]

33 In the accompanying diagram, $\overline{PAB}$ and $\overline{PCD}$ are secants and $\overline{BD}$ is a chord. Chords $\overline{AD}$ and $\overline{CB}$ intersect at G, $\overleftrightarrow{EF}$ is tangent to the circle at B, $\overline{AB} \cong \overline{CD}$, $m\overset{\frown}{AB} = 100$, and $m\overset{\frown}{AC} = 60$.



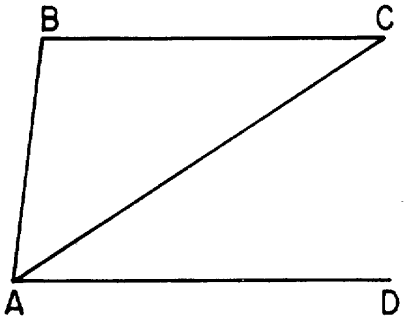
Find: *a* $m\overset{\frown}{BD}$ [2]
b $m\angle P$ [2]
c $m\angle AGB$ [2]
d $m\angle EBD$ [2]
e $m\angle PCB$ [2]

34 Given: $\triangle ABC$ with $\overline{AB} \cong \overline{BC}$. Points D, E, and F are on $\overline{AB}$, $\overline{BC}$, and $\overline{AC}$, respectively, so that $\overline{ED} \perp \overline{DF}$, $\overline{DF} \perp \overline{AC}$, and $\overline{FE} \perp \overline{BC}$.



Prove: *a* $\triangle FEC \sim \triangle EDF$ [6]
b $\triangle EDF \sim \triangle DFA$ [4]

35 Given: $\overline{BC} \parallel \overline{AD}$. $\triangle ABC$ is *not* isosceles.



Prove: $\overline{AC}$ does *not* bisect $\angle BAD$. [10]

☞ **GO RIGHT ON TO THE NEXT PAGE.**

36 A regular pentagon has a side of length 20.

a Find the length of an apothem of the pentagon to the *nearest integer*. [6]

b Using the result obtained in part *a*, find the area of the polygon. [4]

*37 The vertices of $\triangle ABC$ are $A(-1,-2)$, $B(3,1)$, and $C(0,5)$.

a Show, by means of coordinate geometry, that $\triangle ABC$ is a right triangle and state a reason for your conclusion. [6]

b Find the area of $\triangle ABC$. [4]

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

THE UNIVERSITY OF THE STATE OF NEW YORK

THE STATE EDUCATION DEPARTMENT

DIVISION OF EDUCATIONAL TESTING

Tear Here

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	

Tear Here

Tear Here

Tear Here

Tear Here

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

TENTH YEAR MATHEMATICS

Monday, June 23, 1986—1:15 to 4:15 p.m., only

ANSWER SHEET

Part I Score	
Part II Score	
Total	
Rater's Initials:	

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

School .....

Name and author of textbook used .....

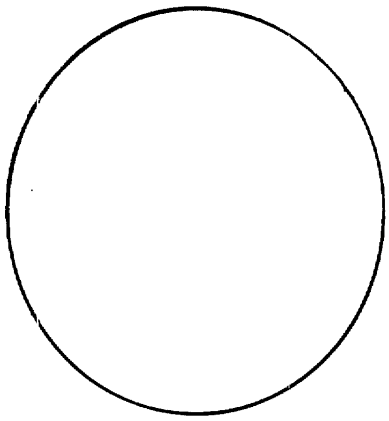
Your answers to Part I should be recorded on this answer sheet.

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

Tear Here

Tear Here

FOR TEACHERS ONLY

10

SCORING KEY

TENTH YEAR MATHEMATICS

Monday, June 23, 1986 — 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 16 – 29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) (–2,–3) *or* $\begin{matrix} x = -2 \\ y = -3 \end{matrix}$

(2) 8

(3) 148

(4) 35

(5) 48

(6) 30

(7) 35

(8) 90

(9) 6

(10) $6\sqrt{3}$ *or* $\sqrt{108}$

(11) –1

(12) 8

(13) 5

(14) 8

(15) 110

(16) 4

(17) 2

(18) 1

(19) 3

(20) 4

(21) 1

(22) 2

(23) 3

(24) 2

(25) 1

(26) 2

(27) 3

(28) 2

(29) 4

(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.

(33) *a* 100 [2]
b 20 [2]
c 100 [2]
d 50 [2]
e 130 [2]

(36) *a* 14 [6]
b 700 [4]

(37) *b* 12.5 [4]