The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Thursday, August 13, 1987—8:30 to 11:30 a.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.

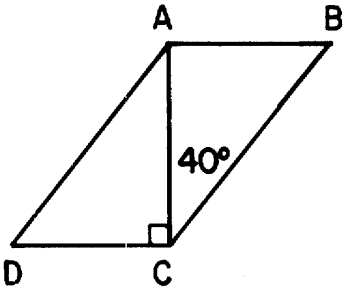
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN

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 If * is a binary operation defined as $a * b = a + b + 2ab$, evaluate $3 * 5$.

2 In parallelogram $ABCD$, diagonal $\overline{AC} \perp \overline{CD}$. If $m\angle ACB = 40$, find $m\angle ADC$.



3 In a triangle, the lengths of the sides are 3, 7, and 8. If the perimeter of a similar triangle is 54, what is the length of the *longest* side of the larger triangle?

4 In $\triangle ABC$, the measure of an exterior angle at B is 100. If $m\angle A$ is 4 times larger than $m\angle C$, find $m\angle C$.

5 In $\triangle ABC$, $m\angle A : m\angle B : m\angle C = 2:3:4$. What is $m\angle C$?

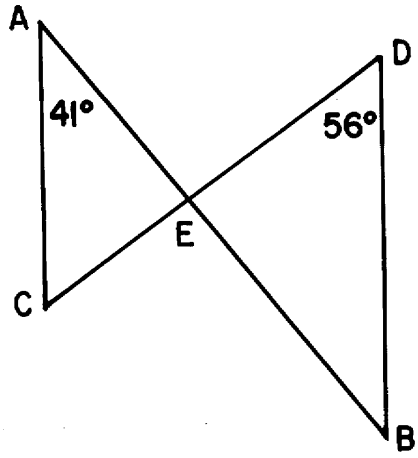
6 How many distinct 6-letter permutations can be formed using the letters in the word "BABBLE"?

7 Two consecutive angles of a parallelogram have measures $3x - 2$ and $4x + 7$. Find x.

8 The lengths of the legs of a right triangle are 3 and 5. Find the length of the hypotenuse.

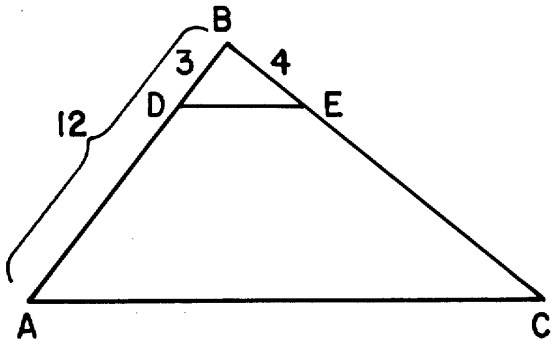
9 What is the area of a triangle whose vertices are $A(4,3)$, $B(8,3)$, and $C(5,8)$?

10 In the accompanying diagram, $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect at E, $\overline{AC} \parallel \overline{DB}$, $m\angle A = 41$, and $m\angle D = 56$. Find $m\angle AEC$.



11 How many different committees of 4 can be selected from a group containing 9 members?

12 In the accompanying diagram of $\triangle ABC$, $\overline{DE} \parallel \overline{AC}$. If $BD = 3$, $BE = 4$, and $AB = 12$, find the length of $\overline{EC}$.



13 In parallelogram $ABCD$, the coordinates of A are $(3,-1)$ and the coordinates of C are $(-1,5)$. Find the coordinates of the point of intersection of the diagonals.

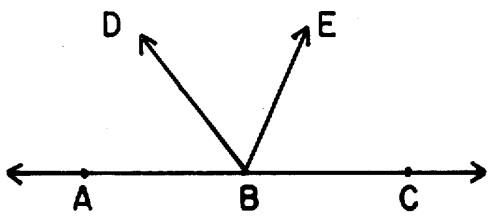
14 What is the slope of the line that passes through the points $(5,3)$ and $(-4,1)$?

15 In right triangle ABC, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. If $CD = 4$ and $AD = 2$, find DB.

16 The area of a trapezoid is 42 and the lengths of the bases are 6 and 8. Find the length of the altitude of the trapezoid.

17 What is the length of the line segment joining the points (–3,–4) and (2,–5)?

18 In the accompanying diagram, $\overleftrightarrow{ABC}$ is a straight line and $\overrightarrow{BE}$ bisects $\angle DBC$. If $m\angle ABD = 2x$ and $m\angle DBE = 2x + 15$, find x.



Directions (19–34): 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.

19 The set $S = \{A,B,C,D\}$ is a commutative group under the operation #. How should the last column appear in the accompanying table?

#	A	B	C	D
A	D	A	B	
B	A	B	C	
C	B	C	D	
D	C	D	A	

(1) A
B
C
D

(2) B
C
D
A

(3) C
D
A
B

(4) D
A
B
C

20 If one solution of the equation $x^2 - 5x + c = 0$ is $x = 7$, then c must equal
(1) 14
(2) 2
(3) –14
(4) –2

21 Which statement is logically equivalent to the negation of $\sim r \wedge s$?
(1) $r \vee \sim s$
(2) $r \vee s$
(3) $r \wedge \sim s$
(4) $r \wedge s$

22 Which equation represents a line that is parallel to the line whose equation is $y = x + 4$?
(1) $y + x = 1$
(2) $y - 4 = -x$
(3) $y = -x - 1$
(4) $y = x - 4$

23 Which set of numbers represents the lengths of the sides of a right triangle?
(1) {7,8,9}
(2) {7,8,10}
(3) {6,8,10}
(4) {6,8,9}

24 What is the negation of the statement $\exists_x \sqrt{x} > x$?
(1) $\forall_x \sqrt{x} = x$
(2) $\forall_x \sqrt{x} \leq x$
(3) $\exists_x \sqrt{x} \neq x$
(4) $\forall_x \sqrt{x} > x$

25 Which statement is always *false*?
(1) $p \wedge \sim p$
(2) $p \vee \sim q$
(3) $p \wedge \sim q$
(4) $p \vee \sim p$

26 Which is an equation of the axis of symmetry of the graph of the equation $y = x^2 - 6x + 9$?
(1) $y = 3$
(2) $y = -3$
(3) $x = 3$
(4) $x = -3$

27 Which is an illustration of the associative property?
(1) $a \cdot b = b \cdot a$
(2) $a \cdot (b \cdot c) = (b \cdot c) \cdot a$
(3) $a \cdot b = a$
(4) $a \cdot (b \cdot c) = (a \cdot b) \cdot c$

28 Given the true statement, "All students attending Learnalot High School are under 20 years of age." Which statement must also be true?

(1) Jay is 17; therefore Jay is a student at Learnalot.
(2) Mitch does not attend Learnalot; therefore Mitch is at least 20 years old.
(3) Dorothy attends high school; therefore Dorothy is under 20 years old.
(4) Stanley is 23 years old; therefore Stanley is not a student at Learnalot.

29 The total number of points 2 units from a given line and also 2 units from a given point on that line is

(1) 1
(2) 2
(3) 3
(4) 4

30 If $a \rightarrow b$ and $q \rightarrow \sim b$ are both true statements, which is a valid conclusion?

(1) $a \rightarrow q$
(2) $a \rightarrow \sim q$
(3) $\sim a \rightarrow q$
(4) $\sim a \rightarrow \sim q$

31 Given the true statements, "If $\triangle ABC \sim \triangle RST$, then $\angle B \cong \angle S$," and "$\angle B$ is not congruent to $\angle S$." Which is a logical conclusion?

(1) $\triangle ABC$ is not similar to $\triangle RST$.
(2) $\triangle ABC \sim \triangle RST$
(3) $\angle A \cong \angle R$
(4) The triangles are isosceles.

32 Which is an equation of the circle whose center is (−2,1) and whose radius is 4?

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

33 One of the roots of the equation $x^2 + 3x - 6 = 0$ is

(1) $\frac{-3 - \sqrt{33}}{2}$
(2) $\frac{-3 + \sqrt{33}}{6}$
(3) $\frac{3 + \sqrt{33}}{2}$
(4) $\frac{3 - \sqrt{33}}{6}$

34 Which is an equation of a parabola which does *not* pass through the origin?

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

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

35 *On your answer sheet*, construct an equilateral triangle in which A is one vertex.

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 $y = x^2 + 4x + 3$ for all values of x such that $-5 \leq x \leq 1$. [6]

b Write an equation of the axis of symmetry of the graph of the equation $y = x^2 + 4x + 3$. [2]

c What are the roots of the equation $x^2 + 4x + 3 = 0$? [2]

37 Elements a, b, c, and d and operations # and @ are defined by the accompanying tables.

#	a	b	c	d
a	b	a	d	c
b	a	b	c	d
c	d	c	a	b
d	c	d	b	a

@	a	b	c	d
a	c	d	b	a
b	d	c	a	b
c	b	a	d	c
d	a	b	c	d

a What is the identity element for #? [2]

b What is the inverse of element c under the operation @? [3]

c Find the value of $(a \# d) \# (b @ c)$. [2]

d Solve for x: $x @ (c \# b) = a$ [3]

38 Solve the following system of equations algebraically and check:

$$y = 3x^2 - 8x + 5$$
$$x + y = 3$$ [8,2]

39 From the members of a band consisting of 5 clarinet players, 4 trumpet players, and 3 tuba players, a 3-member group is to be formed.

a How many 3-member groups can be formed? [2]

b What is the probability that the 3-member group formed consists of 1 clarinet player, 1 trumpet player, and 1 tuba player? [3]

c What is the probability that the 3-member group formed consists of 3 clarinet players, 3 trumpet players, or 3 tuba players? [5]

40 In a right triangle, the length of the longer leg is 2 centimeters more than twice the length of the shorter leg. The length of the hypotenuse is 8 centimeters more than the length of the shorter leg. Find, in centimeters, the lengths of the three sides of the triangle. [*Only an algebraic solution will be accepted.*] [4,6]

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

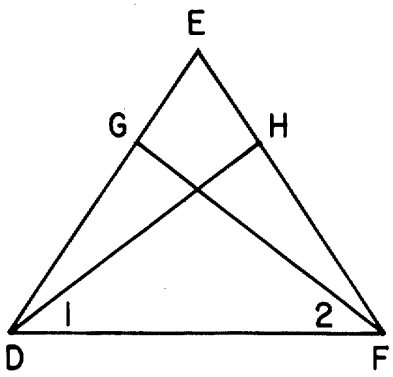
Part III

Answer one question from this part. Show all work unless otherwise directed. [10]

41 Given: $\triangle ABC$ with vertices $A(1,2)$, $B(7,0)$, and $C(3,-2)$.

Prove: $\triangle ABC$ is an isosceles right triangle. [10]

42 Given: $\triangle DEF$, $\overline{EGD}$, $\overline{EHF}$, $\overline{EG} \cong \overline{EH}$, and $\overline{GD} \cong \overline{HF}$.



Prove: $\angle 1 \cong \angle 2$ [10]

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SEQUENTIAL MATH — COURSE II

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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

• A

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

Thursday, August 13, 1987 — 8:30 to 11:30 a.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 19–34, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 38

(2) 50

(3) 24

(4) 20

(5) 80

(6) 120

(7) 25

(8) $\sqrt{34}$

(9) 10

(10) 83

(11) 126

(12) 12

(13) (1,2)

(14) $\frac{2}{9}$

(15) 8

(16) 6

(17) $\sqrt{26}$

(18) 25

(19) 3

(20) 3

(21) 1

(22) 4

(23) 3

(24) 2

(25) 1

(26) 3

(27) 4

(28) 4

(29) 2

(30) 2

(31) 1

(32) 4

(33) 1

(34) 3

(35) construction

Part II

Please refer to the Department publication *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) *b* $x = -2$ [2]
c $-1, -3$ [2]

(37) *a b* [2]
b c [3]
c d [2]
d b [3]

(38) (2,1) and $\left(\frac{1}{3}, \frac{8}{3}\right)$ [8]
Check [2]

(39) *a* 220 [2]
b $\frac{60}{220}$ [3]
c $\frac{15}{220}$ [5]

(40) Analysis [4]
5, 12, 13 [6]