The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Wednesday, August 18, 1982 — 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.

1 Given set $G = \{p, q, r, s\}$ with binary operation * defined by the table below. Find the value of $(q * r) * (r * s)$.

*	p	q	r	s
p	q	r	s	p
q	r	s	p	q
r	s	p	q	r
s	p	q	r	s

2 Using the table below, solve for x if $x \,@\, c = b$.

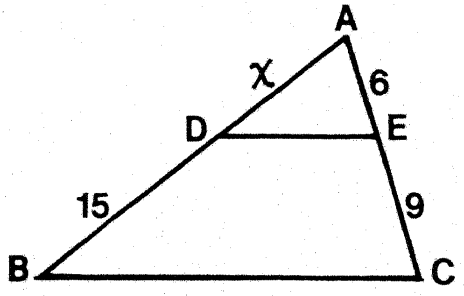
@	a	b	c	d
a	d	a	b	c
b	a	b	c	d
c	b	c	d	a
d	c	d	a	b

3 In parallelogram $ABCD$, $m\angle B = 75$. Find $m\angle A$.

4 If * is a binary operation defined by $a * b = a^b + b^a$, find the value of $3 * 2$.

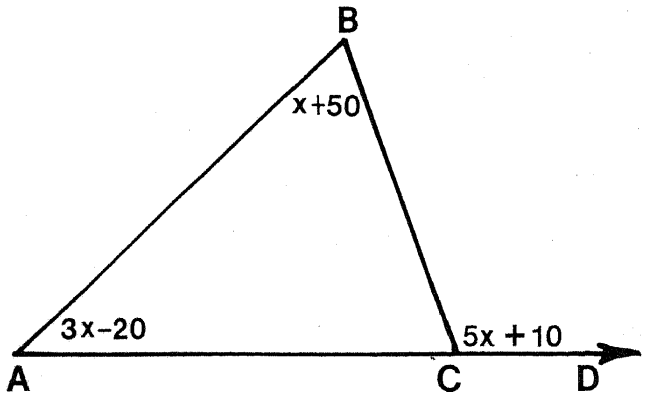
5 The measure of the vertex angle of an isosceles triangle is four times the measure of a base angle. Find the measure of a base angle.

6 In the accompanying diagram of $\triangle ABC$, $\overline{DE} \parallel \overline{BC}$, $AD = x$, $AE = 6$, $DB = 15$, and $EC = 9$. Find x.



7 How many different five-letter permutations can be formed from the letters in the word "PAPER"?

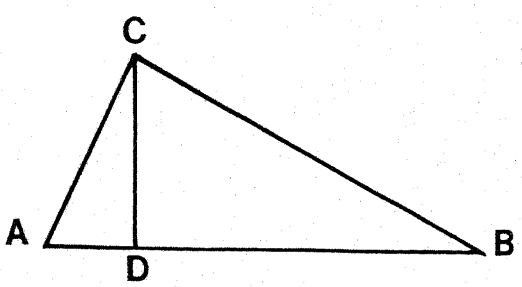
8 In the accompanying figure, side $\overline{AC}$ of $\triangle ABC$ is extended through C to D. If $m\angle BCD = 5x + 10$, $m\angle BAC = 3x - 20$, and $m\angle ABC = x + 50$, find x.



9 The equation of a circle is $(x - 2)^2 + (y + 3)^2 = 16$. What are the coordinates of the center of the circle?

10 Parallelogram $ABCD$ has vertices $A(3,1)$, $B(9,1)$, and $C(7,4)$. Find the coordinates of vertex D.

11 In the accompanying diagram of right triangle ABC, altitude $\overline{CD}$ is drawn to the hypotenuse $\overline{AB}$ and divides the hypotenuse into two parts. If $CD = 10$ and $DB = 20$, find AD.

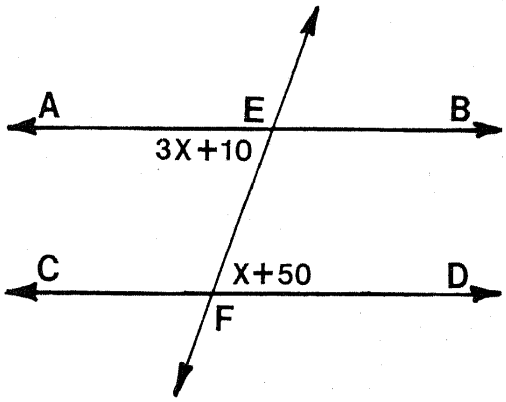


82

12 A rhombus has a side of length 10 and one diagonal of length 16. Find the length of the other diagonal.

13 Find the coordinates of the midpoint of the line segment connecting the points (9,12) and (5,4).

14 In the accompanying diagram, $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, and both lines are intersected by transversal $\overleftrightarrow{EF}$. If $m\angle AEF = 3x + 10$ and $m\angle EFD = x + 50$, find x.



Directions (15–35): 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.

15 Given the true statements, "If gas prices continue to rise, fewer people will be traveling this summer," and "If fewer people travel this summer, our city's economy will suffer."

Which statement *must* also be true?

(1) If gas prices continue to rise, our city's economy will suffer.
(2) If fewer people travel this summer, gas prices will continue to rise.
(3) If more people travel this summer, our city's economy will not suffer.
(4) If our city's economy suffers, gas prices will continue to rise.

16 For what value of n does ${}_nC_2 = 6$?

(1) 8 (3) 3
(2) 2 (4) 4

17 Which argument is *not* valid?

(1) Given: $x \rightarrow y$
x
Conclusion: y

(2) Given: $x \vee y$
$\sim y$
Conclusion: $\sim x$

(3) Given: $x \rightarrow y$
$\sim y$
Conclusion: $\sim x$

(4) Given: $x \rightarrow y$
$y \rightarrow \sim z$
Conclusion: $x \rightarrow \sim z$

18 Given the true statements:

If the sun shines, I will play tennis.
If I play tennis, I will not study math.
I studied math.

Which statement *must* also be true?

(1) I played tennis.
(2) The sun didn't shine.
(3) I didn't study math.
(4) The sun did shine.

19 In a plane, the locus of points 5 centimeters from a given point is a

(1) circle (3) point
(2) line (4) parabola

20 Which figure does *not* necessarily have congruent diagonals?

(1) an isosceles trapezoid (3) a rhombus
(2) a square (4) a rectangle

21 The lengths of two sides of a triangle are 3 and 7. Which could be the length of the third side?

(1) 10 (3) 3
(2) 2 (4) 9

22 What is the total number of distinct diagonals that can be drawn in a pentagon?

(1) 5 (3) 20
(2) 10 (4) 120

23 Which is the negation of the statement, "Some emeralds are not green"?

(1) Some emeralds are green.
(2) No emeralds are green.
(3) All emeralds are green.
(4) All emeralds are not green.

83

24 Which is an equation of the axis of symmetry of the graph $y = 2x^2 - 8x + 12$?

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

25 If the probability of an event occurring is x, what is the probability of the event *not* occurring?

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

26 Which set is *not* closed under addition?

(1) odd integers (3) multiples of three
(2) even integers (4) whole numbers

27 Which is an equation of the line that is parallel to the y-axis and passes through the point (2,5)?

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

28 If the measures of the angles of $\triangle ABC$ are represented by $2x$, $x + 10$, and $2x - 30$, $\triangle ABC$ *must* be

(1) right (3) scalene
(2) obtuse (4) isosceles

29 Which line is parallel to the line $y = 4x - 3$?

(1) $4x + y = 9$ (3) $4x - y = 2$
(2) $2y = 4x - 7$ (4) $x + 4y = 8$

30 What is the slope of the line that passes through the points whose coordinates are (2,3) and (−1,12)?

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

31 The locus of points equidistant from the four vertices of any given rectangle is

(1) a circle (3) a line segment
(2) a point (4) a pair of lines

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

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

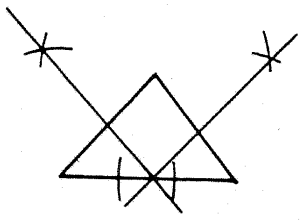
33 The statement $\sim(r \wedge \sim s)$ is logically equivalent to

(1) $\sim r \vee \sim s$ (3) $\sim r \vee s$
(2) $\sim r \wedge \sim s$ (4) $\sim r \wedge s$

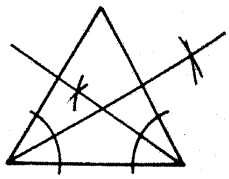
34 Which equation has $x = \frac{-5 \pm \sqrt{17}}{2}$ as its solution?

(1) $x^2 + 5x + 2 = 0$
(2) $x^2 + 5x - 2 = 0$
(3) $x^2 - 5x - 2 = 0$
(4) $x^2 - 5x + 2 = 0$

35 Which drawing best illustrates the construction of an equilateral triangle?



(1)



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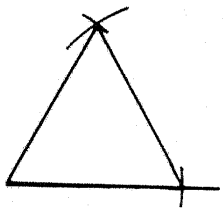

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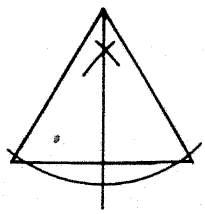


(4)

84

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 *a* Draw the graph of the equation $y = x^2 - 4x + 2$ including all values of x such that $-1 \leq x \leq 5$. [5]

b What are the coordinates of the turning point of $y = x^2 - 4x + 2$? [1]

c Express the roots of $x^2 - 4x + 2 = 0$ in radical form. [4]

37 Solve the following system of equations and check.

$$y = x^2 + 4x + 3$$
$$y = 2x + 6$$

[8,2]

38 A budget committee consists of 5 Democrats and 4 Republicans.

a How many 3-member subcommittees can be formed from the budget committee? [2]

b How many of these subcommittees will consist of 1 Democrat and 2 Republicans? [4]

c What is the probability that the subcommittee will consist of 1 Democrat and 2 Republicans? [2]

d If one of the Democrats on the budget committee is Melodie, what is the probability that she will be a member of one of the subcommittees described in part *b*? [2]

39 Given $(M,+)$, where $M = \{0,1,2,3\}$ and $+$ is addition clock 4 (mod 4).

a Construct an addition table for M as defined. [2]

b What is the identity element in $(M,+)$? [2]

c In $(M,+)$, what is the inverse of 3? [2]

d In $(M,+)$, what is the value of $2 + (3 + 3)$? [2]

e Solve for x in $(M,+)$: $3 + x = 1$ [2]

40 The vertices of $\triangle ABC$ are $A(-4,1)$, $B(2,13)$, and $C(10,9)$.

a Find the length of $\overline{AB}$ in radical form. [2]

b Find the slope of $\overline{AB}$. [2]

c Find the coordinates of point M, the midpoint of $\overline{BC}$. [2]

d Write an equation of the line which is parallel to $\overline{AB}$ and passes through point M. [2]

e The line described in part *d* intersects side $\overline{AC}$ at point D. The ratio of the length of $\overline{DM}$ to the length of $\overline{AB}$ is

(1) 1:1 (2) 1:2 (3) 1:3 (4) 1:4 [2]

☞ GO RIGHT ON TO THE NEXT PAGE.

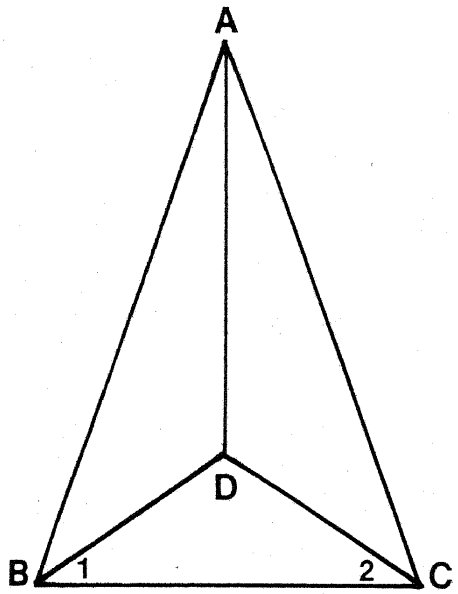
Answers to the following questions are to be written on paper provided by the school.

Part III

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

41 The vertices of isosceles trapezoid $ABCD$ are $A(0,0)$, $B(10,0)$, $C(6,8)$, and $D(4,8)$. Points P, Q, R, and S are the midpoints of sides $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, and $\overline{DA}$, respectively. Prove that $PQRS$ is a rhombus. [10]

42 Given: $\triangle ABC$ with $\overline{AB} \cong \overline{AC}$, $\overline{AD}$ bisects $\angle BAC$.



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

43 Given the following statements:

Either a crime was committed or Arthur is not telling the truth.

If the dog howled, a crime was not committed.

If the dog did not howl, the butler did it.

Arthur is telling the truth.

Let A represent: "Arthur is telling the truth."

Let B represent: "The butler did it."

Let C represent: "A crime was committed."

Let D represent: "The dog howled."

a Using A, B, C, D, and proper connectives, express each statement in symbolic form. [2]

b Using the laws of inference, show that the butler did it. [8]

86

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH — COURSE II

Wednesday, August 18, 1982 — 8:30 to 11:30 a.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	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

87

FOR TEACHERS ONLY

SCORING KEY

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Wednesday, August 18, 1982 — 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 15–35, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) s

(2) a

(3) 105

(4) 17

(5) 30

(6) 10

(7) 60

(8) 20

(9) (2,−3) *or* $x = 2$ $y = -3$

(10) (1,4) *or* $x = 1$ $y = 4$

(11) 5

(12) 12

(13) (7,8) *or* $x = 7$ $y = 8$

(14) 20

(15) 1

(16) 4

(17) 2

(18) 2

(19) 1

(20) 3

(21) 4

(22) 1

(23) 3

(24) 4

(25) 1

(26) 1

(27) 2

(28) 4

(29) 3

(30) 4

(31) 2

(32) 1

(33) 3

(34) 1

(35) 2

[OVER]

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* (2,−2) [1]
or
$x = 2$
$y = -2$

c $2 \pm \sqrt{2}$ [4]
or

$$\frac{4 \pm \sqrt{8}}{2}$$

(37) (1,8), (−3,0) [8]
or

$x = 1$ and $y = 8$; $x = -3$ and $y = 0$

(38) *a* 84 [2]
b 30 [4]
c $\frac{30}{84}$ [2]
d $\frac{1}{5}$ [2]

(39) *a* [2]

+	0	1	2	3
0	0	1	2	3
1	1	2	3	0
2	2	3	0	1
3	3	0	1	2

b 0 [2]
c 1 [2]
d 0 [2]
e 2 [2]

(40) *a* $6\sqrt{5}$ *or* $\sqrt{180}$ [2]
b 2 [2]
c (6,11) [2]
or
$x = 6$ $y = 11$
d $y = 2x - 1$ [2]
e 2 [2]

Part III

(43) *a* $C \vee \sim A$
$D \rightarrow \sim C$ [2]
$\sim D \rightarrow B$
A

NOTE: Beginning in June 1983, Part III will consist of only *two* questions from which the student must select one.