The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Tuesday, August 13, 2002 — 8:30 to 11:30 a.m., only

Notice . . .

Scientific calculators must be available to all students taking this examination.

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 the answer sheet.

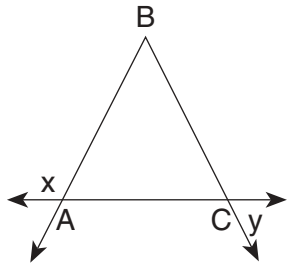
When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. The answer sheet 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 terms of π or in radical form. [60]

1 In the accompanying diagram, $\overline{BA} \cong \overline{BC}$ and $m\angle x = 117$. Find $m\angle y$.

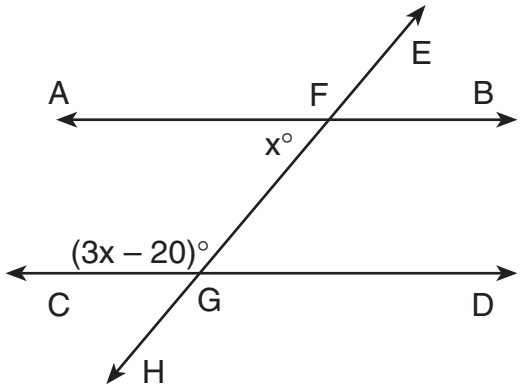


2 If ♥ is a binary operation defined by $N \heartsuit Y = \frac{2(Y^2 - 3N)}{N+3}$, find the value of $7 \heartsuit 6$.

3 Use the accompanying table to find the value of $(P ❄ L) ❄ (A ❄ S)$.

❄	L	A	P	S
L	P	S	L	A
A	S	L	A	P
P	L	A	P	S
S	A	P	S	L

4 In the accompanying diagram, $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, $\overleftrightarrow{EFGH}$ is a transversal, $m\angle AFG = x$, and $m\angle CGF = 3x - 20$. Find the value of x.



5 A flagpole casts a shadow 160 feet long. At the same time, a boy standing nearby who is 5 feet tall casts a shadow 20 feet long. Find the number of feet in the height of the flagpole.

6 The altitude drawn to the hypotenuse of a right triangle divides the hypotenuse into segments of 4 and 12. Express the length of the altitude in radical form.

7 What is the positive root of the equation $\frac{8}{x} + \frac{x}{2} = x$?

8 The equation of a line is $y = mx - 1$. Find the value of m if the line passes through the point (2,3).

9 The coordinates of a rectangle are $A(0,0)$, $B(8,0)$, $C(8,2)$, and $D(0,2)$. Find the coordinates of the midpoint of a diagonal of the rectangle.

10 In $\triangle ABC$, $\overline{AB}$ is extended through B to D, $m\angle CBD = 130$, and $m\angle CAB = 55$. What is the longest side of $\triangle ABC$?

11 The image of (–2,6) after a dilation with respect to the origin is (–10,30). What is the constant of the dilation?

12 Express, in radical form, the length of the line segment with endpoints (–1,2) and (–3,–2).

13 How many different six-letter permutations can be formed from the letters in the word "SUMMER"?

14 Find the positive root of the equation $x^2 - 5x = 24$.

15 What is the inverse of G in the system below?

⚑	F	L	A	G
F	L	G	F	A
L	G	A	L	F
A	F	L	A	G
G	A	F	G	L

Directions (16–34): 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.

16 The measure of a base angle of an isosceles triangle is 13 more than 3 times the measure of the vertex angle. How many degrees are in the vertex angle?

(1) 11 (3) 33
(2) 22 (4) 42

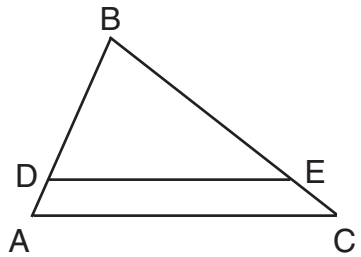
17 Which quadrilateral is equiangular but *not* always equilateral?

(1) rectangle (3) rhombus
(2) parallelogram (4) square

18 If the lengths of two sides of a triangle are 2 and 5, the length of the third side can *not* be

(1) 5 (3) 3
(2) 6 (4) 4

19 In the accompanying diagram, $\overline{AC} \parallel \overline{DE}$, $AB = 10$, $BC = 15$, and $BD = 8$.



What is the length of $\overline{EC}$?

(1) $5\frac{1}{3}$ (3) 3
(2) 2 (4) 12

20 What are the coordinates of point T', the image of point $T(-2,5)$ after a reflection in the origin?

(1) (2,5) (3) (–2,–5)
(2) (2,–5) (4) (5,–2)

21 If the diagonals of a rhombus measure 12 and 16, what is the measure of a side of the rhombus?

(1) 5 (3) $10\sqrt{3}$
(2) 10 (4) 20

22 Which equation represents a line that is parallel to the line represented by the equation $y = 3x - 7$?

(1) $y = -\frac{1}{3}x - 10$ (3) $y = -3x - 10$
(2) $y = \frac{1}{3}x - 10$ (4) $y = 3x - 10$

23 What is the inverse of $\sim p \rightarrow (q \vee r)$?

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

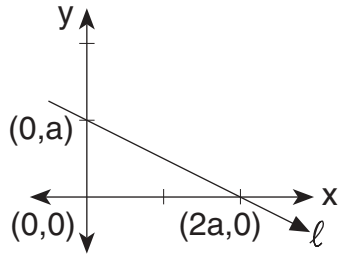
24 The turning point for the graph of the equation $y = x^2 - 2x - 3$ is (1,–4). Which line does *not* intersect this parabola?

(1) $x = 1$ (3) $y = -6$
(2) $x = 3$ (4) $y = -2$

25 Nicholas has 45 CDs and wants to take 5 of them to his friend's house. How many different combinations of 5 CDs can he select?

(1) ${}_{45}C_5$ (3) ${}_{45}P_5$
(2) ${}_5C_1$ (4) 45!

26 In the accompanying diagram, what is the slope of line ℓ?



(1) 0 (3) $\frac{1}{2}$
(2) –2 (4) $-\frac{1}{2}$

27 In right triangle ABC with $m\angle C = 90$, the sine of angle A is always equal to the

(1) sine of angle B
(2) cosine of angle B
(3) tangent of angle B
(4) cosine of angle A

28 Isosceles right triangle WIN has a hypotenuse that measures 10 centimeters. What is the length, in centimeters, of a leg of triangle WIN?

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

29 What is the total number of points 2 inches from a given line and also 3 inches from a given point on the given line?

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

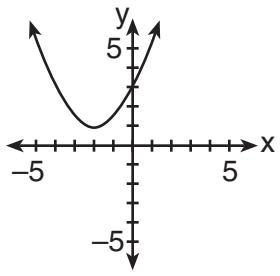
30 Which statement is the negation of "Triangle ABC is not scalene and triangle ABC is a right triangle"?

(1) Triangle ABC is scalene and triangle ABC is not a right triangle.
(2) Triangle ABC is not scalene or triangle ABC is a right triangle.
(3) Triangle ABC is scalene or triangle ABC is not a right triangle.
(4) Triangle ABC is an isosceles right triangle.

31 Expressed in simplest form, $\frac{2x^2-32}{4x-16}$ is equivalent to

(1) $\frac{x+4}{2}$
(2) $\frac{x-16}{2}$
(3) $\frac{x+16}{4}$
(4) $x + 4$

32 The accompanying diagram shows a parabola.



Which statement is *not* true?

(1) The equation of the axis of symmetry is $x = -2$.
(2) The parabola has a minimum point.
(3) The turning point of the parabola is $(-2,1)$.
(4) The parabola has two x-intercepts.

33 Completely factored, $\frac{3x^2}{7} - \frac{5x}{7} - \frac{2}{7}$ is equivalent to

(1) $\frac{3}{7}(x-2)(x-1)$
(2) $\frac{1}{7}(3x+1)(x-2)$
(3) $\frac{1}{7}(3x-1)(x+2)$
(4) $7(3x-1)(x+2)$

34 What is the sum of the measures of the interior angles of a regular hexagon?

(1) 360
(2) 540
(3) 720
(4) 1,080

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

35 *On the answer sheet*, construct a line through point P perpendicular to line a.

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

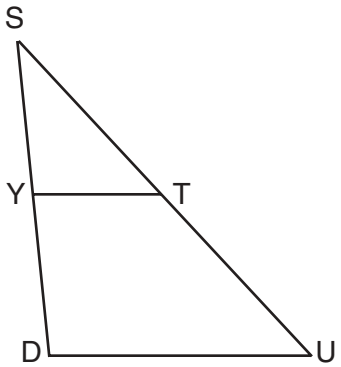
Part II

Answer three questions from this part. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Calculations that may be obtained by mental arithmetic or the calculator do not need to be shown. [30]

36 Solve the following system of equations algebraically or graphically and check:

$$y = 2x^2 - 4x + 1$$
$$y + 2x = 5$$ [8,2]

37 In the accompanying diagram of $\triangle SUD$, Y is a point on $\overline{SD}$ and T is a point on $\overline{SU}$ such that $\overline{YT} \parallel \overline{DU}$, $YT = 4$, $TU = 7$, and DU is 2 more than ST. Find ST to the *nearest tenth*. [10]

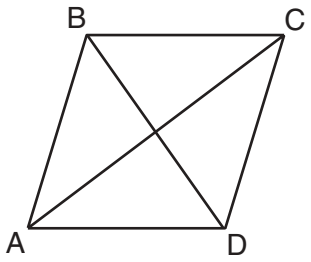


38 *a* Keesha is taking an English course in September and must read six books from the summer reading list. She can choose from eleven books: five autobiographies, four novels, and two plays. If she chooses six books at random, what is the probability that she chooses three autobiographies, two novels, and one play? [5]

b For all values of x for which the expressions are defined, express the quotient in simplest form:

$$\frac{x^2 - 9}{x^2 - 5x} \div \frac{x^2 - x - 12}{2x^2 - 10x}$$ [5]

39 In the accompanying diagram of rhombus $ABCD$, diagonal $AC = 80$ and $m\angle BAC = 36$.



a Find the length of a side of the rhombus to the *nearest tenth*. [4]

b Using your answer in part *a*, find the perimeter of rhombus $ABCD$. [2]

c Find the length of diagonal $\overline{BD}$ to the *nearest integer*. [4]

40 *a* Sketch the locus of points equidistant from circles $x^2 + y^2 = 4$ and $x^2 + y^2 = 36$. [2]

b Write the equation of the locus sketched in part *a*. [2]

c On the same set of axes, sketch the locus of points 4 units from the x-axis. [2]

d Write the equation or equations of the locus sketched in part *c*. [2]

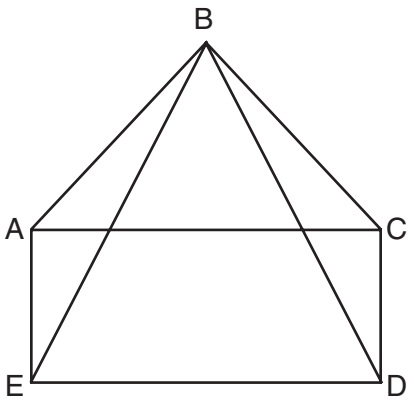
e Write the coordinates of all points that satisfy the conditions in both part *a* and part *c*. [2]

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

Part III

Answer one question from this part. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Calculations that may be obtained by mental arithmetic or the calculator do not need to be shown. [10]

41 Given: $ACDE$ is a rectangle, $\overline{AB} \cong \overline{CB}$, and $\overline{BE}$ and $\overline{BD}$ are drawn.



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

42 Given: If Tom has a job, he saves his money.
If Tom does not have a job, he goes to the ball game.
If Tom saves his money and puts gasoline in the car, Tom's father is happy.
Tom puts gasoline in the car.
Tom's father is not happy.

Let J represent: "Tom has a job."
Let M represent: "Tom saves his money."
Let B represent: "Tom goes to the ball game."
Let G represent: "Tom puts gasoline in the car."
Let H represent: "Tom's father is happy."

Prove: Tom goes to the ball game. [10]

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH – COURSE II

Tuesday, August 13, 2002 — 8:30 to 11:30 a.m., only

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

ANSWER SHEET

Student . . . . . Sex: ☐ Male ☐ Female Grade . . . . .

Teacher . . . . . School . . . . .

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

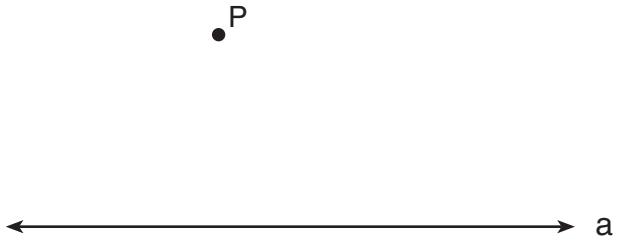
Part I

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	

Tear Here

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

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Tuesday, August 13, 2002 — 8:30 to 11:30 a.m., only

SCORING KEY

Use only *red* ink or *red* pencil in rating Regents papers. Do *not* attempt to correct the student's work by making insertions or changes of any kind. Use checkmarks to indicate student 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 16–34, allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 63

(2) 3

(3) L

(4) 50

(5) 40

(6) $\sqrt{48}$

(7) 4

(8) 2

(9) (4,1)

(10) $\overline{AB}$

(11) 5

(12) $\sqrt{20}$

(13) 360

(14) 8

(15) F

(16) 2

(17) 1

(18) 3

(19) 3

(20) 2

(21) 2

(22) 4

(23) 1

(24) 3

(25) 1

(26) 4

(27) 2

(28) 1

(29) 4

(30) 3

(31) 1

(32) 4

(33) 2

(34) 3

(35) construction

[OVER]

Part II

Please refer to the Department's publication *Guide for Rating Regents Examinations in Mathematics,* 1996 Edition. 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) (–1,7), (2,1) [8]

Check [2]

(37) 6.4 [10]

(38) *a* $\frac{120}{462}$ [5]

b $\frac{2(x - 3)}{x - 4}$ [5]

(39) *a* 49.4 [4]

b 197.6 [2]

c 58 [4]

(40) *b* $x^2 + y^2 = 16$ [2]

d $y = -4$ and $y = 4$ [2]

e (0,–4), (0,4) [2]

As a reminder . . .

Regents examinations based on the Sequential Mathematics, Course II, syllabus will not be offered after January 2003.

Regents examinations based on the Sequential Mathematics, Course III, syllabus will not be offered after January 2004.