FOR TEACHERS ONLY

MATHEMATICS B

Thursday, June 15, 2006 — 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 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 Thursday, June 15, 2006. 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) 3	(6) 1	(11) 2	(16) 4
(2) 1	(7) 1	(12) 2	(17) 1
(3) 2	(8) 2	(13) 4	(18) 2
(4) 4	(9) 3	(14) 4	(19) 3
(5) 3	(10) 1	(15) 2	(20) 1

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. Check this web site http://www.emsc.nysed.gov/osa/ and select the link "Examination Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents examination period.

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 Scoring the Regents 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).

[2]

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]** $-3 + i$, and an appropriate graph is drawn.

[1] The sum is found incorrectly, but an appropriate graph is drawn.

or

[1] $-3 + i$, but no graph or an incorrect graph is drawn.

[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]** 3, and appropriate work is shown, such as $\dfrac{10}{\sin 53°} = \dfrac{b}{\sin 14°}$.

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

or

[1] The proportion $\dfrac{10}{\sin 53°} = \dfrac{b}{\sin 14°}$ is written, but no further correct work is shown.

or

[1] An incorrect proportion of equal difficulty is solved appropriately.

or

[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.

(23) **[2]** 7, and appropriate work is shown, such as $2^3 = x + 1$.

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

or

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

or

[1] $2^3 = x + 1$ is written, but no further correct work is shown.

or

[1] 7, 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]** $\frac{5}{6}$ or $0.8\bar{3}$, and appropriate work is shown.

[1] Appropriate work is shown, but one computational or rounding error is made, such as representing $\frac{5}{6}$ as a terminating decimal.

or

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

or

[1] $\frac{5}{6}$ or $0.8\bar{3}$, 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.

(25) **[2]** .3087 or an equivalent answer, and appropriate work is shown.

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

or

[1] Appropriate work is shown, but one conceptual error is made, such as evaluating $_5C_3(0.3)^3(0.7)^2$.

or

[1] .3087 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.

(26) **[2]** 20, and appropriate work is shown, such as using the formula $S = r\theta$.

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

   or

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

   or

   [1] 20, 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.

[OVER]

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]** (0,–3) and (1,0) or an equivalent answer, and appropriate algebraic work is shown.

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

or

[3] Appropriate work is shown, but only one correct solution is found or only the *x*- or the *y*-values are found correctly.

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

or

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

or

[2] (0,–3) and (1,0), but a method other than an algebraic solution is used.

or

[2] A correct quadratic equation is written in standard form, such as $18x^2 - 18x = 0$, but no further correct work is shown.

or

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

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

or

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

or

[1] $y = 3x - 3$ is found and substituted into the second equation, but no further correct work is shown.

or

[1] (0,–3) and (1,0), but no work is shown.

[0] Only one correct solution is found or only the *x*- or the *y*-values are found correctly, and 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.

(28)   **[4]** $\frac{-a}{2+a}$ or $\frac{a}{-2-a}$, and appropriate work is shown.

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

[2] 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, such as not recognizing that –1 is a factor.

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

or

[1] $\frac{-a}{2+a}$ or $\frac{a}{-2-a}$, 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.

[OVER]

(29)   **[4]** 5, and appropriate algebraic work is shown.

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

or

[3] 5 and 0, and appropriate work is shown, but the zero is not rejected.

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

or

[2] Appropriate work is shown, but one conceptual error is made, such as squaring $x - 1$ incorrectly.

or

[2] 5, but a method other than an algebraic solution is used, such as graphing or trial and error with at least three trials and appropriate checks.

or

[2] A correct quadratic equation is written in standard form, such as $0 = x^2 - 5x$, but no further correct work is shown.

or

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

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

or

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

or

[1] 5, but no work is shown.

[0] 5 and 0, and 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.

(30)   **[4]** Mean = 3.6, standard deviation = 2.9, and 31, and appropriate work is shown, such as an explanation of how the solutions were found.

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

or

[3] The mean and standard deviation are calculated correctly and appropriate work is shown, but the number of presidents in the specified interval is found incorrectly.

[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 using the sample standard deviation.

or

[2] The mean and standard deviation are calculated correctly, but the number of presidents is not found.

or

[2] The mean and standard deviation are calculated incorrectly, but an appropriate number of presidents is found.

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

or

[1] Mean = 3.6, standard deviation = 2.9, and 31, but no work is shown.

[0] Mean = 3.6 *or* standard deviation = 2.9 *or* 31, 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.

[OVER]

(31) **[4]** f(*x*) = 98.8571*x* + 737.3333 or *y* = 98.8571*x* + 737.3333 and day 14, and appropriate substitution is made, such as 2050 = 98.8571*x* + 737.3333.

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

or

[3] A correct linear regression equation is written and day 14, but no substitution is made.

or

[3] The expression 98.8571*x* + 737.3333 is written and day 14, and appropriate substitution is made, but no equation is written.

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

or

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

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

or

[1] The expression 98.8571*x* + 737.3333 is written, but no further correct work is shown.

or

[1] Day 14, 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]** A correct graph is drawn, and 3.

[3] 3, and appropriate work is shown, but one graphing error is made.

or

[3] A correct graph is drawn and the points 0.5 and 3.5 are identified, but the difference is not calculated.

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

or

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

or

[2] 3, but a method other than a graphic solution is used.

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

or

[1] A correct graph is sketched with $t = 0$ to $t = 4$, but no further correct work is shown.

or

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

[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]** Appropriate work is shown, such as using slopes to prove *ABCD* is a parallelogram but not a rectangle, and an appropriate concluding statement is made.

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

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

or

[4] Appropriate work is shown, but one conceptual error is made, such as using an incorrect formula.

or

[4] A proof is written that correctly shows either *ABCD* is a parallelogram or it is not a rectangle, but not both.

[3] Appropriate work is shown, but two or more computational or graphing errors are made, and the concluding statement is incomplete.

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

or

[2] All four slopes are found correctly or the lengths of all four sides are found correctly, and appropriate work is shown, but no further correct work is shown.

[1] The slopes of all four sides are identified or the lengths of all four lines are identified, but no work is shown and no proof is written.

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

(34) **[6]** 16.2, and appropriate work is shown, such as using the Law of Cosines to find one angle, and then using $K = \frac{1}{2}ab \sin C$ or Hero(n)'s formula, $A = \sqrt{s(s-a)(s-b)(s-c)}$, to find the area.

[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.

[3] Appropriate work is shown, but one conceptual error is made, but an appropriate area is found.

or

[3] The Law of Cosines is used to find a correct measure for one of the angles of the triangle, but no further correct work is shown.

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

[1] Correct substitution is made into the Law of Cosines, but no further correct work is shown.

or

[1] 16.2, but no work is shown.

[0] Right triangle trigonometry is used inappropriately.

or

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

Regents Examination in Mathematics B

June 2006

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

The *Chart for Determining the Final Examination Score for the June 2006 Regents Examination in Mathematics B* will be posted on the Department's web site **http://www.emsc.nysed.gov/osa/** on Thursday, June 15, 2006. Conversion charts provided for previous administrations of the Mathematics B examination must NOT be used to determine students' final scores for this administration.

The *Teacher Evaluation of State Examinations* forms will also be posted on the same web site. Please select the link "Teacher Evaluation Forms" and then the examination title to complete the evaluation form for the *June 2006 Regents Examination in Mathematics B.*