The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Wednesday, August 18, 1982 — 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.

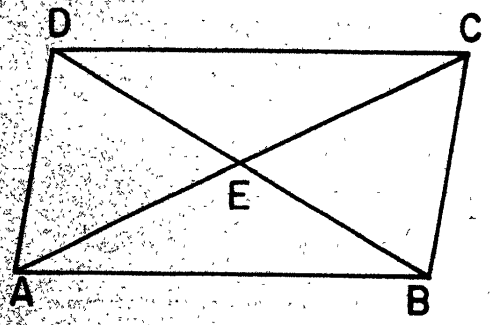
When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during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

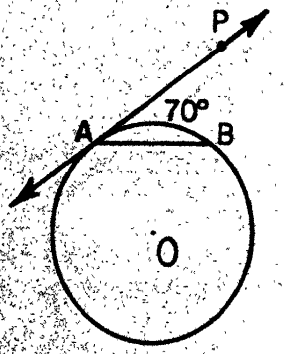
Part I

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.

1 In the accompanying figure, $ABCD$ is a parallelogram with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at E. If $AE = 3x + 2$ and $EC = 20$, what is the value of x?



2 In the accompanying diagram of circle O, $\overleftrightarrow{PA}$ is tangent to circle O at A and $m\overset{\frown}{AB} = 70$. What is $m\angle PAB$?

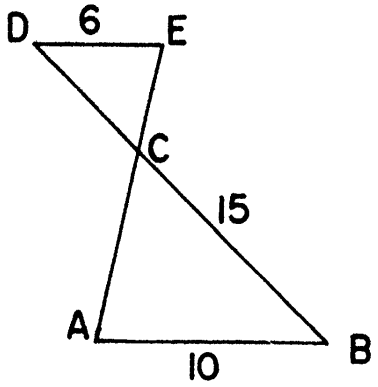


3 The lengths of the bases of a trapezoid are 6 and 8. What is the length of the median of the trapezoid?

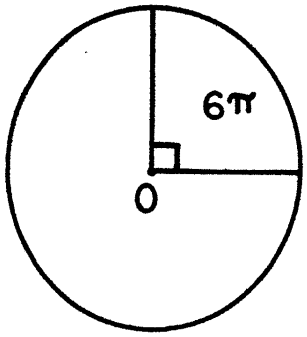
4 In triangle RST, the measure of $\angle R$ is 3 times the measure of $\angle T$. If the measure of an exterior angle at S is 140°, what is $m\angle T$?

5 The measures of the acute angles of a right triangle are in the ratio 1 to 4. What is the number of degrees in the measure of the *smaller* angle?

6 In the accompanying diagram, $\overline{DE} \parallel \overline{AB}$. If $DE = 6$, $AB = 10$, and $BC = 15$, find DC.



7 In the accompanying diagram, the area of the sector of circle O is 6π. If the central angle of the sector measures 90°, find the area of the circle in terms of π.

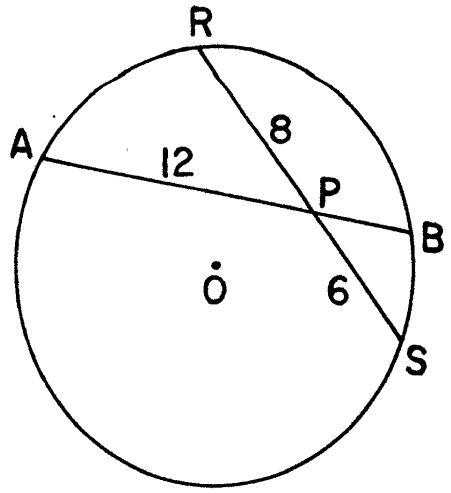


8 The area of triangle ABC is 20. If the length of base $\overline{AB}$ is 10, find the length of the altitude drawn to $\overline{AB}$.

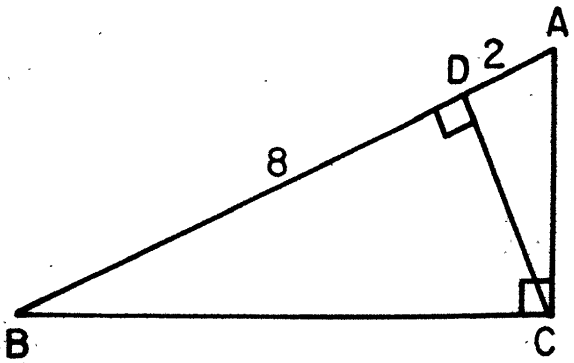
9 Two angles of a parallelogram are in the ratio 4:5. Find the number of degrees in the measure of the *smaller* angle.

10 If the length of a diameter of a circle is 8, find the area of the circle in terms of π.

11 In the accompanying diagram of circle O, chords $\overline{AB}$ and $\overline{RS}$ intersect at point P. If $RP = 8$, $PS = 6$, and $AP = 12$, find PB.



12 In the accompanying diagram, $\triangle ABC$ is a right triangle and $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $AD = 2$ and $DB = 8$, find CD.



Directions (13–30): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

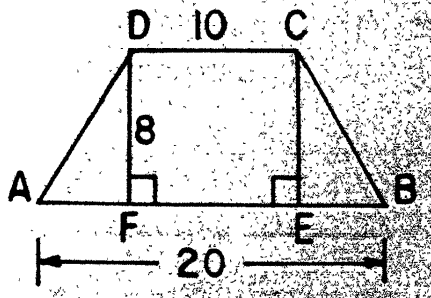
13 A scalene triangle is best defined as a triangle in which
(1) two sides have different lengths
(2) no two sides have the same length
(3) two angles have different measures
(4) three angles have the same measure

14 The measure of each exterior angle of a regular octagon is
(1) 45° (3) 90°
(2) 60° (4) 360°

15 If the coordinates of A are $(0,4)$ and the coordinates of B are $(0,-4)$, then which statement is true?
(1) The midpoint of $\overline{AB}$ is $(0,0)$.
(2) The equation of $\overleftrightarrow{AB}$ is $y = 0$.
(3) The slope of $\overleftrightarrow{AB}$ is 0.
(4) The length of $\overline{AB}$ is 4.

16 Given the true statement: "Vertical angles are congruent." Which is also a true statement?
(1) Congruent angles are vertical angles.
(2) Vertical angles are not congruent.
(3) Noncongruent angles are vertical angles.
(4) Noncongruent angles are not vertical angles.

17 In the accompanying diagram, $ABCD$ is an isosceles trapezoid with altitudes $\overline{CE}$ and $\overline{DF}$. If $AB = 20$, $DC = 10$, and $DF = 8$, what is the area of the trapezoid?



(1) 120 (3) 240
(2) 140 (4) 1,600

18 The perimeter of an equilateral triangle is equal to the perimeter of a square. If the length of a side of the square is 12, the length of a side of the triangle is
(1) 9 (3) 16
(2) 12 (4) 48

19 The length of the longest side of a right triangle is 10. If the length of another side is 3, what is the length of the remaining side?

(1) 7
(2) $\sqrt{91}$
(3) 49
(4) 91

20 The coordinates of the vertices of triangle ABC are $A(2,0)$, $B(4,0)$, and $C(0,4)$, and the coordinates of the vertices of triangle DEC are $D(6,0)$, $E(12,0)$, and $C(0,4)$. What is the ratio of the area of triangle ABC to the area of triangle DEC?

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

21 The lengths of the diagonals of a rhombus are 10 and 15. The area of the rhombus is equal to

(1) 150
(2) 75
(3) 25
(4) 12.5

22 In the plane of a given triangle, the locus of points equidistant from the three vertices of the triangle is

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

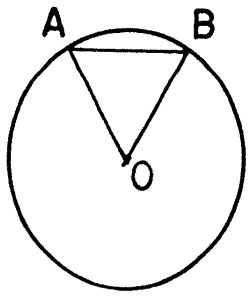
23 In which polygon will the diagonals *always* bisect the angles?

(1) parallelogram
(2) trapezoid
(3) hexagon
(4) rhombus

24 The lengths of the sides of a right triangle are 3, 4, and 5. What is the cosine of the *smallest* angle of the triangle?

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

25 In the accompanying figure, points A and B lie on circle O and equilateral triangle AOB is drawn. If the circumference of circle O is 12π, then what is the length of minor arc AB?



(1) π
(2) 2π
(3) 3π
(4) 4π

26 In a triangle, the measures of the angles are 30°, 60°, and 90°. What is the ratio of the length of the side opposite the 30° angle to the length of the hypotenuse?

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

27 If circle O is circumscribed about $\triangle ABC$, then point O is *always* on

(1) side $\overline{AC}$
(2) the median to side $\overline{AC}$
(3) the bisector of $\angle ABC$
(4) the perpendicular bisector of $\overline{AB}$

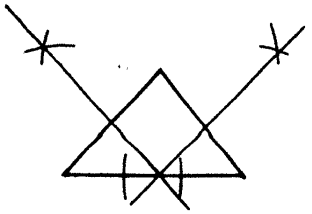
28 What is the inverse of the statement, "If there is a fog, then the airplane flight is canceled"?

(1) If there is not a fog, then the airplane flight is canceled.
(2) If the airplane flight is canceled, then there is a fog.
(3) If there is not a fog, then the airplane flight is not canceled.
(4) If the airplane flight is not canceled, then there is not a fog.

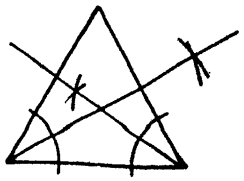
29 If the lengths of two sides of a triangle are 5 and 10, the length of the third side can be

(1) 20
(2) 15
(3) 7
(4) 5

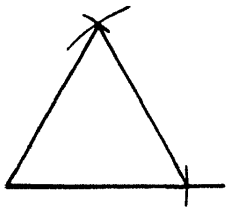
30 Which drawing best illustrates the construction of an equilateral triangle?



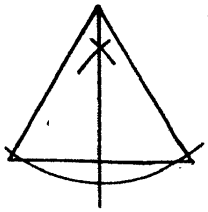
(1)



(3)



(2)



(4)

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.

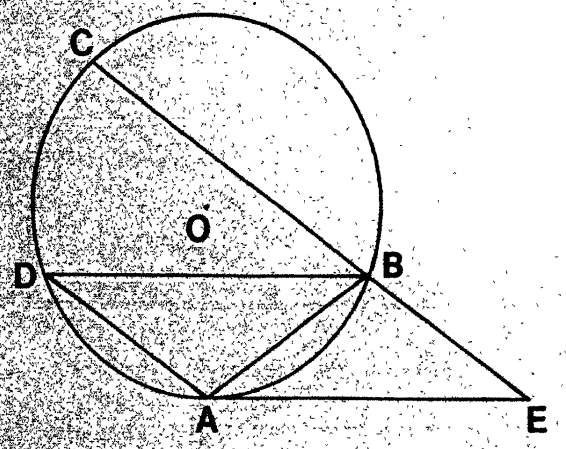
31 Prove *either* *a* or *b* but *not* both.

a The 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 In the accompanying diagram, $\overline{AE}$ is tangent to circle O at A, $\overline{DB} \parallel \overline{AE}$, $\overline{EBC}$ is a secant, $\overline{AD}$ and $\overline{AB}$ are chords, $\widehat{AD} \cong \widehat{DC}$, and $m\widehat{AB} = 70$.



Find: *a* $m\widehat{BC}$ [2]
b $m\angle CBA$ [2]
c $m\angle BEA$ [2]
d $m\angle DAE$ [2]
e $m\angle ABE$ [2]

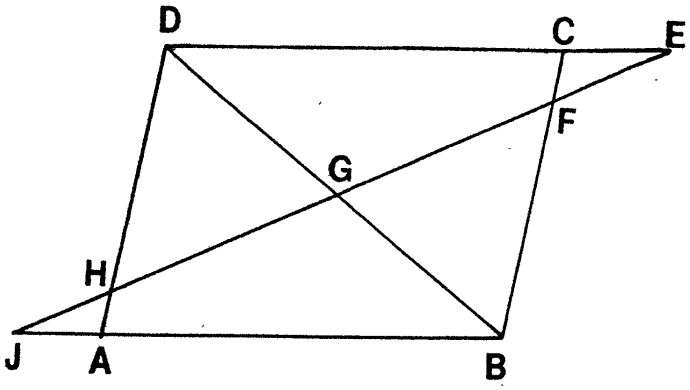
33 A regular polygon of 12 sides is inscribed in a circle whose radius has length 10.

a Find the length of a side of the polygon to the *nearest tenth.* [4]

b Find the length of an apothem of the polygon to the *nearest tenth.* [4]

c Using the results obtained in parts *a* and *b*, find the area of the polygon to the *nearest integer.* [2]

34 Given: $ABCD$ is a parallelogram, bases $\overline{BA}$ and $\overline{DC}$ are extended to J and E, respectively, so that $\overline{AJ} \cong \overline{CE}$, $\overline{EFGHJ}$, $\overline{DGB}$, $\overline{DHA}$, $\overline{CFB}$.



Prove: $\overline{GH} \cong \overline{FG}$ [10]

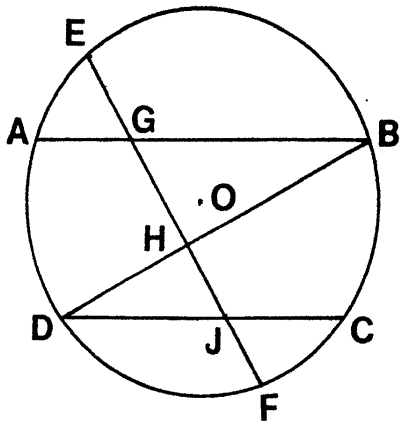
35 The coordinates of the vertices of $\triangle ABC$ are $A(2,3)$, $B(8,-5)$, and $C(-4,-3)$.

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

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

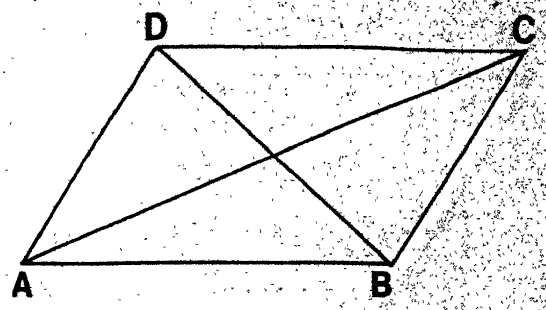
c Show by means of coordinate geometry that $\overline{DE} \parallel \overline{AB}$ and state a reason for your conclusion. [4]

36 Given: circle O with chord $\overline{AB}$ parallel to chord $\overline{CD}$ and chord $\overline{BD}$ is drawn. Chord $\overline{EF}$ intersects $\overline{AB}$ at G, $\overline{BD}$ at H, and $\overline{DC}$ at J.



Prove: $DH \times GH = HB \times HJ$ [10]

37 Given: $ABCD$ is a parallelogram, diagonals $\overline{AC}$ and $\overline{BD}$ are drawn, and $AB > BD$.



Prove: $m\angle ADC > m\angle DCB$ [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

Wednesday, August 18, 1982 — 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 .....

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 .....

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D

FOR TEACHERS ONLY

SCORING KEY

10

TENTH YEAR MATHEMATICS

Wednesday, August 18, 1982 — 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 13–30, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 6	(11) 4	(21) 2
(2) 35	(12) 4	(22) 3
(3) 7	(13) 2	(23) 4
(4) 35	(14) 1	(24) 4
(5) 18	(15) 1	(25) 2
(6) 9	(16) 4	(26) 2
(7) 24π	(17) 1	(27) 4
(8) 4	(18) 3	(28) 3
(9) 80	(19) 2	(29) 3
(10) 16π	(20) 3	(30) 2

[OVER]

57

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) *a* 150 [2]
b 70 [2]
c 35 [2]
d 145 [2]
e 110 [2]

(33) *a* 5.2 [4]
b 9.7 [4]
c 303 [2]

(35) *a* $D(-1,0)$
$E(2,-4)$
or [1,1]
$D\ x = -1$
$y = 0$
$E\ x = 2$
$y = -4$