The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Tuesday, June 21, 1983 — 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

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.

1 Using the accompanying table, find the value of y in the equation $3 \oplus y = 2 \oplus 2$.

$\oplus$	0	1	2	3
0	0	1	2	3
1	1	2	3	0
2	2	3	0	1
3	3	0	1	2

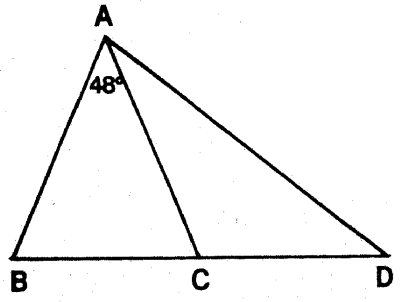
2 If * is an operation defined by $x * y = 3x - y$, find the value of $4 * 2$.

3 In rectangle $ABCD$ with diagonals $\overline{AC}$ and $\overline{BD}$, $AC = 3x - 15$ and $BD = 7x - 55$. Find x.

4 If $x = 3$ is the equation of the axis of symmetry of the graph of $y = x^2 - 6x + 10$, what is the y-coordinate of the turning point?

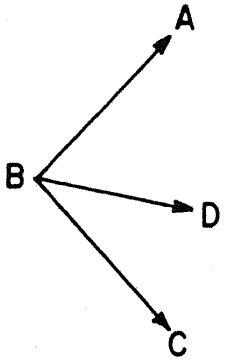
5 In parallelogram $ABCD$, A is (6,3) and C is (4,−1). What are the coordinates of the point of intersection of the diagonals?

6 In the accompanying diagram, $\overline{AB} \cong \overline{AC}$ and $\overline{BCD}$. If $m\angle BAC = 48$, find $m\angle ACD$.



7 How many different committees of 3 can be chosen from 4 people?

8 In the accompanying diagram, $\overrightarrow{BA} \perp \overrightarrow{BC}$, and $\overrightarrow{BD}$ is drawn. If $m\angle ABD = 2x + 18$ and $m\angle CBD = 4x - 18$, find x.



9 What are the coordinates of the center of the circle whose equation is $(x - 5)^2 + (y + 3)^2 = 16$?

10 The center of a circle is at (1,3). If the circle passes through the point (4,7), find the length of the radius of the circle.

11 In $\triangle ABC$, $m\angle A = 50$ and $m\angle B = 20$. Which is the longest side of the triangle?

12 Evaluate: ${}_{10}C_8$

13 Write an equation of the line that passes through the point (2,7) and has a slope of 4.

14 If the slope of the line joining the points (2,4) and $(5,k)$ is 2, find the value of k.

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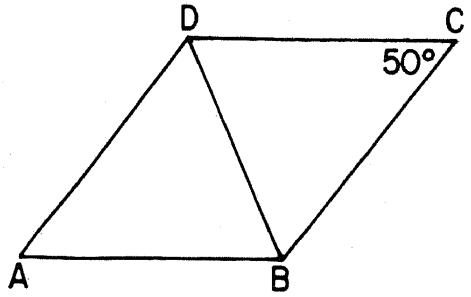
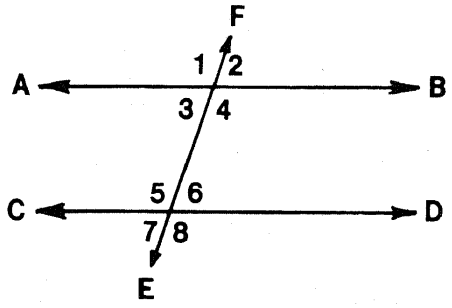
15 In the accompanying diagram of rhombus $ABCD$, diagonal $\overline{BD}$ is drawn and $m\angle C = 50$. Find $m\angle ADB$.



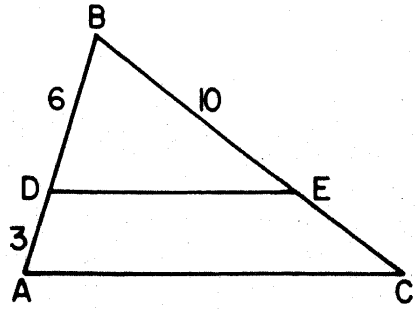
Directions (16–34): For *each* question chosen, write on the separate answer sheet the *numeral* preceding the word or expression that best completes the statement or answers the question.

16 In the accompanying diagram, $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, $\overleftrightarrow{EF}$ is a transversal, and $m\angle 1 = 110$. What is $m\angle 7$?



(1) 110
(2) 70
(3) 50
(4) 20

17 In the accompanying diagram of $\triangle ABC$, $\overline{DE} \parallel \overline{AC}$, $BD = 6$, $DA = 3$, and $BE = 10$. What is the measure of EC?



(1) 5
(2) 6
(3) 15
(4) 20

18 Which statement is logically equivalent to $\sim(r \wedge \sim t)$?
(1) $\sim r \vee \sim t$
(2) $r \vee t$
(3) $\sim r \vee t$
(4) $r \vee \sim t$

19 How many different arrangements of 5 letters can be made from the letters in the word "GREEN"?
(1) 12
(2) 24
(3) 40
(4) 60

20 If the length of the hypotenuse of a right triangle is 6 and the length of one leg is 3, what is the length of the other leg?
(1) 45
(2) 27
(3) $\sqrt{45}$
(4) $\sqrt{27}$

21 If the diagonals of a quadrilateral are perpendicular and *not* congruent, the quadrilateral may be
(1) a rhombus
(2) a rectangle
(3) an isosceles trapezoid
(4) a square

22 If $a \rightarrow b$ and $c \rightarrow \sim b$ are both true statements, which must also be true?
(1) $a \rightarrow c$
(2) $a \rightarrow \sim c$
(3) $c \rightarrow a$
(4) $\sim a \rightarrow c$

23 The coordinates of the vertices of $\triangle ABC$ are $A(2,6)$, $B(2,1)$, and $C(8,1)$. What is the area of the triangle?
(1) 60
(2) 30
(3) 15
(4) 7.5

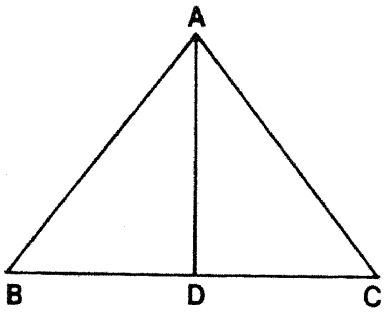
24 What are the roots of the equation $3x^2 - 7x + 1 = 0$?
(1) $\frac{7 \pm \sqrt{37}}{6}$
(2) $\frac{7 \pm \sqrt{61}}{6}$
(3) $\frac{-7 \pm \sqrt{37}}{6}$
(4) $\frac{-7 \pm \sqrt{61}}{6}$

4 8 11

25 If the statement $a \rightarrow b$ is true and b is false, which is true?

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

26 In the accompanying diagram of $\triangle ABC$, altitude $\overline{AD}$ is also the median to $\overline{BC}$. What kind of a triangle *must* $\triangle ABC$ be?



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

27 The graphs of the equations $y = x^2$ and $y = 2x$ intersect in two points, one of which is the origin. What are the coordinates of the other point?

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

28 Under which operation is the set of odd integers closed?

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

29 Which set of numbers can *not* represent the lengths of the sides of a triangle?

(1) {2,3,4}
(2) {1,1,2}
(3) {3,4,5}
(4) $\{1,\sqrt{3},2\}$

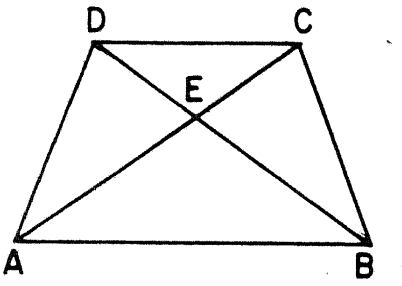
30 If the altitude drawn to the hypotenuse of a right triangle has length 10, the lengths of the segments of the hypotenuse may be

(1) 5 and 20
(2) 2 and 5
(3) 3 and 7
(4) 50 and 50

31 What is the total number of points that are both 2 units from the x-axis and 3 units from the origin?

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

32 In the accompanying diagram of isosceles trapezoid $ABCD$, $\overline{AB} \parallel \overline{DC}$ and diagonals $\overline{DB}$ and $\overline{AC}$ intersect at E. Which statement is *not* true?



(1) $\overline{AC} \cong \overline{BD}$
(2) $\angle CDB \cong \angle DBA$
(3) $\triangle ADC \cong \triangle ABC$
(4) $\triangle CBA \cong \triangle DAB$

33 From a standard deck of 52 cards, two cards are drawn at random without replacement. What is the probability that both cards drawn are aces?

(1) $\frac{6}{2,652}$
(2) $\frac{4}{2,652}$
(3) $\frac{12}{2,652}$
(4) $\frac{4}{52}$

34 If x is an integer, which statement is true?

(1) $\forall_x\ x^2 + 2x = 0$
(2) $\exists_x\ x^2 + 2x = 0$
(3) $\exists_x\ x^2 < 0$
(4) $\forall_x\ x^2 \leq 0$

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

35 Given $\angle ABC$. *On the answer sheet,* construct and label $\overrightarrow{BD}$ such that $\angle ABD \cong \angle CBD$.

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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.

36 Given: set $S = \{A, N, G, L, E\}$ and the commutative operation @ as shown in the accompanying table.

@	A	N	G	L	E
A	A	A		N	A
N		N			N
G	N	L	G	G	G
L		E		L	L
E	A	N	G	L	E

a On your answer paper, copy and complete the table. [2]

b What is the identity element for operation @? [2]

c What is the inverse of L under the operation @? [2]

d Evaluate: $[G \ @ \ (L \ @ \ N)] \ @ \ A$ [2]

e Find x if $(G \ @ \ N) \ @ \ x = N$. [2]

37 A committee of 4 is to be chosen from a group of 2 men and 4 women.

a How many different 4-member committees are possible? [3]

b How many of these committees consist of exactly 1 man and 3 women? [3]

c What is the probability that one of the 4-member committees consists of exactly 1 man and 3 women? [2]

d What is the probability that a woman will be on the committee? [2]

38 In triangle ABC, D is a point on $\overline{AB}$ and E is a point on $\overline{AC}$ such that $\overline{DE} \parallel \overline{BC}$. If $AD = 2$, $DB = x - 1$, $AE = x$, and $EC = x + 2$, find AE. [*Only an algebraic solution will be accepted.*] [4,6]

39 *a* Draw a graph of the equation $y = -x^2 + 4x - 3$ for all values of x such that $-1 \leq x \leq 5$. [6]

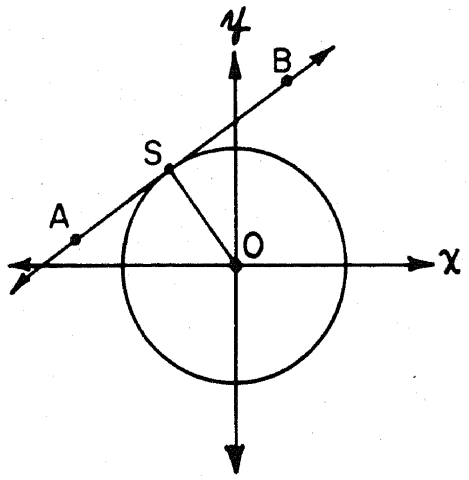
b On the same set of axes, draw the graph of $y + 1 = x$. [2]

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

$$y = -x^2 + 4x - 3$$
$$y + 1 = x$$

[1,1]

40 In the accompanying figure, point $S(-3,4)$ lies on circle O with center $(0,0)$. Line $\overleftrightarrow{ASB}$ and radius $\overline{OS}$ are drawn.



a Find the length of $\overline{OS}$. [2]

b Write an equation of circle O. [2]

c If $\overleftrightarrow{AB} \perp \overline{OS}$, find the slope of $\overleftrightarrow{AB}$. [2]

d Write an equation of line $\overleftrightarrow{ASB}$. [2]

e Find the coordinates of any point on $\overleftrightarrow{AB}$ other than S. [2]

☞ **GO RIGHT ON TO THE NEXT PAGE.**

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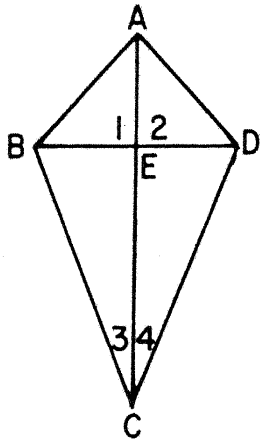
Answers to the following questions are to be written on paper provided by the school.

Part III

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

41 Given: quadrilateral $ABCD$, $\overline{AB} \cong \overline{AD}$, $\overline{AEC}$, $\overline{BED}$, and $\angle 1 \cong \angle 2$.



Prove: *a* $\triangle ABE \cong \triangle ADE$ [5]

b $\angle 3 \cong \angle 4$ [5]

42 Given:

If Jill studies, then she will know the work.

If Jill goes out to play, then she will not know the work.

Jill studies or her parents will not be happy.

Jill's parents are happy or she will not be allowed to go to the party.

Jill is allowed to go to the party.

Let S represent: "Jill studies."
Let W represent: "Jill will know the work."
Let P represent: "Jill goes out to play."
Let H represent: "Jill's parents are happy."
Let A represent: "Jill is allowed to go to the party."

a Using S, W, P, H, A, and proper connectives, express each statement in symbolic form. [2]

b Prove: "Jill does not go out to play." [8]

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH — COURSE II

Tuesday, June 21, 1983 — 1:15 to 4:15 p.m., only

Part I 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	

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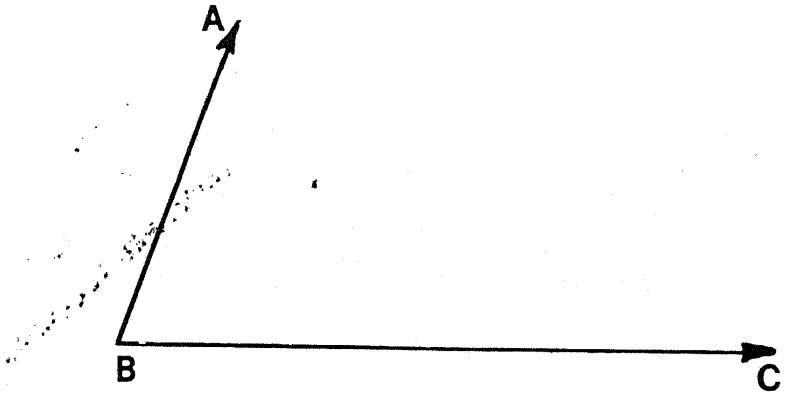
35



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

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FOR TEACHERS ONLY

SCORING KEY

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Tuesday, June 21, 1983 — 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 16–34, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 1

(2) 10

(3) 10

(4) 1

(5) (5,1) *or* $\begin{matrix} x = 5 \\ y = 1 \end{matrix}$

(6) 114

(7) 4

(8) 15

(9) (5,−3) *or* $\begin{matrix} x = 5 \\ y = -3 \end{matrix}$

(10) 5

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

(12) 45

(13) $y - 7 = 4(x - 2)$ *or* $y = 4x - 1$

(14) 10

(15) 65

(16) 2

(17) 1

(18) 3

(19) 4

(20) 4

(21) 1

(22) 2

(23) 3

(24) 1

(25) 2

(26) 1

(27) 3

(28) 4

(29) 2

(30) 1

(31) 4

(32) 3

(33) 3

(34) 2

[OVER]

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.

Part II

(36) *a*

	A	N	G	L	E
A	A	A	N	N	A
N	A	N	L	E	N
G	N	L	G	G	G
L	N	E	G	L	L
E	A	N	G	L	E

[2]

b E [2]

c N [2]

d N [2]

e A [2]

(37) *a* 15 [3]

b 8 [3]

c $\frac{8}{15}$ [2]

d 1 [2]

(38) 4 [4,6]

(39) *c* (1,0) and (2,1)

or [1,1]

$x = 1$ and $x = 2$
$y = 0$ $y = 1$

(40) *a* 5 [2]

b $x^2 + y^2 = 25$ [2]

c $\frac{3}{4}$ [2]

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

or

$4y = 3x + 25$ [2]

or

$y = \frac{3}{4}x + \frac{25}{4}$

Part III

(42) *a* $S \rightarrow W$

$P \rightarrow \sim W$

$S \vee \sim H$

$H \vee \sim A$

A [2]