FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS B

Friday, January 27, 2006 — 9:15 a.m. to 12:15 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 Friday, January 27, 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) 2	(11) 3	(16) 3
(2) 1	(7) 3	(12) 1	(17) 4
(3) 1	(8) 3	(13) 2	(18) 4
(4) 4	(9) 2	(14) 4	(19) 1
(5) 2	(10) 1	(15) 2	(20) 4

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 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).

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]** 11, and appropriate work is shown, such as $f(1) = 4$ and $g(4) = 11$.

[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 solving for $f(g(1))$.

or

[1] 11, 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]** A mapping is drawn that maps at least one element of set A to more than one element of set B, and an appropriate explanation of the difference between functions and relations is written.

[1] An appropriate mapping is drawn, but no explanation is written.

or

[1] An incorrect mapping is drawn, but an appropriate explanation 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.

(23) **[2]** 8, and appropriate work is shown, such as $(PA)^2 = 4 \times 16 = 64$.

[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 failing to reject the negative root.

or

[1] 8, 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]** 4.4, 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.

or

[1] Only the constant of variation, 220, is found.

or

[1] 4.4, but no work is shown.

[0] Direct variation is used.

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]** $\frac{60}{729}$ or $\frac{20}{243}$ or .0823, and appropriate work is shown, such as ${}_6C_2\left(\frac{2}{3}\right)^2\left(\frac{1}{3}\right)^4$.

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

or

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

or

[1] A correct expression is written, such as ${}_6C_2\left(\frac{2}{3}\right)^2\left(\frac{1}{3}\right)^4$, but no further correct work is shown.

or

[1] $\frac{60}{729}$ or $\frac{20}{243}$ or .0823, 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]** 2, 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.

or

[1] 2, but a method other than an algebraic solution is used.

or

[1] 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.

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]** $-1 \pm i\sqrt{6}$, and appropriate work is shown, such as appropriately substituting for a, b, and c in the quadratic formula, solving the equation, and simplifying the answer correctly.

[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 writing the quadratic formula incorrectly.

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

or

[1] $-1 \pm i\sqrt{6}$, 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]** (0,1) and (3,8), and both graphs are sketched correctly.

[3] Appropriate work is shown, but one graphing error is made, but all appropriate points of intersection are identified.

[2] Appropriate work is shown, but two or more graphing errors are made, but all appropriate points of intersection are identified.

or

[2] Appropriate work is shown, but one conceptual error is made, such as failing to draw the graph over the specified interval, resulting in only one point of intersection.

or

[2] Both graphs are sketched correctly, and the two points of intersection are indicated, but the coordinates are not stated or are stated incorrectly.

[1] Only the graph of the exponential function is sketched correctly, and no further correct work is shown.

or

[1] (0,1) and (3,8), but no graph is sketched.

[0] (0,1) *or* (3,8), but no graph is sketched.

or

[0] Only the line is graphed correctly.

or

[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]** $\frac{-1}{m+1}$ or $\frac{1}{-m-1}$, 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.

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

or

[1] $\frac{-1}{m+1}$ or $\frac{1}{-m-1}$, 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]** $\frac{\pi}{6}$ and $\frac{5\pi}{6}$ and 10, and appropriate work is shown.

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

or

[3] $x = 0.52$ and $x = 2.62$ or $x = 30°$ and $x = 150°$ and 10, and appropriate work is shown.

or

[3] $\frac{\pi}{6}$ and $\frac{5\pi}{6}$, and appropriate work is shown, but the maximum height is missing.

[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] $x = 0.52$ and $x = 2.62$ or $x = 30°$ and $x = 150°$, and appropriate work is shown, but the maximum height is missing.

or

[2] $\frac{\pi}{6}$ *or* $\frac{5\pi}{6}$ and 10, and appropriate work is shown.

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

or

[1] 30° *or* 150° and 10, and appropriate work is shown.

or

[1] $\frac{\pi}{6}$ and $\frac{5\pi}{6}$ and 10, 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.

(31) **[4]** 438, and appropriate work is shown, such as using the Law of Cosines or the Law of Sines.

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

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

or

[1] 438, 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.

(32) **[4]** 16,600 and 11.3, and appropriate work is shown.

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

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

or

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

or

[2] Either 16,600 or 11.3 is found, and appropriate work is shown, but the other answer is not found.

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

or

[1] Correct substitutions are made into both formulas, but no further correct work is shown.

or

[1] 16,600 and 11.3, but no work is shown.

[0] 16,600 *or* 11.3, 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.

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]** $p = 8.1875t + 72.7860$, 1993, and 220.2, and appropriate work is shown.

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

or

[5] The expression $8.1875t + 72.7860$ is written and 1993 and 220.2 are found, and appropriate work is shown.

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

or

[4] A correct equation is written, but either the year or the predicted value for 2008 is not found, but appropriate work is shown.

or

[4] An incorrect equation is solved appropriately.

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

or

[3] $p = 8.1875t + 72.7860$, 1993, and 220.2, but no work is shown.

or

[3] The expression $8.1875t + 72.7860$ is written and either 1993 or 220.2 is found, and appropriate work is shown.

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

or

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

or

[2] 1993 and 220.2, but no work is shown.

[1] The expression $8.1875t + 72.7860$ is written, but no further correct work is shown.

or

[1] 1993 *or* 220.2, 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.

(34) **[6]** A complete and correct proof is written.

[5] A proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but one statement or reason is missing or is incorrect, or the concluding statement is missing.

[4] A proof is written that demonstrates a good understanding of the method of proof and contains no conceptual errors, but two statements or reasons are missing or are incorrect.

[3] A proof is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.

[2] Some correct relevant statements about the proof are made, but three or four statements or reasons are missing or are incorrect.

[1] Only one correct statement and reason are written.

[0] The "given" and/or the "prove" statements are rewritten in the style of a formal proof, but no further correct relevant statements are written.

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

Regents Examination in Mathematics B

January 2006

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

The *Chart for Determining the Final Examination Score for the January 2006 Regents Examination in Mathematics B* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Friday, January 27, 2006. Conversion charts provided for previous administrations of the Mathematics B examination must NOT be used to determine students' final scores for this administration.