TENTH YEAR MATHEMATICS

Friday, January 29, 1982 — 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**

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 In the accompanying diagram, $\overline{PQR}$, $\overline{PQ} \cong \overline{QR}$, the coordinates of P are $(-2,3)$ and the coordinates of Q are $(0,0)$. What are the coordinates of R?
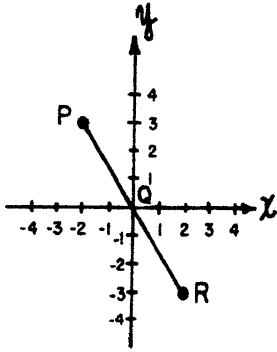
2 In the accompanying figure, equilateral triangle ABC has a perimeter of 18. Points R, S, and T are midpoints of the sides of triangle ABC. What is the length of $\overline{RS}$?
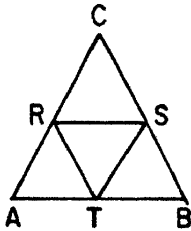
3 In rhombus $ABCD$, $AB = 4x - 2$ and $BC = 3x + 3$. Find x.

4 In the accompanying diagram, the length of diagonal $\overline{AC}$ of rectangle $ABCD$ is 25, $BC = 7$, and $AB = 24$. Express the sine of $\angle CAB$ as a fraction.
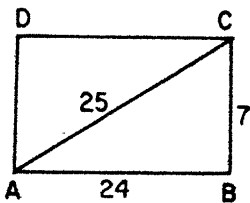

5 In an isosceles right triangle, the measure of an acute angle is represented by $2x + 5$. Find the value of x.

6 Quadrilateral $ABCD$ is inscribed in circle O. If $m\angle A = 2x$ and $m\angle C = 4x$, find x.

7 The perimeter of rectangle $ABCD$ is 30. If $BC = 3$, what is the area of the rectangle?

8 The length of a side of a square is $\sqrt{2}$. What is the length of a diagonal of the square?

9 In the accompanying diagram, chord $\overline{AB}$ of circle O has length 16. If the length of the radius $\overline{OB}$ is 10, find the distance OD from the center of the circle to $\overline{AB}$.
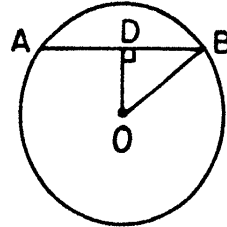
10 As shown in the accompanying diagram, rectangle $ABCD$ is inscribed in circle O. The length of diameter $\overline{DOB}$ of the circle is 13 and $BC = 5$. Find the length of $\overline{AB}$.
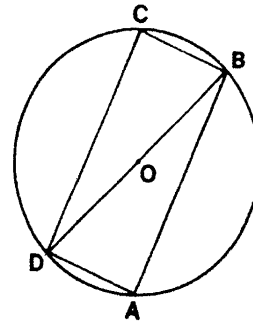
11 In the accompanying diagram of circle O, $OB = 6$ and $m\angle AOB = 60$. Find the area of shaded sector AOB. [Answer may be left in terms of π.]
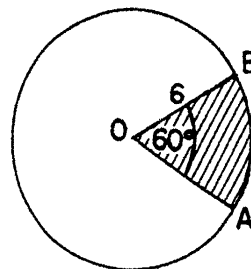
12 The altitude drawn to the hypotenuse of a right tri-
angle divides the hypotenuse into segments of
lengths 4 and 9. Find the length of the altitude.

13 In the accompanying figure, the measure of angle P
formed by tangent $\overline{PA}$ and secant $\overline{PBC}$ is 40°. If
$m\overarc{AC} = 180$, find $m\overarc{AB}$.

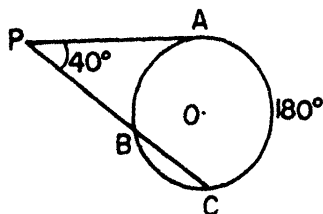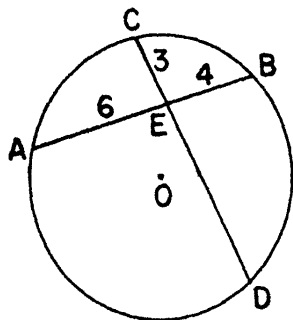14 What is the slope of a line that passes through the
points $(-1,2)$ and $(1,4)$?

15 In the accompanying figure, chords $\overline{AB}$ and $\overline{CD}$ of
circle O intersect at E. If $AE = 6$, $EB = 4$, and
$CE = 3$, find ED.

Directions (16–29): Write in the space provided on the
separate answer sheet the *numeral* preceding the expres-
sion that best completes *each* statement or answers *each*
question.

16 The ratio of the perimeters of two similar triangles is
1:3. If the length of a side of the smaller triangle is
3, the length of the corresponding side of the larger
triangle is

(1) 1   (3) $3\sqrt{3}$
(2) $\sqrt{3}$ (4) 9

17 The measure of each base angle of an isosceles trian-
gle is 15° more than the measure of the vertex angle.
What is the measure of the vertex angle?

(1) 50°   (3) 30°
(2) 40°   (4) 25°

18 If each side of an equilateral triangle has length 6,
what is the length of an altitude of the triangle?

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

19 Which is the converse of the statement, "If an angle
is inscribed in a circle, then it is measured by one-
half of its intercepted arc"?

(1) If an angle is inscribed in a circle, then it is not
measured by one-half of its intercepted arc.
(2) If an angle is measured by one-half of its inter-
cepted arc, then it is an inscribed angle.
(3) If an angle is not an inscribed angle, then it is
measured by one-half of its intercepted arc.
(4) If an angle is not measured by one-half of its in-
tercepted arc, then it is not an inscribed angle.

20 The sum of the measures of the interior angles of a
polygon is 360°. What is the total number of sides of
the polygon?

(1) 5   (3) 3
(2) 6   (4) 4

21 The opposite angles of an isosceles trapezoid are
always

(1) acute   (3) supplementary
(2) congruent   (4) complementary

22 The point $(2,1)$ is the midpoint of a line segment
whose endpoints are $(3,2)$ and $(1,a)$. What is the nu-
merical value of a?

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

23 What is an equation of the locus of points whose or-
dinates are 3 less than twice their abscissas?

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

24 In $\triangle ABC$, $m\angle B = 120$, $m\angle A = 55$, and D is the
point on $\overline{AC}$ such that $\overline{BD}$ bisects $\angle ABC$. Which is
the longest side of $\triangle ABD$?

(1) $\overline{AB}$ (3) $\overline{BD}$
(2) $\overline{AD}$ (4) $\overline{DC}$

25 The *greatest* measure that an exterior angle of any
regular polygon can have is

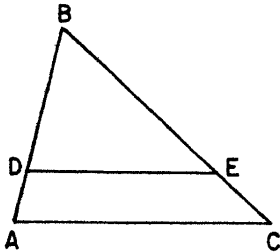(1) 60°   (3) 90°
(2) 72°   (4) 120°

26 The locus of points in a plane that are a given dis-
tance d from a point P is

(1) one circle
(2) two circles
(3) one circle and one point
(4) two parallel lines

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27 In triangle ABC, $AC = 6$, $AB = 12$, and $m\angle C = 90$. What is $m\angle B$?

(1) 30   (3) 60
(2) 45   (4) 90

28 In the accompanying diagram, $\overline{AC} \parallel \overline{DE}$, $AB = 8$, $BC = 12$, and $BD = 6$. What is the length of $\overline{BE}$?

(1) 10   (3) 3
(2) 2   (4) 9

29 The area of a trapezoid is 100 square centimeters, the altitude is 10 centimeters, and the length of one base is 5 centimeters. What is the number of centimeters in the length of the other base?

(1) 5   (3) 15
(2) 10   (4) 20

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

30 *On the answer sheet*, construct an equilateral triangle such that one side has length AB.

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.

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

OR

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

32 Given: $\triangle ABC$, D is the midpoint of $\overline{BC}$, $\overline{AEB}$, $\overline{AFC}$, $\overline{ED} \cong \overline{FD}$, $\angle EDC \cong \angle FDB$.
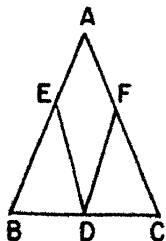
Prove: $\triangle ABC$ is isosceles.   [10]

33 In the accompanying figure, quadrilateral $ABCD$ is inscribed in circle O. Diagonals $\overline{AC}$ and $\overline{BD}$ meet at F, and $\overline{AD}$ is a diameter. Chords $\overline{AB}$ and $\overline{DC}$ are extended to meet at E. B is the midpoint of $\widehat{AC}$ and $m\widehat{AB}:m\widehat{CD} = 4:1$.
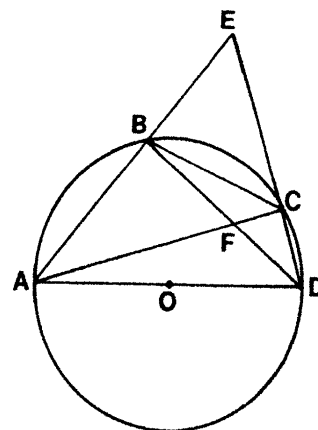
Find:

a $m\widehat{CD}$ [2]
b $m\angle BDA$ [2]
c $m\angle BFC$ [2]
d $m\angle E$ [2]
e $m\angle EBD$ [2]

34 Given: $\triangle ABC$ is inscribed in circle O, $\overline{AB}$ is a diameter, $\overleftrightarrow{BD}$ is tangent to circle O at point B, $\overline{CD}$ is drawn and intersects $\overline{AB}$ at point E such that $\overline{AC} \cong \overline{CE}$.
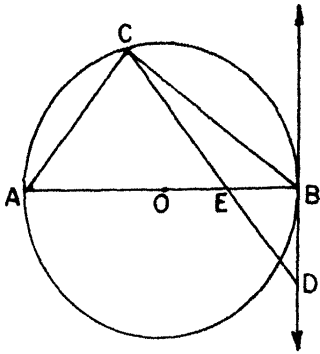
Prove: $\dfrac{AB}{ED} = \dfrac{AC}{EB}$ [10]

35 In the accompanying figure, M is the midpoint of $\overline{AB}$.

a Describe fully the locus of points in a plane which are

(1) equidistant from A and B [2]
(2) 4 units from $\overleftrightarrow{AB}$ [3]
(3) d units from M [3]

b For what value of d will there be *exactly* two points which satisfy all three conditions in part a?   [2]

36 The vertices of $\triangle ABC$ are $A(0,2)$, $B(8,8)$, and $C(12,4)$.

a Find the coordinates of D, the midpoint of $\overline{AC}$, and the coordinates of E, the midpoint of $\overline{BC}$. [2]

b Show by coordinate geometry that $\overline{DE} \parallel \overline{AB}$. [4]

c Show by coordinate geometry that $DE = \frac{1}{2}AB$. [4]

37 Given: parallelogram $ABCD$ with $BC > AB$ and diagonal $\overline{AC}$.
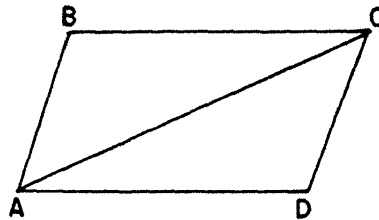
Prove: $\angle BAC$ is *not* congruent to $\angle DAC$.   [10]

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[7]

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[8]

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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

Friday, January 29, 1982 — 1:15 to 4:15 p.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.**

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A   B

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

SCORING KEY

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TENTH YEAR MATHEMATICS

Friday, January 29, 1982 — 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* $\begin{array}{l} x = 2 \\ y = -3 \end{array}$

(2) 3

(3) 5

(4) $\frac{7}{25}$ *or* .28

(5) 20

(6) 30

(7) 36

(8) 2

(9) 6

(10) 12

(11) 6π

(12) 6

(13) 100

(14) 1

(15) 8

(16) 4

(17) 1

(18) 4

(19) 2

(20) 4

(21) 3

(22) 4

(23) 2

(24) 1

(25) 4

(26) 1

(27) 1

(28) 4

(29) 3

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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.

(33) *a* 20   [2]
     b 40   [2]
     c 130   [2]
     d 50   [2]
     e 90   [2]

(36) *a* D (6,3)   [2]
       E (10,6)

(35) *a* (1) the perpendicular bisector of $\overline{AB}$ [2]

     (2) two lines parallel to $\overleftrightarrow{AB}$, 4 units from $\overleftrightarrow{AB}$ and on either side of $\overleftrightarrow{AB}$ [3]

     (3) a circle with center at M having a radius of d units   [3]

   b 4   [2]

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