The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Monday, June 18, 1973 — 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 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.

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.
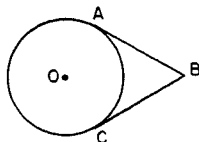
1 One base angle of an isosceles triangle has a measure of 15°. Find the number of degrees in the measure of the vertex angle.

2 In the accompanying figure, m∠CEB = 40 and m∠ECB = 58. Find m∠ABC.
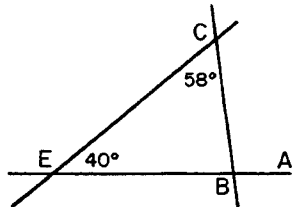
3 Square ABCD has coordinates A(1,1), B(4,1), and C(4,4). Find the coordinates of point D.

4 In the accompanying figure, $\overline{BA}$ and $\overline{BC}$ are tangent to circle O at points A and C. If m$\overarc{AC}$ = 120, find m∠B.


5 In triangle ABC, D is a point on $\overline{AC}$ and E is a point on $\overline{BC}$ so that $\overline{DE}$ is parallel to $\overline{AB}$. If CD = 12, DA = 8, and EB = 6, find CE.

6 What is the length of the diagonal of a rectangle with width 5 and length 12?

7 In the accompanying figure, parallel lines r and s are intersected by transversal t at points A and B, respectively. If m∠1 = x + 10 and m∠2 = 2x + 20, find x.
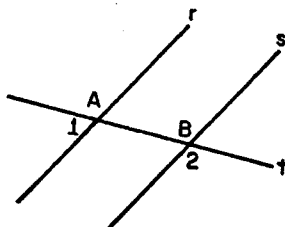
8 In the accompanying figure, $\overline{ROS}$ is a diameter of circle O, as shown. Radius $\overline{OT}$ and chords $\overline{RT}$ and $\overline{TS}$ are drawn. If m∠R = 50, find m∠1.
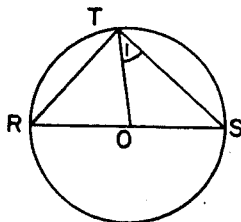

9 The altitude to the hypotenuse of a right triangle divides the hypotenuse into two segments whose lengths are 2 and 18. Find the length of the altitude.

10 Find the area of a right triangle whose legs are of lengths 5 and 7, respectively.

11 Find in radical form the distance from the origin to the point (2,5).

12 In the accompanying figure, $\overline{PQ}$ is tangent to circle O and $\overline{PRT}$ is a secant. If PR = 3 and RT = 9, find PQ.
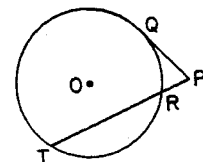
13 A chord is 4 inches from the center of a circle whose radius is 5 inches. Find the number of inches in the length of the chord.

14 Quadrilateral ABCD is inscribed in circle O. If m∠A = 3x − 5 and m∠C = 2x + 10, find x.

15 A tree on level ground casts a shadow 12 feet long when the angle of elevation of the sun measures 65 degrees. Find, correct to the *nearest foot*, the height of the tree.

16 Find the slope of the line passing through the points (4,1) and (8,3).

Directions (17–29): Write in the space provided on the separate answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

17 If AB > CD and EF > GH, then which statement is *not* always true?
(1) ½AB > ½CD
(2) 2EF > 2GH
(3) AB + EF > CD + GH
(4) AB − EF > CD − GH

18 If the bases of a trapezoid are of lengths a and b, then the median of the trapezoid is of length
(1) ½ab   (3) a + b
(2) ½(a + b)   (4) 2(a + b)

19 Which set of integers can *not* be used as the lengths of the sides of a triangle?
(1) {1,2,3} (3) {3,4,5}
(2) {2,3,4} (4) {4,5,6}

20 Circles O and O' intersect at two distinct points. The maximum number of common tangents they may have is
(1) 1 (3) 3
(2) 2 (4) 4

21 The point $Q(3,4)$ is the midpoint of $\overline{AB}$. If the co-ordinates of A are $(7,6)$, find the coordinates of B.
(1) (—1,2) (3) (5,5)
(2) (2,1) (4) (11,8)

22 What is the length of the radius of the circle inscribed in a square with side of length 8?
(1) $2\sqrt{2}$ (3) $4\sqrt{2}$
(2) $2\sqrt{3}$ (4) 4

23 In a given plane, the locus of points equidistant from the *three* vertices of a triangle is
(1) 1 point (3) 3 points
(2) 1 line (4) 3 lines

24 The coordinates of the point on the x-axis equidistant from the two lines, $x = 6$, and $x = -2$, are
(1) (2,0) (3) (0,2)
(2) (—2,0) (4) (0,—2)

25 The diagonals of a quadrilateral always divide it into four congruent triangles if the quadrilateral is
(1) a rhombus
(2) a rectangle
(3) a trapezoid
(4) an isosceles trapezoid

26 If two angles of a triangle are complementary, then the triangle *must* be
(1) scalene (3) right
(2) isosceles (4) equiangular

27 If the perimeter of an equilateral triangle is 24, then the area of the triangle is
(1) $96\sqrt{3}$ (3) $16\sqrt{3}$
(2) $64\sqrt{3}$ (4) $4\sqrt{3}$

28 The midpoints of the sides of triangle ABC are joined to form triangle DEF. The ratio of the area of triangle DEF to the area of triangle ABC is
(1) 1:2 (3) 1:4
(2) 1:3 (4) 1:9

29 If the sum of the measures of the interior angles of a polygon is 1,080 degrees, the number of sides of the polygon is
(1) 6 (3) 3
(2) 8 (4) 4

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

30 *On the answer sheet,* construct the *median* to side $\overline{AB}$ of triangle ABC.
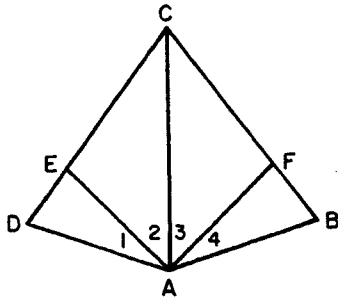
Part II

Answer four questions from this part. Show all work unless otherwise directed.

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

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

<center>OR</center>

   b The area of a trapezoid is equal to one-half the product of the length of the altitude and the sum of the lengths of the bases.

32 In the figure below, $\overline{AE} \cong \overline{AF}$, $\angle 1 \cong \angle 4$, and $\angle 2 \cong \angle 3$.

   Prove: $\triangle AEC \cong \triangle AFC$
 $\overline{AD} \cong \overline{AB}$ [3,7]

33 The coordinates of the vertices of triangle ABC are $A(-2,-1)$, $B(6,-1)$, and $C(2,5)$.

   a Find the coordinates of the midpoint M of side $\overline{BC}$. [2]

   b Find, in radical form, the length of the median $\overline{AM}$. [2]

   c Write an equation of the locus of points equidistant from A and B. [2]

   d Find the area of triangle ABC. [4]

34 In the accompanying figure, diagonals $\overline{AC}$ and $\overline{BD}$ of rhombus $ABCD$ intersect at E. The length of diagonal $\overline{AC}$ is 20 and $m\angle EAB = 38$.
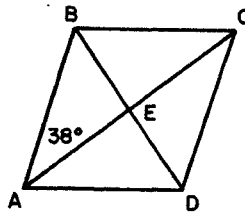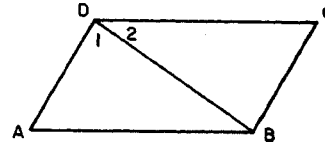

   a Find the length of diagonal $\overline{BD}$ to the *nearest integer*. [4]

   b Using the result found in part *a*, find the area of the rhombus. [2]

   c Find, to the *nearest integer*, the length of side $\overline{AB}$. [4]

35 In the diagram below, isosceles triangle ABC, with $\overline{AB} \cong \overline{AC}$, is inscribed in circle O. Chord $\overline{AE}$ intersects side $\overline{BC}$ at D. Chord $\overline{BE}$ is drawn.
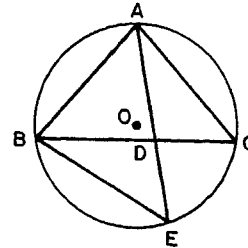
   Prove: $(AB)^2 = AD \times AE$ [10]

36 Given: Parallelogram $ABCD$, diagonal $\overline{BD}$, $AB > AD$

   Prove: $m\angle 1 > m\angle 2$ [10]

*37 The vertices of triangle ABC are $A(8,-2)$, $B(5,6)$, and $C(-2,2)$.

   a Find the slope of $\overleftrightarrow{AC}$. [2]

   b Write an equation of the line through B and parallel to $\overleftrightarrow{AC}$. [3]

   c Write an equation of the line through M, the midpoint of $\overline{AC}$, and perpendicular to $\overleftrightarrow{AC}$. [5]

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

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

10 TENTH YEAR MATHEMATICS

Monday, June 18, 1973 — 1:15 to 4:15 p.m., only

Just before the start of the examination period, distribute one examination booklet, face up, to each pupil. Instruct the pupils to read the directions on the cover of the examination booklets and to detach the answer sheet and reference tables and to fill in the heading on their answer sheet. When each pupil has received a booklet and finished filling in the heading of the answer sheet, instruct the pupils to open their examination booklets and begin work.

Use only *red* ink or 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.

SCORING KEY

Part I

Allow 2 credits for each correct answer; allow no partial credit. For questions 17–29, allow credit if the pupil has written the correct answer instead of the number 1, 2, 3, or 4.

(1) 150	(11) $\sqrt{29}$	(21) 1
(2) 98	(12) 6	(22) 4
(3) (1,4)	(13) 6	(23) 1
(4) 60	(14) 35	(24) 1
(5) 9	(15) 26	(25) 1
(6) 13	(16) 0.5	(26) 3
(7) 50	(17) 4	(27) 3
(8) 40	(18) 2	(28) 3
(9) 6	(19) 1	(29) 2
(10) 17.5	(20) 2	

[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.

(33) *a* (4,2)　　[2]

　　 b $3\sqrt{5}$　　[2]

　　 c $x = 2$　　[2]

　　 d 24　　[4]

(34) *a* 16　　[4]

　　 b 160　　[2]

　　 c 13　　[4]

(37) *a* $-\frac{2}{5}$　　[2]

　　 b $y - 6 = -\frac{2}{5}(x - 5)$　　[3]

　　 c $y = \frac{5}{2}(x - 3)$　　[5]