

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Friday, January 27, 1984 — 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.

- 1 Find the value of $(4 \odot 2) \odot 8$ in the system defined below.

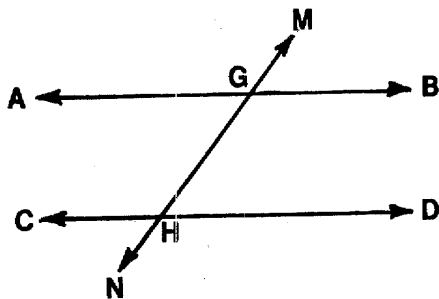
\odot	2	4	6	8
2	8	2	4	6
4	2	4	6	8
6	4	6	8	2
8	6	8	2	4

- 2 The operation \oplus for the set $\{a,b,c,d\}$ is defined in the accompanying table. What is the identity element for \oplus ?

\oplus	a	b	c	d
a	d	c	a	b
b	c	d	b	a
c	a	b	c	d
d	b	a	d	c

- 3 The coordinates of three of the vertices of rectangle $ABCD$ are $A(-1,5)$, $B(3,5)$, and $C(3,1)$. What are the coordinates of vertex D ?

- 4 In the diagram below, $\vec{AB} \parallel \vec{CD}$ and each is intersected by \vec{MN} at G and H , respectively. If $m\angle BGH = 2x + 50$ and $m\angle CHG = 5x - 70$, find x .



- 5 The lengths of the sides of a triangle are 5, 7, and 8. If the length of the longest side of a similar triangle is 24, find the perimeter of the larger triangle.

- 6 In triangle ABC , $\overline{AB} \cong \overline{BC}$. If $m\angle A = 45$, find $m\angle B$.

- 7 In the equilateral triangle ABC , $AB = 16$. Find the perimeter of the triangle formed by connecting the midpoints of the sides of triangle ABC .

- 8 If the coordinates of A are $(-2,-5)$ and the coordinates of B are $(-6,7)$, what are the coordinates of the midpoint of \overline{AB} ?

- 9 How many different arrangements of 5 letters can be made using the letters in the word "SASSY"?

- 10 How many different teams of 5 can be formed from a group of 8 bowlers?

- 11 If the lengths of the diagonals of a rhombus are 10 and 24, find the length of one side of the rhombus.

- 12 Write an equation of the line which passes through the points $(2,1)$ and $(6,3)$.

- 13 In rectangle $ABCD$, diagonals \overline{AC} and \overline{BD} intersect at point E . If $AE = 20$ and $BD = 2x + 30$, find x .

- 14 Find the area of the triangle whose vertices have the coordinates $(1,1)$, $(7,1)$, and $(3,6)$.

- 15 If $(x - 3)^2 + (y + 5)^2 = 20$ is an equation of a circle and the center is $(h, -5)$, find h .

- (12)16 Find the distance between the points whose coordinates are $(2,7)$ and $(8,-1)$.

- 17 The line that passes through the points $(-2,3)$ and $(5,y)$ has a slope of $\frac{4}{7}$. Find y .

Directions (18–35): 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 Given the true statements, "If the winds are above 20 knots, I will not go sailing," and "I am sailing." Which conclusion must be true?

- (1) The winds are decreasing in intensity.
- (2) The winds are increasing in intensity.
- (3) The winds are not above 20 knots.
- (4) The winds are above 20 knots.

19 If $*$ is a binary operation defined by $a * b = (2a)^b$, what is the value of $5 * 2$?

- (1) 20
- (2) 100
- (3) 200
- (4) 1,024

20 The negation of $x \vee \sim y$ is

- (1) $\sim x \vee y$
- (2) $\sim x \wedge \sim y$
- (3) $x \wedge \sim y$
- (4) $\sim x \wedge y$

21 Two congruent angles are supplementary. The measure of each angle is

- (1) 45
- (2) 60
- (3) 90
- (4) 180

22 Point C is 3 centimeters from line \overleftrightarrow{AB} . The number of points on \overleftrightarrow{AB} which are also 5 centimeters from C is

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

23 Which polygons are *always* similar?

- (1) equilateral triangles
- (2) parallelograms
- (3) trapezoids
- (4) rectangles

24 What are the roots of the equation

$$5x^2 - 7x + 1 = 0?$$

- (1) $\frac{7 \pm \sqrt{29}}{10}$
- (2) $\frac{-7 \pm \sqrt{29}}{10}$
- (3) $\frac{7 \pm \sqrt{69}}{10}$
- (4) $\frac{-7 \pm \sqrt{69}}{10}$

25 If the length of a diagonal of a square is 10, the length of a side of the square is

- (1) $5\sqrt{2}$
- (2) $\sqrt{10}$
- (3) 10
- (4) 50

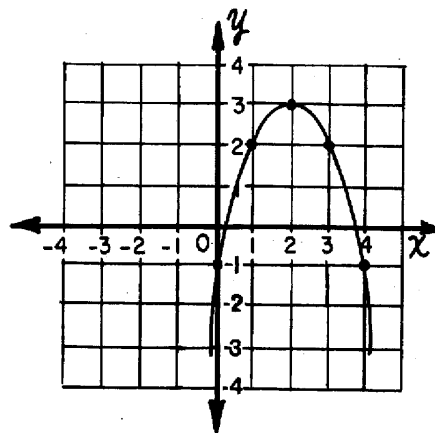
26 Which is an equation of the line which is parallel to the x -axis and passes through the point $(1,5)$?

- (1) $x = 1$
- (2) $y = 1$
- (3) $x = 5$
- (4) $y = 5$

27 If a card is randomly selected from a standard deck of 52 cards, what is the probability of picking a black king or a club?

- (1) $\frac{1}{52}$
- (2) $\frac{13}{2652}$
- (3) $\frac{14}{52}$
- (4) $\frac{15}{52}$

28 Which is an equation of the axis of symmetry of the parabola shown in the accompanying graph?



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

29 How many points do the graphs of $x^2 + y^2 = 9$ and $y = 4$ have in common?

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

30 What is the negation of the statement

$$\exists_x x + 3 = 10?$$

- (1) $\forall_x x + 3 = 10$
- (2) $\forall_x x + 3 \neq 10$
- (3) $\exists_x x + 3 \neq 10$
- (4) $\forall_x x + 3 > 10$

31 Which equation illustrates the associative property of addition?

- (1) $a + 0 = a$
- (2) $a + b = b + a$
- (3) $a + (b + c) = (a + b) + c$
- (4) $a(b + c) = ab + ac$

32 Which are coordinates of the turning point of the parabola whose equation is $y = x^2 - 8x + 5$?

- (1) (0,5)
- (2) (5,0)
- (3) (8,5)
- (4) (4,-11)

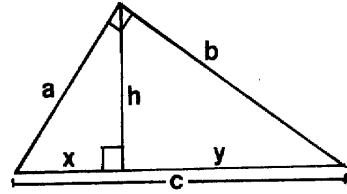
33 Which set of numbers could be the lengths of the sides of a triangle?

- (1) {6,7,13}
- (2) {12,13,20}
- (3) {5,5,11}
- (4) {3,6,9}

34 If $a \rightarrow b$ and $\sim c \rightarrow \sim b$ are true statements, which statement must also be true?

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

35 In the accompanying figure, a , b , and c represent the sides of a right triangle. The segments made by altitude h drawn to hypotenuse c are represented by x and y . Which statement must be true?




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

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 On your answer paper, write the letters a through e . Next to each letter write a conclusion which can be deduced using both true statements.
- a If I am unhappy then I cry.
I do not cry. [2]
- b $(x + 2 = 5) \vee (x - 7 = 1)$
 $x \neq 3$ [2]
- c Jim will get an A if he passes this test.
Jim passes this test. [2]
- d If I play tennis then I will not have time for dinner.
If I do not have time for dinner then I will not go swimming. [2]
- e Either I have money or I will stay home.
I do not have money. [2]
- 37 a Using the letters in the word "OCTAGON," how many distinct arrangements using all 7 letters are possible? [2]
- b Using the letters in the word "TRAPEZOID," how many distinct combinations using 7 letters at a time are possible? [3]
- c Using the letters in the word "SQUARE," what is the probability that in a 6-letter arrangement the first 2 letters are vowels? [3]
- d Using the letters in the word "RHOMBUS," what is the probability that in a 7-letter arrangement the first 3 letters are vowels? [2]
- 38 a Draw the graph of $y = -x^2 + 4x$ including all values of x such that $-1 \leq x \leq 5$. [5]
- b On the same set of axes, draw the graph of $y = x^2$ including all values of x such that $-3 \leq x \leq 3$. [3]
- c How many points do the graphs drawn in parts a and b have in common? [2]
- 39 In right triangle ABC , $BC = x$, $AC = 8 - x$, and hypotenuse $AB = 6$.
- a Write an equation which can be used to find x . [3]
- b Solve the equation for x .
[Answer may be left in radical form.] [7]
- 40 Given $(Z_3, +, \bullet)$ where $Z_3 = \{0,1,2\}$, $+$ is addition clock 3, and \bullet is multiplication clock 3.
- a Construct an addition table and a multiplication table for Z_3 as defined. [4]
- b Solve for all values of x in the clock 3 system:
- (1) $x + x = 2$ [2]
(2) $x \bullet x = 2$ [2]
(3) $x + x = x \bullet x$ [2]

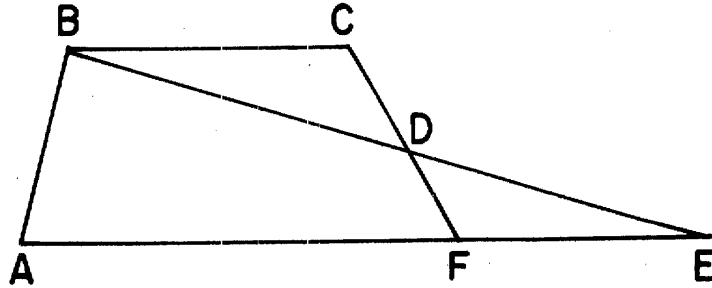
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Answers to the following questions are to be written on paper provided by the school.

Part III

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

- 41 Given: quadrilateral $ABCF$, \overline{BDE} , \overline{CDF} , \overline{AFE} , \overline{BE} bisects \overline{CF} , and $\overline{AE} \parallel \overline{BC}$.



Prove: $\overline{BD} \cong \overline{DE}$ [10]

- 42 Quadrilateral $ABCD$ has vertices $A(-1,0)$, $B(3,3)$, $C(6,-1)$, and $D(2,-4)$. Prove that quadrilateral $ABCD$ is a square. [10]
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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH — COURSE II

Friday, January 27, 1984 — 9:15 a.m. to 12:15 p.m., only

Part I Score:

Rater's Initials:

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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 |
| 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.

Signature

FOR TEACHERS ONLY

SCORING KEY

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Friday, January 27, 1984 — 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 18–35, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 6	(11) 13	(21) 3	(31) 3
(2) c	(12) $y = \frac{1}{2}x$ or $y - 1 = \frac{1}{2}(x - 2)$	(22) 2	(32) 4
(3) $(-1,1)$	(13) 5	(23) 1	(33) 2
(4) 40	(14) 15	(24) 1	(34) 1
(5) 60	(15) 3	(25) 1	(35) 4
(6) 90	(16) 10	(26) 4	
(7) 24	(17) 7	(27) 3	
(8) $(-4,1)$	(18) 3	(28) 2	
(9) 20	(19) 2	(29) 3	
(10) 56	(20) 4	(30) 2	

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) *a* I am happy. [2]
b $x = 8$ [2]
c Jim will get an A. [2]
d If I play tennis then I will not go swimming. [2]
e I will stay home. [2]
- (37) *a* 2520 [2]
b 36 [3]
c $\frac{1}{5}$ [3]
d 0 [2]
- (38) *c* 2 [2]
- (39) *a* $x^2 + (8 - x)^2 = 6^2$ [3]
b $4 \pm \sqrt{2}$ or $\frac{8 \pm \sqrt{8}}{2}$ [7]
- (40) *a* $\begin{array}{c|ccc} + & 0 & 1 & 2 \\ \hline & 0 & 1 & 2 \\ & 1 & 2 & 0 \\ & 2 & 0 & 1 \end{array}$ $\begin{array}{c|ccc} \bullet & 0 & 1 & 2 \\ \hline & 0 & 0 & 0 \\ & 1 & 0 & 1 & 2 \\ & 2 & 0 & 2 & 1 \end{array}$ [4]
- b* (1) 1 [2]
(2) ϕ or { } [2]
(3) 0,2 [1,1]