The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

# REE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

# COURSE II

Wednesday, August 17, 1994 — 8:30 to 11:30 a.m., only

Notice . . .

Calculators must be available to all students taking this examination.

e of the booklet is the answer sheet. Fold the last page along the perforations and, slowly ar off the answer sheet. Then fill in the heading of your answer sheet.

ou will find the "Tables of Natural Trigonometric Functions" which you may need to answer n this examination. Fold this page along the perforations, and tear it off also slowly and

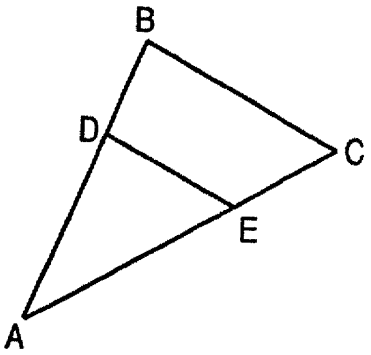
ve completed the examination, you must sign the statement printed at the end of the answer that you had no unlawful knowledge of the questions or answers prior to the examination ve neither given nor received assistance in answering any of the questions during the ir answer paper cannot be accepted if you fail to sign this declaration.

OT 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 $\pi$ or in radical form.** [60]

1 In the accompanying diagram, $\overline{DE} \parallel \overline{BC}$, $AD = 8$, $AB = 12$, and $EC = 5$. Find $AE$.




2 If $x * y = x^y + \frac{x}{y}$, find the value of $4 * 2$.

3 What are the coordinates of $A'$, the image of point $A(-5,1)$ after a reflection in the $y$-axis?

4 In a right triangle, the legs have lengths 5 and 7. Express the length of the hypotenuse in radical form.

5 In parallelogram $LMNO$, an exterior angle at vertex $O$ measures 72°. Find the measure, in degrees, of $\angle L$.

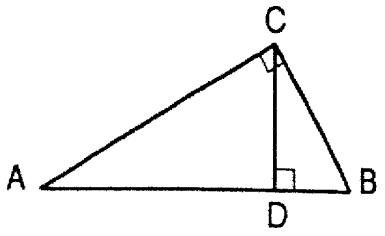
6 Two parallel lines are cut by a transversal. Two interior angles on the same side of the transversal are represented by $2x$ and $30 + x$. What is the measure of the *smaller* angle?

7 Solve for $a$: $\frac{a}{3} + \frac{5a}{12} = \frac{9}{4}$

8 A club has 12 members. How many different two-person committees can be formed?

9 In $\triangle ABC$, $m\angle A = 41$, $m\angle B = 2x - 37$, and $m\angle C = 3x - 29$. Which side of the triangle is the *shortest* side?

10 In the accompanying diagram of right triangle $ABC$, $\overline{CD}$ is drawn perpendicular to hypotenuse $\overline{AB}$. If $AB = 16$ and $DB = 4$, find $BC$.




11 A triangle has sides of lengths 12, 14, and 18. Find the perimeter of a similar triangle after a dilation of 2.

12 Solve for the positive value of $x$:

$$\frac{x-4}{5} = \frac{1}{x}, \; x \neq 0$$

13 What is the total number of points that are 3 units from line $m$ and also 5 units from $P$, a point on line $m$?

14 Factor completely: $x^3 + 5x^2 + 6x$

*Directions* (15–34): 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.

15 If $a$, $b$, and $c$ are real numbers, which statement is always true?

(1) $a \div b = b \div a$
(2) $a(b + c) = (a + b) \times (a + c)$
(3) $a(b \times c) = (a \times b)c$
(4) $a \times 0 = a$

16 If the statements $\sim r \rightarrow b$, $b \rightarrow \sim m$, and $\sim r$ are true, which statement must also be true?

(1) $\sim b$
(2) $\sim m$
(3) $r$
(4) $m$

17 Two triangles are congruent if
(1) corresponding angles are congruent
(2) corresponding sides and corresponding angles are congruent
(3) the angles in each triangle have a sum of 180°
(4) corresponding sides are proportional

18 In a triangle, one exterior angle measures 36°. What is the probability that the triangle is a right triangle?

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

(2) $\frac{2}{3}$ (4) 0

19 If line $\ell$ is perpendicular to line $m$ and the slope of line $\ell$ is undefined, what is the slope of line $m$?

(1) 1 (3) 0

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

20 What is the product of the roots of the equation $x^2 - 2x - 15 = 0$?

(1) -15 (3) -8
(2) -2 (4) 30

21 Which statement is the converse of $a \rightarrow b$?

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

22 What is the equation of the locus of points equidistant from points $A(1,2)$ and $B(5,2)$?

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

23 If $\cos x = 0.8$, what is the value of $\sin x$?

(1) 1.0 (3) 0.6
(2) 0.2 (4) 0.4

24 In $\triangle ABC$, $AB = 10$ and $BC = 5$. Which expression can be true?

(1) $AC = 5$ (3) $AC < 5$
(2) $AC = 20$ (4) $AC > 5$

25 How many different eight-letter arrangements can be formed from the word "MONOMIAL"?

(1) $\frac{8!}{2!2!}$ (3) 8!

(2) $\frac{8!}{2!}$ (4) 6!

26 Which statement is logically equivalent to $(a \vee b) \rightarrow c$?

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

27 Which is a solution for the following system of equations?

$$y = x^2$$
$$y = -4x + 12$$

(1) (-2,4) (3) (2,4)
(2) (6,36) (4) (-6,24)

28 Which point is closest to the origin?

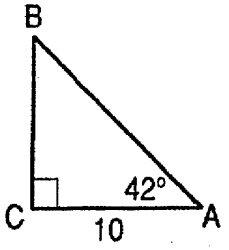
(1) (5,12) (3) (10,4)
(2) (6,8) (4) (0,11)

29 If the endpoints of a diameter of a circle are (2,-1) and (4,0), what are the coordinates of the center of the circle?

(1) (6,-1) (3) $\left(3,\frac{1}{2}\right)$

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

30 In the diagram below, $m\angle C = 90$, $m\angle A = 42$, and $CA = 10$.




Which equation can be used to find $AB$?

(1) $\tan 42° = \frac{10}{AB}$ (3) $\cos 42° = \frac{AB}{10}$

(2) $\tan 42° = \frac{AB}{10}$ (4) $\cos 42° = \frac{10}{AB}$

31 The graph of the equation $x - 3y = 6$ is parallel to the graph of

(1) $y = -3x + 7$ (3) $y = 3x - 8$

(2) $y = -\frac{1}{3}x + 5$ (4) $y = \frac{1}{3}x + 8$

32 Which is an equation of the circle with center at (−3,1) and radius of 5?

(1) $(x + 3)^2 + (y - 1)^2 = 5$
(2) $(x - 3)^2 + (y + 1)^2 = 5$
(3) $(x + 3)^2 + (y - 1)^2 = 25$
(4) $(x - 3)^2 + (y + 1)^2 = 25$

33 What are the coordinates of the turning point of the parabola whose equation is $y = x^2 - 2x - 3$?

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

34 Let $p$ represent "The diagonals are congruent" and let $q$ represent "The diagonals are perpendicular." For which quadrilateral is $p \wedge \sim q$ true?

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

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

35 *On the answer sheet*, using a straightedge and compass, locate the midpoint of line segment $\overline{AB}$ and label it $M$.

**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.

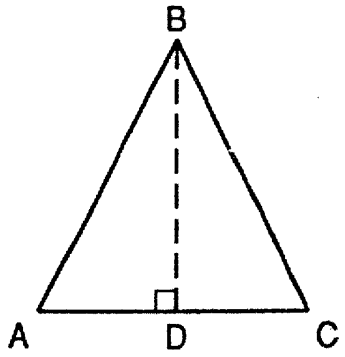
*a* $\dfrac{3x + 1}{x^2 - 1} - \dfrac{1}{x + 1}$ [5]

*b* $\dfrac{x^2 - 3x}{x^2 + 2x} \div \dfrac{x^2 - 5x + 6}{x^2 - 4}$ [5]

37 Solve the following system of equations and check. [*Either an algebraic or a graphic method will be accepted.*]

$$x^2 + y^2 = 25$$
$$3x - 4y = 0$$ [8,2]

38 In the accompanying diagram of isosceles triangle $ABC$, $\overline{AB} \cong \overline{CB}$ and altitude $BD$ is 2 more than $AD$. The area of isosceles triangle $ABC$ is 10.




*a* Find the length of $\overline{AD}$ to the *nearest tenth.* [7]

*b* Using the answer from part *a*, find the length of $\overline{AB}$ to the *nearest tenth.* [3]

39 *a* On graph paper, draw the graph of the parabola $y = (x + 3)^2 - 2$ for all values of $x$ in the interval $-6 \leq x \leq 0$. [5]

*b* On the same set of axes, draw the image of the graph drawn in part *a* after a translation that maps $(x,y)$ to $(x + 3, y + 2)$. [3]

*c* On the same set of axes, draw the image of the graph drawn in part *b* after a reflection in the $x$-axis. [2]

40 The operation * is commutative in the table shown below.

| * | L | O | G | I | C |
|---|---|---|---|---|---|
| L | L | L | O | O | L |
| O | | O | | C | O |
| G | | I | G | G | G |
| I | | | | I | I |
| C | L | O | G | | C |

*a* Copy and complete the table. [2]

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

*c* What is the inverse of $O$ under the operation *? [2]

*d* Evaluate: $[O * (G * L)] * C$ [2]

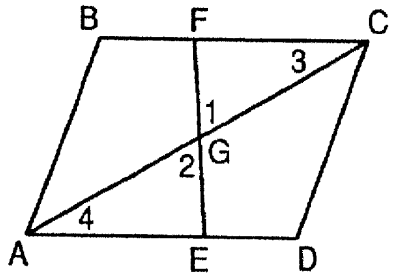
*e* Solve for $x$: $(C * I) * (G * x) = C$ [2]

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: quadrilateral $ABCD$, $\overline{FGE}$, $\overline{AGC}$, $\overline{FG} \cong \overline{EG}$, $\overline{AG} \cong \overline{CG}$, and $\angle B \cong \angle D$.




*a* Prove that $\overline{BC} \cong \overline{DA}$. [7]

*b* Prove that $ABCD$ is a parallelogram. [3]

42 The coordinates of $\triangle ABC$ are $A(0,0)$, $B(2,6)$, and $C(4,2)$. Using coordinate geometry, prove that if the midpoints of sides $\overline{AB}$ and $\overline{AC}$ are joined, the segment formed is parallel to the third side and equal to one-half the length of the third side. [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 | |

# FOR TEACHERS ONLY

SCORING KEY

## THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

# COURSE II

**Wednesday**, August 17, 1994 — 8:30 to 11:30 a.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 15–34, allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 10

(2) 18

(3) (5,1)

(4) $\sqrt{74}$

(5) 72

(6) 80

(7) 3

(8) 66

(9) $\overline{BC}$

(10) 8

(11) 88

(12) 5

(13) 4

(14) $x(x + 2)(x + 3)$

(15) 3

(16) 2

(17) 2

(18) 4

(19) 3

(20) 1

(21) 2

(22) 1

(23) 3

(24) 4

(25) 1

(26) 1

(27) 3

(28) 2

(29) 2

(30) 4

(31) 4

(32) 3

(33) 1

(34) 4

(35) construction

## 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* $\frac{2}{x-1}$ [5]

*b* 1 [5]

(37) (4,3), (−4,−3) [8,2]

(38) *a* 2.3 [7]

*b* 4.9 [3]

(40) *a*

| * | *L* | *O* | *G* | *I* | *C* |
|---|---|---|---|---|---|
| *L* | *L* | *L* | *O* | *O* | *L* |
| *O* | *L* | *O* | ***I*** | *C* | *O* |
| *G* | ***O*** | *I* | *G* | *G* | *G* |
| *I* | ***O*** | ***C*** | ***G*** | *I* | *I* |
| *C* | *L* | *O* | *G* | ***I*** | *C* |

[2]

*b* *C* [2]

*c* *I* [2]

*d* *O* [2]

*e* *L* [2]

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

# SEQUENTIAL MATH — COURSE II

Wednesday, August 17, 1994 — 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 .....

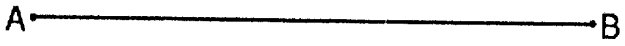
**Your answers to Part I should be recorded on this answer sheet.**

**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 ..... | |

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