The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Wednesday, August 17, 1977 — 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 7 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

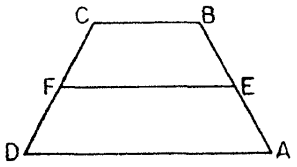
Part I

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 The measures of three of the angles of a quadrilateral are 90, 100, and 110. Find the measure in degrees of the fourth angle.

2 If an angle inscribed in a circle intercepts an arc measuring 100°, what is the measure of the angle?

3 In the accompanying diagram, $\overline{BEA}$, $\overline{CFD}$, $\overline{AD} \parallel \overline{EF}$, $\overline{EF} \parallel \overline{BC}$. If $BE = 5$, $BA = 10$, and $CF = 4$, find FD.

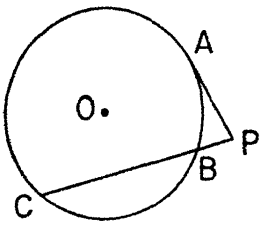


4 The circumferences of two circles are in the ratio of 5:4. If the radius of the larger circle is 25, what is the radius of the smaller circle?

5 If in $\triangle ABC$, $m\angle A = 120$ and $\overline{AB} \cong \overline{AC}$, find $m\angle B$.

6 In a trapezoid, the lengths of the bases are 8 and 12, and the length of the altitude is 14. Find the area of the trapezoid.

7 In the accompanying figure, $\overline{PA}$ is tangent to circle O at A and $\overline{PBC}$ is a secant. If $PA = 8$ and $PB = 4$, find PC.



8 The coordinates of the endpoints of $\overline{PR}$ are $P(-4,-2)$ and $R(6,-8)$. Find the coordinates of the midpoint of $\overline{PR}$.

9 In right triangle ABC, $m\angle C = 90$, $AB = 10$, and $m\angle B = 24$. Find AC to the *nearest integer*.

Directions (10–29): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

10 An equation of a line which is equidistant from both the x-axis and y-axis is

(1) $2x + y = 4$
(2) $x = 2y$
(3) $y = x$
(4) $y = x + 3$

11 If the coordinates of three vertices of a parallelogram are (8,2), (1,2), and (3,5), then the coordinates of the fourth vertex may be

(1) (10,5)
(2) (8,5)
(3) (11,4)
(4) (−1,3)

12 The corresponding sides of two similar polygons have lengths of 2 and 3. The ratio of the area of the smaller polygon to that of the larger is

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

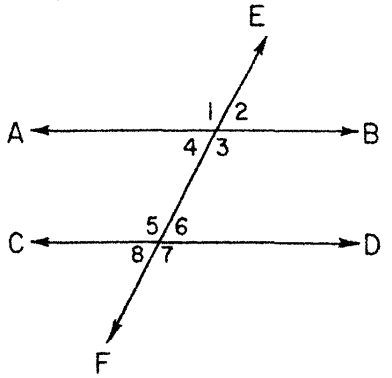
13 In right triangle ABC, $\overline{CD}$ is drawn to the hypotenuse $\overline{AB}$. If area $\triangle CAD$ = area $\triangle CBD$, then $\overline{CD}$ must be

(1) an altitude
(2) a median
(3) an angle bisector
(4) congruent to $\overline{AC}$

14 Quadrilateral $ABCD$ is inscribed in circle O. If $m\angle A = 72$, what is $m\angle C$?

(1) 18
(2) 36
(3) 108
(4) 144

15 In the accompanying diagram, parallel lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are intersected by transversal $\overleftrightarrow{EF}$. Which is a pair of corresponding angles?



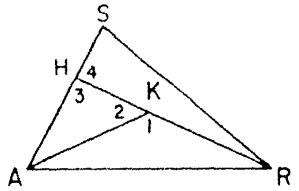
(1) $\angle 1$ and $\angle 7$
(2) $\angle 4$ and $\angle 5$
(3) $\angle 3$ and $\angle 5$
(4) $\angle 2$ and $\angle 6$

26

16 Which is true of two chords that are equidistant from the center of a circle?

(1) They are congruent.
(2) They are not congruent.
(3) They are parallel.
(4) They are not parallel.

17 In the accompanying diagram, $\triangle ARS$ is given with $\overline{AHS}$, $\overline{HKR}$, and $\overline{AK}$. Which statement is always true?



(1) $m\angle 4 > m\angle 1$
(2) $m\angle 2 > m\angle 3$
(3) $m\angle S > m\angle 2$
(4) $m\angle 1 > m\angle S$

18 The circumference of a circle is 14π. What is the length of the radius of the circle?

(1) 7π
(2) 7
(3) 49π
(4) 14

19 The length of a side of a rhombus is 10. If the length of the shorter diagonal is 12, then the length of the longer diagonal is

(1) 24
(2) 20
(3) 16
(4) 12

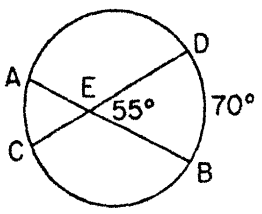
20 Which set of numbers could be the lengths of the sides of an isosceles triangle?

(1) {1,1,2}
(2) {1,2,3}
(3) {2,2,4}
(4) {2,2,3}

21 Given point P on $\overleftrightarrow{AB}$. What is the total number of points that are at a distance of 4 units from $\overleftrightarrow{AB}$ and also at a distance of 10 units from point P?

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

22 In the accompanying diagram, chords $\overline{AB}$ and $\overline{CD}$ intersect at point E. If $m\angle DEB = 55$ and $m\overset{\frown}{DB} = 70$, what is $m\overset{\frown}{AC}$?

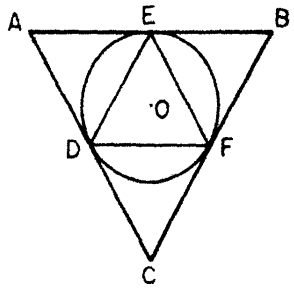


(1) 15
(2) 40
(3) 55
(4) 70

23 The coordinates of the vertices of a triangle are (0,0), (5,0), and (3,10). The area of the triangle is equal to

(1) 5
(2) 7.5
(3) 25
(4) 50

24 In the accompanying diagram, equilateral $\triangle ABC$ is circumscribed about circle O and equilateral $\triangle DEF$ is inscribed in the same circle. What is the ratio of AB to DE?



(1) 4:1
(2) 2:1
(3) $2:\sqrt{2}$
(4) 1:2

25 Given: $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$. If the slope of $\overleftrightarrow{AB} = -\frac{3}{4}$ and the slope of $\overleftrightarrow{CD} = \frac{6}{x}$, then the value of x is

(1) -8
(2) -4.5
(3) 4.5
(4) 8

26 In circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E. If $AE = 9$, $EB = 16$, $CE = x$, and $ED = y$, then

(1) $xy = 144$
(2) $9x = 16y$
(3) $16x = 9y$
(4) $x + y = 25$

27 The radius of a circle is 10. If the measure of the angle of a sector of this circle is 90°, then the area of the sector is

(1) 5π
(2) 10π
(3) 25π
(4) 50π

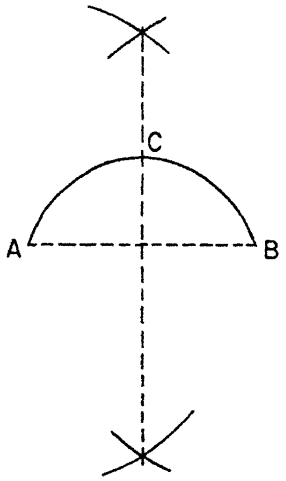
28 If the area of an equilateral triangle is $16\sqrt{3}$, what is the length of a side of the triangle?

(1) 24
(2) $8\sqrt{3}$
(3) 8
(4) $4\sqrt{3}$

☞ GO RIGHT ON TO THE NEXT PAGE.

27

29 The accompanying diagram shows the construction for locating the midpoint of an arc. On which theorem is this construction based?



(1) The perpendicular bisector of a chord of a circle bisects the arc of that chord.
(2) Any line through the midpoint of a chord of a circle passes through the midpoint of the arc of that chord.
(3) A diameter of a circle divides an arc into two congruent arcs.
(4) Any line perpendicular to a chord of a circle bisects the chord and its arc.

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

30 *On the answer sheet*, construct an equilateral triangle using $\overline{AB}$ as one of the sides.

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.

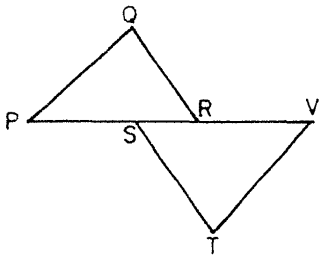
31 Prove *either* *a* or *b*, but *not* both. [10]

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.

OR

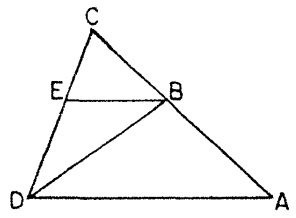
b If in a right triangle the altitude is drawn upon the hypotenuse, the two triangles thus formed are similar to the given triangle and similar to each other.

32 In the diagram, $\overline{PSRV}$, $\overline{PS} \cong \overline{RV}$, $\overline{QR} \parallel \overline{ST}$, $\overline{PQ} \perp \overline{QR}$, and $\overline{VT} \perp \overline{ST}$.



Prove: $\overline{PQ} \cong \overline{TV}$ [10]

33 Given: $\triangle ACD$, $\overrightarrow{DB}$ bisects $\angle ADC$, $\overline{DE} \cong \overline{BE}$, $\overline{DEC}$, and $\overline{CBA}$.

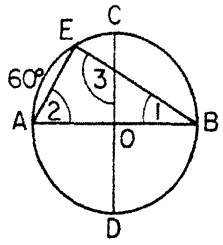


Prove: $\triangle CEB \sim \triangle CDA$ [10]

34 In $\triangle PQR$, the bisector of $\angle RPQ$ intersects $\overline{RQ}$ at point S.

Prove: $PQ > SQ$ [10]

35 In circle O, diameter $\overline{AB}$ is perpendicular to diameter $\overline{CD}$, chords $\overline{AE}$ and $\overline{EB}$ are drawn. If $m\widehat{AE} = 60$, find each of the following.



a $m\angle 1$ [2]

b $m\angle 2$ [2]

c $m\angle 3$ [2]

d $m\widehat{EC}$ [2]

e $m\widehat{EBD}$ [2]

36 The coordinates of the vertices of quadrilateral $JKLM$ are $J(0,0)$, $K(a,0)$, $L(a+b,c)$, and $M(b,c)$.

a Show by means of coordinate geometry that quadrilateral $JKLM$ is a parallelogram and state reasons for your conclusion. [7]

b Write an equation of line $\overleftrightarrow{LM}$. [3]

*37 Three points are located on a graph. Their coordinates are $A(0,1)$, $B(-2,-1)$, and $C(6,-3)$.

a If point D is the fourth vertex of parallelogram $ABCD$, what are its coordinates? [2]

b Find the coordinates of the midpoint of $\overline{AC}$. [2]

c Write an equation of line $\overleftrightarrow{AB}$. [3]

d If point E is on line $\overleftrightarrow{AB}$ and has coordinates $(7,y)$, find y. [3]

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

THE UNIVERSITY OF THE STATE OF NEW YORK

THE STATE EDUCATION DEPARTMENT

BUREAU OF ELEMENTARY AND SECONDARY 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	

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Wednesday, August 17, 1977 — 8:30 to 11:30 a.m., only

Part I Score: .....
Rater's Initials:
.....

ANSWER SHEET

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

School.....

Name and author of textbook used.....

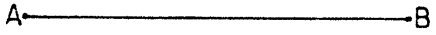
Your answers to Part I should be recorded on this answer sheet.

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.**

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

Wednesday, August 17, 1977 — 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 10–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 60

(2) 50 *or* 50°

(3) 4

(4) 20

(5) 30

(6) 140

(7) 16

(8) $(1,-5)$ *or* $\begin{array}{l} x = 1 \\ y = -5 \end{array}$

(9) 4

(10) 3

(11) 1

(12) 2

(13) 2

(14) 3

(15) 4

(16) 1

(17) 4

(18) 2

(19) 3

(20) 4

(21) 4

(22) 2

(23) 3

(24) 2

(25) 1

(26) 1

(27) 3

(28) 3

(29) 1

[OVER]

37

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.

(35) *a* 30 [2]
b 60 [2]
c 120 [2]
d 30 [2]
e 210 [2]

(36) *b* $y = c$ [3]

(37) *a* $(8,-1)$ *or* $\begin{matrix} x = 8 \\ y = -1 \end{matrix}$ [2]

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

c $y = x + 1$ [3]

d 8 [3]