

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

**THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS**

**COURSE II**

Friday, January 28, 2000 — 9:15 a.m. to 12:15 p.m., only

**Notice . . .**

Scientific calculators must be available to all students taking this examination.

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.

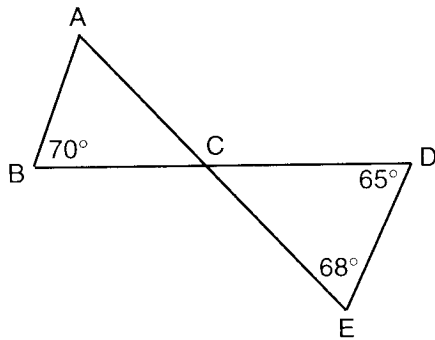
**DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.**

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 terms of  $\pi$  or in radical form. [60]

1 If the binary operation  $\odot$  is defined by  $c \odot b = \sqrt{c^2 - b^2}$ , what is the value of  $25 \odot 24$ ?

2 In the accompanying diagram,  $\overline{BD}$  and  $\overline{AE}$  intersect at  $C$ ,  $\overline{AB}$  and  $\overline{DE}$  are drawn,  $m\angle D = 65$ ,  $m\angle E = 68$ , and  $m\angle B = 70$ . Find  $m\angle A$ .



3 In similar triangles  $ABC$  and  $DEF$ , corresponding sides  $AB$  and  $DE$  equal 15 and 12, respectively. If the perimeter of  $\triangle ABC = 40$ , what is the perimeter of  $\triangle DEF$ ?

4 Solve for  $x$ :  $\frac{3x+1}{2} = \frac{7x-4}{4}$

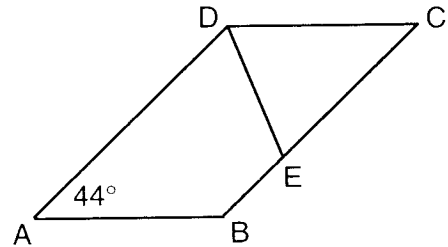
5 Two parallel lines are cut by a transversal. If two interior angles on the same side of the transversal are represented by  $x^\circ$  and  $(5x - 60)^\circ$ , find the value of  $x$ .

6 In  $\triangle ABC$ ,  $m\angle A = 40$ ,  $m\angle B = 70$ , and  $AC = 5$  centimeters. Find the length of  $\overline{AB}$  in centimeters.

7 In  $\triangle ABC$ , the exterior angle at  $A$  is acute. Based on this information, which is the longest side of  $\triangle ABC$ ?

8 What is the total number of different 3-person committees that can be formed from a group of 21 students?

9 In the accompanying diagram of parallelogram  $ABCD$ ,  $\overline{DE}$  bisects  $\angle ADC$  and  $m\angle A = 44$ . Find  $m\angle CDE$ .



10 If point  $(k,3k)$  lies on the graph of the equation  $3x + y = 12$ , what is the value of  $k$ ?

11 The hypotenuse of an isosceles right triangle is  $6\sqrt{2}$ . Find the length of one leg of the triangle.

12 What are the coordinates of  $A'$ , the image of point  $A(-2,3)$  after a dilation of constant 5 with respect to the origin?

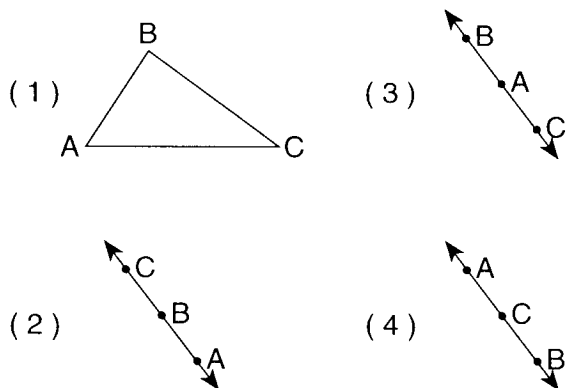
Directions (13–34): For each question chosen, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question.

13 The operation  $\clubsuit$  for the set  $\{C,L,U,B\}$  is defined in the accompanying table. What is the identity element for  $\clubsuit$ ?

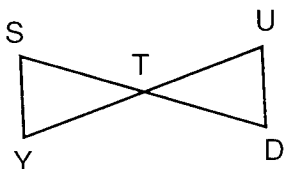
$\clubsuit$	C	L	U	B
C	B	U	C	L
L	U	B	L	C
U	C	L	U	B
B	L	C	B	U

- (1) C (3) U  
 (2) L (4) B

- 14 Which diagram could represent the equation  $AB + BC - AC = 0$ ?



- 15 In the accompanying diagram, point  $T$  is the midpoint of  $\overline{SD}$  and  $\overline{YU}$ ;  $\overline{SY}$  and  $\overline{UD}$  are drawn.



Which statement can be used to prove  $\triangle STY \cong \triangle DTU$ ?

- (1)  $SSS \cong SSS$  (2)  $SAS \cong SAS$  (3)  $ASA \cong ASA$  (4)  $HL \cong HL$
- 16 Which statement is the negation of  $p \vee \sim q$ ?
- (1)  $\sim p \vee \sim q$  (2)  $p \wedge q$  (3)  $\sim p \vee q$  (4)  $\sim p \wedge q$
- 17 Which point is closest to the origin?
- (1) (3,4) (2) (-1,6) (3) (7,0) (4) (-2,-5)
- 18 A translation moves point  $B(-5,3)$  to point  $B'(2,1)$ . What is the image of  $(x,y)$  under this translation?
- (1)  $(x + 7, y - 2)$  (2)  $(x + 7, y + 2)$  (3)  $(x - 3, y - 2)$  (4)  $(x - 3, y + 2)$
- 19 Which set of numbers can represent the lengths of the sides of a triangle?
- (1) {3,3,6} (2) {3,4,7} (3) {4,7,10} (4) {4,4,9}

- 20 The coordinates of the midpoint of line segment  $\overline{AB}$  are  $(2,-5)$ . If the coordinates of  $A$  are  $(6,y)$  and the coordinates of  $B$  are  $(-2,-3)$ , then the value of  $y$  is

- (1) 1 (2) -1 (3) -7 (4) -8

- 21 What is the total number of different 11-letter permutations that can be formed from the letters of the word "EQUILATERAL"?

- (1)  $11!$  (2)  $\frac{11!}{2!2!2!}$  (3)  $\frac{11!}{5!}$  (4)  $\frac{11!}{6!}$

- 22 The roots of the equation  $x^2 + 7x - 4 = 0$  can be represented as

- (1)  $\frac{-7 \pm \sqrt{65}}{2}$  (2)  $\frac{7 \pm \sqrt{65}}{2}$  (3)  $\frac{-7 \pm \sqrt{33}}{2}$  (4)  $\frac{7 \pm \sqrt{33}}{2}$

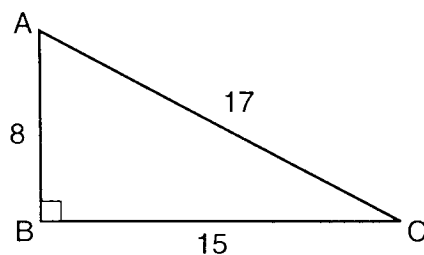
- 23 What is the slope of the line containing points  $(4,-2)$  and  $(5,3)$ ?

- (1)  $\frac{1}{9}$  (2) 9 (3)  $\frac{1}{5}$  (4) 5

- 24 If  $a \rightarrow \sim b$ ,  $b \vee c$ , and  $\sim c$  are all true statements, then which statement must also be true?

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

- 25 In the accompanying diagram of right triangle  $ABC$ ,  $\angle B$  is a right angle,  $AB = 8$ ,  $BC = 15$ , and  $CA = 17$ .



Which ratio is equal to  $\frac{8}{17}$ ?

- (1)  $\sin A$  (2)  $\sin C$  (3)  $\cos C$  (4)  $\tan A$

- 26 What are the coordinates of the turning point of the graph of the equation  $y = x^2 - 4x + 1$ ?
- (1) (4,1)                                      (3) (-2,13)  
(2) (-4,33)                                    (4) (2,-3)
- 27 Right triangle  $ABC$  has a right angle at  $C$ , altitude  $\overline{CD}$  is drawn,  $AC = 10$ , and  $AB = 20$ . What is the length of  $\overline{AD}$ ?
- (1)  $\sqrt{200}$                                     (3) 40  
(2) 2    (4) 5
- 28 What is the solution set of the equation  $6x - x^2 = 0$ ?
- (1) {0}    (3) {0,6}  
(2) {0,-6}                                    (4) {6}
- 29 Which equation represents the circle whose center is  $(2,-3)$  and whose radius is 7?
- (1)  $(x - 2)^2 + (y + 3)^2 = 7$   
(2)  $(x + 2)^2 + (y - 3)^2 = 7$   
(3)  $(x - 2)^2 + (y + 3)^2 = 49$   
(4)  $(x + 2)^2 + (y - 3)^2 = 49$
- 30 Which equation represents a line that passes through point  $(-3,2)$  and is parallel to the line whose equation is  $y = -1$ ?
- (1)  $y = 2$                                       (3)  $y = -3$   
(2)  $x = 2$                                       (4)  $x = -3$
- 31 Which line is parallel to the line  $y - 2x = 4$ ?
- (1)  $y = 2x + 6$                               (3)  $y = 4x - 2$   
(2)  $y = -2x + 4$                             (4)  $2y = x + 4$
- 32 What is the number of degrees in the measure of each exterior angle of a regular polygon of 18 sides?
- (1) 18    (3) 90  
(2) 20    (4) 160
- 33 If point  $p$  is on line  $\ell$ , what is the total number of points 3 centimeters from point  $p$  and 4 centimeters from line  $\ell$ ?
- (1) 1    (3) 0  
(2) 2    (4) 4
- 34 What are the coordinates of  $A'$ , the image of  $A(-2,5)$  under a reflection in the line  $y = x$ ?
- (1)  $(2,-5)$                                     (3)  $(-2,-5)$   
(2)  $(-5,2)$                                     (4)  $(5,-2)$
- Directions (35):* Leave all construction lines on the answer sheet.
- 35 *On the answer sheet*, using point  $A$  as the vertex, construct an angle whose measure is  $60^\circ$ .

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

Part II

Answer three questions from this part. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Calculations that may be obtained by mental arithmetic or the calculator do not need to be shown. [30]

36 Answer both  $a$  and  $b$  for all values of  $y$  for which these expressions are defined.

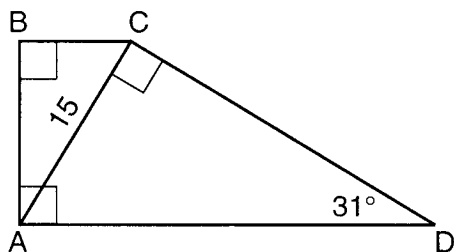
$a$  Express the product as a single fraction in lowest terms:

$$\frac{y^2 - 4y}{2y^2 - 5y - 3} \cdot \frac{y^2 - 9}{y^2 - y - 12} \quad [5]$$

$b$  Express the difference as a single fraction in lowest terms:

$$\frac{3y + 1}{y^2 - 1} - \frac{1}{y + 1} \quad [5]$$

37 In the accompanying diagram of trapezoid  $ABCD$ ,  $\overline{AB} \perp \overline{BC}$ ,  $\overline{BA} \perp \overline{AD}$ , and  $\overline{AC} \perp \overline{CD}$ . If  $AC = 15$  and  $m\angle D = 31$ , find the area of trapezoid  $ABCD$  to the nearest integer. [10]



38 Solve the following system of equations algebraically or graphically and check.

$$\begin{aligned} y &= x^2 - 8x + 10 \\ y - x &= -8 \end{aligned} \quad [8,2]$$

39 Nine boys and eight girls are members of the drama club. A committee of 5 members is to be selected.

$a$  How many different 5-member committees can be selected? [2]

$b$  How many of these committees will have two boys and three girls? [2]

$c$  What is the probability that all boys will be on the committee? [3]

$d$  What is the probability that four girls and one boy will be on the committee? [3]

40 The vertices of a pentagon are  $A(-2,-1)$ ,  $B(1,3)$ ,  $C(3,4)$ ,  $D(5,0)$ , and  $E(3,-2)$ . Find the area of pentagon  $ABCDE$ . [10]

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. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Calculations that may be obtained by mental arithmetic or the calculator do not need to be shown. [10]

- 41 Given: If I save money, then I buy a car.  
If I do not save money, then I will take the train.  
If I buy a car and I buy a bike, then I need insurance.  
I do not need insurance.  
I buy a bike.

Let  $M$  represent: "I save money."

Let  $C$  represent: "I buy a car."

Let  $T$  represent: "I take the train."

Let  $I$  represent: "I need insurance."

Let  $B$  represent: "I buy a bike."

Prove: I take the train. [10]

- 42 Triangle  $CAT$  has vertices  $C(-2,6)$ ,  $A(6,4)$ , and  $T(0,-2)$ , and point  $S(3,1)$  is on side  $\overline{AT}$ . Prove that

a  $\triangle CAT$  is isosceles [4]

b  $\overline{CS}$  is the perpendicular bisector of  $\overline{AT}$  [6]

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REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH – COURSE II

Friday, January 28, 2000 — 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 ..... Sex:  Male  Female Grade .....

Teacher ..... School .....

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 |
| 6 .....  | 16 ..... | 26 ..... | on the other side     |
| 7 .....  | 17 ..... | 27 ..... | of this sheet.        |
| 8 .....  | 18 ..... | 28 ..... |                       |
| 9 .....  | 19 ..... | 29 ..... |                       |
| 10 ..... | 20 ..... | 30 ..... |                       |

Tear Here

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

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

## COURSE II

Friday, January 28, 2000 — 9:15 a.m. to 12:15 p.m., only

### SCORING KEY

Use only *red* ink or *red* pencil in rating Regents papers. Do not attempt to *correct* the student's work by making insertions or changes of any kind. Use checkmarks to indicate student 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 13–34, allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 7	(11) 6	(21) 2	(31) 1
(2) 63	(12) (-10,15)	(22) 1	(32) 2
(3) 32	(13) 3	(23) 4	(33) 3
(4) 6	(14) 2	(24) 2	(34) 4
(5) 40	(15) 2	(25) 2	(35) construction
(6) 5	(16) 4	(26) 4	
(7) $\overline{BC}$	(17) 1	(27) 4	
(8) 1330	(18) 1	(28) 3	
(9) 68	(19) 3	(29) 3	
(10) 2	(20) 3	(30) 1	

[OVER]

**Part II**

Please refer to the Department's publication *Guide for Rating Regents Examinations in Mathematics*, 1996 Edition. 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)  $a \frac{y}{2y+1}$  [5]

$b \frac{2}{y-1}$  [5]

(37) 237 [10]

(38) (3,-5), (6,-2) [8]  
 Check [2]

(39)  $a$  6188 [2]

$b$  2016 [2]

$c \frac{126}{6188}$  [3]

$d \frac{630}{6188}$  [3]

(40) 23.5 [10]