

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Monday, June 21, 1982 — 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

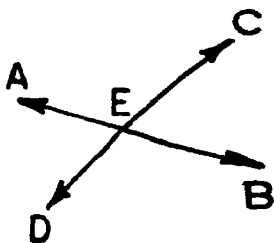
Answer 30 questions from this part. Each correct answer will receive 2 credits. Write your answers in the spaces provided on the separate answer sheet. Where applicable, answers may be left in radical form.

1 If $a \otimes b$ is defined as $a^2 + b$, what is the value of $5 \otimes 2$?

2 Using the accompanying table, find the identity element for the operation \square .

\square	1	2	3	4
1	3	4	1	2
2	4	1	2	3
3	1	2	3	4
4	2	3	4	1

3 In the accompanying figure, $m\angle AEC = 5x + 20$ and $m\angle DEB = 3x + 60$. Find x .



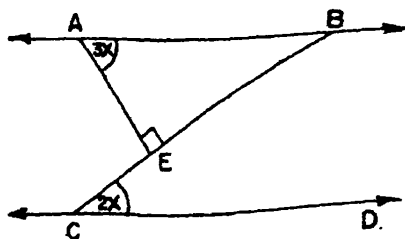
4 In parallelogram $ABCD$, $m\angle B = 60$. Find $m\angle C$.

5 In a right triangle, one leg has length 7 and the hypotenuse has length 10. What is the length, in radical form, of the other leg?

6 Compute $(z * y) * x$ in the system defined by the accompanying table.

*	x	y	z
x	x	z	z
y	z	y	z
z	x	y	x

7 In the accompanying diagram, $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, $\overline{AE} \perp \overline{CB}$, $m\angle BCD = 2x$, and $m\angle BAE = 3x$. Find the value of x .



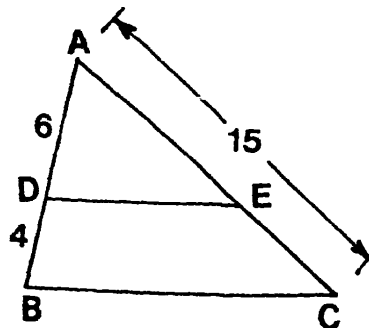
8 How many different six-letter permutations can be formed from the letters in the word "BUBBLE"?

9 If each base angle of an isosceles triangle measures 15 more than the vertex angle, find the measure of the vertex angle.

10 What is the length of the radius of a circle whose center is the origin and which passes through the point $(5, -12)$?

11 The lengths of the sides of a triangle are 2, 5, and 6. If the length of the longest side of a similar triangle is 18, find the perimeter of the larger triangle.

12 In the accompanying diagram of $\triangle ABC$, 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 $AD = 6$, $DB = 4$, and $AC = 15$, find EC .



13 How many different 3-member committees can be chosen from a 5-member club?

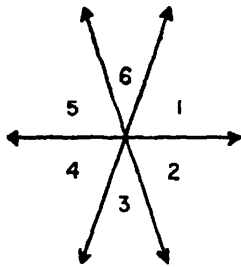
14 The diagonals of a rhombus have lengths of 8 and 6. Find the length of a side of the rhombus.

15 What is the slope of a line perpendicular to the line whose equation is $y = 3x + 6$?

16 What is the area of the triangle whose vertices are $A(4,0)$, $B(0,0)$, and $C(0,4)$?

Directions (17-34): 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.

- 17 As shown in the diagram at the right, three straight lines intersect at one point. If $\angle 2 \cong \angle 4$, then $m\angle 1 + m\angle 3 + m\angle 4$ is equal to
- (1) 180
 - (2) 200
 - (3) 222
 - (4) 250



- 18 Given the true statements, "If George is a dog, then Charlie is a cat," and "Charlie is not a cat." Which statement *must* also be true?
- (1) Charlie is a cat.
 - (2) Charlie is not a dog.
 - (3) George is a cat.
 - (4) George is not a dog.
- 19 Which is the negation of the sentence $\sim p \vee \sim q$?
- (1) $p \wedge q$
 - (2) $\sim p \wedge \sim q$
 - (3) $p \vee q$
 - (4) $p \wedge \sim q$
- 20 Given the true statements, "Mark goes shopping or he goes to the movies" and "Mark doesn't go to the movies." Which statement *must* also be true?
- (1) Mark goes shopping.
 - (2) Mark doesn't go shopping.
 - (3) Mark doesn't go shopping and he doesn't go to the movies.
 - (4) Mark stays home.
- 21 In the clock 5 (mod 5) system of arithmetic, what is the solution set for the equation $x + 4 = 3$?
- (1) {1}
 - (2) {2}
 - (3) {3}
 - (4) {4}
- 22 Which statement is logically equivalent to $\sim p \rightarrow q$?
- (1) $q \rightarrow p$
 - (2) $\sim q \rightarrow p$
 - (3) $q \rightarrow \sim p$
 - (4) $\sim q \rightarrow \sim p$
- 23 What are the roots of the equation $x^2 - 4x - 3 = 0$?
- (1) $\frac{-4 \pm \sqrt{28}}{2}$
 - (2) $\frac{4 \pm \sqrt{28}}{2}$
 - (3) $\frac{1}{2}, \frac{5}{2}$
 - (4) 1, 5

- 24 Two points, L and P , are 8 units apart. How many points are equidistant from L and P and also 3 units from L ?
- (1) 1
 - (2) 2
 - (3) 0
 - (4) 4
- 25 Which is a point of intersection of the graphs of the line $y = x$ and the parabola $y = x^2 - 2$?
- (1) (1,1)
 - (2) (2,2)
 - (3) (0,0)
 - (4) (2,-1)
- 26 The coordinates of the midpoint of \overline{AB} are $(-7,6)$. If the coordinates of A are $(2,-4)$ and the coordinates of B are $(-16,y)$, what is the value of y ?
- (1) -14
 - (2) -2
 - (3) 8
 - (4) 16
- 27 Which is the negation of the statement, "All squares are parallelograms"?
- (1) All squares are not parallelograms.
 - (2) No squares are parallelograms.
 - (3) Some squares are parallelograms.
 - (4) Some squares are not parallelograms.
- 28 Which equation has irrational roots?
- (1) $x^2 - 4 = 0$
 - (2) $x^2 - 2 = 0$
 - (3) $x^2 - 2x + 1 = 0$
 - (4) $x^2 - 2x = 0$
- 29 The equation of the axis of symmetry for the graph of $y = x^2 - 4x + 3$ is
- (1) $x = -2$
 - (2) $x = 2$
 - (3) $x = -4$
 - (4) $x = 4$
- 30 A bag of marbles contains 2 green, 1 blue, and 3 red marbles. If two marbles are chosen at random without replacement, what is the probability that both will be red?
- (1) $\frac{1}{5}$
 - (2) $\frac{1}{6}$
 - (3) $\frac{1}{10}$
 - (4) $\frac{1}{12}$
- 31 Which statement is *false*?
- (1) A square is a rectangle.
 - (2) A square is a rhombus.
 - (3) A rhombus is a square.
 - (4) A rectangle is a parallelogram.

32 Which is an equation of the circle whose center is at (4,2) and whose radius is 3?

- (1) $(x + 4)^2 + (y + 2)^2 = 9$
- (2) $(x + 4)^2 + (y + 2)^2 = 3$
- (3) $(x - 4)^2 + (y - 2)^2 = 9$
- (4) $(x - 4)^2 + (y - 2)^2 = 3$

33 If the measures of the three angles of a triangle are represented by x , y , and $(x + y)$, then the triangle must be

- (1) equilateral
- (2) isosceles
- (3) obtuse
- (4) right

34 An equation of the line which passes through the point (3,2) and which has a slope of 4 is

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

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

35 On the answer sheet, construct the bisector of $\angle ABC$.

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.

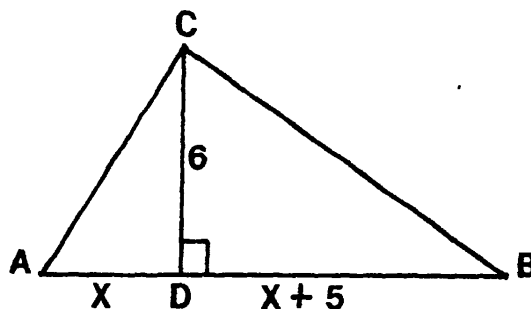
- 36 *a* Draw the graph of the equation $y = x^2 - 2x - 1$ including all values of x such that $-2 \leq x \leq 4$. [6]
b On the same set of axes used in part *a*, draw the graph of the equation $y - x = 3$. [2]
c What are the coordinates of the points of intersection of the graphs in parts *a* and *b*? [1,1]

- 37 Set $A = \{M, S, T, R\}$ and the operation \otimes defines the commutative group (A, \otimes) .

\otimes	M	S	T	R
M	R	M	T	
S	M	S	T	
T	S		R	M
R		R		S

- a* On your answer paper, copy and complete the given table. [2]
b What is the identity element? [2]
c What is the inverse of M ? [2]
d Find the value of $(M \otimes S) \otimes (T \otimes R)$. [2]
e Solve for x : $x \otimes x = R$ [1,1]
- 38 Quadrilateral $ABCD$ has vertices $A(-4, -2)$, $B(0, 5)$, $C(9, 3)$, and $D(7, -4)$.
a On graph paper, plot the vertices and draw quadrilateral $ABCD$. [2]
b Find the area of quadrilateral $ABCD$. [8]

- 39 In the accompanying diagram of right triangle ABC , altitude \overline{CD} divides hypotenuse \overline{AB} into segments of lengths x and $(x + 5)$. If $CD = 6$, find the length of hypotenuse \overline{AB} . [Only an algebraic solution will be accepted.] [4,6]



- 40 There are 5 boys and 3 girls in a math class.
a In how many different ways may the 8 students be arranged in a line? [2]
b In how many different ways may the 8 students be arranged in a line if all 3 girls are to be in line ahead of the 5 boys? [2]
c How many 6-member committees can be formed from the 8 students? [2]
d How many of these committees consist of exactly 4 boys and 2 girls? [2]
e What is the probability that one of the 6-member committees consists of exactly 4 boys and 2 girls? [2]

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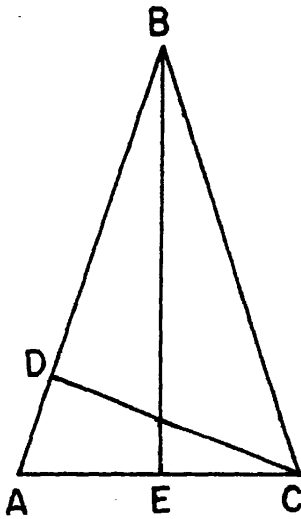
Answers to the following questions are to be written on paper provided by the school.

Part III

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

41 Quadrilateral $KLMN$ has vertices $K(2,3)$, $L(7,3)$, $M(4,7)$, and $N(-1,7)$. Prove by means of coordinate geometry that $KLMN$ is a rhombus. [10]

42 Given: Isosceles triangle ABC , $\overline{BA} \cong \overline{BC}$, altitudes \overline{BE} and \overline{CD} are drawn, \overline{BDA} and \overline{CEA} .



Prove: $BC \times DA = CA \times EC$ [10]

43 Given: If today is warm, the pool will be crowded.
If it rains today, the pool will not be crowded.
Either today is warm or I will wear a long-sleeve shirt.
I will not wear a long-sleeve shirt.

Let W represent: "Today is warm."

Let P represent: "The pool will be crowded."

Let R represent: "It rains today."

Let S represent: "I will wear a long-sleeve shirt."

a Using W, P, R, S , and proper connectives, express each sentence in symbolic form. [2]

b Using laws of inference, show that it will not rain today. [8]

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REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH — COURSE II

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Part I Score:
Rater's Initials:

ANSWER SHEET

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

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

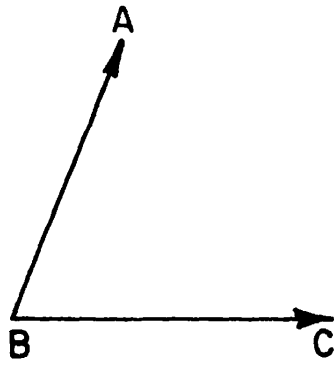
Your answers to Part I should be recorded on this answer sheet.

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..... | |

Tear Here



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

Monday, June 21, 1982 — 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 17–34, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 27	(11) 39	(21) 4	(31) 3
(2) 3	(12) 6	(22) 2	(32) 3
(3) 20	(13) 10	(23) 2	(33) 4
(4) 120	(14) 5	(24) 3	(34) 1
(5) $\sqrt{51}$	(15) $-\frac{1}{3}$	(25) 2	(35) construction
(6) z	(16) 8	(26) 4	
(7) 18	(17) 1	(27) 4	
(8) 120	(18) 4	(28) 2	
(9) 50	(19) 1	(29) 2	
(10) 13	(20) 1	(30) 1	

[OVER]

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SEQUENTIAL MATH—COURSE II — *concluded*

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) *c* (4,7), (-1,2) [1,1]

(39) 13 [4,6]

(37) *a*

⊙	M	S	T	R	[2]
M	R	M	S	T	
S	M	S	T	R	
T	S	T	R	M	
R	T	R	M	S	

(40) *a* 40,320 [2]

b 720 [2]

c 28 [2]

d 15 [2]

e $\frac{15}{28}$ [2]

b S [2]

c T [2]

d R [2]

e M, T [1,1]

(38) *b* 76 [8]

Part III

(43) *a* $W \rightarrow P$
 $R \rightarrow \sim P$ [2]
 $W \vee S$
 $\sim S$

NOTE: Beginning in June 1983, Part III will consist of only *two* questions from which the student must select one.