### The University of the State of New York

## REGENTS HIGH SCHOOL EXAMINATION

# THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

# **COURSE II**

Tuesday, June 16, 1987-1:15 to 4:15 p.m., only

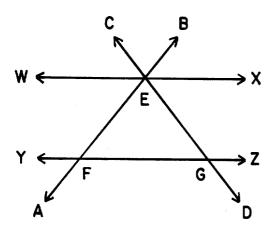
The last page of the booklet is the answer sheet. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

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 The slope of line  $\overrightarrow{AB}$  is  $\frac{2}{3}$  and the slope of line  $\overrightarrow{CD}$  is  $\frac{k}{12}$ . If  $\overrightarrow{AB}$  is parallel to  $\overrightarrow{CD}$ , what is the value of k?
- 2 In the accompanying figure,  $\overrightarrow{WX} \parallel \overrightarrow{YZ}$ ;  $\overrightarrow{AB}$  and  $\overrightarrow{CD}$  intersect  $\overrightarrow{WX}$  at E and  $\overrightarrow{YZ}$  at F and G, respectively. If  $m \angle CEW = m \angle BEX = 50$ , find  $m \angle EGF$ .



- 3 In parallelogram ABCD,  $m \angle A = 5x 10$  and  $m \angle C = 3x + 4$ . Find the value of x.
- 4 What is the inverse of a in the system defined below?

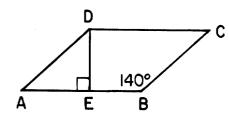
&	a	b	c	d
a	$\begin{vmatrix} b \\ d \end{vmatrix}$	d	a	c
b	d	c	b	a
c	a	$\boldsymbol{b}$ .	c	d
d	c	a	d	b

5 Corresponding sides of two similar triangles are 6 and 15. If the perimeter of the smaller triangle is 22, what is the perimeter of the larger triangle?

6 Determine the value of a # (d # b) in the system defined below.

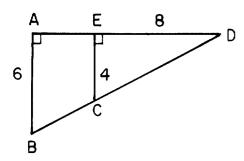
#	a	b	c	d
a	d	с	$egin{array}{c} a \ b \ c \end{array}$	b
b	c	d	b	a
$\boldsymbol{c}$	a	b	$egin{array}{c} c \ d \end{array}$	d
d	b	c	d	a

7 In the accompanying diagram, ABCD is a parallelogram with altitude  $\overline{DE}$  drawn to side  $\overline{AB}$ . If  $m \angle B = 140$ , find  $m \angle ADE$ .



- 8 If @ is a binary operation defined as  $p @ q = p^2 2pq + q^2$ , evaluate 2 @ 3.
- 9 In  $\triangle ABC$ ,  $\overline{BC}$  is extended through C to D. If  $m \angle A = 65$  and  $m \angle B = 70$ , what is the measure of  $\triangle DCA$ ?
- 10 The perimeter of  $\triangle ABC$  is 36. If  $\angle A \cong \angle B$ , AC = x, and AB = x + 3, find the value of x.
- 11 How many different 6-letter permutations can be formed from the letters in the word "DELETE"?
- 12 How many different sets of 3 pictures can be chosen from a set of 8 pictures?
- 13 What is the area of a parallelogram if the coordinates of its vertices are (0, -2), (3,2), (8,2), and (5, -2)?

14 In the accompanying diagram of  $\triangle ABD$ ,  $\overrightarrow{AB} \perp \overrightarrow{AD}$  and  $\overrightarrow{EC} \perp \overrightarrow{AD}$ . If  $\overrightarrow{AB} = 6$ ,  $\overrightarrow{EC} = 4$ , and ED = 8, find AE.



15 Write an equation of the locus of points equidistant from the graphs of the equations y = 3and y = -5.

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 Which is the negation of the statement, "Chris likes to paint or Rona likes soccer"?
  - (1) Chris likes to paint and Rona does not like soccer.
  - (2) Chris does not like to paint or Rona does not like soccer.
  - (3) Chris does not like to paint and Rona does not like soccer.
  - (4) Chris does not like to paint or Rona likes soccer.
- 17 If two cards are drawn from a standard deck of 52 cards without replacement, what is the probability that both cards are fives?
  - $(1) \frac{2}{52}$
- (3)  $\frac{1}{4} \cdot \frac{1}{3}$
- (2)  $\frac{4}{52} \cdot \frac{3}{51}$
- $(4) \frac{5}{52} \cdot \frac{4}{51}$
- 18 Which number property is illustrated by the equation  $\frac{35}{4} + 0 = \frac{35}{4}$ ?
  - (1) associative property for addition
  - (2) commutative property for addition
  - (3) identity property for addition
  - (4) inverse property for addition

- 19 If the lengths of the legs of a right triangle are 2 and 3, then the length of its hypotenuse is
  - (1)  $\sqrt{13}$
- (3) 5
- (2)  $\sqrt{5}$
- $(4) \ 4$
- 20 If  $A \rightarrow C$  and  $R \rightarrow \sim C$ , which statement is a valid conclusion?
- (1)  $A \rightarrow R$ (2)  $\sim A \rightarrow \sim R$ (3)  $C \rightarrow R$ (4)  $A \rightarrow \sim R$
- 21 Given the true statement, "If a person drives a car, he or she must be at least 16 years old." Which statement is logically correct?
  - (1) David is 16 years old; therefore he drives a
  - (2) Maria does not drive a car; therefore she is not yet 16 years old.
  - (3) Noel is not yet 16 years old; therefore he does not drive a car.
  - (4) Irene drives a car; therefore she is not yet 16 years old.
- 22 If the measures of the angles of a triangle are in the ratio 2:3:4, the measure of the smallest angle is
  - (1) 20

(3) 60

(2) 40

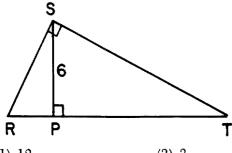
- (4) 80
- 23 An equation whose roots are -3 and 2 is
  - $(1) x^2 x + 6 = 0$
  - $(2) x^2 + x 6 = 0$
  - $(3) x^2 + x + 6 = 0$
  - $(4) x^2 + 5x 6 = 0$
- 24 The distance between the points A(a,0) and B(0,b) is

- (3) a + b  $(4) \sqrt{a} + \sqrt{b}$
- 25 Which point is on the graph of the parabola whose equation is  $y = 2x^2 - 3x + 4$ ?
- (2) (3,0)
- (4) (0,4)
- 26 What is the negation of  $V_x x < 7$ ?
- (1)  $\exists_x \ x < 7$  (3)  $\exists_x \ x \ge 7$  (2)  $\forall_x \ x \ge 7$  (4)  $\forall_x \ x > 7$

- 27 In  $\triangle ABC$ , if AB = 10 and BC = 6, AC can not be equal to
  - (1) 10

(2) 8

- (4) 4
- 28 In the accompanying diagram,  $\triangle RST$  is a right triangle and  $\overline{SP}$  is the altitude to hypotenuse  $R\overline{T}$ . If SP = 6 and the lengths of  $\overline{RP}$  and  $\overline{PT}$  are in the ratio 1:4, what is the length of  $\overline{RP}$ ?



(1) 12

 $(3) \ 3$ 

(2) 15

- (4) 9
- 29 Circle O has center (7,-3) and diameter  $\overline{AB}$ . The coordinates of A are (-2,4). What are the coordinates of B?
  - (1) (16,-10)
- $(3) \cdot (16,-2)$
- (2) (12,-2)
- (4) (12,-10)
- 30 Which is an equation of the circle whose center is (3,-2) and whose radius is 5?

$$(1) (x + 3)^{2} + (y - 2)^{2} = 5$$

$$(1) (x + 3)^{2} + (y - 2)^{2} = 5$$

$$(2) (x + 3)^{2} + (y - 2)^{2} = 25$$

(3) 
$$(x - 3)^2 + (y + 2)^2 = 5$$
  
(4)  $(x - 3)^2 + (y + 2)^2 = 25$ 

$$(4) (x - 3)^2 + (y + 2)^2 = 25$$

- 31 Which statement is true?
  - (1) Every square is a rhombus.
  - (2) Every rhombus is a square.
  - (3) Every trapezoid is a parallelogram.
  - (4) Every parallelogram is a rectangle.

32 Which is an equation of a line perpendicular to the line whose equation is  $y = \frac{1}{3}x - 5$ ?

(1) 
$$y = \frac{1}{3}x + 5$$
 (3)  $y = -3x - 5$ 

$$(3) y = -3x - 5$$

(2) 
$$y = -\frac{1}{3}x - 5$$
 (4)  $y = 3x + 5$ 

$$(4) y = 3x + 5$$

33 Which is an equation of the axis of symmetry of the parabola whose equation is

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

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

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

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

$$(4) y = \frac{3}{4}$$

34 What are the roots of the equation  $x^2 - 3x - 1 = 0$ ?

(1) 
$$r = \frac{3 \pm \sqrt{5}}{}$$

(1) 
$$x = \frac{3 \pm \sqrt{5}}{2}$$
 (3)  $x = \frac{3 \pm \sqrt{13}}{2}$ 

$$(2) x = \frac{-3 \pm \sqrt{5}}{2}$$

(2) 
$$x = \frac{-3 \pm \sqrt{5}}{2}$$
 (4)  $x = \frac{-3 \pm \sqrt{13}}{2}$ 

- Directions (35): Leave all construction lines on the answer sheet.
- 35 On the answer sheet, construct the locus of points equidistant from the sides of  $\angle A$ .

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  $y = x^2 - 4x - 5$ , including all values of x such that  $-2 \le x \le 6$ . [6]

b On the same set of axes, draw the graph of the equation y = x - 5. [2]

- c What are the coordinates of the points of intersection of the graphs drawn in parts a and b? [2]
- 37 The diagonals of rhombus ABCD intersect at E. The vertices of ABCD are A(1,2), B(9,8), C(15,0), and D(7,-6).

a Find the length of a side of rhombus ABCD. [2]

b Write an equation of the circle whose center is at E and whose radius is equal in length to a side of rhombus ABCD. [4]

c. What is the slope of diagonal  $\overline{BD}$ ? [2]

- d Write an equation of diagonal  $\overline{BD}$ . [2]
- 38 Solve the following system of equations algebraically and check.

 $y = x^2 + 3x + 4$ y - x = 7 [8,2] 39 Danny has 3 English, 5 Spanish, and 4 Latin books.

a How many different selections of 5 books can be made? [2]

b What is the probability that a 5-book selection contains 1 English, 2 Spanish, and 2 Latin books? [4]

c What is the probability that a 5-book selection contains no Latin books? [4]

40 In right triangle ABC, altitude  $\overline{CD}$  is drawn to hypotenuse  $\overline{AB}$ . If AD is 12 and DB is three less than the altitude, find the length of  $\overline{CD}$ . [Only an algebraic solution will be accepted.] [5,5]

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 I go to summer school or I go on vacation.

If I go on vacation, then I will swim every day.

If I swim every day, then I will try out for the team.

I did not try out for the team.

Let S represent: "I go to summer school."

Let G represent: "I go on vacation."

Let E represent: "I swim every day."

Let T represent: "I try out for the team."

Prove: I go to summer school.

42 Quadrilateral JAKE has coordinates J(0,3a),  $\tilde{A}(3a,3a)$ , K(4a,0), and E(-a,0). Prove by coordinate geometry that quadrilateral JAKE is an isosceles trapezoid. [10]

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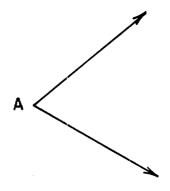
# SEQUENTIAL MATH - COURSE II

Tuesday, June 16, 1987—1:15 to 4:15 p.m., only

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

## ANSWER SHEET

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.         7       17       27         8       18       28         9       19       29         0       20       30	Pupil	••••••	Teacher	••••••
Part I Answer 30 questions from this part.  1				
Answer 30 questions from this part.  1	You	r answers to Part I should	be recorded on this answer	sheet.
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.         7       17       27         8       18       28         9       19       29				
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.       7     17     27       8     18     28       9     19     29		Answer 30 questi	ions from this part.	
3       13       23       33         4       14       24       34         5       15       25       35 Answer question 35 on the other side of this sheet.         7       16       26       side of this sheet.         8       18       28         9       19       29	1	11	21	31
4       14       24       34         5       15       25       35 Answer question 35 on the other side of this sheet.         6       16       26       side of this sheet.         7       17       27         8       18       28         9       19       29	2	12	22	32
5       15       25       35 Answer question 35 on the other side of this sheet.         6       16       26       side of this sheet.         7       17       27         8       18       28         9       19       29	3	13	23	33
6       16       26       35 Answer question 35 on the other side of this sheet.         7       17       27         8       18       28         9       19       29	4	14	24	34
6	5	15	25	35 Answer question
8	6	16	26	side of this sheet.
9 29	7	17	27	
0	8	18	28	
.0	9	19	29	
	0	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 16, 1987-1:15 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)	8	(11) 120	(21) 3	(31) 1
(2)	50	(12) 56	(22) 2	(32) 3
(3)	7	(13) 20	(23) 2	(33) 2
(4)	d	(14) 4	(24) 1	(34) 3
(5)	55	(15) y = -1	(25) 4	(35) construction
(6)	a	(16) 3	(26) 3	
(7)	50	(17) 2	(27) 4	
(8)	1	(18) 3	(28) 3	
(9)	135	(19) 1	(29) 1	
(10)	11	(20) 4	(30) 4	

#### SEQUENTIAL MATH--COURSE II — concluded

#### 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) c $(0,-5)$ and $(5,0)$	[2]	$(39) \ a \ 792$	[2]
		$b = \frac{180}{792}$	[4]
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	[2] [4] [2]	$c = \frac{56}{792}$	[4]
d y = 7x - 55	[2]	(40) A 1 ·	f.1
		(40) Analysis	[5]
(38) (1,8) and (-3,4)	[8]	6	[5]
Check	[2]		