FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS B

Tuesday, June 23, 2009 — 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 Examination in 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 check marks 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 23, 2009. 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) 3	(11) 3	(16) 3
(2) 1	(7) 2	(12) 4	(17) 1
(3) 2	(8) 4	(13) 3	(18) 1
(4) 1	(9) 4	(14) 3	(19) 4
(5) 2	(10) 3	(15) 4	(20) 2

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 Examination in 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 Examination in 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]** 5, 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 finding $g\big(f(-2)\big)$.

or

[1] 5, 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]** 0.42, 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] A correct equation is written, but sin B is not found.

or

[1] 0.42, 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]** $\frac{1}{3}$, and appropriate algebraic 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 equation $(3^2)^{3x} = 3^{3x+1}$ or an equivalent equation is written, but no further correct work is shown.

or

[1] $\frac{1}{3}$, but a method other than algebraic is used.

or

[1] $\frac{1}{3}$, 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]** 40, 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] 40, 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]** 3, 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] $8^{\frac{2}{3}} = x + 1$, but no further correct work is shown.

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.

(26) **[2]** The inverse function is graphed correctly.

[1] One graphing error is made.

[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]** $y = -35.5x + 457.5$ and 103, and appropriate work is shown, such as substituting 10 into the regression equation.

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

or

[3] The expression $-35.5x + 457.5$ is written and 103, and appropriate substitution is shown, but no equation is written.

or

[3] $y = -35.5x + 457.5$ and 103, but no substitution is shown.

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

or

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

or

[2] An incorrect linear regression equation is written, but an appropriate number of new cases is found.

or

[2] $y = -35.5x + 457.5$, but no further correct work is shown.

or

[2] The expression $-35.5x + 457.5$ is written and 103, but no substitution is shown.

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

or

[1] The expression $-35.5x + 457.5$ is written or 103, but no substitution 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]** Both $\triangle ABC$ and $\triangle A''B''C''$ are graphed and labeled correctly.

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

or

[3] Appropriate work is shown, but only $\triangle A''B''C''$ is graphed and labeled correctly.

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

or

[2] Appropriate work is shown, but one conceptual error is made, such as reflecting over the x-axis before reflecting over the line $y = x$.

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

or

[1] $A''(1,-3)$, $B''(4,0)$, and $C''(3,5)$ are stated, but no work is shown.

or

[1] $\triangle ABC$ is graphed and labeled correctly, but only $r_{y = x}$ or $r_{x\text{-axis}}$ is graphed correctly.

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

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

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

or

[2] Appropriate work is shown, but one conceptual error is made, such as not factoring out –1.

or

[2] Appropriate work is shown, but the answer is left as $\frac{3x - 9}{2(x - 3)}$ or as an equivalent expression.

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

or

[1] Appropriate work is shown, but the answer is left as $\frac{3x}{2(x - 3)} + \frac{9}{2(3 - x)}$.

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.

(30) **[4]** $\frac{918}{1024}$ or an equivalent answer, and appropriate work is shown, such as

$${}_5C_0\left(\frac{1}{4}\right)^0\left(\frac{3}{4}\right)^5 + {}_5C_1\left(\frac{1}{4}\right)^1\left(\frac{3}{4}\right)^4 + {}_5C_2\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right)^3 .$$

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

or

[3] ${}_5C_0\left(\frac{1}{4}\right)^0\left(\frac{3}{4}\right)^5$, ${}_5C_1\left(\frac{1}{4}\right)^1\left(\frac{3}{4}\right)^4$, and ${}_5C_2\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right)^3$ are evaluated, but the values are not added.

[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 finding the probability of "*not* telling the truth at most twice" or the probability of "telling the truth at least twice."

or

[2] ${}_5C_0\left(\frac{1}{4}\right)^0\left(\frac{3}{4}\right)^5 + {}_5C_1\left(\frac{1}{4}\right)^1\left(\frac{3}{4}\right)^4 + {}_5C_2\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right)^3$, 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] Appropriate work is shown to find $\frac{270}{1024}$, the probability of telling the truth exactly twice out of five times.

or

[1] $\frac{918}{1024}$ 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.

(31) **[4]** $24 + 8\sqrt{2} + 8\sqrt{3}$, and appropriate work is shown, such as labeling the diagram using special right triangle rules or right triangle trigonometry.

[3] Appropriate work is shown, but one computational error is made or the answer is not in simplest radical form.

or

[3] The measures of the four segments are found correctly, but the perimeter is not found or is found incorrectly.

[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 measures of three segments are found correctly, but no further correct work is shown.

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

or

[1] The measures of two segments are found correctly, but no further correct work is shown.

or

[1] $24 + 8\sqrt{2} + 8\sqrt{3}$, 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.

(32) **[4]** 60, 109.5, 250.5, 300, and appropriate work is shown algebraically or graphically.

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

or

[3] Appropriate work is shown, but only three correct values of θ are found.

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

or

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

or

[2] Appropriate work is shown, but only two correct values of θ are found.

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

or

[1] Appropriate substitutions are made and the equation is written in standard form, but no further correct work is shown.

or

[1] 60, 109.5, 250.5, 300, but no work is shown.

[0] 60 or 109.5 or 250.5 or 300, 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]** 8,200, and appropriate work is shown, such as using the Law of Cosines or Hero(n)'s 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.

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

or

[3] The Law of Cosines is used to find an angle, 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] A correct substitution is made into the Law of Cosines, but no further correct work is shown.

or

[1] 8,200, 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 that includes a conclusion 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 and/or reason is missing or is incorrect.

or

[5] $\triangle BEA = \triangle CED$ is proven or $\triangle BEC$ is proven to be isosceles, but no further correct work is shown.

[4] A proof is written that demonstrates a good understanding of the method of proof, but two statements and/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 and/or reasons are missing or are incorrect.

or

[2] A proof is written that demonstrates understanding of the method of proof, but one conceptual error is made, and one statement or reason is missing or is incorrect.

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

Regents Examination in Mathematics B

June 2009

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

The *Chart for Determining the Final Examination Score for the June 2009 Regents Examination in Mathematics B* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Tuesday, June 23, 2009. Conversion charts provided for the previous administrations of the Regents Examination in Mathematics B must NOT be used to determine students' final scores for this administration.

Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to http://www.emsc.nysed.gov/osa/exameval.
2. Select the test title.
3. Complete the required demographic fields.
4. Complete each evaluation question and provide comments in the space provided.
5. Click the SUBMIT button at the bottom of the page to submit the completed form.

As a reminder . . .

Regents examinations based on the Mathematics B syllabus will not be offered after June 2010.