

# FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

## MATHEMATICS B

Tuesday, January 27, 2009 — 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 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, January 27, 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) 4	(6) 1	(11) 2	(16) 4
(2) 3	(7) 2	(12) 4	(17) 1
(3) 4	(8) 4	(13) 3	(18) 4
(4) 2	(9) 3	(14) 3	(19) 3
(5) 4	(10) 1	(15) 3	(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).

**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]  $-2$ , and appropriate work is shown, such as solving the equation algebraically, graphically, or using trial and error with at least three trials and appropriate checks.

[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 trial-and-error method is attempted and at least six systematic trials and appropriate checks are shown, but no solution is found.

*or*

[1]  $-2$ , but no work or fewer than three trials and appropriate checks are 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]  $0$ , 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]  $0$ , 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.

MATHEMATICS B – *continued*

(23) [2] 135, 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] Appropriate work is shown to find 9, the number of periods, but it is not converted to minutes.

**or**

[1] 135, 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] 30, 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 only half the area of the parallelogram.

**or**

[1] The altitude of the parallelogram is found to be 3, but no further correct work is shown.

**or**

[1] 30, 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.

MATHEMATICS B – *continued*

- (25) [2]  $-3 \leq x \leq 8$  or an equivalent expression, 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] Appropriate work is shown, but only  $x \leq 8$  or  $-3 \leq x$  is found.
- or**
- [1]  $-3 \leq x \leq 8$ , 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.
- (26) [2]  $r = \sqrt[3]{\frac{3V}{4\pi}}$  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.
- or**
- [1]  $r = \sqrt[3]{\frac{3V}{4\pi}}$  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.
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**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]  $\bar{x} = 54.2$ ,  $\sigma = 17.6$ , and the number of months is 6, and appropriate work is shown.

[3]  $\bar{x} = 54.2$ ,  $\sigma = 17.6$ , but one computational error is made in determining the number of months.

*or*

[3]  $\bar{x} = 54.2$ , but  $\sigma$  is incorrect, but work is shown to find an appropriate number of months.

*or*

[3]  $\bar{x} = 54.2$ ,  $\sigma = 17.6$ , and the number of months is 6, but no work is shown.

[2]  $\bar{x}$  and  $\sigma$  are incorrect, but work is shown to find an appropriate number of months.

*or*

[2]  $\bar{x} = 54.2$ ,  $\sigma = 17.6$ , but the number of months is not determined.

[1] 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.

MATHEMATICS B – *continued*

- (28) [4]  $-1$ , 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 not multiplying by the reciprocal.
- [1] Appropriate work is shown, but one conceptual error and one computational, factoring, or simplification error are made.
- or***
- [1]  $-1$ , 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.

MATHEMATICS B – *continued*

- (29) [4] 41.4, 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 substitution is made into the Law of Cosines, but no further correct work is shown.
- or***
- [1] 41.4, 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.

MATHEMATICS B – *continued*

(30) [4] Triangles  $ABC$  and  $A''B''C''$  are graphed and labeled correctly. [Students are *not* required to state the coordinates  $A''(6,-6)$ ,  $B''(-4,-10)$ , and  $C''(-2,6)$ .]

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

**or**

[3] Only triangle  $A''B''C''$  is graphed and labeled correctly.

[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] Triangle  $ABC$  is graphed and labeled correctly, and either the rotation or dilation is graphed and labeled correctly.

**or**

[2] The coordinates  $A''(6,-6)$ ,  $B''(-4,-10)$ , and  $C''(-2,6)$  are stated, 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] Triangle  $ABC$  is graphed and labeled correctly, 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.

MATHEMATICS B – *continued*

(31) [4]  $1 \pm i\sqrt{6}$ , and appropriate work is shown.

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

*or*

[3] Appropriate work is shown, but the solution is expressed as  $\frac{2 \pm 2i\sqrt{6}}{2}$ .

[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] Appropriate work is shown, but the solution is expressed as  $\frac{2 \pm \sqrt{-24}}{2}$ .

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

*or*

[1] A correct substitution is made in the quadratic formula, but no further correct work is shown.

*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.

MATHEMATICS B – *continued*

- (32) [4]  $(3,4)$ ,  $(4,3)$ ,  $(-3,-4)$ , and  $(-4,-3)$ , and appropriate graphs are drawn.
- [3] Appropriate work is shown, but one computational or graphing error is made.
- or***
- [3] Appropriate graphs are drawn, but only two or three points of intersection are identified.
- [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 only graphing half of the hyperbola and finding two points of intersection.
- or***
- [2] Appropriate graphs are drawn, but no points of intersection are identified.
- [1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
- or***
- [1] Either the circle or the hyperbola is graphed correctly, but no further correct work is shown.
- or***
- [1]  $(3,4)$ ,  $(4,3)$ ,  $(-3,-4)$ , and  $(-4,-3)$ , 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.
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**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]  $y = 13.0134 - 7.3135 \ln x$ ,  $-16$ , and  $6$ , and appropriate work is shown.

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

*or*

[5] The expression  $13.0134 - 7.3135 \ln x$  is written and  $-16$  and  $6$  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 logarithmic regression equation is written, but either the wind chill factor or the wind speed is not found, but appropriate work is shown.

*or*

[4] An incorrect logarithmic regression equation of equal difficulty is written, but appropriate answers are found for the wind chill factor and the wind speed, and appropriate work is shown.

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

*or*

[3]  $y = 13.0134 - 7.3135 \ln x$ ,  $-16$ , and  $6$ , but no work is shown.

*or*

[3] The expression  $13.0134 - 7.3135 \ln x$  is written and either  $-16$  or  $6$  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]  $y = 13.0134 - 7.3135 \ln x$ , but no further correct work is shown.

*or*

[2] An incorrect logarithmic regression equation of equal difficulty is written, but an appropriate answer is found for either the wind chill factor or the wind speed, and appropriate work is shown.

*or*

MATHEMATICS B – *continued*

- [2] An incorrect regression equation of a lesser degree of difficulty is written, but appropriate answers are found for the wind chill factor and the wind speed, and appropriate work is shown.

*or*

- [2]  $-16$  and  $6$ , but no equation is written and no work is shown.

- [1] An incorrect regression equation of a lesser degree of difficulty is written, but an appropriate answer is found for either the wind chill factor or the wind speed, and appropriate work is shown.

*or*

- [1] The expression  $13.0134 - 7.3135 \ln x$  is written, but no further correct work is shown.

*or*

- [1]  $-16$  *or*  $6$ , but no equation is written and 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]  $\triangle SEP \cong \triangle VEO$  is proven, but no further correct work is shown.
- [4] A proof is written that demonstrates a good understanding of the method of proof and contains no conceptual errors, 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.
- [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.
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**Map to Learning Standards**

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

**Regents Examination in Mathematics B**

**January 2009**

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

**The *Chart for Determining the Final Examination Score for the January 2009 Regents Examination in Mathematics B* will be posted on the Department’s web site <http://www.emsc.nysed.gov/osa/> on Tuesday, January 27, 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 A syllabus will not be offered after January 2009.**

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

