The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Tuesday, January 28, 1986—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

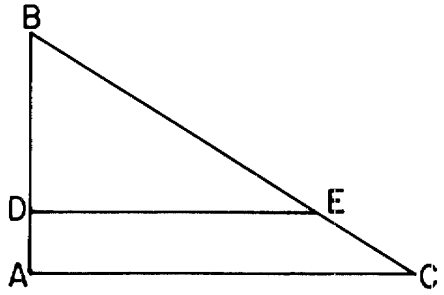
Part I

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]

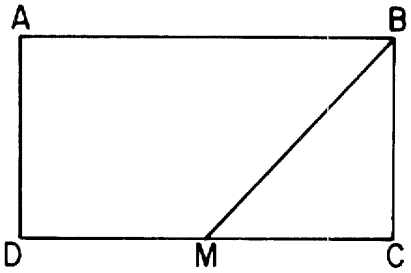
1 Using the accompanying table, find the value of x in the equation $(r \,\text{Ø}\, u) \,\text{Ø}\, x = r$.

Ø	t	r	u	e
t	t	t	t	t
r	t	r	u	e
u	t	u	r	u
e	t	e	u	r

2 In the accompanying diagram of triangle ABC, D is a point on $\overline{AB}$ and E is a point on $\overline{BC}$ such that $\overline{DE} \parallel \overline{AC}$. If $AB = 8$, $DB = 6$, and $EC = 16$, find the length of $\overline{BE}$.



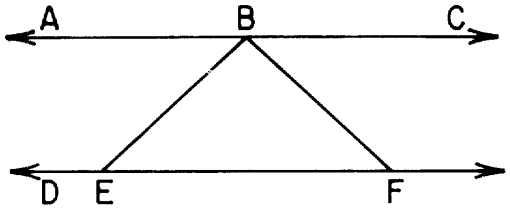
3 In the accompanying diagram of rectangle $ABCD$, point M is the midpoint of side $\overline{DC}$. Line segment $\overline{BM}$ is drawn. The area of triangle BCM is what fractional part of the area of rectangle $ABCD$?



4 The slope of $\overleftrightarrow{AB}$ is $\frac{2}{3}$ and the slope of $\overleftrightarrow{CD}$ is $\frac{x-2}{6}$. If $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, find the value of x.

5 In rectangle $ABCD$, the bisectors of angles A and B meet at point E. Find the measure of angle AEB.

6 In the accompanying diagram, $\overleftrightarrow{ABC} \parallel \overleftrightarrow{DEF}$ and $\overline{BE} \cong \overline{BF}$. If $m\angle CBF = 40$, find $m\angle BED$.



7 Using the set $\{0,2,4,6,8\}$ and the operations # and @ as shown in the accompanying tables, determine the value of $(4 \,@\, 6) \,\#\, (4 \,@\, 8)$.

#	0	2	4	6	8
0	0	2	4	6	8
2	2	4	6	8	0
4	4	6	8	0	2
6	6	8	0	2	4
8	8	0	2	4	6

@	0	2	4	6	8
0	0	0	0	0	0
2	0	4	8	2	6
4	0	8	6	4	2
6	0	2	4	6	8
8	0	6	2	8	4

8 How many different 5-letter permutations can be formed from the letters in the word "ERROR"?

9 Find, in radical form, the length of a diagonal of a square if the perimeter of the square is 20.

10 Parallelogram $ABCD$ has vertices $A(-1,0)$, $B(1,2)$, and $C(4,2)$. Find the coordinates of point D.

11 In triangle ABC, $m\angle A = 80$ and $AB > AC$. What is the *smallest* angle of triangle ABC?

12 What is the distance, in radical form, between the points (4,6) and (8,−2)?

13 How many different 5-member teams can be formed from 8 players?

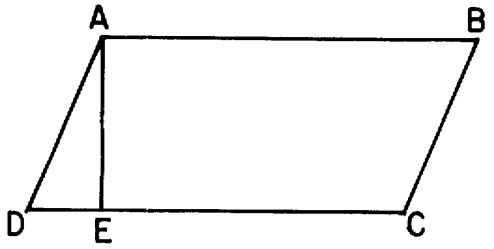
14 A set contains 5 quadrilaterals: a rectangle, a rhombus, a parallelogram, a square, and an isosceles trapezoid. If one quadrilateral is selected from the set at random, what is the probability that its diagonals bisect each other?

15 In a circle, the coordinates of the endpoints of a diameter are (4,5) and (10,1). What are the coordinates of the center of the circle?

16 Write an equation of the line that passes through the point (1,6) and is parallel to the line whose equation is $y = 3x - 5$.

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 In the accompanying diagram of parallelogram $ABCD$, $AB > AD$. If altitude $\overline{AE}$ is drawn to side $\overline{DC}$, which statement *must* be true?



(1) $BC < AE$
(2) $EC = BC$
(3) $AE < AD$
(4) $BC > DC$

18 The negation of $\exists_x\, x = 5$ is
(1) $\forall_x\, x \neq 5$
(2) $\forall_x\, x \leq 5$
(3) $\exists_x\, x > 5$
(4) $\exists_x\, x \neq 5$

19 Which statement is logically equivalent to $a \rightarrow \sim b$?
(1) $\sim b \rightarrow \sim a$
(2) $\sim b \rightarrow a$
(3) $b \rightarrow \sim a$
(4) $b \rightarrow a$

20 The statement $\sim(\sim p \wedge \sim q)$ is logically equivalent to
(1) $p \wedge q$
(2) $p \vee q$
(3) $\sim p \wedge \sim q$
(4) $\sim p \vee \sim q$

21 If $*$ is a binary operation defined by $c * d = 3c + d$, find the value of x when $2 * x = 8$.
(1) 1
(2) 2
(3) 3
(4) 4

22 What are the coordinates of the minimum point of a parabola whose equation is $y = x^2 + 3$?
(1) (0,3)
(2) (–1,2)
(3) (3,0)
(4) (3,12)

23 The graph of which equation would *not* be parallel to the graph of the equation $y = 3x + 2$?
(1) $y = 3x$
(2) $2y = 6x + 2$
(3) $y - 3x = 4$
(4) $y = 2x + 3$

24 Which set of numbers can *not* represent the lengths of the sides of a triangle?
(1) {6,8,11}
(2) {7,5,6}
(3) {7,18,11}
(4) {9,12,19}

25 Which is an equation of a circle with center at (7,0) and radius 4?
(1) $x^2 + (y - 7)^2 = 2$
(2) $(x - 7)^2 + y^2 = 4$
(3) $x^2 + (y - 7)^2 = 8$
(4) $(x - 7)^2 + y^2 = 16$

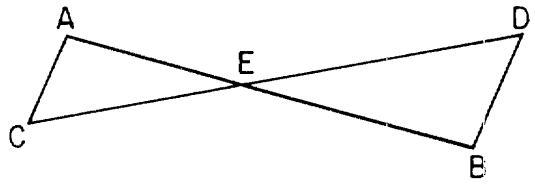
26 What are the roots of the equation $2x^2 + 7x - 1 = 0$?
(1) $\frac{-7 \pm \sqrt{41}}{4}$
(2) $\frac{-7 \pm \sqrt{57}}{4}$
(3) $\frac{7 \pm \sqrt{57}}{4}$
(4) $\frac{7 \pm \sqrt{41}}{4}$

27 The diagonals of a rhombus have lengths of 8 centimeters and 6 centimeters. The perimeter of the rhombus is
(1) 20 cm
(2) 24 cm
(3) 5 cm
(4) 14 cm

28 Given the true statements, "If you take a swim, then you don't catch a fish," and "If you row a boat, then you catch a fish." Which statement *must* also be true?
(1) If you don't row a boat, then you don't take a swim.
(2) If you take a swim, then you don't row a boat.
(3) If you don't take a swim, then you catch a fish.
(4) If you don't catch a fish, then you don't take a swim.

29 Which is an equation of the parabola that intersects the x-axis at the points (2,0) and (5,0)?
(1) $y = x^2 + 7x + 10$ (3) $y = x^2 - 7x + 10$
(2) $y = x^2 + 10x + 7$ (4) $y = x^2 - 10x + 7$

30 In the accompanying diagram, $\overline{AB}$ and $\overline{CD}$ intersect at point E such that $\overline{AC}$ is parallel to $\overline{DB}$. If $AC = 3$, $DB = 4$, and $AB = 14$, what is AE?



(1) 19 (3) 8
(2) 10.5 (4) 6

31 The graphs of the equations $x^2 + y^2 = 4$ and $y = 2$ are drawn on the same set of axes. What is the total number of points common to both graphs?
(1) 1 (3) 3
(2) 2 (4) 4

32 Which is an equation of the locus of points equidistant from the points (3,2) and (3,–4)?
(1) $x = 3$ (3) $y = -1$
(2) $x = -1$ (4) $y = 3$

33 In right triangle ABC, altitude $\overline{CD}$ is drawn to the hypotenuse. If $CD = 10$ and $AD = 4$, then DB equals
(1) 2.5 (3) 25
(2) 14 (4) 40

34 Which is an equation of the axis of symmetry of the parabola whose equation is $y = 3x^2 - 12x - 13$?
(1) $x = -4$ (3) $x = 3$
(2) $x = 2$ (4) $x = 4$

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. [30]

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

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

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

$$y = x^2 + 2x + 1$$
$$y = 2x + 5$$ [2]

37 Given: $\triangle ABC$ with vertices $A(2,1)$, $B(10,7)$, and $C(4,10)$.

a Find the area of triangle ABC. [6]

b Find the length of side $\overline{AB}$. [2]

c Using the answers from parts *a* and *b*, find the length of the altitude drawn from C to $\overline{AB}$. [2]

38 A committee of students is to be chosen from 3 boys and 4 girls.

a How many different 4-member committees are possible? [2]

b How many 4-member committees will contain 2 boys and 2 girls? [3]

c What is the probability that a committee will be made up of 2 boys and 2 girls? [2]

d If a committee of 2 boys and 2 girls is seated in a line, in how many ways can it be arranged so that 2 members of the same sex do *not* sit next to each other? [3]

39 Solve the following system of equations algebraically and check.

$$x^2 + y^2 = 25$$
$$x + 2y = 10$$ [8,2]

40 In the accompanying table, set $S = \{a,b,c,d\}$ and the operation * defines the commutative group $(S, *)$.

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

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 *d*? [2]

d Solve for x: $a * c * x = c$ [2]

e Solve for y: $y * y = b$ [1,1]

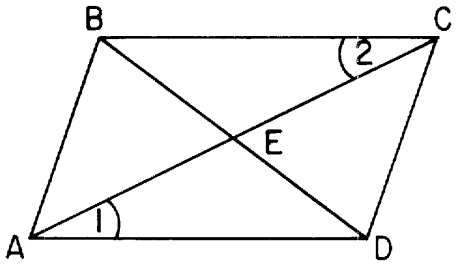
☞ GO RIGHT ON TO THE NEXT PAGE.

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: quadrilateral $ABCD$ with diagonals $\overline{AC}$ and $\overline{BD}$, $\angle 1 \cong \angle 2$, and $\overline{BD}$ bisects $\overline{AC}$ at E.



Prove: $ABCD$ is a parallelogram. [10]

42 Given: If Lori washes dishes, then Keri dries them.
Lori washes dishes or Jason mows the lawn.
We get an allowance if Jason mows the lawn.
If we get an allowance, we can see a movie.
Keri doesn't dry the dishes.

Let L represent: "Lori washes dishes."
Let K represent: "Keri dries the dishes."
Let J represent: "Jason mows the lawn."
Let A represent: "We get an allowance."
Let M represent: "We can see a movie."

Using L, K, J, A, and M, prove: "We can see a movie." [10]

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REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH — COURSE II

Tuesday, January 28, 1986—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 .....

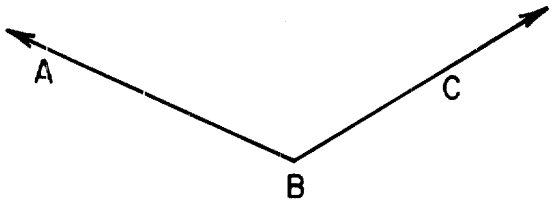
Your answers to Part I should be recorded on this answer sheet.

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 28, 1986—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 17 – 34, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) u

(2) 12

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

(4) 6

(5) 90

(6) 140

(7) 6

(8) 20

(9) $5\sqrt{2}$ *or* $\sqrt{50}$

(10) (2,0)

(11) *B or ABC*

(12) $4\sqrt{5}$ *or* $\sqrt{80}$

(13) 56

(14) $\frac{4}{5}$

(15) (7,3)

(16) $y = 3x + 3$

(17) 3

(18) 1

(19) 3

(20) 2

(21) 2

(22) 1

(23) 4

(24) 3

(25) 4

(26) 2

(27) 1

(28) 2

(29) 3

(30) 4

(31) 1

(32) 3

(33) 3

(34) 2

(35) construction

Part II

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.

(36) *c* (2,9)
(−2,1) [1,1]

(37) *a* 30 [6]
b 10 [2]
c 6 [2]

(38) *a* 35 [2]
b 18 [3]
c $\frac{18}{35}$ [2]
d 8 [3]

(39) (0,5)
(4,3) [8]
Check [2]

(40) *a*

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

[2]

b *b* [2]
c *a* [2]
d *d* [2]
e *b*, *c* [1,1]