

New York State Education Department  
Three-year Sequence for High School Mathematics  
Course II

Final Examination

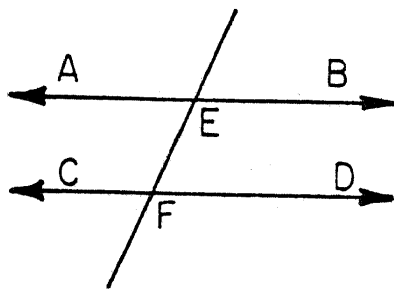
In Lieu of the Tenth Year Mathematics Regents Examination  
Friday, June 16, 1978, p.m.

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.

Part I

Answer 30 questions from this part. Each correct answer will receive 2 credits. Write your answers in the spaces provided on the separate answer sheet. Where applicable, answers may be left in radical form.

- 1 The measures of two consecutive angles of a parallelogram are represented by  $2x - 40$  and  $3x + 10$ . Find  $x$ .
- 2 In the accompanying figure,  $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ , and  $\overline{EF}$  intersects  $\overleftrightarrow{AB}$  at  $E$  and  $\overleftrightarrow{CD}$  at  $F$ . If  $m\angle AEF$  is  $2x$  and  $m\angle DFE$  is  $5x - 60$ , find the value of  $x$ .



- 3 The altitude to the hypotenuse of a right triangle divides the hypotenuse into two segments. If the altitude is 4 and the shorter segment is 2, what is the length of the longer segment?
- 4 Each base angle of an isosceles triangle has a measure which is 20 more than 3 times the measure of the vertex angle. Find the measure of the vertex angle.

- 5 Find the side of a rhombus whose diagonals are 6 and 8.
- 6 Corresponding sides of two similar triangles are 2 and 3. Find the ratio of the area of the smaller triangle to the area of the larger triangle.
- 7 Find the radius of a circle whose center is the origin and which passes through the point (5,12).
- 8 The points A(1,2), B(10,5), C(9,8), and D(0,5) are the vertices of a parallelogram. Find the coordinates of the intersection of the diagonals  $\overline{AC}$  and  $\overline{BD}$ .
- 9 Find the altitude of an equilateral triangle whose side is 6.
- 10 Write an equation for the locus of points that are equidistant from the points (5,0) and (-3,0).
- 11 Write an equation of the circle whose center is at (2,-3) and whose radius is 5.
- 12 How many different 5-letter permutations are there from the word "EERIE"?
- 13 On an examination which has ten questions, the student is to select six to answer. How many different sets of six can be selected?
- 14 Find the positive root of  $2x^2 - x - 6 = 0$ .
- 15 Solve the equation  $a * y = b$  for  $y$  within the following system:

*	e	a	b	c
e	e	a	b	c
a	a	b	c	e
b	b	c	e	a
c	c	e	a	b

16 Determine the inverse of  $y$  in the following system:

*	w	y	x	z
w	z	x	w	y
y	x	z	y	w
x	w	y	x	z
z	y	w	z	x

Directions (17-34): 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.

17 Which is the negation of the statement, "Some triangles are right triangles"?

- (1) Some triangles are not right triangles.
- (2) All triangles are right triangles.
- (3) No triangles are right triangles.
- (4) No triangles are not right triangles.

18 The negation of  $r \wedge \sim t$  is

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

19 If  $P \rightarrow Q$  and  $\sim Q$ , then which is true?

- (1)  $P$
- (2)  $Q$
- (3)  $\sim P$
- (4)  $\sim Q$

20 Which is logically equivalent to the statement, "If I vacation in New York State, then I love New York"?

- (1) If I do not love New York, then I do not vacation in New York.
- (2) If I love New York, then I vacation in New York.
- (3) If I do not vacation in New York, then I do not love New York.
- (4) If I vacation in New York, then I love New York.

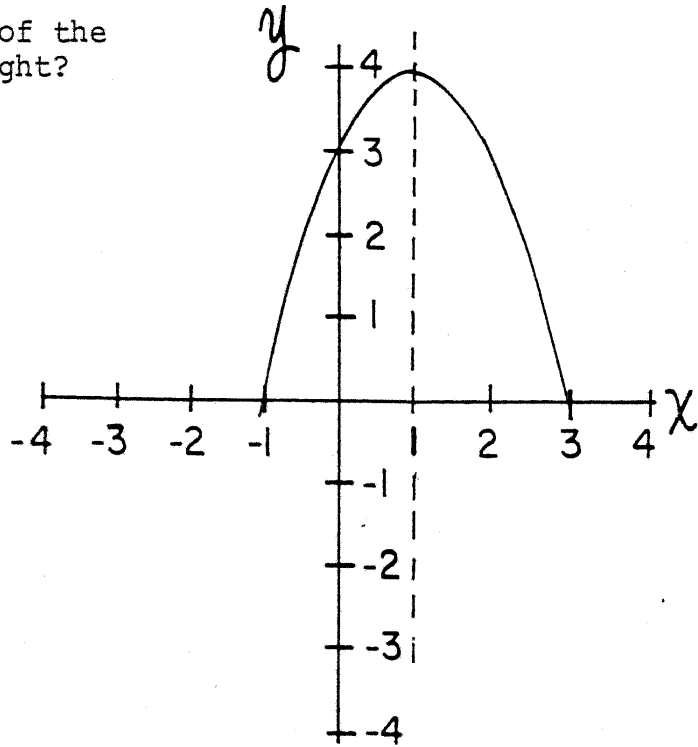
21 The lengths of the sides of a triangle may be

- (1) 1, 2, 3
- (2) 2, 3, 6
- (3) 5, 5, 10
- (4) 4, 5, 6

- 22 The natural (or counting) numbers fail to form a group under addition because the set
- (1) is not closed
  - (2) is not associative
  - (3) does not have an identity element
  - (4) is not commutative
- 23 Under which operation is the set of odd integers closed?
- (1) addition
  - (2) subtraction
  - (3) multiplication
  - (4) division
- 24 Which is an equation of the axis of symmetry of the graph  $y = x^2 - 6x + 7$ ?
- (1)  $x = 1$
  - (2)  $y = 1$
  - (3)  $x = -3$
  - (4)  $x = 3$

25 Which is an equation of the graph shown at the right?

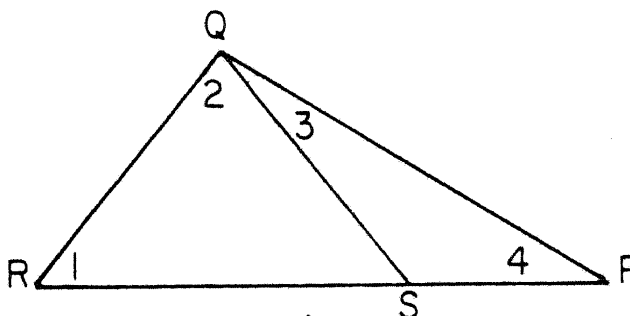
- (1)  $y = x^2 - 2x + 3$
- (2)  $y = x^2 - 2x - 3$
- (3)  $y = -x^2 + 2x + 3$
- (4)  $y = -x^2 - 2x - 3$



- 26 An urn contains 6 red balls and 4 white balls, all of equal size. If three balls are selected at random (no replacement), what is the probability that all three balls selected are the same color?
- (1)  $\frac{1}{5}$
  - (2)  $\frac{1}{6}$
  - (3)  $\frac{2}{3}$
  - (4)  $\frac{1}{30}$

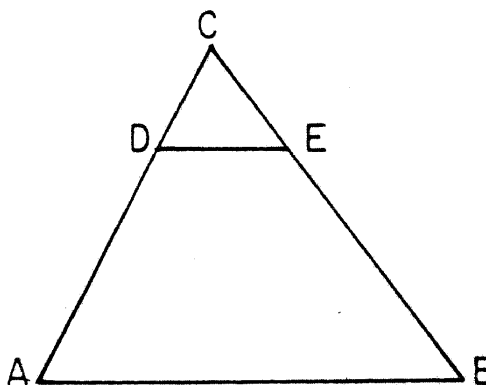
- 27 In the accompanying diagram,  $\overline{QR} \cong \overline{QS}$  and the points R, S, and P are collinear. It is always true that

- (1)  $m\angle 1 > m\angle 2$
- (2)  $m\angle 1 > m\angle 4$
- (3)  $m\angle 3 > m\angle 4$
- (4)  $m\angle 4 > m\angle 2$



- 28 In the accompanying figure,  $\triangle ABC$ ,  $CD = 5$ , and  $AD = 10$ . If  $AB = 18$ , then  $DE$  is

- (1) 15
- (2) 12
- (3) 9
- (4) 6



- 29 The bases of a trapezoid are 10 centimeters and 20 centimeters. If the area of the trapezoid is 60 square centimeters, then the number of centimeters in the length of the altitude of the trapezoid is

- (1) 30
- (2) 2
- (3) 6
- (4) 4

- 30 An example of a quadrilateral whose diagonals are congruent but do not bisect each other is

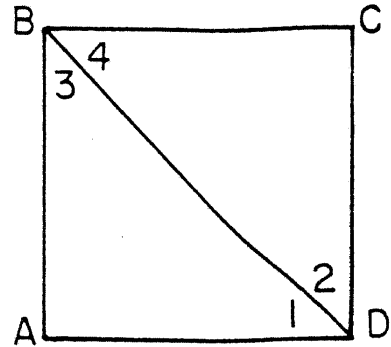
- (1) a square
- (2) an isosceles trapezoid
- (3) a rhombus
- (4) a rectangle

- 31 The number of points in a plane 3 centimeters from a given line and 4 centimeters from a given point on the line is exactly

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

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

- (1)  $\overline{BD} \cong \overline{AB}$       (3)  $\angle 1 \cong \angle 2$   
(2)  $\angle 2 \cong \angle 3$       (4)  $\angle 1 \cong \angle 3$



33 What is the slope of a line parallel to  $2x + 3y = 8$ ?

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

34 Which is an equation for the line that passes through the point (3,4) and has a slope of -5?

- (1)  $y = -5x + 19$       (3)  $y = -5x + 23$   
(2)  $y = \frac{4}{3}x - 5$       (4)  $y = -5x + 4$

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

35 On the answer sheet, construct the bisector of angle B in triangle ABC.

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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 Find in radical form the roots of  $x^2 - 4x + 2 = 0$ . [4]  
b Draw the graph of the equation  $y = x^2 - 4x + 2$ , using all integral values of  $x$  such that  $-1 \leq x \leq 5$ . [4]  
c What are the coordinates of the turning point of  $y = x^2 - 4x + 2$ ? [2]
- 37 Given the points  $P(-2,3)$  and  $Q(4,3)$ .
- a Draw the graph of the locus of points equidistant from  $P$  and  $Q$ . [1]  
b Write an equation of the locus described in part a. [3]  
c On the same set of axes used in part a, draw the graph of the locus of points 4 units from  $Q$ . [1]  
d Write an equation of the locus described in part c. [3]  
e What is the total number of points that satisfy the loci described in part a and part c? [2]
- 38 In triangle  $ABC$ ,  $D$  is a point on  $\overline{AB}$  and  $E$  is a point on  $\overline{AC}$  such that  $\overline{DE} \parallel \overline{BC}$ . If  $AD = 2$ ,  $DB = x - 1$ ,  $AE = x$ , and  $EC = x + 2$ , find  $AE$ . [Only an algebraic solution will be accepted.] [5,5]
- 39 Given trapezoid  $ABCD$  with longer base  $\overline{AB}$  and shorter base  $\overline{DC}$ . The vertices are  $A(7,-3)$ ,  $B(2k,2)$ ,  $C(k,5)$ , and  $D(3,2)$ .
- a Express the slope of  $\overline{AB}$  in terms of  $k$ . [2]  
b Express the slope of  $\overline{DC}$  in terms of  $k$ . [2]  
c Write an equation which can be used to solve for  $k$ . [2]  
d Solve for  $k$  the equation written in part c. [2]  
e Write an equation of the line that passes through points  $B$  and  $D$ . [2]

40 Given the operations \* and # in the tables below:

*	a	b	c	d
a	a	c	b	a
b	c	d	a	b
c	b	a	d	c
d	a	b	c	d

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

- a Is the set closed under the operations \* and #? [2]
- b What is the identity element for \*? [2]
- c What is the inverse of element c under the operation \*? [2]
- d Find the value of  $a * (b \# c)$ . [2]
- e Find the value of  $(a * b) \# (a * c)$ . [2]

41 A committee of 5 people is to be chosen for a class function.

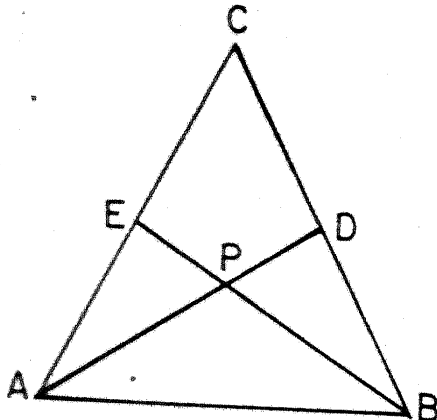
- a How many different 5-member committees can be chosen if 8 people are available for the committee? [3]
- b The committee, when chosen, has 3 male members and 2 female members.
  - (1) How many 3-person subcommittees can be formed having at least 2 males? [4]
  - (2) What is the probability of the 3-person subcommittee having exactly 1 male member? [3]

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.

42 Given:  $\triangle ABC$ ,  $\overline{CA} = \overline{CB}$ ,  $\overline{AD}$  and  $\overline{BE}$  intersect at P,  $\angle PAB \cong \angle PBA$ .



Prove:  $\overline{PE} \cong \overline{PD}$  [10]



43 Given: Points  $A(2,3)$ ,  $B(6,11)$ , and  $C(8,5)$  are the vertices of  $\triangle ABC$ .

- a Show that  $\triangle ABC$  is isosceles. [4]
- b Find the coordinates of  $D$ , the midpoint of the base. [2]
- c Show that  $\overline{CD} \perp \overline{AB}$ , and state a reason for your conclusion. [4]

44 Given the following sentences:

If John joins the Army, then he will get married.  
If he gets married, then he will need a good income.  
Either he will go to college, or he will join the Army.  
John will not need a good income.

Let  $A$  represent: "He will join the Army."  
Let  $M$  represent: "He will get married."  
Let  $C$  represent: "John will go to college."  
Let  $I$  represent: "He will need a good income."

- a Using  $A$ ,  $M$ ,  $C$ ,  $I$ , and proper connectives, express each sentence in symbolic form. [4]
- b Using laws of inference, show that John will go to college. [6]



Part I Score _____
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New York State Education Department  
 Three-year Sequence for High School Mathematics

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

School.....

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

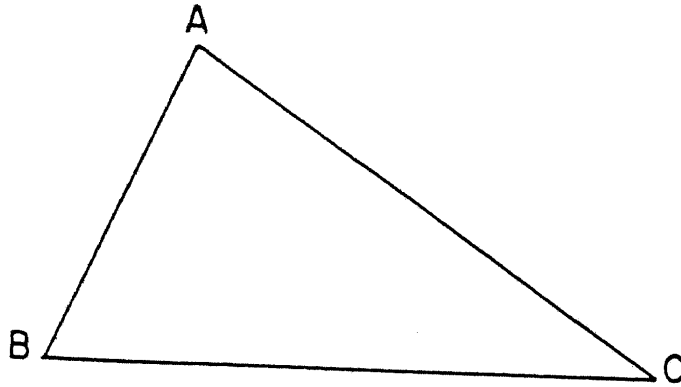
Part I

Answer 30 questions in this part.

- |          |          |  |
|----------|----------|--|
| 1 _____  | 13 _____ | 25 _____   |
| 2 _____  | 14 _____ | 26 _____   |
| 3 _____  | 15 _____ | 27 _____   |
| 4 _____  | 16 _____ | 28 _____   |
| 5 _____  | 17 _____ | 29 _____   |
| 6 _____  | 18 _____ | 30 _____   |
| 7 _____  | 19 _____ | 31 _____   |
| 8 _____  | 20 _____ | 32 _____   |
| 9 _____  | 21 _____ | 33 _____   |
| 10 _____ | 22 _____ | 34 _____   |
| 11 _____ | 23 _____ | 35 Answer question 35<br>on the other side<br>of this sheet. |
| 12 _____ | 24 _____ |  |

[OVER]

645



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.

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Signature

For Teachers Only  
Scoring Key  
Three-year Sequence for High School Mathematics

Course II  
June 16, 1978

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.] For questions 17-34, allow credit if the pupil has written the correct answer instead of the numeral 1,2,3 or 4.

(1) 42	(13) 210	(25) 3
(2) 20	(14) 2	(26) 1
(3) 8	(15) a	(27) 2
(4) 20	(16) w	(28) 4
(5) 5	(17) 3	(29) 4
(6) $\frac{4}{9}$ or 4:9	(18) 1	(30) 2
(7) 13	(19) 3	(31) 4
(8) (5,5) or $\begin{matrix} x = 5 \\ y = 5 \end{matrix}$	(20) 1	(32) 1
(9) $3\sqrt{3}$	(21) 4	(33) 2
(10) $x = 1$	(22) 3	(34) 1
(11) $(x - 2)^2 + (y + 3)^2 = 25$	(23) 3	(35) construction
(12) 20	(24) 4	

[OVER]

General Directions - Parts II and III

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  $2 \pm \sqrt{2}$  or  $\frac{4 \pm \sqrt{8}}{2}$  [4]

c  $(2, -2)$  or  $\begin{matrix} x = 2 \\ y = -2 \end{matrix}$  [2]

(37) b  $x = 1$  [3]

d  $(x - 4)^2 + (y - 3)^2 = 16$  [3]

e 2 [2]

(38) Analysis [5]

4 [5]

(39) a  $\frac{5}{2k - 7}$  [2]

b  $\frac{3}{k - 3}$  [2]

c  $\frac{5}{2k - 7} = \frac{3}{k - 3}$  [2]

d 6 [2]

e  $y = 2$  [2]

(40) a yes [2]

b d [2]

c c [2]

d a [2]

e a [2]

(41) a 56 [3]

b (1) 7 [4]

(2)  $\frac{3}{10}$  [3]

Part III

(43) b  $(4, 7)$  or  $\begin{matrix} x = 4 \\ y = 7 \end{matrix}$  [2]

(44) a  $A \rightarrow M$

$M \rightarrow I$  [4]

$C \vee A$

$\sim I$