

# FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

## MATHEMATICS B

Tuesday, January 26, 2010 — 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 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 scale 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 26, 2010. The student's scale score should be entered in the box provided on the student's detachable answer sheet. The scale 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) 3
(2) 1	(7) 3	(12) 4	(17) 2
(3) 3	(8) 2	(13) 4	(18) 4
(4) 3	(9) 4	(14) 2	(19) 2
(5) 1	(10) 3	(15) 1	(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] 10, 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  $(g \circ f)(2)$ .

*or*

[1] 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.

(22) [2]  $\angle B \cong \angle C$  and ASA, or  $\angle T \cong \angle E$  and AAS, or  $\overline{AT} \cong \overline{RE}$  and SAS.

[1] A correct statement is written, but the method is not stated or is stated incorrectly.

*or*

[1] An acceptable method to prove congruency is stated, but no statement 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.

MATHEMATICS B – *continued*

- (23) [2]  $8 - 3i$ , and a correct graph is drawn as either a vector or a point.
- [1] Appropriate work is shown, but one computational or graphing error is made.
- or**
- [1] Appropriate work is shown, but one conceptual error is made.
- or**
- [1] The solution is plotted correctly, but the difference is not stated.
- or**
- [1]  $8 - 3i$ , but 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.
- (24) [2] A correct graph connecting the points  $(4,3)$ ,  $(3,1)$ , and  $(-2,-1)$  is drawn.
- [1] Appropriate work is shown, but one graphing error is made.
- or**
- [1] Appropriate work is shown, but one conceptual 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.
- (25) [2]  $17i\sqrt{3}$ , 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]  $17i\sqrt{3}$ , 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.

(26) [2]  $\frac{3 + \sqrt{7}}{2}$ , 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]  $\frac{3 + \sqrt{7}}{2}$ , but no work is shown.

[0]  $\frac{1}{3 - \sqrt{7}}$ , 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.

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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] 172, 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.

*or*

[2] Appropriate work is shown to find  $ST = 19.96$  or  $RT = 17.81$ , 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] 172, 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]  $y = 0.0834x + 1.259$  and 1.28, and appropriate work is shown, such as substituting 5 for  $x$ .

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

*or*

[3]  $y = 0.0834x + 1.259$ , and appropriate work is shown to find 1.676, the predicted price, but the difference in price is not found or is found incorrectly.

*or*

[3] The expression  $0.0834x + 1.259$  is written and 1.28, and appropriate work is shown.

*or*

[3]  $y = 0.0834x + 1.259$  and 1.28, but no work is shown.

[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]  $y = 0.0834x + 1.259$ , but no further correct work is shown.

*or*

[2] An incorrect linear equation is written, but an appropriate difference in price is found.

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

*or*

[1] The expression  $0.0834x + 1.259$  is written, but no further correct work is shown.

*or*

[1] 1.28, 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] A complete and correct proof that includes a concluding statement is written.
- [3] A complete proof is written that includes a concluding statement, but one computational or graphing error is made.
- or**
- [3] Appropriate calculations are shown to demonstrate that  $\triangle JEN$  is an isosceles right triangle, but a concluding statement is missing or is incorrect.
- [2] A complete proof is written that includes a concluding statement, but two or more computational or graphing errors are made.
- or**
- [2] Appropriate work is shown, but one conceptual error is made.
- or**
- [2] The triangle is proved to be isosceles, but no further correct work is shown.
- or**
- [2] The triangle is proved to be a right triangle, but no further correct work is shown.
- or**
- [2] Appropriate work is shown to find the slopes and lengths of  $\overline{JE}$  and  $\overline{EN}$ , but no further correct work is shown.
- [1] A complete proof is written, but one conceptual error and one computational or graphing error are made.
- or**
- [1]  $JE$  and  $EN$  are calculated correctly, but no further correct work is shown.
- or**
- [1] The slopes of  $\overline{JE}$  and  $\overline{EN}$  are calculated 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*

- (30) [4] .73728 or  $\frac{2304}{3125}$ , and appropriate work is shown, such as evaluating  ${}_5C_0(.2)^0(.8)^5 + {}_5C_1(.2)(.8)^4$ .
- [3] Appropriate work is shown, but one computational or rounding error is made.
- or**
- [3] Appropriate work is shown, but the probability for “at least one” is found.
- [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 multiplying the probabilities.
- or**
- [2] Appropriate work is shown, but  $\frac{256}{625}$ , the probability that “exactly one” candidate is not telling the truth, is found.
- or**
- [2] The expression  ${}_5C_0(.2)^0(.8)^5 + {}_5C_1(.2)(.8)^4$  is written, 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, but  $\frac{4}{625}$ , the probability that “exactly one” candidate is telling the truth, is found.
- or**
- [1] .73728 or  $\frac{2304}{3125}$ , 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*

- (31) [3] 78,400 and 14.6, and appropriate algebraic work is shown.
- or***
- [3] Appropriate work is shown, but one computational or rounding error is made.
- or***
- [3] Appropriate work is shown to find 14.6, but no further correct work is shown.
- [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] Appropriate work is shown to find 78,400, and a correct logarithmic equation is written, but no further correct work is shown.
- or***
- [2] 78,400 and 14.6, but a method other than algebraic is used.
- [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 78,400, but no further correct work is shown.
- or***
- [1] A correct logarithmic equation is written, but no further correct work is shown.
- or***
- [1] 78,400 and 14.6, but no work is shown.
- [0] 78,400 or 14.6, 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.

MATHEMATICS B – *continued*

(32) [4] 2,364, 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, such as using  $72^\circ$  instead of  $108^\circ$ .

[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] 2,364, 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]  $m\angle P = 25$ ,  $m\angle BEC = 115$ , and  $m\angle PCA = 115$ , and appropriate work is shown, such as a labeled diagram.

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

***or***

[5] Appropriate work is shown to find  $m\angle P = 25$ ,  $m\angle BEC = 115$ , and  $m\angle PAC = 40$ .

[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.

***or***

[4] Appropriate work is shown to find two of the angles, but no further correct work is shown.

***or***

[4] Appropriate work is shown to find 25, 115, and 115, but the angles are not labeled or are labeled incorrectly.

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

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

***or***

[2] Appropriate work is shown, but two conceptual errors are made.

***or***

[2] Appropriate work is shown to find one of the angles, but no further correct work is shown.

***or***

[2] Appropriate work is shown to find  $m\angle ACD = 65$  and  $m\angle PAC = 40$ , but no further correct work is shown.

***or***

[2] The measures of all three angles are stated and labeled correctly, but no work is shown.

MATHEMATICS B – *continued*

[1]  $m\widehat{BD} = 50$ ,  $m\widehat{BC} = 100$ , and  $m\widehat{AC} = 80$ , but no further correct work is shown.

***or***

[1] The measures of two of the angles are stated and labeled correctly, but no work is shown.

[0] 25, 115, and 115, 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] 0.4 and  $-2.7$ , and appropriate algebraic work is shown.

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

***or***

[5] Appropriate work is shown, but only one solution is found.

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

***or***

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

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

***or***

[3] The equation  $3x^2 + 7x - 3 = 0$  is found, but no further correct work is shown.

***or***

[3] 0.4 and  $-2.7$ , but a method other than algebraic is used.

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

***or***

[2] The fractions are cleared by multiplying by the common denominator, but no further correct work is shown.

[1] A common denominator of  $x(x + 3)$  is found, but no further correct work is shown.

***or***

[1] 0.4 and  $-2.7$ , but no work is shown.

[0] 0.4 or  $-2.7$ , 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.

**Map to Learning Standards**

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

**Regents Examination in Mathematics B**

**January 2010**

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

***The Chart for Determining the Final Examination Score for the January 2010 Regents Examination in Mathematics B will be posted on the Department’s web site <http://www.emsc.nysed.gov/osa/> on Tuesday, January 26, 2010. 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.**

