The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Tuesday, June 20, 1989 — 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

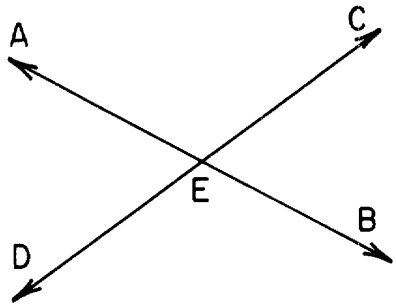
Answer 30 questions from this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Write your answers in the spaces provided on the separate answer sheet. Where applicable, answers may be left in radical form. [60]

1 Using the accompanying table, solve for x if $2 \# x = 3$.

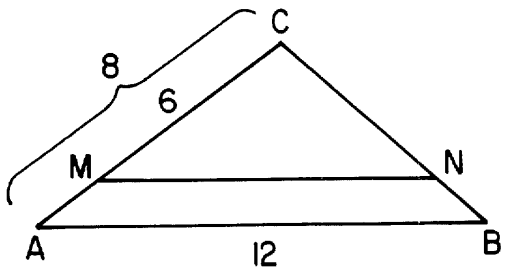
#	1	2	3	4
1	1	1	1	1
2	1	2	3	4
3	1	3	4	2
4	1	4	2	3

2 The ratio of the corresponding sides of two similar polygons is 2:3. If the perimeter of the larger polygon is 27, find the perimeter of the smaller polygon.

3 In the accompanying diagram, $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect at E. If $m\angle AEC = 2x + 40$ and $m\angle CEB = x + 20$, find x.

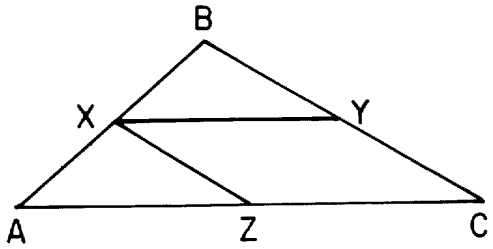


4 In the accompanying diagram of $\triangle ABC$, $\overline{MN} \parallel \overline{AB}$, $AC = 8$, $AB = 12$, and $CM = 6$. Find the length of $\overline{MN}$.



5 If * is an operation defined by $x * y = x^3 - y^2$, find the value of $2 * 1$.

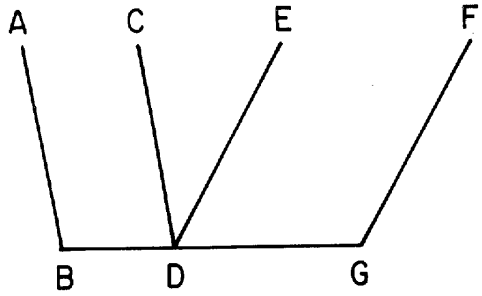
6 In the accompanying diagram of $\triangle ABC$, $AB = 6$, $BC = 8$, and $AC = 12$. Points X, Y, and Z are midpoints of $\overline{AB}$, $\overline{BC}$, and $\overline{AC}$, respectively. Find the perimeter of quadrilateral $XYCZ$.



7 In $\triangle ABC$, side $\overline{AC}$ is extended through C to D. If $m\angle DCB = 50$, which is the *longest* side of $\triangle ABC$?

8 In $\triangle ABC$, $m\angle B$ is 10° larger than $m\angle A$, and $m\angle C$ is 5° less than 3 times $m\angle A$. Find $m\angle A$.

9 In the accompanying diagram, $\overline{BDG}$, $m\angle ABD = 100$, $m\angle DGF = 120$, $\overline{AB} \parallel \overline{CD}$, and $\overline{ED} \parallel \overline{FG}$. Find $m\angle CDE$.



10 What is an equation of the line that is parallel to the x-axis and passes through the point (2,3)?

11 What is the inverse of N defined in the system below?

*	N	I	C	E
N	I	N	E	C
I	N	I	C	E
C	E	C	N	I
E	C	E	I	N

12 How many different 6-letter arrangements can be formed from the letters in the word "CANADA"?

13 Find the distance between the points (−1,5) and (−7,3).

14 What is the slope of the line that passes through the points whose coordinates are (−1,4) and (1,5)?

15 Evaluate: ${}_{10}C_4$

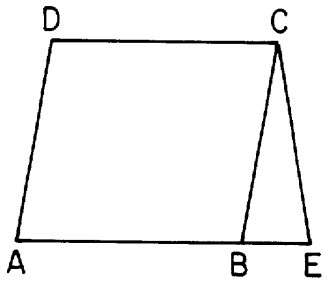
16 In right triangle ABC, $m\angle C = 90$, $AC = 6$, and $AB = 10$. Find the perimeter of $\triangle ABC$.

17 Segment $\overline{AB}$ is the diameter of a circle whose center is (2,0). If the coordinates of A are (0,−3), find the coordinates of B.

Directions (18–35): 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 In parallelogram $ABCD$, diagonals $\overline{AC}$ and $\overline{DB}$ intersect at E. Which statement is *always* true?
(1) Triangle AED is isosceles.
(2) Triangle ABD is a right triangle.
(3) Triangle AEB is congruent to triangle AED.
(4) Triangle ABC is congruent to triangle CDA.

19 In the accompanying diagram of parallelogram $ABCD$, $\overline{AB}$ is extended to E such that $\overline{CB} \cong \overline{CE}$. If $m\angle ADC = 100$, what is $m\angle CEB$?



(1) 100
(2) 80
(3) 50
(4) 40

20 If a and b are any two whole numbers, which statement is always true?
(1) $2a + b = 2b + a$
(2) $a + b = b + a$
(3) $a^b = b^a$
(4) $a \div b = b \div a$

21 The legs of an isosceles right triangle each measure 4. What is the length of the hypotenuse?
(1) 6
(2) $2\sqrt{2}$
(3) $4\sqrt{2}$
(4) 4

22 Which equation has equal roots?
(1) $2x^2 + 5x - 3 = 0$
(2) $x^2 - 4x - 32 = 0$
(3) $x^2 - 7x + 3 = 0$
(4) $x^2 - 8x + 16 = 0$

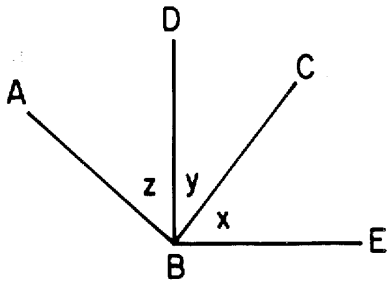
23 What is the converse of the statement, "If x is even, then $x + 1$ is odd"?
(1) If x is odd, then $x + 1$ is even.
(2) If $x + 1$ is odd, then x is even.
(3) If x is not even, then $x + 1$ is odd.
(4) If y is even, then $y + 1$ is odd.

24 Which is an equation of the circle whose center is (1,3) and whose radius is 2?
(1) $(x - 1)^2 + (y - 3)^2 = 2$
(2) $(x - 1)^2 + (y - 3)^2 = 4$
(3) $x^2 + y^2 = 4$
(4) $(x + 1)^2 + (y + 3)^2 = 4$

25 Which is the negation of the statement, "Some rectangles are squares"?
(1) Some rectangles are not squares.
(2) All squares are rectangles.
(3) All rectangles are not squares.
(4) All rectangles are squares.

26 What are the roots of the equation $x^2 + 3x - 5 = 0$?
(1) $\frac{-3 \pm \sqrt{29}}{2}$
(2) $\frac{3 \pm \sqrt{29}}{2}$
(3) $\frac{-3 \pm \sqrt{11}}{2}$
(4) $\frac{3 \pm \sqrt{11}}{2}$

27 In the accompanying diagram, $\overline{AB} \perp \overline{BC}$, $\overline{DB} \perp \overline{BE}$, $m\angle CBE = x$, $m\angle DBC = y$, and $m\angle ABD = z$. Which statement must be true?



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

28 Which statement is *always* true?
(1) All trapezoids are parallelograms.
(2) All parallelograms are rectangles.
(3) All squares are rhombuses.
(4) All rhombuses are rectangles.

29 Which is an equation of the axis of symmetry for the parabola whose equation is $y = x^2 - 8x - 7$?
(1) $x = 4$
(2) $y = 4$
(3) $x = 8$
(4) $y = 8$

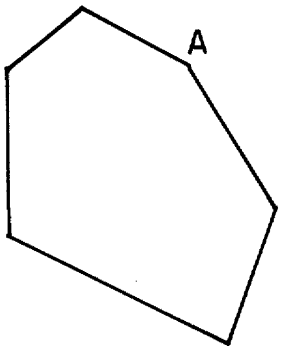
30 If $a \rightarrow \sim c$ and $\sim e \rightarrow c$, then which is true?
(1) $a \rightarrow \sim e$
(2) $\sim e \rightarrow a$
(3) $a \rightarrow e$
(4) $e \rightarrow a$

31 What is an equation of the line parallel to the line whose equation is $2x + y = 6$ and that passes through the point (0,–1)?
(1) $x + 2y = -1$
(2) $y = -1$
(3) $2x + y = 1$
(4) $y = -2x - 1$

32 If 2 cards are dealt randomly from a standard deck of 52 cards, what is the probability that they are both red queens?
(1) $\frac{4}{52} \cdot \frac{3}{51}$
(2) $\frac{2}{26}$
(3) $\frac{2}{52} \cdot \frac{1}{51}$
(4) $\frac{2}{52}$

33 The locus of the midpoints of the radii of a circle is
(1) a point
(2) two lines
(3) a line
(4) a circle

34 In the accompanying diagram, what is the total number of distinct diagonals that can be drawn from vertex *A*?



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

35 To locate a point equidistant from the vertices of a triangle, construct
(1) the perpendicular bisectors of the sides
(2) the angle bisectors
(3) the altitudes
(4) the medians

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 *a* Draw the graph of the equation $y = x^2 - 6x + 6$ including all values of x in the interval $0 \leq x \leq 6$. [6]

b On the same set of axes, draw the graph of the equation $x + y = 6$. [2]

c Using the graphs drawn in parts *a* and *b*, determine the solution of the system:

$$y = x^2 - 6x + 6$$
$$x + y = 6$$ [2]

37 Given the operations * and # as defined in the tables below.

*	M	O	T
M	A	N	V
O	V	A	N
T	N	V	A

#	V	A	N
V	T	M	O
A	M	O	T
N	O	T	M

a Evaluate: $T * (A \# N)$ [2]

b Evaluate: $(T * O) \# (M * T)$ [3]

c Solve for x: $(N \# A) * x = A$ [2]

d Solve for y: $(M * y) \# A = M$ [3]

38 The base of a rectangle is twice the side of a square, and the height of the rectangle is 2 more than the side of the square. The area of the rectangle is 32 square units more than the area of the square. Find the dimensions of the rectangle. [*Only an algebraic solution will be accepted.*] [10]

39 A committee of 6 is to be chosen from 4 juniors and 5 seniors.

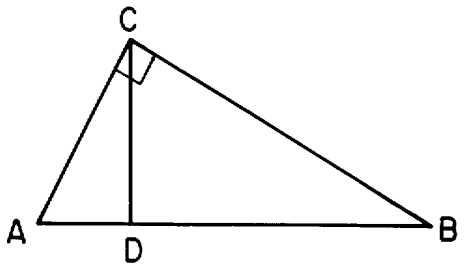
a What is the probability that the committee will include the same number of juniors and seniors? [5]

b What is the probability that the committee will include all 5 seniors? [3]

c What is the probability that the committee will include no seniors? [2]

40 *On your answer paper*, write the numerals 1 through 7, and next to each numeral, give a reason for each statement in the proof.

Given: $\triangle ABC$, $\angle ACB$ is a right angle, and $\overline{CD} \perp \overline{AB}$.



Prove: $AC \times BD = CD \times BC$

Statements	Reasons	
(1) $\angle ACB$ is a right angle, $\overline{CD} \perp \overline{AB}$	(1)	[1]
(2) $\angle B \cong \angle B$	(2)	[1]
(3) $\angle CDB$ is a right angle	(3)	[1]
(4) $\angle CDB \cong \angle ACB$	(4)	[1]
(5) $\triangle ABC \sim \triangle CBD$	(5)	[2]
(6) $\frac{AC}{CD} = \frac{BC}{BD}$	(6)	[2]
(7) $AC \times BD = CD \times BC$	(7)	[2]

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 The coordinates of the vertices of quadrilateral $ABCD$ are $A(4,1)$, $B(1,5)$, $C(-3,2)$, and $D(0,-2)$. Prove the quadrilateral is a square. [10]

42 Acid rain is a problem in our environment.

Given: If industry causes acid rain, then the air is polluted.

If the lakes are not contaminated, then the air is not polluted.

The statement "Fish will die and industry does not cause acid rain" is not true.

The lakes are not contaminated.

Let A represent: "Industry causes acid rain."
Let P represent: "The air is polluted."
Let C represent: "The lakes are contaminated."
Let D represent: "The fish will die."

Using laws of inference, prove: The fish will not die. [10]

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH — COURSE II

Tuesday, June 20, 1989 — 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 .....
6	16	26	
7	17	27	
8	18	28	
9	19	29	
10	20	30	

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, June 20, 1989 — 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 18–35, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 3

(2) 18

(3) 40

(4) 9

(5) 7

(6) 20

(7) $\overline{AB}$ *or* AB *or* c

(8) 35

(9) 40

(10) $y = 3$

(11) N

(12) 120

(13) $2\sqrt{10}$

(14) $\frac{1}{2}$

(15) 210

(16) 24

(17) (4,3)

(18) 4

(19) 2

(20) 2

(21) 3

(22) 4

(23) 2

(24) 2

(25) 3

(26) 1

(27) 2

(28) 3

(29) 1

(30) 3

(31) 4

(32) 3

(33) 4

(34) 3

(35) 1

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) *c* (0,6) and (5,1) [2]

(37) *a* A [2]
b T [3]
c T [2]
d T [3]

(38) 6, 8 [10]

(39) *a* $\frac{10}{21}$ [5]
b $\frac{1}{21}$ [3]
c 0 [2]

Notice . . .

The January 1990 Regents examination in Course II, Three-Year Sequence for High School Mathematics, will be the last examination based on the original 1977 Syllabus. The June 1990 examination will be based on the revised syllabus (1989). If you have not received a copy of the revised syllabus, contact Fredric Paul, Chief, Bureau of Mathematics Education, State Education Department, Albany, NY 12234.