The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Wednesday, August 18, 1976—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 5 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 The lengths of a pair of corresponding sides of two similar polygons are 4 and 6, respectively. If the perimeter of the smaller polygon is 12, what is the perimeter of the *larger* polygon?

2 In the accompanying figure, $\overrightarrow{BD}$ bisects $\angle ABC$ and $\overrightarrow{EF} \parallel \overrightarrow{BC}$. If m$\angle ABC = 70$, find m$\angle BFE$.
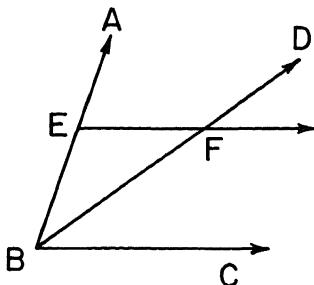
3 Given $\triangle DEF$ similar to $\triangle MNR$ and m$\angle D$ = m$\angle M$ = 95. In $\triangle DEF$ the length of the longest side is twice the length of the shortest side. If the length of the shortest side of $\triangle MNR$ is 4, find NR.

4 Find the radius of a circle whose area is 16π.

5 The measure of the larger of two supplementary angles exceeds the measure of the smaller by 84°. Find the number of degrees in the measure of the *smaller* angle.

6 A circle whose center is at $(4,-2)$ is tangent to the x-axis. Find the coordinates of the point of tangency.

7 Find the area of an equilateral triangle each of whose sides has length 10.

8 In the accompanying diagram, points P, Q, and R are the midpoints of sides $\overline{AB}$, $\overline{BC}$, and $\overline{CA}$ of $\triangle ABC$, respectively. If m$\angle A = 20$ and m$\angle ARP = 100$, find m$\angle PQB$.
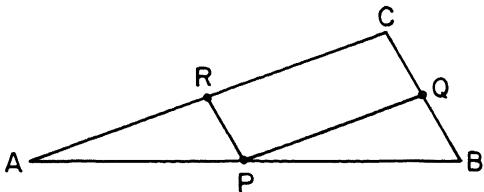
9 Express in radical form the length of the line segment joining the points $(3,6)$ and $(7,11)$.

10 In $\triangle ABC$, m$\angle C$ = 90, m$\angle B$ = 23, and BC = 40. Find AC to the *nearest integer*.

11 In the accompanying figure, $\overline{EF}$ is parallel to bases $\overline{AB}$ and $\overline{DC}$ in trapezoid $ABCD$. If $DE = 5$, $EA = 7$, and $CF = 4$, find FB.
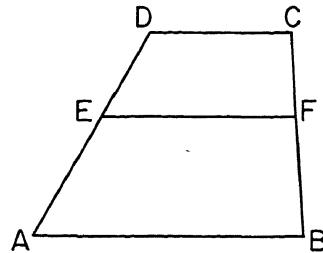
12 The supplement and the complement of any acute angle differ by how many degrees?

13 In circle O, chords $\overline{AC}$ and $\overline{BC}$ are perpendicular to each other at point C. If $AC = 5$ and $BC = 12$, what is the length of the diameter of the circle?

14 Trapezoid $ABCD$, with $\overline{BC} \parallel \overline{AD}$, is inscribed in circle O. Base $\overline{AD}$ is a diameter of the circle and m$\overarc{BC}$ = 80. Find m$\overarc{CD}$.

15 A chord 6 centimeters in length is 4 centimeters from the center of a circle. What is the number of centimeters in the length of the radius of the circle?

16 In the accompanying diagram, $\overline{PDA}$, $\overline{PEB}$, $\overline{DCE}$, $PD = PE = y$, $AD = BE = x$. If $\overline{AD} \cong \overline{DC}$, and $\overline{CE} \cong \overline{EB}$, express the perimeter of triangle PDE in terms of x and y.
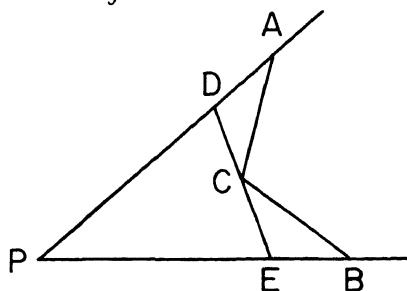
17 The diagonals of square $ABCD$ intersect at E. If the coordinates of E are $(4,3)$ and the coordinates of A are $(1,0)$, find the coordinates of C.

18 Find the area of a square whose perimeter is $4a$.

19 Find the radius of the circle circumscribed about a regular hexagon whose side has length 9.

20 In the accompanying diagram, $\overline{ABC}$, $\overline{DB} \perp \overline{BE}$, $m\angle ABD = (3x - 10)$ and $m\angle EBC = (2x + 20)$. Find x.
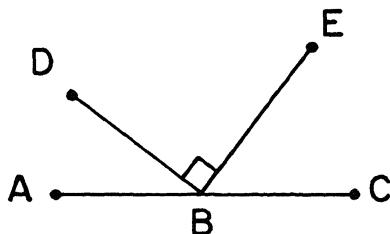
Directions (21–29): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

21 Which is an example of valid reasoning?
(1) All cows are purple. Bessie is a cow. Therefore, Bessie is purple.
(2) All cats have four feet. Morris has four feet. Therefore, Morris is a cat.
(3) All birds can sing. Buddy is a bird. Therefore, Buddy can fly.
(4) All mice are gray. Bridget is not a mouse. Therefore, Bridget is not gray.

22 The locus of points equidistant from the x-axis and the y-axis consists of two straight lines. An equation for one of these lines is
(1) $y = 0$ (3) $x = 1$
(2) $x = 0$ (4) $y = x$

23 If two sides of an isosceles triangle have lengths 4 and 9, respectively, then the length of the third side must be
(1) 13   (3) 5
(2) 9   (4) 4

24 Point P is 8 centimeters from $\overleftrightarrow{AB}$. How many points are 6 centimeters from point P and also 3 centimeters from $\overleftrightarrow{AB}$?
(1) 0   (3) 3
(2) 2   (4) 4

25 If the diagonals of a quadrilateral are perpendicular, bisect each other, and are unequal in length, the quadrilateral may be a
(1) rectangle   (3) rhombus
(2) trapezoid   (4) square

26 The circumferences of two circles are 4π and 36π, respectively. What is the ratio of the radius of the smaller circle to the radius of the larger circle?
(1) 1:81   (3) 2:6
(2) 1:9   (4) 9:1

27 In the accompanying diagram, $ABCD$ is a parallelogram. $AB = 15$, $AD = 6$, and $m\angle DAB = 30$. What is the area of the parallelogram?
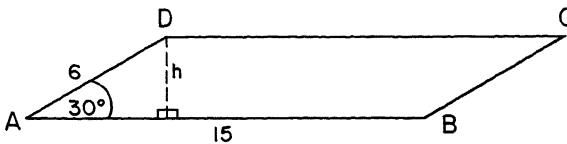
(1) 45   (3) $45\sqrt{3}$
(2) $45\sqrt{2}$ (4) 90

28 In circle O, chord $\overline{AB}$ is perpendicular to chord $\overline{CD}$. If $m\widehat{AC} = x$, then $m\widehat{BD}$, in terms of x, is
(1) $90 + x$ (3) $180 - x$
(2) $180 + x$ (4) $360 - 2x$

29 A triangle and a parallelogram have the same base b. If the altitude of the triangle to base b is $\frac{1}{2}$ the altitude of the parallelogram to base b, then the ratio of the area of the triangle to that of the parallelogram is
(1) 1:1   (3) 1:3
(2) 1:2   (4) 1:4

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

30 Given $m\angle ACD = x$. *On the answer sheet*, construct an angle whose measure is equal to $(2x)°$.

_____

☞ **GO RIGHT ON TO THE NEXT PAGE.**

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 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.   [10]

32 Given: $\triangle MNS$, $\overline{NPRS}$, $\overline{NP} \cong \overline{RS}$, $\angle MPR \cong \angle MRP$
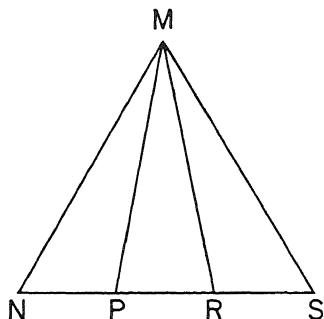
Prove: $\angle NMP \cong \angle SMR$ [10]

33 Given: parallelogram $ABCD$ with $\overline{AE}$ and $\overline{CF}$ the bisectors of $\angle DAB$ and $\angle BCD$, respectively.
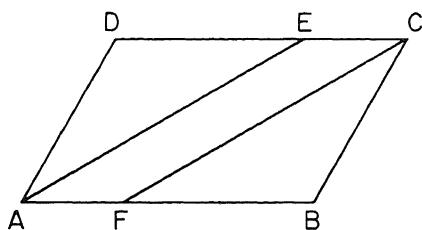
Prove: quadrilateral $AFCE$ is a parallelogram   [10]

34 Given: $m\angle CDB > m\angle CBD$ and $\overline{AD} \cong \overline{AB}$
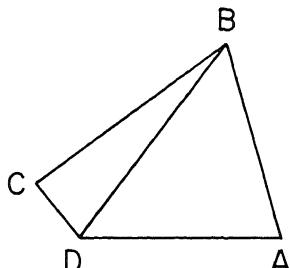
Prove: $m\angle CDA > m\angle CBA$ [10]

35 In the accompanying diagram, pentagon $ABCDE$ is inscribed in circle O. Secant $\overline{PBA}$ and tangent $\overline{PCK}$ are drawn. Chords $\overline{AD}$ and $\overline{EC}$ are drawn intersecting at R.
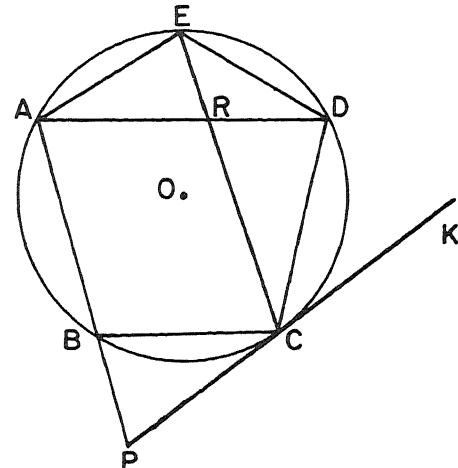
If $\overline{AD} \parallel \overline{BC}$, $EA = ED$, $m\angle AED = 110$, and $m\angle ARC = 105$, find
a $m\widehat{AE}$ [2]
b $m\widehat{ABC}$ [3]
c $m\angle DCK$ [2]
d $m\angle P$ [3]

36 In the accompanying diagram, $\triangle ABC$ is a right triangle with $m\angle C = 90$, and $\overline{BDC}$.
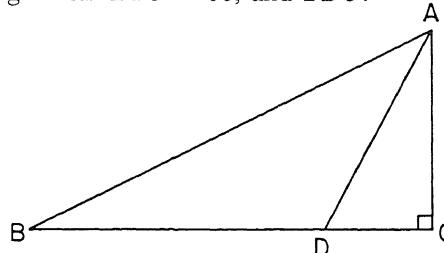
If $m\angle B = 26$, $m\angle ADC = 61$, and $DC = 50$,
a find AC to the *nearest integer*   [4]
b using the result in part *a*, find BD to the *nearest integer*   [6]

37 Quadrilateral $ABCD$ has vertices $A(-4,-1)$, $B(5,-2)$, $C(2,3)$, and $D(-7,4)$.

  a Show by means of coordinate geometry that $ABCD$ is a parallelogram and state a reason for your conclusion.   [6]

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

  c Find the slope of $\overline{AC}$.   [2]

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	

FOR TEACHERS ONLY

SCORING KEY

10

TENTH YEAR MATHEMATICS

Wednesday, August 18, 1976 — 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 21–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 18

(2) 35

(3) 8

(4) 4

(5) 48

(6) (4,0) *or* $\begin{aligned}x &= 4 \\ y &= 0\end{aligned}$

(7) $25\sqrt{3}$

(8) 100

(9) $\sqrt{41}$

(10) 17

(11) $\dfrac{28}{5}$ *or* 5.6

(12) 90

(13) 13

(14) 50

(15) 5

(16) $2x + 2y$

(17) (7,6) *or* $\begin{aligned}x &= 7 \\ y &= 6\end{aligned}$

(18) a^2

(19) 9

(20) 16

(21) 1

(22) 4

(23) 2

(24) 2

(25) 3

(26) 2

(27) 1

(28) 3

(29) 4

[OVER]

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* 70   [2]
     b 140   [3]
     c 40   [2]
     d 80   [3]

(36) *a* 90   [4]
     b 135   [6]

(37) *b* $\sqrt{52}$ *or* $2\sqrt{13}$ [2]
     c $\dfrac{2}{3}$ [2]