The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Monday, January 27, 2003 — 1:15 to 4:15 p.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.

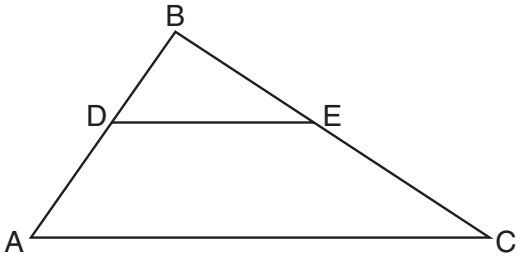
When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during 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 of $\triangle ABC$, $\overline{DE} \parallel \overline{AC}$, $BD = 8$, $BA = 18$, and $BC = 27$. Find the length of $\overline{BE}$.

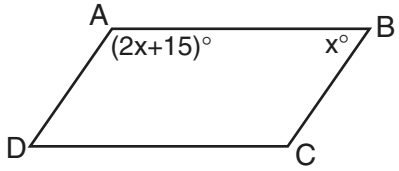


2 In the tables below, the elements a, b, c and the operations # and ✷ are defined. Using the tables, solve for x if $(c \text{ ✷ } x) \# b = a$.

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

✷	a	b	c
a	a	a	a
b	a	b	c
c	a	c	b

3 In the accompanying diagram of parallelogram $ABCD$, $m\angle A = 2x + 15$ and $m\angle B = x$. Find $m\angle A$.



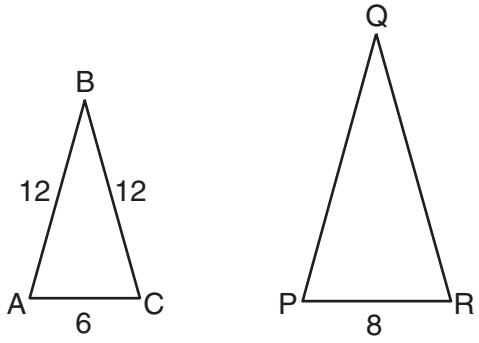
4 In $\triangle ABC$, $m\angle A = 60$ and $m\angle B = 40$. Which side of $\triangle ABC$ is longest?

5 The lengths of the sides of a triangle are 9, 12, and 15. What is the perimeter of the triangle formed by joining the midpoints of these sides?

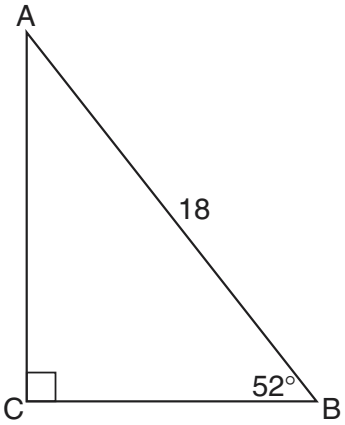
6 How many different nine-letter permutations can be formed from the nine letters in the word "ISOSCELES"?

7 Write an equation of the straight line whose slope is 2 and whose y-intercept is the same as that of the line represented by the equation $y = 4x - 2$.

8 In the accompanying diagram, $\triangle ABC$ is similar to $\triangle PQR$, $AC = 6$, $AB = BC = 12$, and $PR = 8$. Find the perimeter of $\triangle PQR$.



9 In the accompanying diagram of right triangle ABC, $m\angle C = 90$, $AB = 18$, and $m\angle B = 52$. Find the length of $\overline{BC}$ to the *nearest tenth*.



10 In right triangle ABC, hypotenuse $\overline{AB}$ is extended through B to D. If $m\angle CBD = 140$, find $m\angle CAB$.

11 Find, in radical form, the distance between points (3,2) and (–3,–2).

12 The line that passes through point (–1,4) and point (6,y) has a slope of $\frac{5}{7}$. Find y.

13 The coordinates of the vertices of $\triangle ABC$ are $A(0,0)$, $B(6,0)$, and $C(0,8)$. Find the area of $\triangle ABC$.

14 How many different committees of three people can be chosen from a group of six people?

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

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

16 What is the image of point (4,–2) after a dilation of 3?

(1) $\left(\frac{4}{3}, -\frac{2}{3}\right)$
(2) (12,–6)
(3) (7,1)
(4) (1,–5)

17 Which equation represents a circle whose center is (7,–5) and whose radius is 6?

(1) $(x + 7)^2 + (y - 5)^2 = 36$
(2) $(x + 7)^2 + (y - 5)^2 = 6$
(3) $(x - 7)^2 + (y + 5)^2 = 36$
(4) $(x - 7)^2 + (y + 5)^2 = 6$

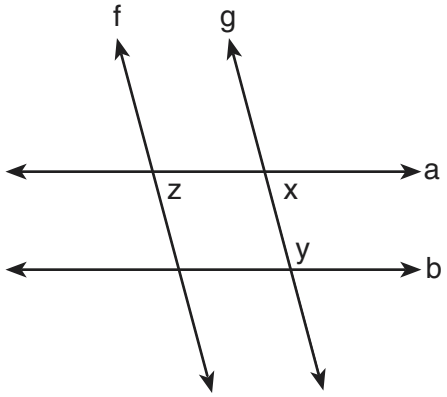
18 If $\sim p \rightarrow q$ and $\sim p$ are true statements, which statement must be *false*?

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

19 If the coordinates of point A are (3,8) and the coordinates of point B are (3,–4), the equation of the locus of points equidistant from point A and point B is

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

20 In the accompanying figure, $a \parallel b$, $f \parallel g$, and $m\angle x = 75$.



What is the value of $m\angle y + m\angle z$?

(1) 75
(2) 105
(3) 150
(4) 180

21 The table below shows the set $\{F,A,C,E\}$ and the operation ☺.

☺	F	A	C	E
F	A	E	F	A
A	E	C	A	F
C	F	A	C	E
E	A	F	E	C

Which statement is *not* true?

(1) The identity element for the set is C.
(2) The set is commutative under ☺.
(3) Every element of the set has an inverse.
(4) $(F$ ☺ $A)$ ☺ $C = E$

22 In $\triangle ABC$, $\angle A$ is obtuse. Which statement is true about the sum of the measures of $\angle B$ and $\angle C$?

(1) $m\angle B + m\angle C = 90$
(2) $m\angle B + m\angle C > 90$
(3) $m\angle B + m\angle C < 90$
(4) $m\angle B + m\angle C = 180$

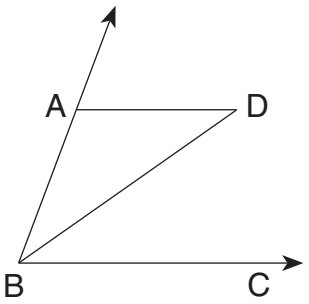
23 Which set of numbers could represent the lengths of the sides of an isosceles triangle?

(1) {4,5,7}
(2) {8,8,16}
(3) {6,6,13}
(4) {5,5,9}

24 Point $P'(-6,-4)$ is the image of point $P(-2,3)$ under translation T. What is the image of $(5,-1)$ under the same translation?

(1) (9,6)
(2) (1,–8)
(3) (–1,–5)
(4) (3,2)

25 In the accompanying diagram, $\overline{BD}$ bisects acute angle ABC and $\overline{AD} \parallel \overrightarrow{BC}$.



Which kind of triangle must $\triangle ABD$ be?

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

26 The equation of the axis of symmetry of the parabola $y = ax^2 + 4x - 2$ is $x = 1$. What is the value of a?

(1) –2
(2) 2
(3) –4
(4) 4

27 What are the coordinates of A', the image of $A(3,-4)$ under a reflection in point $(3,1)$?

(1) (3,–3)
(2) (3,–1)
(3) (3,4)
(4) (3,6)

28 If the sum of the interior angles of a polygon is equal to the sum of the exterior angles, how many sides does the polygon have?

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

29 The diagonals of a rhombus have lengths of 16 and 30. The length of a side of the rhombus is

(1) 17
(2) $15\sqrt{2}$
(3) $16\sqrt{2}$
(4) 34

30 Which statement is the converse of "If I am late, then I run"?

(1) If I am not late, then I do not run.
(2) If I do not run, then I am not late.
(3) If I run, then I am late.
(4) If I am not late, then I run.

31 Which ordered pair is a solution for the system of equations $y = \frac{1}{2}x + 1$ and $y = x^2 - 4x + 3$?

(1) $\left(\frac{1}{2},4\right)$
(2) (4,3)
(3) (–4,–1)
(4) (–4,3)

32 Which is *not* a factor of $2x^2 - 32$?

(1) $x^2 - 32$
(2) 2
(3) $x - 4$
(4) $x^2 - 16$

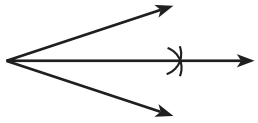
33 What are the roots of the equation $3x^2 - 6x - 2 = 0$?

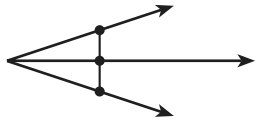
(1) $1 \pm \sqrt{12}$
(2) $6 \pm \sqrt{10}$
(3) $\frac{6 \pm \sqrt{60}}{6}$
(4) $\frac{6 \pm \sqrt{12}}{6}$

34 Which equation represents the line that passes through point (4,2) and is perpendicular to the line represented by the equation $y = -\frac{1}{2}x + 3$?

(1) $y = -\frac{1}{2}x + 4$
(2) $y = 2x - 6$
(3) $y = 2x + 3$
(4) $y = -2x - 6$

35 Which diagram shows a correct mathematical construction using only a compass and a straightedge to bisect an angle?


(1)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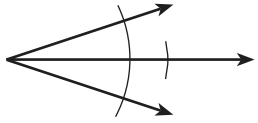
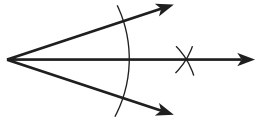

(2)

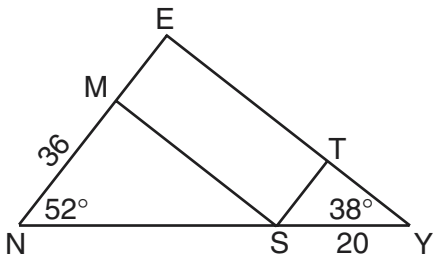

(4)

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 In the accompanying diagram of $\triangle NEY$, quadrilateral $METS$ is a rectangle, $m\angle N = 52$, $m\angle Y = 38$, $SY = 20$, and $NM = 36$.



a Find the length of $\overline{EY}$ to the *nearest integer*. [5]

b Find the length of $\overline{EN}$ to the *nearest integer*. [3]

c Using your answers from parts *a* and *b*, find the area of $\triangle NEY$. [2]

37 The letters *A*, *B*, *C*, *D*, *E*, *F*, *G*, *H*, *I*, *J*, and *K* are written on separate pieces of paper and placed in a jar.

a If two letters are drawn randomly from the jar, without replacement, find the:

(1) total number of different combinations of letters [2]

(2) total number of different combinations of letters that are *not* vowels [2]

(3) probability that both letters chosen are vowels [2]

b How many of the two-letter combinations in part *a*(1) will contain the letter *G*? [2]

c If four letters are drawn randomly from the jar, without replacement, in how many different ways can those four letters be arranged? [2]

38 In a right triangle, one leg is 3 more than the other, and the hypotenuse is 3 less than twice the shorter leg. Find the numerical value of the perimeter of this triangle. [10]

39 For all values of x for which the expressions are defined:

a Simplify completely: $\frac{x^2 - 9}{2x^2} \bullet \frac{6x}{9 - 3x}$ [3]

b Express as a single fraction in lowest terms: $\frac{2x + 3}{3} - \frac{3x + 2}{5}$ [3]

c Solve for x: $\frac{2}{x} + \frac{x}{x - 2} = 1$ [4]

40 *a* Sketch the graph of the equation $y = x^2 - 8x + 15$ for all values of x in the interval $1 \le x \le 7$. [6]

b Find the roots of the equation $x^2 - 8x + 15 = 0$. [2]

c Find the number of points of intersection of the graphs of the equations $y = x^2 - 8x + 15$ and $y = -2$. [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 *a* Given: $A \rightarrow \sim B$
$\sim(C \wedge \sim A)$
B
$\sim C \rightarrow D$

Prove: D [8]

b Write a sentence, in words, that is logically equivalent to "If the test is not difficult, then I will do well." [2]

42 The vertices of quadrilateral *BIRD* are $B(-1,-3)$, $I(8,0)$, $R(3,5)$, and $D(0,4)$. Prove by means of coordinate geometry that quadrilateral *BIRD* is an isosceles trapezoid. [10]

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH – COURSE II

Monday, January 27, 2003 — 1:15 to 4:15 p.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 . . . . .
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.

Tear Here

_____

Signature

Tear Here

Tear Here

FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Monday, January 27, 2003 — 1:15 to 4:15 p.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 15–35, allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 12

(2) b

(3) 125

(4) $\overline{AB}$ or c

(5) 18

(6) 30,240

(7) $y = 2x - 2$

(8) 40

(9) 11.1

(10) 50

(11) $\sqrt{52}$

(12) 9

(13) 24

(14) 20

(15) 1

(16) 2

(17) 3

(18) 1

(19) 1

(20) 4

(21) 3

(22) 3

(23) 4

(24) 2

(25) 2

(26) 1

(27) 4

(28) 4

(29) 1

(30) 3

(31) 2

(32) 1

(33) 3

(34) 2

(35) 4

[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) *a* 62 [5]

b 48 [3]

c 1,488 [2]

(37) *a* (1) 55 [2]

(2) 28 [2]

(3) $\frac{3}{55}$ [2]

b 10 [2]

c 24 [2]

(38) 36 [10]

(39) *a* $-\frac{(x+3)}{x}$ [3]

b $\frac{x+9}{15}$ [3]

c 1 [4]

(40) *b* 3,5 [2]

c 0 [2]

Part III

(41) *b* If I do not do well, then the test is difficult.

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.