FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS B

Tuesday, June 22, 2004 — 1:15 to 4:15 p.m., only

SCORING KEY

Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Mathematics B examination. More detailed information about scoring is provided in the publication *Information Booklet for Administering and Scoring the Regents Examinations in Mathematics A and Mathematics B*.

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.

Each student's answer paper is to be scored by a minimum of three mathematics teachers. On the back of the student's detachable answer sheet, raters must enter their initials in the boxes next to the questions they have scored and also write their name in the box under the heading "Rater's/Scorer's Name."

Raters should record the student's scores for all questions and the total raw score on the student's detachable answer sheet. Then the student's total raw score should be converted to a scaled score by using the conversion chart that will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Tuesday, June 22, 2004. The student's scaled score should be entered in the box provided on the student's detachable answer sheet. The scaled score is the student's final examination score.

Part I

Allow a total of 40 credits, 2 credits for each of the following. Allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 1	(6) 4	(11) 4	(16) 1
(2) 1	(7) 3	(12) 3	(17) 4
(3) 2	(8) 1	(13) 4	(18) 2
(4) 2	(9) 4	(14) 3	(19) 2
(5) 3	(10) 2	(15) 1	(20) 3

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Visit the site http://www.emsc.nysed.gov/osa/ and select the link "Latest Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and at least one more time before the final scores for the examination are recorded.

General Rules for Applying Mathematics Rubrics

I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examinations in Mathematics A and Mathematics B are designed to provide a systematic, consistent method for awarding credit. The rubrics are not to be considered all-inclusive; it is impossible to anticipate all the different methods that students might use to solve a given problem. Each response must be rated carefully using the teacher's professional judgment and knowledge of mathematics; all calculations must be checked. The specific rubrics for each question must be applied consistently to all responses. In cases that are not specifically addressed in the rubrics, raters must follow the general rating guidelines in the publication *Information Booklet for Administering and Scoring Examinations in Mathematics A and Mathematics B*, use their own professional judgment, confer with other mathematics teachers, and/or contact the consultants at the State Education Department for guidance. During each Regents examination administration period, rating questions may be referred directly to the Education Department. The contact numbers are sent to all schools before each administration period.

II. Full-Credit Responses

A full-credit response provides a complete and correct answer to all parts of the question. Sufficient work is shown to enable the rater to determine how the student arrived at the correct answer.

When the rubric for the full-credit response includes one or more examples of an acceptable method for solving the question (usually introduced by the phrase "such as"), it does ***not*** mean that there are no additional acceptable methods of arriving at the correct answer. Unless otherwise specified, mathematically correct alternative solutions should be awarded credit. The only exceptions are those questions that specify the type of solution that must be used; e.g., an algebraic solution or a graphic solution. A correct solution using a method other than the one specified is awarded half the credit of a correct solution using the specified method.

III. Appropriate Work

Full-Credit Responses: The directions in the examination booklet for all the constructed-response questions state: "Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, charts, etc." The student has the responsibility of providing the correct answer ***and*** showing how that answer was obtained. The student must "construct" the response; the teacher should not have to search through a group of seemingly random calculations scribbled on the student paper to ascertain what method the student may have used.

Responses With Errors: Rubrics that state "Appropriate work is shown, but …" are intended to be used with solutions that show an essentially complete response to the question but contain certain types of errors, whether computational, rounding, graphing, or conceptual. If the response is incomplete, i.e., an equation is written but not solved or an equation is solved but not all of the parts of the question are answered, appropriate work has ***not*** been shown. Other rubrics address incomplete responses.

IV. Multiple Errors

Computational Errors, Graphing Errors, and Rounding Errors: Each of these types of errors results in a 1-credit deduction. Any combination of two of these types of errors results in a 2-credit deduction. No more than 2 credits should be deducted for such mechanical errors in any response. The teacher must carefully review the student's work to determine what errors were made and what type of errors they were.

Conceptual Errors: A conceptual error involves a more serious lack of knowledge or procedure. Examples of conceptual errors include using the incorrect formula for the area of a figure, choosing the incorrect trigonometric function, or multiplying the exponents instead of adding them when multiplying terms with exponents. A response with one conceptual error can receive no more than half credit.

If a response shows repeated occurrences of the same conceptual error, the student should not be penalized twice. If the same conceptual error is repeated in responses to other questions, credit should be deducted in each response.

If a response shows two (or more) different major conceptual errors, it should be considered completely incorrect and receive no credit.

If a response shows one conceptual error and one computational, graphing, or rounding error, the teacher must award credit that takes into account both errors: i.e., awarding half credit for the conceptual error and deducting 1 credit for each mechanical error (maximum of two deductions for mechanical errors).

Part II

For each question, use the specific criteria to award a maximum of two credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(21) **[2]** 41,583, and appropriate work is shown.

[1] Appropriate work is shown, but one conceptual error or one computational error is made.

or

[1] 41,583, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(22) **[2]** $\frac{3}{2}$, and appropriate work is shown.

[1] Appropriate work is shown, but one conceptual error or one computational error is made.

or

[1] $\frac{3}{2}$, but a graphic solution is provided.

or

[1] $\frac{3}{2}$, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(23) **[2]** $k > \frac{1}{3}$, and appropriate work is shown, such as the solution of $4 - 4(3)(k) < 0$.

[1] Appropriate work is shown, but one conceptual error or one computational error is made.

or

[1] Appropriate work is shown, but the answer is written as $k < \frac{1}{3}$.

or

[1] $k > \frac{1}{3}$, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(24) **[2]** $\triangle HOC$ and opposite, and an appropriate explanation is written.

[1] The image of $\triangle EOA$ is identified incorrectly, but the type of isometry is appropriate, and an appropriate explanation is written.

or

[1] The difference between a direct and opposite isometry is explained correctly, but no further correct work is shown.

or

[1] $\triangle HOC$, but no explanation or an incorrect explanation is written.

[0] Opposite, but no further correct work is shown.

or

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(25) **[2]** A correct indirect proof is written with appropriate statements and reasons.

[1] The assumption that $\overline{AT}$ is perpendicular to $\overline{CD}$ is written, but no further correct work is shown.

or

[1] A method other than an indirect proof is used to show that $\overline{AT}$ is not perpendicular to $\overline{CD}$.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(26) **[2]** –17, and appropriate work is shown.

[1] Appropriate work is shown, but one conceptual error or one computational or graphing error is made.

or

[1] –17, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Part III

For each question, use the specific criteria to award a maximum of four credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(27) **[4]** 44, and appropriate work is shown, such as solving the equation $6{,}076 = 6{,}077 - 31 \cos 2\theta$.

[3] Appropriate work is shown, but one computational or rounding error is made.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] An incorrect equation of equal difficulty is solved appropriately.

[1] Appropriate work is shown, but one conceptual error and one computational error are made.

or

[1] 44, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(28) **[4]** 65.27, and appropriate work is shown, such as $\frac{100}{\sin 100} = \frac{x}{\sin 40}$.

[3] Appropriate work is shown, but one computational or rounding error is made.

or

[3] Appropriate work is shown, but calculations are performed in radians, resulting in an answer of –147.15.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made, such as the use of an incorrect trigonometric function.

or

[2] An incorrect diagram is drawn, but appropriate work is shown, and an appropriate answer is found.

[1] A correctly labeled diagram is drawn, but no further correct work is shown.

or

[1] 65.27, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(29) **[4]** $\frac{-3 \pm \sqrt{37}}{7}$ or an equivalent answer, and appropriate work is shown.

[3] A correct quadratic equation is written and appropriate work is shown, but one computational or simplification error is made.

or

[3] An incorrect quadratic equation of equal difficulty is solved appropriately.

[2] A correct quadratic equation is written and appropriate work is shown, but two or more computational or simplification errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] A correct quadratic equation is written in standard form, but no further correct work is shown.

[1] An incorrect equation of a lesser degree of difficulty is solved appropriately.

or

[1] $\frac{-3 \pm \sqrt{37}}{7}$ or an equivalent answer, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(30) **[4]** 3 and 42, and appropriate work is shown, such as a graph, substitution, or a table of values.

[3] Appropriate work is shown, but one computational or graphing error is made.

[2] Appropriate work is shown, but two or more computational or graphing errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] The number of seconds is found correctly, and appropriate work is shown, but the height is not found or is found incorrectly.

or

[2] The height is found correctly, and appropriate work is shown, but the number of seconds is not found or is found incorrectly.

[1] 3 and 42, but no work is shown.

[0] 3 *or* 42, but no work is shown.

or

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(31) **[4]** 1,500, and appropriate work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or

[1] A correct equation is written, but no further correct work is shown.

or

[1] 1,500, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(32) **[4]** 84, and appropriate work is shown, and correct explanations are written.

[3] Appropriate work is shown, but one computational or rounding error is made, but both explanations are correct.

or

[3] 84, but only one of the explanations is correct.

[2] 84, but both explanations are only partially correct.

[1] 84, but both explanations are missing or are incorrect.

or

[1] One correct explanation is written, but no further correct work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Part IV

For each question, use the specific criteria to award a maximum of six credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(33) **[6]** 80 and 9.2, and appropriate work is shown.

[5] Appropriate work is shown, but one computational or rounding error is made.

[4] Appropriate work is shown, but two or more computational or rounding errors are made.

or

[4] Appropriate work is shown, but one conceptual error is made in solving for one of the values.

or

[4] 80, and appropriate work is shown, but the length of $\overline{PT}$ is not found or is found incorrectly.

or

[4] The measure of all three arcs and the length of $\overline{PT}$ are found correctly, but the measure of $\angle P$ is not found or is found incorrectly.

[3] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

[2] Appropriate work is shown, but one conceptual error is made in solving for each value.

or

[2] 80 and 9.2, but no work is shown.

or

[2] 9.2, and appropriate work is shown, but no further correct work is shown.

or

[2] The measures of all three arcs are found correctly, but no further correct work is shown.

[1] 80 *or* 9.2, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Office of State Assessment
Albany, New York 12234

IMPORTANT NOTICE

Notice to Teachers

Mathematics B
Scoring Key

Tuesday, June 22, 2004—1:15 p.m.

Please refer to the following additional guidance when rating Question 33:

1. Students who assumed that $m\overset{\frown}{RT}$ referred to the minor arc should be awarded 2 credits for writing the equation $x + 3x = 5x$.

2. You may accept multiple solutions when students solve for *PT*.

- Students who use a mean proportion to solve for *PT* will find the answer 9.2, as specified in the rubric.

  Example of response using a mean proportion:

  $\frac{17}{x} = \frac{x}{5}$
  $x^2 = 85$
  $x = 9.2$

- Students who use the Law of Sines or the Law of Cosines will find different measures for $\overline{PT}$, based on whether $\triangle TRP$ or $\triangle TAP$ is constructed.

  Example of response using Law of Cosines and $\triangle TRP$:

  $x^2 = 17^2 + 17^2 - 2(17)(17)\cos 20$
  $x^2 = 289 + 289 - 543.1423348$
  $x^2 = 34.85766519$
  $x = 5.9$

  Example of response using Law of Sines and $\triangle TAP$:

  $\frac{\sin 20}{5} = \frac{\sin 80}{x}$
  $x = 14.4$

- Apply the rubric as written to the student's method of response, whether it is a method described here or another mathematically appropriate method.

(34) **[6]** 312 and 30,642, and appropriate work is shown, such as using the Law of Cosines and the area formula.

[5] Appropriate work is shown, but one computational or rounding error is made.

[4] Appropriate work is shown, but two or more computational or rounding errors are made.

or

[4] Appropriate work is shown, but one conceptual error is made.

or

[4] Appropriate work is shown, but the square root is not computed to find the length of the third side, but an appropriate area is found.

or

[4] The length of the third side is found correctly, but no further correct work is shown.

[3] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

[2] The area of the triangle is found correctly, but no further correct work is shown.

or

[2] 312 and 30,642, but no work is shown.

[1] Appropriate work is shown to find the area of the triangle, but one computational or rounding error is made, and no further correct work is shown.

or

[1] 312 *or* 30,642, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Map to Learning Standards

Key Ideas	Item Numbers
Mathematical Reasoning	20, 25
Number and Numeration	1, 15, 23
Operations	4, 10, 14, 19
Modeling/Multiple Representation	6, 8, 9, 11, 28, 30, 31
Measurement	3, 12, 16, 33, 34
Uncertainty	2, 7, 21, 32
Patterns/Functions	5, 13, 17, 18, 22, 24, 26, 27, 29

Regents Examination in Mathematics B

June 2004

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scaled Scores)

The *Chart for Determining the Final Examination Score for the June 2004 Regents Examination in Mathematics B*, normally located on this page, will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Tuesday, June 22, 2004. Conversion charts provided for previous administrations of the Mathematics B examination must NOT be used to determine students' final scores for this administration.