The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Tuesday, August 14, 1984 — 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

NEW YORK 1784 1984 THE STATE OF LEARNING

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.

1 If $a * b$ is a binary operation defined as $\frac{a-b}{2}$, evaluate $5 * 3$.

2 Using the accompanying table, find $(s * t) * (x * w)$.

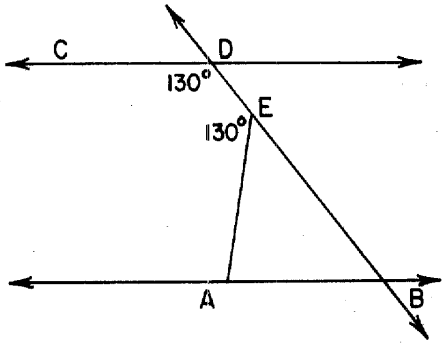
$*$	s	t	w	x
s	x	s	t	w
t	s	t	w	x
w	t	w	x	s
x	w	x	s	t

3 Two parallel lines are cut by a transversal, forming a pair of alternate interior angles with measures $3x + 10$ and $7x - 30$. Find the value of x.

4 What is the positive root of the equation $x^2 + 7x - 8 = 0$?

5 Find the midpoint of the segment whose endpoints are $(3,2)$ and $(-7,4)$.

6 In the accompanying diagram, parallel lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are cut by transversal $\overleftrightarrow{DEB}$. If $m\angle CDE = m\angle DEA = 130$, find $m\angle BAE$.

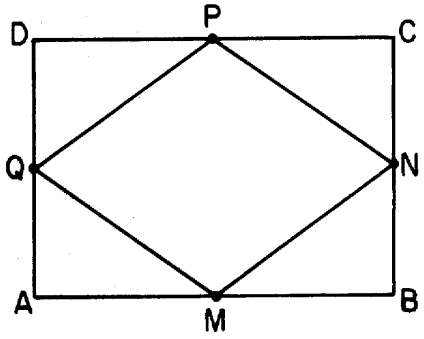


7 In rhombus $ABCD$, diagonal $AC = 16$ and diagonal $BD = 12$. Find the length of side $\overline{CD}$.

8 What is the length of the radius of a circle whose center is the origin and which passes through the point $(3,4)$?

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

10 In the accompanying diagram, rectangle $ABCD$ has length 12 and width 8. The midpoints of sides $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, and $\overline{DA}$ are connected to form quadrilateral $MNPQ$. Find the area of quadrilateral $MNPQ$.



11 Write an equation of the line that is parallel to the x-axis and passes through the point $(-3,7)$.

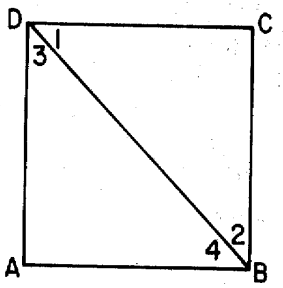
12 Given the equations: $x = 0$
$y = 0$
$y = x$
$y = x^2$

If one of the equations is picked at random, what is the probability that the graph of the equation will pass through the origin?

13 Given isosceles trapezoid $ABCD$, with $\overline{AB} \parallel \overline{CD}$, $AB = 14$, $CD = 4$, and $AD = 13$. Find the length of an altitude of trapezoid $ABCD$.

Directions (14–34): 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.

14 In the accompanying diagram, $ABCD$ is a square with diagonal $\overline{BD}$. Which statement is *not* true?



(1) $\angle 1 \cong \angle 2$
(2) $\angle 2 \cong \angle 3$
(3) $\overline{BD} \cong \overline{AD}$
(4) $\overline{CD} \cong \overline{BC}$

15 The lengths of the sides of a triangle are 14, 10, and 8. If the length of the shortest side of a similar triangle is 4, the length of the longest side of the similar triangle is
(1) 7
(2) 28
(3) 32
(4) 56

16 Given the true statements, "Jay loves the math team," and "If the math team does not win, then Jay does not love the math team." Which statement must also be true?
(1) The math team loses.
(2) The math team wins.
(3) The math team loves Jay.
(4) Jay does not love the math team.

17 Given the true statements:
$J \vee \sim N$
N
Which statement must also be true?
(1) J
(2) $\sim J$
(3) $J \wedge \sim N$
(4) $\sim J \wedge N$

18 Which set of numbers can *not* represent the lengths of the sides of a triangle?
(1) {2,3,4}
(2) {3,4,5}
(3) {3,1,1}
(4) {3,4,4}

19 If the slope of $\overleftrightarrow{AB}$ is $\frac{2}{3}$ and $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$, what is the slope of $\overleftrightarrow{CD}$?
(1) $\frac{2}{3}$
(2) $-\frac{2}{3}$
(3) $\frac{3}{2}$
(4) $-\frac{3}{2}$

20 In $\triangle ABC$, $\overline{BD}$ and $\overline{AE}$ are medians. If $\overline{ED}$ is drawn, what is the ratio of ED:AB?
(1) 1:2
(2) 2:1
(3) 1:3
(4) 3:1

21 If $a \rightarrow b$ and $\sim c \rightarrow \sim b$ are both true statements, then which must also be true?
(1) $a \rightarrow c$
(2) $b \rightarrow a$
(3) $c \rightarrow a$
(4) $c \rightarrow b$

22 The table below defines the operation $\textcircled{x}$ for the set $S = \{1,3,5,7,9\}$. According to this table, which statement is *false*?

$\textcircled{x}$	1	3	5	7	9
1	1	3	5	7	9
3	3	9	5	1	7
5	5	5	5	5	5
7	7	1	5	9	3
9	9	7	5	3	1

(1) The identity element is 1.
(2) The set S is closed under $\textcircled{x}$.
(3) The operation $\textcircled{x}$ is commutative.
(4) Every element has an inverse.

23 In $\triangle ABC$, side $\overline{AC}$ is extended through point C to D, forming an exterior angle whose measure is 40. Which angle has the greatest measure?
(1) $\angle A$
(2) $\angle B$
(3) $\angle ACB$
(4) $\angle BCD$

24 Which quadrilateral always has congruent diagonals?
(1) parallelogram
(2) trapezoid
(3) rhombus
(4) rectangle

25 In clock 5, with elements $\{0,1,2,3,4\}$, the solution set of the equation $2x + 3 = 2$ is

(1) $\{1\}$ (3) $\{0\}$
(2) $\{2\}$ (4) $\{4\}$

26 The number of different 5-member cheerleading squads that can be selected from 8 people is represented by

(1) ${}_8P_3$ (3) ${}_5C_3$
(2) ${}_8P_5$ (4) ${}_8C_5$

27 In parallelogram $QRST$, diagonals $\overline{QS}$ and $\overline{RT}$ intersect at point E. Which statement is always true?

(1) $\overline{QS} \perp \overline{RT}$ (3) $\triangle RES \cong \triangle TEQ$
(2) $\angle RQS \cong \angle SQT$ (4) $\triangle TQE \cong \triangle RQE$

28 What are the coordinates of the center of the circle whose equation is $(x + 2)^2 + (y - 1)^2 = 25$?

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

29 Which is an equation of the axis of symmetry of the parabola whose equation is $y = -3x^2 + 6x - 3$?

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

30 Which of the following is the negation of the statement $\forall_x\ x^2 > 25$?

(1) $\forall_x\ x^2 > 25$ (3) $\exists_x\ x^2 > 25$
(2) $\forall_x\ x^2 \leq 25$ (4) $\exists_x\ x^2 \leq 25$

31 When the altitude is drawn to the hypotenuse of a right triangle, the triangles formed *must* be

(1) congruent (3) isosceles
(2) similar (4) equal in area

32 The roots of $x^2 + 8x + 1 = 0$ are

(1) $-4 \pm \sqrt{15}$ (3) $4 \pm \sqrt{17}$
(2) $4 \pm \sqrt{15}$ (4) $-4 \pm \sqrt{17}$

33 Which statement is logically equivalent to $\sim(p \vee \sim q)$?

(1) $p \wedge \sim q$ (3) $\sim p \vee q$
(2) $\sim p \wedge q$ (4) $\sim p \wedge \sim q$

34 In a plane, the total number of points equidistant from two parallel lines 6 centimeters apart, and also 3 centimeters from a point on one of the lines is

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

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

35 *On the answer sheet*, construct an angle congruent to $\angle ABC$ using $\overrightarrow{EF}$ as one side.

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 Given: elements P, Q, R, and S and operations @ and $*$ as defined by the accompanying tables.

@	P	Q	R	S
P	S	Q	P	R
Q	Q	Q	Q	Q
R	P	Q	R	S
S	R	Q	S	P

$*$	P	Q	R	S
P	Q	P	S	R
Q	P	Q	R	S
R	S	R	Q	P
S	R	S	P	Q

a What is the identity element for @? [2]
b What is the inverse of P under the operation $*$? [2]
c Evaluate: S @ $(P * R)$ [2]
d Evaluate: $(S$ @ $P) * (S$ @ $R)$ [2]
e Solve for x: $(x$ @ $R) * S = Q$ [2]

37 *a* Draw the graph of the equation $y = x^2 - 5$ including all values of x from $x = -4$ to $x = 4$. [5]

b Using a compass, construct the graph of $x^2 + y^2 = 25$ on the same set of axes used in part *a*. [2]

c Determine the coordinates of all points of intersection of the graphs drawn in parts *a* and *b*. [3]

38 In triangle ABC, $m\angle C = 90$, $AC = x$, $BC = x + 3$, and $AB = x + 5$.

a Write an equation in terms of x which can be used to find AC. [3]
b Find AC. [*Answer may be left in radical form.*] [7]

39 The vertices of $\triangle ABC$ are $A(-2,2)$, $B(5,-3)$, and $C(1,7)$. Median $\overline{AE}$ is drawn to side $\overline{BC}$.

a Find the coordinates of point E. [2]
b Write an equation of line $\overleftrightarrow{AE}$. [2]
c Find the slope of the line passing through points A and C. [2]
d Write an equation of the line which passes through point E and is parallel to side $\overline{AC}$. [2]
e Find the area of $\triangle ACE$. [2]

40 A committee of 6 is to be chosen from a group of 5 sophomores and 4 juniors.

a How many different 6-member committees are possible? [3]
b How many of these committees consist of 4 sophomores and 2 juniors? [3]
c What is the probability that one of the 6-member committees consists of 4 sophomores and 2 juniors? [2]
d What is the probability that a 6-member committee contains no junior? [2]

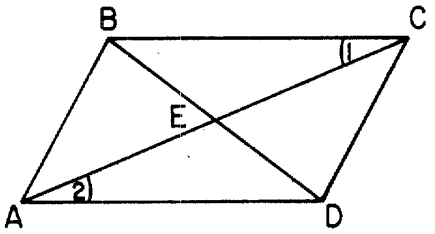
☞ GO RIGHT ON TO THE NEXT PAGE.

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.

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



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

42 The vertices of triangle ABC are $A(1,2)$, $B(5,4)$, and $C(7,0)$. Prove that ABC is an isosceles right triangle. [10]

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH — COURSE II

Tuesday, August 14, 1984 — 8:30 to 11:30 a.m., only

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

ANSWER SHEET

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

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

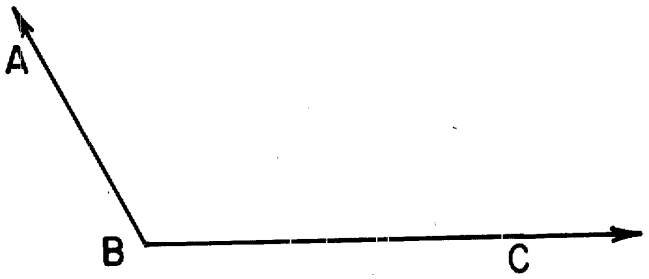
Your answers to Part I should be recorded on this answer sheet.

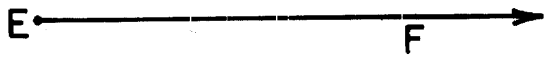
Part I

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, August 14, 1984 — 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 14–34, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 1

(2) x

(3) 10

(4) 1

(5) $(-2,3)$ *or* $\begin{matrix} x = -2 \\ y = 3 \end{matrix}$

(6) 80

(7) 10

(8) 5

(9) 60

(10) 48

(11) $y = 7$

(12) 1

(13) 12

(14) 3

(15) 1

(16) 2

(17) 1

(18) 3

(19) 4

(20) 1

(21) 1

(22) 4

(23) 3

(24) 4

(25) 2

(26) 4

(27) 3

(28) 2

(29) 1

(30) 4

(31) 2

(32) 1

(33) 2

(34) 1

(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) *a* *R* [2]
b *P* [2]
c *P* [2]
d *P* [2]
e *S* [2]

(37) *c* (3,4)
(−3,4)
(0,−5) [3]

(38) *a* $x^2 + (x + 3)^2 = (x + 5)^2$ [3]

b $2 + 2\sqrt{5}$ *or* $\frac{4 + \sqrt{80}}{2}$ [7]

(39) *a* (3,2) [2]
b $y = 2$ [2]
c $\frac{5}{3}$ [2]
d $y - 2 = \frac{5}{3}(x - 3)$ *or* $3y - 5x = -9$ [2]
e $12\frac{1}{2}$ [2]

(40) *a* 84 [3]
b 30 [3]
c $\frac{30}{84}$ [2]
d 0 [2]