The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Tuesday, January 27, 1987—9:15 a.m. to 12:15 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

Part I

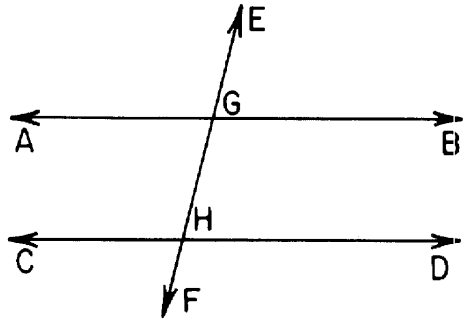
Answer 30 questions from this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Write your answers in the spaces provided on the separate answer sheet. Where applicable, answers may be left in radical form. [60]

1 Using the accompanying table, solve for x if $a * b = c * x$.

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

2 In triangle ABC, D is a point on $\overline{AB}$ and E is a point on $\overline{AC}$ such that $\overline{DE}$ is parallel to $\overline{BC}$. If $AB = 12$, $AC = 15$, and $AD = 8$, find the length of $\overline{AE}$.

3 In the accompanying diagram, parallel lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are intersected by transversal $\overleftrightarrow{EF}$ at G and H, respectively. If $m\angle AGH = 75$, find $m\angle FHD$.



4 The opposite angles of a parallelogram have measures of $3x - 20$ and $x + 15$. Find x.

5 In $\triangle ABC$, $m\angle B$ is three times as large as $m\angle A$. An exterior angle at C measures 140. Find $m\angle A$.

6 What is the area of rectangle $ABCD$ whose vertices are $A(3,2)$, $B(3,-2)$, $C(-3,-2)$, and $D(-3,2)$?

7 Segment AB is the diameter of a circle whose center is the point (2,5). If the coordinates of A are (1,3), find the coordinates of B.

8 The corresponding sides of two similar triangles are 8 and 12. If the perimeter of the smaller triangle is 28, find the perimeter of the larger triangle.

9 Find a positive value for x such that $\frac{x}{2} = \frac{3}{x-5}$.

10 In $\triangle ABC$, $\angle A \cong \angle C$, $AB = 10x - 7$, $BC = 2x + 33$, and $AC = 4x - 6$. Find x.

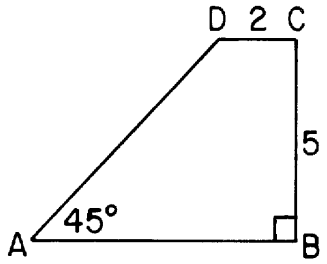
11 How many different 6-letter permutations can be formed from the letters in the word "KOODOO"?

12 Evaluate: ${}_7C_3$

13 What is the slope of the line which passes through the points (3,-8) and (-1,0)?

14 If the coordinates of A are (-2,3) and the coordinates of B are (7,-1), find, in radical form, the length of $\overline{AB}$.

15 In the accompanying diagram, the altitude of trapezoid $ABCD$ is 5, $CD = 2$, $m\angle A = 45$, and $m\angle B = 90$. Find AB.



16 The diagonals of a rhombus measure 6 meters and 8 meters. Find the number of meters in the perimeter of the rhombus.

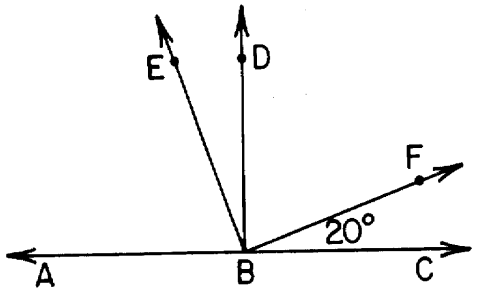
17 In right triangle ABC, altitude $\overline{CD}$ is drawn to the hypotenuse $\overline{AB}$. If $CD = 6$ and $AD = 3$, find the length of $\overline{DB}$.

Directions (18–34): 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.

18 If * is a binary operation defined by $x * y = x^2 + y$, what is the value of $2 * 3$?

(1) 6
(2) 7
(3) 8
(4) 9

19 In the accompanying diagram, $\overrightarrow{BD} \perp \overleftrightarrow{ABC}$ at B and $\overrightarrow{BE} \perp \overrightarrow{BF}$ at B. If $m\angle FBC = 20$, what is $m\angle EBD$?



(1) 20
(2) 70
(3) 90
(4) 110

20 The accompanying table defines the operation $\heartsuit$ for the set $P = \{H,E,A,R,T\}$. According to this table, which statement is true?

$\heartsuit$	H	E	A	R	T
H	E	T	R	H	A
E	R	A	T	E	H
A	T	R	O	A	E
R	H	E	A	R	T
T	A	H	E	T	R

(1) The set P is closed under $\heartsuit$.
(2) The identity element is R.
(3) The operation $\heartsuit$ is commutative.
(4) The inverse of T is R.

21 Which statement is the negation of $m \vee \sim n$?

(1) $\sim m \wedge n$
(2) $\sim m \vee n$
(3) $\sim m \vee \sim n$
(4) $\sim m \wedge \sim n$

22 Which sentence is *not* true?

(1) $\exists_x\, x^2 > 5$
(2) $\forall_x\, x^2 \geq 0$
(3) $\forall_x\, x + 1 = 5$
(4) $\exists_x\, x - 2 = 6$

23 The graph of which equation does *not* pass through the origin?

(1) $y = x$
(2) $y = -x$
(3) $y = 0$
(4) $y = 1$

24 The coordinates of a point on the graph of the equation $y = x^2 - 4$ are

(1) (0,0)
(2) (–2,0)
(3) (–4,0)
(4) (2,2)

25 An equation of the circle whose center is at (2,–3) and whose radius measures 4 is

(1) $(x - 2)^2 + (y + 3)^2 = 16$
(2) $(x + 2)^2 + (y - 3)^2 = 16$
(3) $(x - 2)^2 + (y - 3)^2 = 4$
(4) $(x + 2)^2 + (y - 3)^2 = 4$

26 What are the roots of the quadratic equation $2x^2 + 7x + 4 = 0$?

(1) $\frac{7 \pm \sqrt{17}}{4}$
(2) $\frac{7 \pm \sqrt{17}}{2}$
(3) $\frac{-7 \pm \sqrt{17}}{4}$
(4) $\frac{-7 \pm \sqrt{17}}{2}$

27 Which set of numbers represents the lengths of the sides of a right triangle?

(1) {2,3,6}
(2) {5,5,10}
(3) {4,5,6}
(4) {5,12,13}

28 If r and $\sim s$ are true statements, then what is the probabilty that $s \rightarrow \sim r$ is true?

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

29 If $p \rightarrow q$ is a true statement and $\sim q$ is a true statement, then it follows that

(1) p must be a true statement
(2) p must be a false statement
(3) p may be either a true or a false statement
(4) q must be a true statement

30 Which is an equation of a line whose slope is 0?

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

31 What is the total number of points of intersection of the graphs of the equations $x^2 + y^2 = 9$ and $y = x$?

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

32 If the midpoints of two consecutive sides of a rhombus are joined, the triangle formed must be

(1) isosceles
(2) acute
(3) equilateral
(4) right

33 What is the turning point of the parabola whose equation is $y = 2x^2 + 4x - 3$?

(1) (1,3)
(2) (−2,−3)
(3) (2,13)
(4) (−1,−5)

34 Under which operation is the set of positive rational numbers *not* closed?

(1) addition
(2) subtraction
(3) multiplication
(4) division

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

35 *On the answer sheet*, construct the bisector of angle C in parallelogram $ABCD$.

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 The accompanying table defines the operation @ on the set $\{N,I,T,A\}$.

@	N	I	T	A
N	I	T	A	N
I	T	A	N	I
T	A	N	I	T
A	N	I	T	A

a What is the identity element for @? [2]
b What is the inverse of T? [2]
c What is the value of N @ A @ T? [2]
d Solve for x in the system: N @ $x = I$ [2]
e Solve for y in the system: y @ $y = A$ [1,1]

37 Find the area of quadrilateral $ABCD$ with vertices $A(-1,1)$, $B(3,4)$, $C(8,5)$, and $D(5,-3)$. [10]

38 *a* Draw the graph of the equation $y = x^2 - 4x$ for all values of x such that $-1 \leq x \leq 5$. [6]
b On the same set of axes used in part *a*, draw the graph of the equation $y = -x + 4$. [2]
c Using the graphs drawn in parts *a* and *b*, what is the positive value of x for which $x^2 - 4x = -x + 4$. [2]

39 There are 6 boys and 4 girls of equal ability trying out for a 4-player school bowling team.
a What is the probability this team will consist of 2 boys and 2 girls? [6]
b How many all-boy teams can be formed? [2]
c How many all-girl teams can be formed? [2]

40 In a trapezoid, the length of one base is 5 times the length of the other base. The height of the trapezoid is 1 less than the length of the shorter base. If the area of the trapezoid is 90, find the length of the *shorter* base. [*Only an algebraic solution will be accepted.*] [4,6]

☞ GO RIGHT ON TO THE NEXT PAGE.

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: Either Evan or Rona went out on Saturday night.
If Evan went out on Saturday night, then he studied on Tuesday.
If Evan studied on Tuesday, then Anita did not do her schoolwork on Sunday.
Anita did her schoolwork on Sunday.

Let E represent: "Evan went out on Saturday night."
Let R represent: "Rona went out on Saturday night."
Let T represent: "Evan studied on Tuesday."
Let A represent: "Anita did her schoolwork on Sunday."

Prove: Rona went out on Saturday night. [10]

42 Quadrilateral $QRST$ has vertices $Q(a,b)$, $R(0,0)$, $S(c,0)$, and $T(a+c,b)$. Prove that $QRST$ is a parallelogram. [10]

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH — COURSE II

Tuesday, January 27, 1987—9:15 a.m. to 12:15 p.m., only

Part I Score	
Part II Score	
Part III Score	
Total Score	
Rater's Initials:	

ANSWER SHEET

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

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

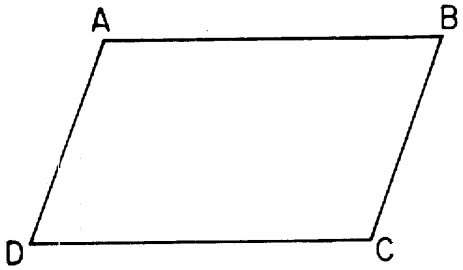
Your answers to Part I should be recorded on this answer sheet.

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

Tuesday, January 27, 1987—9:15 a.m. to 12:15 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 18–34, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) d

(2) 10

(3) 105

(4) 17.5

(5) 35

(6) 24

(7) (3,7)

(8) 42

(9) 6

(10) 5

(11) 30

(12) 35

(13) -2

(14) $\sqrt{97}$

(15) 7

(16) 20

(17) 12

(18) 2

(19) 1

(20) 2

(21) 1

(22) 3

(23) 4

(24) 2

(25) 1

(26) 3

(27) 4

(28) 1

(29) 2

(30) 3

(31) 2

(32) 1

(33) 4

(34) 2

(35) construction

[OVER]

Part II

Please refer to the Department's pamphlet *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* *A* [2]
b *N* [2]
c *A* [2]
d *N* [2]
e *I,A* [1,1]

(37) 35.5 [10]

(38) *c* 4 [2]

(39) *a* $\frac{90}{210}$ [6]
b 15 [2]
c 1 [2]

(40) Analysis [4]
6 [6]