The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Thursday, August 13, 1998 — 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 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.

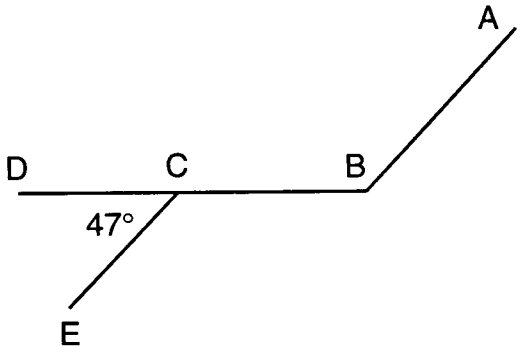
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

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 terms of π or in radical form. [60]

1 One angle is four times as large as a second angle. If the angles are supplementary, find the number of degrees in the smaller angle.

2 In the accompanying diagram, $\overline{DCB}$, $\overleftrightarrow{AB} \parallel \overleftrightarrow{CE}$, and $m\angle ECD = 47$. Find $m\angle CBA$.



3 If $c \heartsuit b$ is defined as $\sqrt{c^2 - b^2}$, evaluate $13 \heartsuit 5$.

4 Solve for the positive value of x: $\frac{x-3}{4} = \frac{4}{x+3}$

5 The base $\overline{BC}$ of isosceles triangle ABC is extended through C to D. If $m\angle ACD = 108$, what is the number of degrees in the measure of vertex angle A?

6 The number of degrees in a pair of vertical angles is represented by x and $3x - 48$. What is the value of x?

7 The lengths of the sides of scalene triangle PQR are 10, 11, and 17. What is the perimeter of the triangle formed by joining the midpoints of the sides of triangle PQR?

8 If the slope of $\overleftrightarrow{JK}$ is $\frac{3}{4}$ and $\overleftrightarrow{JK} \perp \overleftrightarrow{PQ}$, what is the slope of $\overleftrightarrow{PQ}$?

9 How many different 6-letter arrangements can be formed using the letters in the word "AUGUST"?

10 What is the image of point $P(2,-1)$ under a dilation of 3?

11 The measures of the angles of a quadrilateral are in the ratio 2:3:6:7. Find the number of degrees in the largest angle of the quadrilateral.

12 In right triangle RST, $\overline{TP}$ is the altitude to hypotenuse $\overline{RS}$. If $RP = 11$ and $SP = 21$, find the length of $\overline{TP}$ to the *nearest tenth*.

Directions (13–34): 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.

13 If $x = 1$ is a solution of $x^2 + cx + 2 = 0$, what is the value of c?

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

14 Which statement is the negation of $\sim p \vee q$?

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

15 A quadrilateral whose diagonals are always congruent is a

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

16 Which set of numbers may represent the lengths of the sides of a triangle?

(1) {1,3,4} (3) {5,7,9}
(2) {4,4,9} (4) {8,5,3}

17 Which statement is the contrapositive of "If a regular polygon is a regular hexagon, each angle measures 120°"?

(1) If each angle of a regular polygon measures 120°, the polygon is a regular hexagon.
(2) If each angle of a regular polygon does not measure 120°, the polygon is not a regular hexagon.
(3) If a polygon is not a regular hexagon, each angle does not measure 120°.
(4) If a polygon is a regular hexagon, the polygon has six equal sides.

18 Which is an equation of the locus of points equidistant from points (–2,0) and (4,0)?

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

19 The corresponding altitudes of two similar triangles are 6 and 14. If the perimeter of the *smaller* triangle is 21, what is the perimeter of the larger triangle?

(1) 9 (3) 49
(2) 27 (4) 64

20 The coordinates of the center of a circle are (–2,–3), and a diameter of the circle has one endpoint at (–5,–2). What are the coordinates of the other endpoint of the diameter?

(1) (9,8) (3) (–8,–1)
(2) (1,–4) (4) $(-3\frac{1}{2},-2\frac{1}{2})$

21 Which transformation represents a reflection in the origin?

(1) $(x,y) \rightarrow (x + h, y + k)$
(2) $(x,y) \rightarrow (kx, -ky)$
(3) $(x,y) \rightarrow (y,x)$
(4) $(x,y) \rightarrow (-x,-y)$

22 What is the length of the line segment that joins points (4,–1) and (7,5)?

(1) 5 (3) $\sqrt{29}$
(2) $\sqrt{13}$ (4) $\sqrt{45}$

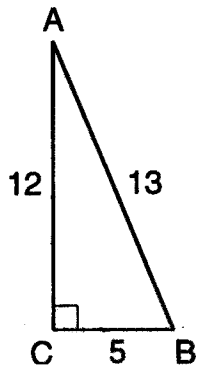
23 In rectangle *ABCD*, $AD = 10$ and diagonal $AC = 26$. What is the perimeter of *ABCD*?

(1) 34 (3) 240
(2) 68 (4) 260

24 Two angles of a triangle measure 72° and 46°. What is the measure of an exterior angle of this triangle?

(1) 46° (3) 108°
(2) 62° (4) 144°

25 In the accompanying diagram of right triangle *ABC*, legs *AC* and *BC* are 12 and 5, respectively, and hypotenuse *AB* is 13.



What is tan *B*?

(1) $\frac{12}{5}$ (3) $\frac{5}{13}$
(2) $\frac{12}{13}$ (4) $\frac{5}{12}$

26 Expressed in simplest form, $\frac{x^2 - x - 6}{x^2 - 9}$, $x \neq \pm 3$, is equivalent to

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

27 Which equation represents a line parallel to the line whose equation is $y = \frac{2}{3}x + 3$?

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

28 The roots of the equation $3x^2 + 8x - 2 = 0$ are

(1) $\frac{8 \pm \sqrt{88}}{6}$ (3) $\frac{8 \pm \sqrt{40}}{6}$

(2) $\frac{-8 \pm \sqrt{88}}{6}$ (4) $\frac{-8 \pm \sqrt{40}}{6}$

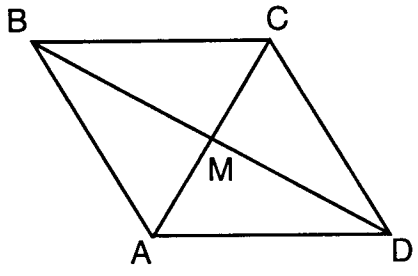
29 What are the coordinates of the turning point of the parabola whose equation is $y = x^2 - 6x + 5$?

(1) (–3,–4) (3) (3,14)
(2) (–3,32) (4) (3,–4)

30 If two isosceles triangles have congruent vertex angles, the triangles must be

(1) congruent (3) right
(2) equilateral (4) similar

31 In the accompanying diagram of rhombus $ABCD$, $\overline{AC}$ and $\overline{BD}$ are diagonals intersecting at point M.



What is the perimeter of the rhombus if $m\angle DAB = 120$ and $AC = 12$?

(1) 48 (3) $24\sqrt{3}$
(2) $48\sqrt{3}$ (4) 24

32 When drawn on the same set of axes, which pair of equations will result in two points of intersection?

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

33 Which of these arguments is *not* valid?

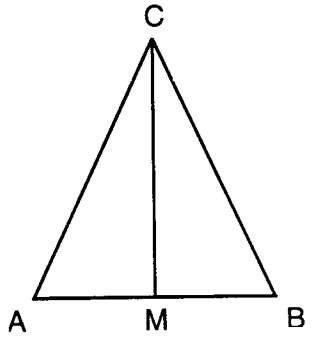
(1) $x \rightarrow y$
$z \rightarrow \sim y$
$\therefore x \rightarrow \sim z$

(3) $x \vee y$
x
$\therefore y$

(2) $x \rightarrow y$
$\sim y$
$\therefore \sim x$

(4) $x \rightarrow y$
x
$\therefore y$

34 In the accompanying diagram of isosceles triangle ABC, $\angle ACB$ is the vertex angle, $\overline{CM} \perp \overline{AB}$, and M is the midpoint of $\overline{AB}$.



Which statement can *not* be used to justify $\triangle ACM \cong \triangle BCM$?

(1) HL ≅ HL (3) SSS ≅ SSS
(2) AAS ≅ AAS (4) AAA ≅ AAA

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

35 *On the answer sheet*, using a straightedge and compass, locate the center of the circle on diameter $\overline{AB}$.

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:

$$y = x^2 - 6x + 2$$
$$y + x = 2$$
[8,2]

37 *a* Find, to the *nearest tenth*, all values of x for which the expression is defined.

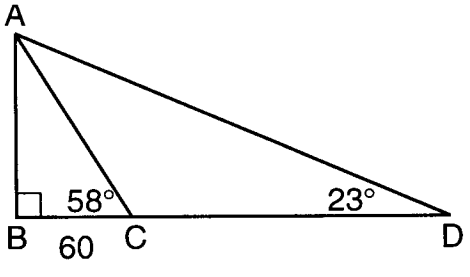
$$\frac{2x}{x-4} = \frac{x-6}{x-2}$$
[5]

b A committee of 5 is to be selected from 12 students: 5 sophomores, 4 juniors, and 3 seniors.

(1) How many committees of 5 students can be formed? [2]

(2) What is the probability that the committee will consist of 2 sophomores, 2 juniors, and 1 senior? [3]

38 In the accompanying diagram of $\triangle ABD$, $m\angle B = 90$, $\overline{BCD}$, $m\angle ACB = 58$, $m\angle D = 23$, and $BC = 60$ meters.



a Find, to the *nearest meter*, the length of $\overline{AB}$. [3]

b Using the result from part *a*, find the perimeter of $\triangle ABD$ to the *nearest meter*. [7]

39 In the table below, operation ✦ is commutative.

✦	S	O	L	V	E
S	S		S	L	
O	S	O	O	L	S
L	S	O	L	V	E
V			V	V	
E	V		E	O	E

a On your answer paper, copy and complete the table. [2]

b What is the identity element for the operation ✦? [2]

c What is the inverse for element O under the operation ✦? [2]

d Solve for x: $(L \spadesuit O) \spadesuit x = V \spadesuit S$ [2]

e Explain why element E does *not* have an inverse. [2]

40 *a* On graph paper, draw the graph of circle O, which is represented by the equation $(x-1)^2 + (y+3)^2 = 16$. [3]

b On the same set of axes, draw the image of circle O after the translation $(x,y) \rightarrow (x-2, y+4)$ and label it O'. [2]

c Write an equation of circle O'. [2]

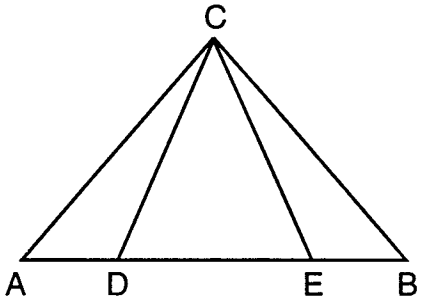
d Write an equation of the line that passes through the centers of circle O and circle O'. [3]

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: $\angle CDE \cong \angle CED$, $\overline{AD} \cong \overline{EB}$



Prove: $\angle ACD \cong \angle BCE$ [10]

42 The coordinates of the vertices of quadrilateral $ABCD$ are $A(0,-4)$, $B(8,-3)$, $C(4,4)$, and $D(-4,3)$. Prove that quadrilateral $ABCD$ is

a a rhombus [7]

b *not* a rectangle [3]

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH – COURSE II

Thursday, August 13, 1998 — 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 ..... Sex: ☐ Male ☐ Female Grade .....

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

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

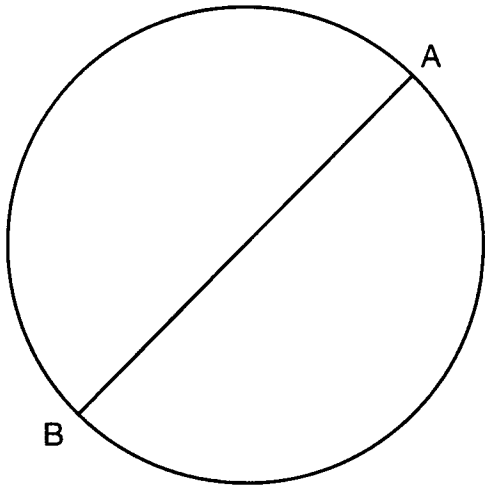
Part I

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

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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 13–34, allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 36	(11) 140	(21) 4	(31) 1
(2) 133	(12) 15.2	(22) 4	(32) 4
(3) 12	(13) 1	(23) 2	(33) 3
(4) 5	(14) 1	(24) 3	(34) 4
(5) 36	(15) 2	(25) 1	(35) construction
(6) 24	(16) 3	(26) 2	
(7) 19	(17) 2	(27) 3	
(8) $-\frac{4}{3}$	(18) 1	(28) 2	
(9) 360	(19) 3	(29) 4	
(10) (6,–3)	(20) 2	(30) 4	

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) (0,2) (5,–3) [8]
Check [2]

(37) *a* 2.7, –8.7 [5]
b (1) 792 [2]
(2) $\frac{180}{792}$ [3]

(38) *a* 96 [3]
b 568 [7]

(39) *a*

✦	S	O	L	V	E
S	S	**S**	S	L	**V**
O	S	O	O	L	S
L	S	O	L	V	E
V	**L**	**L**	V	V	**O**
E	V	**S**	E	O	E

[2]

b L [2]
c V [2]
d V [2]
e Answers will vary. [2]

(40) *c* $(x + 1)^2 + (y - 1)^2 = 16$ [2]
d $y = -2x - 1$ [3]