The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Wednesday, January 24, 1996 – 9:15 a.m. to 12:15 p.m., only

Notice . . .

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.

On page 9 you will find the "Tables of Natural Trigonometric Functions" which you may need to answer some questions in this examination. Fold this page along the perforations, and tear it off also slowly and carefully.

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.

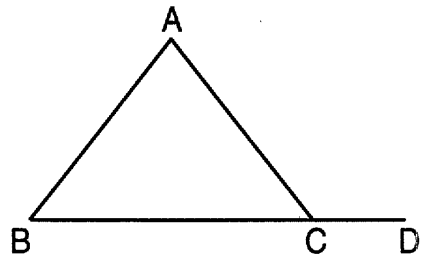
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

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 If $a \Delta b$ is a binary operation defined as $\frac{2a + b}{a}$ evaluate $2 \Delta 4$.

2 In the accompanying diagram, $\triangle ABC$ is isosceles, $\overline{BC}$ is extended to D, $\overline{AB} \cong \overline{AC}$, and $m\angle A = 80$. Find $m\angle ACD$.



3 In $\triangle PEN$, $m\angle P = 40$ and $m\angle N = 80$. Which side of the triangle is the longest?

4 Solve for x: $\frac{x - 2}{x + 4} = \frac{x + 2}{x + 12}$

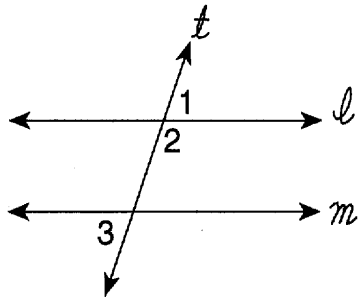
5 The lengths of the sides of a triangle are 4, 5, and 6. If the length of the longest side of a similar triangle is 15, what is the length of the *shortest* side of this triangle?

6 The coordinates of the vertices of $\triangle ABC$ are $A(0,0)$, $B(3,0)$, and $C(0,4)$. What is the length of $\overline{BC}$?

7 What is the slope of the line determined by points $(-1,3)$ and $(3,-1)$?

8 What are the coordinates of N', the image of $N(5,-3)$ under a reflection in the y-axis?

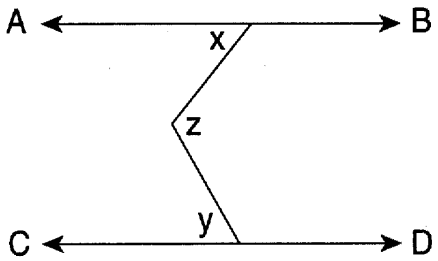
9 In the accompanying diagram, line ℓ is parallel to line m and line t is a transversal. If $m\angle 1 = 2x + 20$ and $m\angle 2 = 4x + 10$, what is the number of degrees in $\angle 3$?



10 Find the number of square units in the area of the triangle whose vertices are points $A(2,0)$, $B(6,0)$, and $C(8,5)$.

11 The measure of one angle of a triangle equals the sum of the measures of the other two angles. Find the number of degrees in the measure of the largest angle of the triangle.

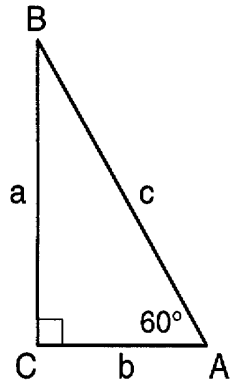
12 In the accompanying diagram, $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, $m\angle x = 50$, and $m\angle y = 60$. What is $m\angle z$?



13 A translation maps $A(-3,4)$ onto $A'(2,-6)$. Find the coordinates of B', the image of $B(-4,0)$ under the same translation.

14 How many committees of three students can be chosen from a class of seven students?

15 In the accompanying diagram of right triangle ABC, $b = 40$ centimeters, $m\angle A = 60$, and $m\angle C = 90$. Find the number of centimeters in the length of side c.



16 Factor completely: $3x^2 - 15x - 42$

Directions (17–35): 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.

17 Which statement is the negation of $p \wedge \sim q$?

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

18 Which equation illustrates the additive inverse property?

(1) $a + (-a) = 0$
(2) $a + 0 = a$
(3) $a \div (-a) = -1$
(4) $a \cdot \frac{1}{a} = 1$

19 In right triangle ABC, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. If $AD = 2$ and $DB = 6$, then AC is

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

20 What is a solution for the system of equations $x - y = 2$ and $y = 2x - 4$?

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

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

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

22 Which equation represents the graph of a circle?

(1) $y = x$
(2) $y = x^2$
(3) $x^2 + y^2 = 9$
(4) $x = 4$

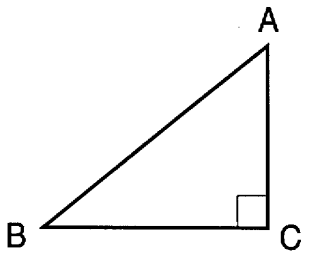
23 What is the length of the altitude of an equilateral triangle whose side has length 4?

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

24 Which statement about two equilateral triangles is *always* true?

(1) They are similar.
(2) They are congruent.
(3) They are equal in area.
(4) They have congruent altitudes.

25 In the accompanying diagram of right triangle ABC, the hypotenuse is $\overline{AB}$, $AC = 3$, $BC = 4$, and $AB = 5$.



Sin B is equal to

(1) $\sin A$
(2) $\cos A$
(3) $\tan A$
(4) $\cos B$

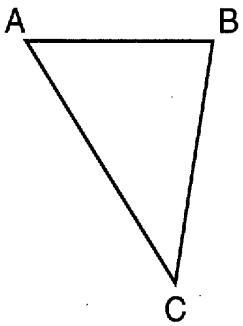
26 If C is the midpoint of line segment $\overline{AB}$ and D is the midpoint of line segment $\overline{AC}$, which statement is true?

(1) $AC > BC$
(2) $AD < CD$
(3) $DB = AC$
(4) $DB = 3CD$

27 Which statement is logically equivalent to $\sim a \rightarrow b$?

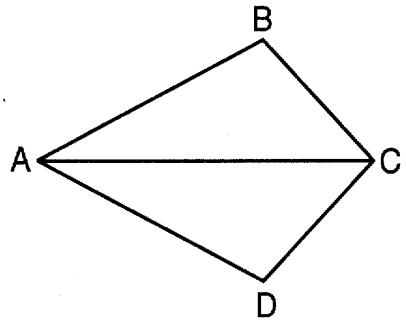
(1) $a \rightarrow \sim b$
(2) $b \rightarrow \sim a$
(3) $\sim b \rightarrow a$
(4) $\sim b \rightarrow \sim a$

28 In the accompanying diagram of $\triangle ABC$, if $AB < BC < AC$, then which statement is *false*?



(1) $m\angle A > m\angle C$
(2) $m\angle A < m\angle B$
(3) $m\angle B > m\angle C$
(4) $m\angle B < m\angle A$

29 In the accompanying diagram of quadrilateral $ABCD$, diagonal $\overline{AC}$ bisects $\angle BAD$ and $\angle BCD$.



Which statement can be used to prove that $\triangle ABC \cong \triangle ADC$?

(1) HL $\cong$ HL
(2) SSS $\cong$ SSS
(3) ASA $\cong$ ASA
(4) SAS $\cong$ SAS

30 How many different six-letter arrangements can be formed using the letters in the word "DIVIDE"?

(1) 6!
(2) ${}_6P_6$
(3) $\frac{6!}{2!2!}$
(4) $\frac{6!}{4!}$

31 The roots of the equation $x^2 + 3x - 1 = 0$ are

(1) $\frac{-3 \pm \sqrt{5}}{2}$
(2) $\frac{-3 \pm \sqrt{13}}{2}$
(3) $\frac{3 \pm \sqrt{5}}{2}$
(4) $\frac{3 \pm \sqrt{13}}{2}$

32 Which is an equation of the axis of symmetry of the graph of the equation $y = x^2 - 6x + 2$?

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

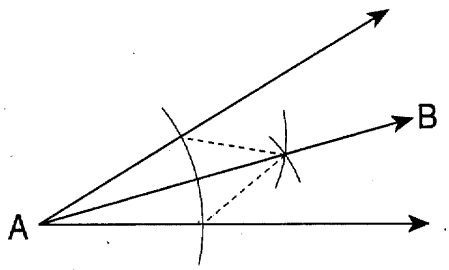
33 In the coordinate plane, what is the total number of points that are 8 units from the origin and equidistant from the axes?

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

34 In rhombus $PQRS$, diagonals $\overline{PR}$ and $\overline{QS}$ intersect at T. Which statement is *always* true?

(1) Quadrilateral $PQRS$ is a square.
(2) Triangle RTQ is a right triangle.
(3) Triangle PQS is equilateral.
(4) Diagonals $\overline{PR}$ and $\overline{QS}$ are congruent.

35 In the accompanying diagram, the bisector of an angle has been constructed.



In proving this construction, which reason is used for the congruence involved?

(1) ASA
(2) SSS
(3) AAS
(4) SAS

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 For all values of x for which these expressions are defined, perform the indicated operation and express in simplest form.

a $\dfrac{3x - 9}{x^2 - 9} - \dfrac{1}{x + 3}$ [5]

b $\dfrac{x^2 + 3x - 4}{5x - 5} \cdot \dfrac{10x^2 - 40x}{x^2 - 16}$ [5]

37 *a* On graph paper, draw the graph of the equation $y = -x^2 - 2x + 8$, including all values of x in the interval $-5 \le x \le 3$. [6]

b On the same set of axes, draw the graph of the equation $y = x + 4$. [2]

c What is the solution for the following system of equations?

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

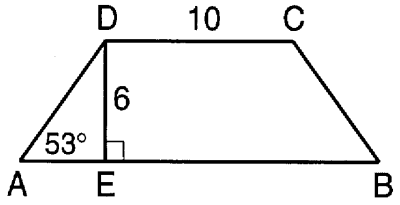
38 The vertices of $\triangle ABC$ are $A(-3,-2)$, $B(2,3)$, and $C(5,-4)$.

a On graph paper, draw and label $\triangle ABC$. [1]

b Graph and state the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation of 2. [3]

c Find the area of $\triangle A'B'C'$. [6]

39 In the accompanying diagram of isosceles trapezoid $ABCD$, $m\angle A = 53$, $DE = 6$, and $DC = 10$.



a Find AE to the *nearest tenth*. [4]

b Find, to the *nearest integer*, the perimeter of isosceles trapezoid $ABCD$. [6]

40 *a* Find the positive solution of $3x^2 + 2x = 7$ to the *nearest tenth*. [4]

b Given: If I receive a check for \$500, then we will go on a trip.
If the car breaks down, then we will not go on a trip.
Either I receive a check for \$500 or we will not buy souvenirs.
The car breaks down.

Let C represent: "I receive a \$500 check."
Let T represent: "We will go on a trip."
Let B represent: "The car breaks down."
Let S represent: "We will buy souvenirs."

Using the laws of logic, prove that we will not buy souvenirs. [6]

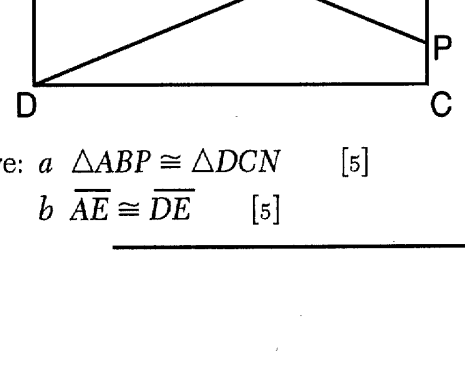
☞ GO RIGHT ON TO THE NEXT PAGE.

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

Part III

Answer one question from this part. 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: rectangle $ABCD$, $\overline{BNPC}$, $\overline{AEP}$, $\overline{DEN}$, and $\overline{AP} \cong \overline{DN}$.



Prove: *a* $\triangle ABP \cong \triangle DCN$ [5]

b $\overline{AE} \cong \overline{DE}$ [5]

42 The vertices of quadrilateral $GAME$ are $G(r, s)$, $A(0,0)$, $M(t,0)$, and $E(t + r, s)$. Using coordinate geometry, prove that quadrilateral $GAME$ is a parallelogram. [10]

THE UNIVERSITY OF THE STATE OF NEW YORK

THE STATE EDUCATION DEPARTMENT

Tables of Natural Trigonometric Functions

(For use with Sequential Math – Course II Regents Examinations)

Angle	Sine	Cosine	Tangent	Angle	Sine	Cosine	Tangent
1°	.0175	.9998	.0175	46°	.7193	.6947	1.0355
2°	.0349	.9994	.0349	47°	.7314	.6820	1.0724
3°	.0523	.9986	.0524	48°	.7431	.6691	1.1106
4°	.0698	.9976	.0699	49°	.7547	.6561	1.1504
5°	.0872	.9962	.0875	50°	.7660	.6428	1.1918
6°	.1045	.9945	.1051	51°	.7771	.6293	1.2349
7°	.1219	.9925	.1228	52°	.7880	.6157	1.2799
8°	.1392	.9903	.1405	53°	.7986	.6018	1.3270
9°	.1564	.9877	.1584	54°	.8090	.5878	1.3764
10°	.1736	.9848	.1763	55°	.8192	.5736	1.4281
11°	.1908	.9816	.1944	56°	.8290	.5592	1.4826
12°	.2079	.9781	.2126	57°	.8387	.5446	1.5399
13°	.2250	.9744	.2309	58°	.8480	.5299	1.6003
14°	.2419	.9703	.2493	59°	.8572	.5150	1.6643
15°	.2588	.9659	.2679	60°	.8660	.5000	1.7321
16°	.2756	.9613	.2867	61°	.8746	.4848	1.8040
17°	.2924	.9563	.3057	62°	.8829	.4695	1.8807
18°	.3090	.9511	.3249	63°	.8910	.4540	1.9626
19°	.3256	.9455	.3443	64°	.8988	.4384	2.0503
20°	.3420	.9397	.3640	65°	.9063	.4226	2.1445
21°	.3584	.9336	.3839	66°	.9135	.4067	2.2460
22°	.3746	.9272	.4040	67°	.9205	.3907	2.3559
23°	.3907	.9205	.4245	68°	.9272	.3746	2.4751
24°	.4067	.9135	.4452	69°	.9336	.3584	2.6051
25°	.4226	.9063	.4663	70°	.9397	.3420	2.7475
26°	.4384	.8988	.4877	71°	.9455	.3256	2.9042
27°	.4540	.8910	.5095	72°	.9511	.3090	3.0777
28°	.4695	.8829	.5317	73°	.9563	.2924	3.2709
29°	.4848	.8746	.5543	74°	.9613	.2756	3.4874
30°	.5000	.8660	.5774	75°	.9659	.2588	3.7321
31°	.5150	.8572	.6009	76°	.9703	.2419	4.0108
32°	.5299	.8480	.6249	77°	.9744	.2250	4.3315
33°	.5446	.8387	.6494	78°	.9781	.2079	4.7046
34°	.5592	.8290	.6745	79°	.9816	.1908	5.1446
35°	.5736	.8192	.7002	80°	.9848	.1736	5.6713
36°	.5878	.8090	.7265	81°	.9877	.1564	6.3138
37°	.6018	.7986	.7536	82°	.9903	.1392	7.1154
38°	.6157	.7880	.7813	83°	.9925	.1219	8.1443
39°	.6293	.7771	.8098	84°	.9945	.1045	9.5144
40°	.6428	.7660	.8391	85°	.9962	.0872	11.4301
41°	.6561	.7547	.8693	86°	.9976	.0698	14.3007
42°	.6691	.7431	.9004	87°	.9986	.0523	19.0811
43°	.6820	.7314	.9325	88°	.9994	.0349	28.6363
44°	.6947	.7193	.9657	89°	.9998	.0175	57.2900
45°	.7071	.7071	1.0000	90°	1.0000	.0000	

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH – COURSE II

Wednesday, January 24, 1996 – 9:15 a.m. to 12:15 p.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 .....
6	16	26	
7	17	27	
8	18	28	
9	19	29	
10	20	30	

Your answers for Part II 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

SCORING KEY

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Wednesday, January 24, 1996—9:15 a.m. to 12:15 p.m., only

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 17–35, allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 4

(2) 130

(3) $\overline{PE}$

(4) 8

(5) 10

(6) 5

(7) –1

(8) (–5,–3)

(9) 70

(10) 10

(11) 90

(12) 110

(13) (1,–10)

(14) 35

(15) 80

(16) $3(x + 2)(x - 7)$

(17) 1

(18) 1

(19) 4

(20) 2

(21) 1

(22) 3

(23) 1

(24) 1

(25) 2

(26) 4

(27) 3

(28) 4

(29) 3

(30) 3

(31) 2

(32) 3

(33) 4

(34) 2

(35) 2

Part II

Please refer to the Department's publication *Guide for Rating Regents Examinations in Mathematics* and its supplement. 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* $\frac{2}{x+3}$ [5]

b $2x$ [5]

(37) *c* (1,5) and (−4,0) [1,1]

(38) *b* $A'(-6,-4)$, $B'(4,6)$, $C'(10,-8)$ [3]

c 100 [6]

(39) *a* 4.5 [4]

b 44 [6]

(40) *a* 1.2 [4]

Notice . . .
Beginning in June 1996, a **scientific** calculator must be available to all students taking **all** sequential mathematics examinations. The Course II examination booklet will **not** include the tables of trigonometric functions, and the Course III examination booklet will **not** include the reference tables for mathematics. However, the formula sheet for Course III will continue to be printed in the examination booklet.