The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Thursday, January 26, 1989 — 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.

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 30 questions from this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Write your answers in the spaces provided on the separate answer sheet. Where applicable, answers may be left in radical form.   [60]

1 In rectangle $ABCD$, $AC = 2x + 15$ and $BD = 4x - 5$. Find x.

2 If the measures of three angles of a quadrilateral are 30, 70, and 110, find the measure of the fourth angle.

3 The perimeter of $\triangle ABC$ is 30. Find the perimeter of the triangle formed by joining the midpoints of the sides of $\triangle ABC$.

4 If $p \# q$ is defined as $3p \div 2q$, find the value of $4 \# 1$.

5 In $\triangle LMN$, P is a point on $\overline{LM}$ and Q is a point on $\overline{LN}$ such that $\overline{PQ} \parallel \overline{MN}$. If $LP = 4$, $PM = 3$, and $QN = 9$, what is the length of $\overline{LQ}$?

6 Evaluate: $_{20}C_{19}$

7 In $\triangle ABC$, the measure of $\angle A$ is 50 and the measure of an exterior angle at vertex B is 125. Which is the longest side of the triangle?

8 If 2 is a root of the equation $x^2 + kx + 6 = 0$, find the value of k.

9 The ratio of the corresponding sides of two similar triangles is 7:5. Find the ratio of their perimeters.

10 In the accompanying diagram, $\triangle ABC$ is a right triangle and $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $AD = 4$ and $DB = 16$, find the length of $\overline{CD}$.
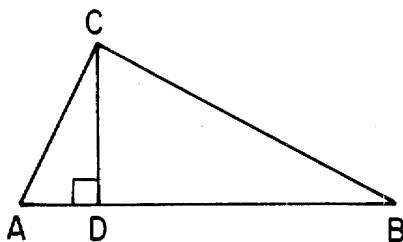
11 Find, in radical form, the length of the line segment joining points (1,5) and (3,9).

12 In parallelogram $ABCD$, $m\angle A$ is 30 more than $m\angle B$. Find the measure of $\angle D$.

13 Find the roots of the equation $x^2 + 8x + 15 = 0$.

14 Find the slope of the line that passes through points $L(4,5)$ and $N(3,-4)$.

15 How many different arrangements of 7 letters can be formed from the letters in the name "SOLOMON"?

16 In parallelogram $ABCD$, the coordinates of A are (7,3) and of C are (5,-1). What are the coordinates of the intersection of the diagonals?

17 Find the length of a diagonal of a square whose perimeter is 20.

18 If the equation of a circle is $x^2 + y^2 = 34$, what is the length of the radius?

Directions (19–34): For *each* question chosen, write on the separate answer sheet the *numeral* preceding the word or expression that best completes the statement or answers the question.

19 In the system $(S,*)$ defined below, what is the solution to the equation $x * x = x$?

*	a	b	c	d
a	c	d	a	b
b	d	a	b	c
c	a	b	c	d
d	b	c	d	a

(1) a (3) c
(2) b (4) d

20 The table below defines the operation ⊕ for the set of elements $\{w,x,y,z\}$. What is the identity element?

⊕	w	x	y	z
w	x	z	w	y
x	z	y	x	w
y	w	x	y	z
z	y	w	z	x

(1) w
(2) x
(3) y
(4) z

21 Which equation describes a set of points equidistant from the x-axis and the y-axis?

(1) $x = y$
(2) $x + y = 1$
(3) $y = 3$
(4) $x = -7$

22 Which set of numbers can *not* represent the measures of the angles of a triangle?

(1) $\{35,125,10\}$
(2) $\{20,100,60\}$
(3) $\{30,110,40\}$
(4) $\{97,59,24\}$

23 If the points (3,5), (4,2), and (5,k) lie on a straight line, the value of k is

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

24 Which statement is logically equivalent to $\sim(\sim a \vee b)$?

(1) $a \vee \sim b$
(2) $a \wedge \sim b$
(3) $\sim a \vee \sim b$
(4) $\sim a \wedge \sim b$

25 The coordinates of the turning point of the parabola whose equation is $y = x^2 - 6x + 8$ are

(1) (3,35)
(2) (-3,-1)
(3) (-3,35)
(4) (3,-1)

26 If the lengths of two sides of a triangle are 7 and 10, the length of the third side may be

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

27 Given the true statements:

$p \rightarrow r$
$q \rightarrow \sim r$
p

Which conclusion is valid?

(1) q
(2) $\sim q$
(3) $\sim r$
(4) $\sim p$

28 Which is the negation of the statement "All squares are rectangles"?

(1) Some squares are not rectangles.
(2) Some squares are rectangles.
(3) All squares are not rectangles.
(4) No squares are rectangles.

29 Which pair of points will determine a line parallel to the y-axis?

(1) (2,3) and (-1,3)
(2) (2,2) and (-3,-3)
(3) (3,2) and (3,-1)
(4) (2,-2) and (-2,2)

30 Which is an example of a quadrilateral whose diagonals are congruent but do *not* bisect each other?

(1) a square
(2) an isosceles trapezoid
(3) a rhombus
(4) a rectangle

31 The elements a, b, c, and d form commutative group R with respect to @. Which expression is equivalent to a @ c in group R?

(1) b
(2) c @ a
(3) a @ a^{-1}
(4) $(a^{-1}$ @ $c^{-1})$

32 A set contains three triangles: one equilateral, one isosceles, and one scalene. If a triangle is selected from the set at random, what is the probability that at least one of its medians is also an altitude?

(1) 1
(2) 0
(3) $\frac{1}{3}$
(4) $\frac{2}{3}$

33 Which is an equation of the line that has a y-intercept of -2 and is parallel to the line whose equation is $4y = 3x + 7$?

(1) $y = \frac{3}{4}x - 2$ (3) $y = \frac{4}{3}x - 2$

(2) $y = \frac{3}{4}x + 2$ (4) $y = -\frac{4}{3}x - 2$

34 How many points are 2 centimeters from a given line and 2 centimeters from a given point on that line?

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

Directions (35): Leave all construction lines on the answer sheet.

35 *On the answer sheet,* construct the median to side $\overline{AC}$ in $\triangle ABC$.

Answers to the following questions are to be written on paper provided by the school.

Part II

Answer three questions from this part. Show all work unless otherwise directed. [30]

36 At random, Coach Smith chooses her 5-member math team from a club that consists of 3 boys and 5 girls.

a How many different 5-member teams can be chosen? [2]

b What is the probability that the team has only 1 boy? [2]

c What is the probability that the team has only 1 girl? [2]

d What is the probability that Susan, a member of the club, is *not* chosen for the team? [4]

37 The equation of line $\overleftrightarrow{AB}$ is $x = 2$.

a Describe fully the locus of points d units from line $\overleftrightarrow{AB}$. [2]

b Describe fully the locus of points 1 unit from the origin. [2]

c How many points satisfy the conditions in parts a and b simultaneously for the following values of d?

(1) $d = 2$ [2]
(2) $d = 3$ [2]
(3) $d = 4$ [2]

38 a Find the roots of the equation $x^2 - 2x - 4 = 0$. [Answer may be left in radical form.] [3]

b On graph paper, draw the graph of the equation $y = x^2 - 2x - 4$ using all integral values of x such that $-2 \le x \le 4$. [5]

c Based on the graph drawn in part b, between which two positive consecutive integers does the value of $y = 0$ lie? [2]

39 Find the area of quadrilateral $ABCD$ with vertices $A(5,2)$, $B(0,5)$, $C(-2,-2)$, and $D(0,0)$. [10]

40 Jean, Bill, and Mel are competing in a game of marbles. At the start of the game, each has the same number of marbles. After Jean wins two marbles from Bill and two marbles from Mel, the number that Jean has is the product of the numbers remaining for Bill and Mel. How many marbles did each have at the start of the game? [*Only an algebraic solution will be accepted.*] [5,5]

Answers to the following questions are to be written on paper provided by the school.

Part III

Answer one question from this part. Show all work unless otherwise directed. [10]

41 Given: If Cathy gets married and moves to Germany, her mother will be lonely.
Cathy gets married.
Her mother is not lonely.

Let C represent: "Cathy gets married."
Let G represent: "Cathy moves to Germany."
Let L represent: "Her mother is lonely."

Prove: Cathy does not move to Germany. [10]

42 The vertices of $\triangle ABC$ are $A(-2,3)$, $B(0,-3)$, and $C(4,1)$. Prove, by means of coordinate geometry, that

a $\triangle ABC$ is isosceles [4]

b the median to side $\overline{BC}$ is also the altitude to side $\overline{BC}$ [6]

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH — COURSE II

Thursday, January 26, 1989 — 1:15 to 4:15 p.m., only

ANSWER SHEET

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

School . . . . .Grade. . . . .

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

Part I
Answer 30 questions from this part.

1 . . . .   11 . . . .   21 . . . .   31 . . . .

2 . . . .   12 . . . .   22 . . . .   32 . . . .

3 . . . .   13 . . . .   23 . . . .   33 . . . .

4 . . . .   14 . . . .   24 . . . .   34 . . . .

5 . . . .   15 . . . .   25 . . . .   35 Answer question 35
on the other side
of this sheet.

6 . . . .   16 . . . .   26 . . . .

7 . . . .   17 . . . .   27 . . . .

8 . . . .   18 . . . .   28 . . . .

9 . . . .   19 . . . .   29 . . . .

10 . . . .   20 . . . .   30 . . . .

35
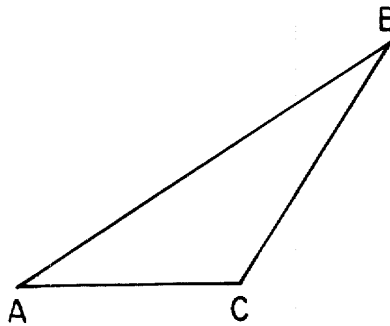
Your answers for Part II and Part III should be placed on paper provided by the school.

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

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Thursday, January 26, 1989 — 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 a total of 60 credits, 2 credits for each of 30 of the following. [If more than 30 are answered, only the first 30 answered should be considered.] Allow no partial credit. For questions 19–34, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 10	(11) $2\sqrt{5}$	(21) 1	(31) 2
(2) 150	(12) 75	(22) 1	(32) 4
(3) 15	(13) $-5, -3$	(23) 3	(33) 1
(4) 6	(14) 9	(24) 2	(34) 2
(5) 12	(15) 840	(25) 4	(35) construction
(6) 20	(16) (6,1)	(26) 4	
(7) $\overline{AB}$	(17) $5\sqrt{2}$	(27) 2	
(8) -5	(18) $\sqrt{34}$	(28) 1	
(9) 7:5	(19) 3	(29) 3	
(10) 8	(20) 3	(30) 2	

Part II

Please refer to the Department publication *Guide for Rating Regents Examinations 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.

(36) *a* 56   [2]

    b $\frac{15}{56}$ [2]

    c 0   [2]

    d $\frac{3}{8}$ [4]

(37) *a* 2 lines parallel to $x = 2$ and
        d units on either side
             or   [2]
        $x = 2 + d$ and $x = 2 - d$

    b a circle with center at the origin
        and radius of 1
             or   [2]
        $x^2 + y^2 = 1$

    c (1) 2   [2]
       (2) 1   [2]
       (3) 0   [2]

(38) *a* $1 \pm \sqrt{5}$ [3]

    c 3 and 4   [2]

(39) $17\frac{1}{2}$ [10]

(40) 5 each   [5,5]