

The University of the State of New York  
REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

**COURSE II**

Thursday, January 24, 1980 — 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.

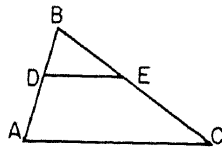
When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during 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**

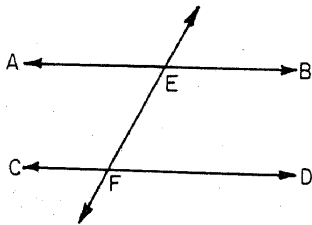
Part I

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.

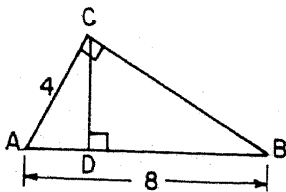
- 1 In the accompanying diagram,  $\triangle ABC$ ,  $D$  is a point on  $\overline{BA}$ , and  $E$  is a point on  $\overline{BC}$  such that  $\overline{DE} \parallel \overline{AC}$ . If  $BD = 4$ ,  $BA = 10$ , and  $BC = 20$ , what is the length of  $\overline{BE}$ ?



- 2 In parallelogram  $ABCD$ ,  $AB = 5x - 4$  and  $CD = 2x + 14$ . Find the value of  $x$ .
- 3 Quadrilateral  $ABCD$  is a rectangle. The coordinates of  $A$ ,  $B$ , and  $C$  are  $A(5,0)$ ,  $B(0,0)$ ,  $C(0,-6)$ . What are the coordinates of point  $D$ ?
- 4 In the accompanying diagram,  $\overleftrightarrow{AB}$  is parallel to  $\overleftrightarrow{CD}$  and both lines are intersected by transversal  $\overleftrightarrow{EF}$ . If  $m\angle BEF$  is twice  $m\angle DFE$ , find  $m\angle DFE$ .



- 5 In the accompanying diagram,  $\triangle ABC$  is a right triangle with right angle at  $C$  and  $\overline{CD} \perp \overline{AB}$  at  $D$ . If  $AB = 8$  and  $AC = 4$ , find  $AD$ .



- 6 Find the slope of the line which passes through the points whose coordinates are  $(-2,5)$  and  $(3,9)$ .

- 7 Express in radical form the length of an altitude of an equilateral triangle whose side has length 10.
- 8 Point  $M$  is the midpoint of  $\overline{CD}$ . The coordinates of  $C$  are  $(5,-3)$  and the coordinates of  $M$  are  $(5,7)$ . What are the coordinates of  $D$ ?

- 9 Write an equation of the line which passes through the origin and is perpendicular to  $y = -\frac{3}{4}x + 7$ .
- 10 The length of each side of a rhombus is 13. If the length of the shorter diagonal is 10, find the length of the longer diagonal.

- 11 The roots of a quadratic equation are  $x = 2$  and  $x = -5$ . Write its equation in the form  $x^2 + bx + c = 0$ .
- 12 How many different 6-letter permutations are there of the letters in the word "FREEZE"?
- 13 Three students are chosen to form a committee from the membership of a club of 4 seniors and 6 juniors. How many different committees consisting of 1 senior and 2 juniors can be formed?

- 14 A 3-digit numeral is formed by selecting from the digits 1, 2, 5, and 6, with no repetition. What is the probability that the number formed is greater than 500?
- 15 In the mod 7 (clock 7) system of arithmetic, which member of the set  $\{0,1,2,3,4,5,6\}$  does not have a multiplicative inverse?

- 16 Determine the value of  $(2 \otimes 4) \otimes (6 \otimes 8)$  within the following system:

$\otimes$	2	4	6	8
2	4	8	2	6
4	8	6	4	2
6	2	4	6	8
8	6	2	8	4

17 If the operation  $*$  is defined as  $a * b = a^2 + b$ , find the value of  $3 * 5$ .

Directions (18–34): 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.

18 The sides of a triangle have lengths 6, 8, and 10. What is the length of the *shortest* side of a similar triangle that has a perimeter of 12?

- (1) 6 (3) 3  
(2) 8 (4) 4

19 The measures of the angles of a triangle are in the ratio of 2:3:4. The measure in degrees of the *smallest* angle of the triangle is

- (1) 20 (3) 60  
(2) 40 (4) 80

20 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  $CDA$ .

21 Which set of numbers could represent the lengths of the sides of a triangle?

- (1)  $\{1, 2, 3\}$  (3)  $\{3, 5, 7\}$   
(2)  $\{2, 4, 6\}$  (4)  $\{5, 10, 20\}$

22 Which equation is an illustration of the distributive law?

- (1)  $a(b + c) = ab + ac$   
(2)  $(a + b) + c = a + (b + c)$   
(3)  $(ab)c = a(bc)$   
(4)  $ab + ac = ac + ab$

23 Parallel lines  $\ell$  and  $m$  are 4 centimeters apart and  $P$  is a point on line  $\ell$ . The total number of points that are equidistant from  $\ell$  and  $m$  and also 2 centimeters from point  $P$  is

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

24 A set contains the element  $a$ . If  $a * x = x$  and  $x * a = x$  for every element  $x$  in the set, it can be concluded that

- (1)  $a$  is the inverse of  $x$   
(2)  $a$  is the identity of the set under  $*$   
(3) the set is closed under  $*$   
(4)  $x$  is the identity of the set under  $*$

25 Assume that the statement, "All geniuses have studied geometry," is true. Which statement must also be true?

- (1) Ron has studied geometry; therefore, Ron is a genius.  
(2) Mary is not a genius; therefore, Mary has not studied geometry.  
(3) Lance has not studied geometry; therefore, Lance is not a genius.  
(4) If Lucy studies geometry, Lucy is a genius.

26 If  $A \rightarrow B$  and  $\sim C \rightarrow \sim B$ , then

- (1)  $A \rightarrow C$  (3)  $\sim A \rightarrow \sim C$   
(2)  $A \rightarrow \sim C$  (4)  $\sim A \rightarrow C$

27 An equation of the axis of symmetry of the parabola  $y = ax^2 - 4x + 1$  is  $x = 1$ . The value of  $a$  is

- (1)  $-2$  (3)  $-4$   
(2)  $2$  (4)  $4$

28 Which parabola touches the  $x$ -axis at one point only?

- (1)  $y = x^2 + 8x + 16$  (3)  $y = x^2 - 5x + 6$   
(2)  $y = x^2 - 16$  (4)  $y = x^2 + 4$

29 The negation of  $\forall x, x > 5$  is

- (1)  $\exists x, x > 5$  (3)  $\exists x, x \leq 5$   
(2)  $\forall x, x \leq 5$  (4)  $\exists x, x < 5$

30 Which is the negation of the statement, "Larry is old and Gary is not here"?

- (1) Larry is old and Gary is here.  
(2) Larry is not old or Gary is here.  
(3) Larry is not old and Gary is not here.  
(4) Larry is old or Gary is here.

31 One root of the equation  $6x^2 - 11x + 5 = 0$  is 1. What is the other root?

- (1)  $\frac{2}{5}$  (3)  $\frac{4}{3}$   
(2)  $\frac{1}{2}$  (4)  $\frac{5}{6}$

32 If the measures of the angles of a triangle are represented by  $x$ ,  $y$ , and  $x + y$ , then the triangle is always

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

33 Triangle  $ABC$  is obtuse and  $\overline{AB} \cong \overline{BC}$ . Which is *always* true?

- (1)  $\triangle ABC$  is equilateral.  
(2)  $\overline{CA}$  is the shortest side.  
(3)  $m\angle A > m\angle B$   
(4)  $CA > AB$

34 An equation of a circle with center at  $(2, -3)$  and radius 5 is

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

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

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

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

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

35 *On the answer sheet,* construct a line through point A parallel to  $\overleftrightarrow{BC}$ .

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 The vertices of triangle  $ABC$  are  $A(4,4)$ ,  $B(12,10)$ , and  $C(6,13)$ .

- a* Show that  $\triangle ABC$  is *not* equilateral. [4]  
*b* Find the area of  $\triangle ABC$ . [6]

37 *a* Graph  $y = x^2 - 3x - 4$  including all integral values of  $x$  from  $-2$  to  $5$ . [6]

- b* Write an equation for the axis of symmetry of this parabola. [2]  
*c* What are the roots of  $x^2 - 3x - 4 = 0$ ? [2]

38 The perimeter of a rectangle is 28 centimeters. If the length of a diagonal of the rectangle is 10 centimeters, find the number of centimeters in the length and width of the rectangle. [Only an algebraic solution will be accepted.] [4,6]

39 The table below represents the operation  $\square$  for the set  $\{c,d,e,f\}$ .

$\square$	$c$	$d$	$e$	$f$
$c$	$c$	$d$	$e$	$f$
$d$	$d$	$e$	$f$	$c$
$e$	$e$	$f$	$c$	$d$
$f$	$f$	$c$	$d$	$e$


- a* What is the identity element of this system? [2]  
*b* What is the inverse of  $f$ ? [2]  
*c* Find the value of  $(e \square e) \square d$ . [2]  
*d* Solve for  $x$ :  $(f \square e) \square x = f$  [2]  
*e* If  $h$  had been an element found within this table in any of the 4 rows, what property of groups would *not* have been fulfilled? [2]

40 The balls which are used to play billiards are divided into two groups; solid-color balls which are numbered from 1 to 8 and striped balls numbered from 9 to 15.

- a* If a player pockets one ball, what is the probability that it is either a solid-color ball or that it bears an even number? [3]  
*b* Assume that the player in part *a* is successful in pocketing the striped 10 ball. If he gets another turn, what is the probability that he will pocket another even-numbered striped ball from the remaining group? [3]  
*c* If a player pockets two balls, what is the probability they will both be solid colors? [4]

41 On your answer paper, write the letters *a* through *e*. After *each* letter, write a valid conclusion for each set of premises. If no conclusion is possible, write "no conclusion."

- a* Paul is tall or June is in bloom.  
 Paul is not tall. [2]  
*b* If Kate goes to the party, then I am not going.  
 If I need a gift, then I am going to the party. [2]  
*c* If I pass this test, then I will eat my hat.  
 I will eat my hat. [2]  
*d* Blue is my favorite color or the Yankees are not my favorite baseball team.  
 The Yankees are not my favorite baseball team. [2]  
*e* If you do not like the Olympics, you will not go to Lake Placid.  
 You are going to Lake Placid. [2]

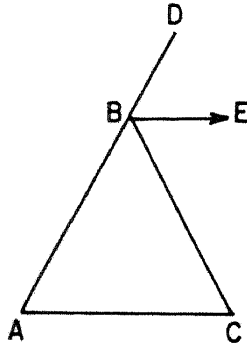
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Answers to the following questions are to be written on paper provided by the school.

Part III

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

- 42 Given:  $\triangle ABC$ ,  $\overline{ABD}$ ,  $\overrightarrow{BE}$  bisects  $\angle CBD$ ,  $\overleftrightarrow{BE} \parallel \overleftrightarrow{AC}$ .



Prove:  $\overline{AB} \cong \overline{BC}$  [10]

- 43 Quadrilateral  $ABCD$  has vertices  $A(0, -2)$ ,  $B(9, 1)$ ,  $C(4, 6)$ , and  $D(1, 5)$ . Prove by coordinate geometry that:

- a  $ABCD$  is a trapezoid [6]  
b  $ABCD$  is not isosceles [4]

- 44 Given the following sentences:

Either I will buy a car or I will go to college.  
If I go to college, then I will work during the summer.  
I will not travel if I work during the summer.  
If I buy a car, I will impress Ann.  
I will travel.

Let  $B$  represent: "I will buy a car."

Let  $C$  represent: "I will go to college."

Let  $T$  represent: "I will travel."

Let  $W$  represent: "I will work during the summer."

Let  $A$  represent: "I will impress Ann."

a Using  $B$ ,  $C$ ,  $T$ ,  $W$ ,  $A$ , and proper connectives, express *each* sentence in symbolic form. [5]

b Using laws of inference, show that Ann is impressed. [5]

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

**SEQUENTIAL MATH — COURSE II**

Thursday, January 24, 1980 — 1:15 to 4:15 p.m., only

Part I Score: .....

Rater's Initials:

.....

**ANSWER SHEET**

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

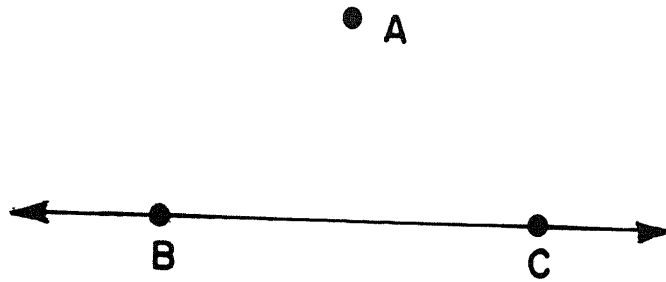
School.....Grade.....

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..... | <b>35 Answer question 35<br/>on the other side<br/>of this sheet.</b> |
| 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.

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Signature



# FOR TEACHERS ONLY

## SCORING KEY

### THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

## COURSE II

Thursday, January 24, 1980 — 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.] For questions 18-34, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

- |  |                          |        |                   |
|--|--------------------------|--------|-------------------|
| (1) 8  | (11) $x^2 + 3x - 10 = 0$ | (21) 3 | (31) 4            |
| (2) 6  | (12) 120                 | (22) 1 | (32) 3            |
| (3) (5, -6) or $\begin{matrix} x = 5 \\ y = -6 \end{matrix}$ | (13) 60                  | (23) 1 | (33) 4            |
| (4) 60   | (14) $\frac{1}{2}$       | (24) 2 | (34) 1            |
| (5) 2  | (15) 0                   | (25) 3 | (35) construction |
| (6) $\frac{4}{5}$  | (16) 4                   | (26) 1 |                   |
| (7) $5\sqrt{3}$ or $\sqrt{75}$                               | (17) 14                  | (27) 2 |                   |
| (8) (5, 17) or $\begin{matrix} x = 5 \\ y = 17 \end{matrix}$ | (18) 3                   | (28) 1 |                   |
| (9) $y = \frac{4}{3}x$ or $3y = 4x$                          | (19) 2                   | (29) 3 |                   |
| (10) 24  | (20) 4                   | (30) 2 |                   |

[OVER]

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)  $b = 30$  [6]

(40)  $a = \frac{11}{15}$  [3]

(37)  $b = \frac{3}{2}$  [2]

$b = \frac{2}{14}$  or  $\frac{1}{7}$  [3]

$c = -1, 4$  [2]

$c = \frac{56}{210}$  or  $\frac{28}{105}$  or  $\frac{4}{15}$  [4]

(38) length 8 [4,6]  
width 6

(41)  $a$  June is in bloom. [2]

(39)  $a$   $c$  [2]  
 $b$   $d$  [2]  
 $c$   $d$  [2]  
 $d$   $e$  [2]  
 $e$  closure [2]

$b$  If Kate goes to the party then I don't need a gift.

or

If I need a gift then Kate does not go to the party. [2]

$c$  no conclusion [2]

$d$  no conclusion [2]

$e$  You like the Olympics. [2]

Part III

(44)  $a$   $B \vee C$  [1]  
 $C \rightarrow W$  [1]  
 $W \rightarrow \sim T$  [1]  
 $B \rightarrow A$  [1]  
 $T$  [1]