FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS B

Tuesday, August 16, 2005 — 8:30 to 11:30 a.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 Tuesday, August 16, 2005. 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) 2	(6) 1	(11) 4	(16) 1
(2) 3	(7) 3	(12) 2	(17) 2
(3) 4	(8) 4	(13) 3	(18) 1
(4) 3	(9) 2	(14) 3	(19) 2
(5) 4	(10) 1	(15) 4	(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]** 70, 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] The values for $n = 1$ through $n = 5$ are computed correctly, but they are not added.

or

[1] 70, 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]** $\frac{40}{243}$ or an equivalent fraction or .1646, and appropriate work is shown, such as ${}_5C_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2$.

[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, such as finding the probability of choosing at least three even-numbered channels.

or

[1] $\frac{40}{243}$ or an equivalent fraction or .1646, 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]** 32, and appropriate work is shown.

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

or

[1] Only the constant of variation, 28,800, is found.

or

[1] 32, 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.

(24) **[2]** 6.9, and appropriate work is shown, such as $2.4 \bullet 165 \bullet \frac{\pi}{180}$.

[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] Appropriate work is shown, but the calculations are performed in radians.

or

[1] Correct substitution is made into the equation for the length of the arc, but no further correct work is shown.

or

[1] 6.9, 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]** A complete and correct explanation is written, such as stating that since the graph lies entirely above the x-axis, there is no point on the graph where $y = 0$.

[1] An incomplete or partially correct explanation is written, such as stating that the equation has imaginary roots.

[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]** $2 \cos x$, and appropriate work is shown, such as factoring the numerator and substituting $\cos^2 x$ for $1 - \sin^2 x$.

[1] Appropriate work is shown, but one factoring or substitution error is made, or the expression is not simplified completely.

or

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

or

[1] $2 \cos x$, 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]** 88, and appropriate work is shown, such as $\frac{y}{\sin 32} = \frac{100}{\sin 33}$ and $\sin 65 = \frac{x}{y}$.

[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, such as setting up an incorrect proportion.

or

[2] The hypotenuse of one of the right triangles is found correctly, 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] The obtuse triangle is treated as a right triangle, but an appropriate height is found for the tower.

or

[1] 88, 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]** 15.13, and appropriate work is shown, such as solving the equation $236.64 = \pi(4.75)\sqrt{(4.75)^2 + h^2}$.

[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] Correct substitution of values is made into the equation, but no further correct work is shown.

or

[1] 15.13, 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]** 3 and $\frac{1}{2}$, and appropriate work is shown.

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

or

[3] Appropriate work is shown, but only one of the values is found.

[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] The correct quadratic equation is written in standard form, 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] 3 and $\frac{1}{2}$, but no work is shown.

[0] 3 *or* $\frac{1}{2}$, 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.

(30) **[4]** The function is graphed over the specified interval, and 96, and appropriate work is shown, such as calculating the revenue at 95 and 96 to show that 96 will make the hotel profitable or writing an explanation.

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

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

or

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

or

[2] 96, and appropriate work is shown, but no graph is drawn.

or

[2] The function is graphed correctly, but no further correct work is shown.

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

or

[1] 96, 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.

(31) **[4]** $15 < x < 60$, and appropriate work is shown, such as solving the algebraic inequality $-10x^2 + 750x - 9000 > 0$ or a graphic solution.

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

or

[3] $15 \leq x \leq 60$, and appropriate work is shown.

[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, such as solving the equation $-10x^2 + 750x - 9000 = 0$ for 15 and 60.

or

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

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

or

[1] $15 < x < 60$, but no work is shown.

[0] $15 \leq x \leq 60$, 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.

(32) **[4]** Both equations are graphed correctly over the specified domain and the interval $-\frac{\pi}{3} \le x \le \frac{\pi}{3}$ is identified.

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

or

[3] Both equations are graphed correctly over the specified domain, but the interval is not identified or is written as $-1.0472 \le x \le 1.0472$ or $-60° \le x \le 60°$ or $-\frac{\pi}{3} < x < \frac{\pi}{3}$.

[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, such as graphing $y = 4 \sin x$.

or

[2] The equation $y = 4 \cos x$ is graphed correctly over the specified domain, but no further correct work is shown.

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

or

[1] $-\frac{\pi}{3} \le x \le \frac{\pi}{3}$, but no work is shown and no graphs are drawn.

[0] The equation $y = 2$ is graphed correctly, but no further correct work is shown.

or

[0] $-1.0472 \le x \le 1.0472$ or $-60° \le x \le 60°$ or $-\frac{\pi}{3} < x < \frac{\pi}{3}$, 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.

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]** $y = 0.01021x - 1.66787$, 4.56, and 913, and appropriate work is shown.

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

or

[5] The expression $0.01021x - 1.66787$ is written and 4.56 and 913 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 gross earnings or the number of theaters is not found, but appropriate work is shown.

or

[4] An incorrect equation of equal difficulty is written, but appropriate answers are found, and appropriate work is shown.

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

or

[3] $y = 0.01021x - 1.66787$, 4.56, and 913, but no work is shown.

or

[3] The expression $0.01021x - 1.66787$ is written and either 4.56 or 913 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.

[1] 4.56 and 913, but no work is shown.

or

[1] The expression $0.01021x - 1.66787$ is written, but no further correct work is shown.

[0] Either 4.56 or 913, 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.

(34) **[6]** A complete and correct proof that includes a concluding statement is written, such as showing that $\overline{AB}$ is parallel to $\overline{CD}$ and that $\overline{BC}$ is not parallel to $\overline{AD}$ by finding their slopes and using the distance formula to show that the two nonparallel sides are equal.

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

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

or

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

or

[4] The slopes of all four sides are found correctly and the lengths of $\overline{AD}$ and $\overline{BC}$ are found correctly, and appropriate work is shown, but no conclusion is stated.

or

[4] A proof is written that correctly shows *ABCD* is a trapezoid, but it is not proved to be isosceles.

[3] The slopes of only one pair of sides are found correctly, but the lengths of $\overline{AD}$ and $\overline{BC}$ are found correctly, and appropriate work is shown, and an appropriate conclusion is stated.

or

[3] A correct numerical illustration is given in lieu of a proof of the general case.

[2] The slopes of only one pair of sides are found correctly, but the lengths of $\overline{AD}$ and $\overline{BC}$ are found correctly, and appropriate work is shown, but no conclusion is stated.

[1] Either the slopes or the lengths of $\overline{AD}$ and $\overline{BC}$ are found correctly, but no conclusion is stated.

or

[1] The correct definition of an isosceles trapezoid is written, but no further correct work is shown.

[0] The slopes of $\overline{AB}$ and $\overline{DC}$ are found correctly, 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.

Map to Learning Standards

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

Regents Examination in Mathematics B

August 2005

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

The *Chart for Determining the Final Examination Score for the August 2005 Regents Examination in Mathematics B* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Tuesday, August 16, 2005. Conversion charts provided for previous administrations of the Mathematics B examination must NOT be used to determine students' final scores for this administration.