

# FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

## ALGEBRA 2/TRIGONOMETRY

Friday, June 14, 2013 — 1:15 to 4:15 p.m., only

### SCORING KEY AND RATING GUIDE

#### Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Regents Examination in Algebra 2/Trigonometry. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examinations in Mathematics*.

Do *not* attempt to correct the student's work by making insertions or changes of any kind. In scoring the open-ended questions, 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. No one teacher is to score more than approximately one-third of the open-ended questions on a student's paper. Teachers may not score their own students' answer papers. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

**Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.**

Raters should record the student's scores for all questions and the total raw score on the student's separate 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 at: <http://www.p12.nysed.gov/assessment/> on Friday, June 14, 2013. Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score. The student's scale score should be entered in the box provided on the student's separate answer sheet. The scale score is the student's final examination score.

If the student’s responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.

### Part I

Allow a total of 54 credits, 2 credits for each of the following.

(1) . . . . . 2 . . . . .	(10) . . . . . 2 . . . . .	(19) . . . . . 3 . . . . .
(2) . . . . . 2 . . . . .	(11) . . . . . 2 . . . . .	(20) . . . . . 3 . . . . .
(3) . . . . . 4 . . . . .	(12) . . . . . 4 . . . . .	(21) . . . . . 3 . . . . .
(4) . . . . . 3 . . . . .	(13) . . . . . 3 . . . . .	(22) . . . . . 2 . . . . .
(5) . . . . . 2 . . . . .	(14) . . . . . 3 . . . . .	(23) . . . . . 2 . . . . .
(6) . . . . . 3 . . . . .	(15) . . . . . 4 . . . . .	(24) . . . . . 1 . . . . .
(7) . . . . . 1 . . . . .	(16) . . . . . 1 . . . . .	(25) . . . . . 4 . . . . .
(8) . . . . . 3 . . . . .	(17) . . . . . 1 . . . . .	(26) . . . . . 2 . . . . .
(9) . . . . . 4 . . . . .	(18) . . . . . 4 . . . . .	(27) . . . . . 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. Check this web site at: <http://www.p12.nysed.gov/assessment/> and select the link “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.

Beginning in June 2013, the Department is providing supplemental scoring guidance, the “Sample Response Set,” for the Regents Examination in Algebra 2/Trigonometry. This guidance is not required as part of the scorer training. It is at the school’s discretion to incorporate it into the scorer training or to use it as supplemental information during scoring. While not reflective of all scenarios, the sample student responses selected for the Sample Response Set illustrate how less common student responses to open-ended questions may be scored. The Sample Response Set will be available on the Department’s web site at: <http://www.p12.nysed.gov/assessment/scoring/home-hs.html>.

# General Rules for Applying Mathematics Rubrics

## I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examination in Algebra 2/Trigonometry 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*, use their own professional judgment, confer with other mathematics teachers, and/or contact 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, graphs, 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 2 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(28) [2] Sum =  $-\frac{1}{12}$  and product =  $-\frac{1}{2}$  or an equivalent answer.

[1] Appropriate work is shown, but one computational error is made, but an appropriate sum and product are stated.

*or*

[1] Appropriate work is shown, but one conceptual error is made, but an appropriate sum and product are stated.

*or*

[1] Appropriate work is shown to find  $-\frac{1}{12}$  and  $-\frac{1}{2}$ , but the solutions are not labeled or are labeled incorrectly.

*or*

[1] Sum =  $-\frac{1}{12}$  or product =  $-\frac{1}{2}$ .

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(29) [2] 41, and appropriate algebraic work is shown.

[1] Appropriate work is shown, but one computational error is made, but an appropriate value of  $x$  is stated.

*or*

[1] Appropriate work is shown, but one conceptual error is made, but an appropriate value of  $x$  is stated.

*or*

[1]  $27^{\frac{4}{3}} = 2x - 1$  is written, but no further correct work is shown.

*or*

[1] 41, but a method other than algebraic is used.

*or*

[1] 41, 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) [2] 50,400, and appropriate work is shown.

[1] Appropriate work is shown, but one computational error is made, but an appropriate number of arrangements is stated.

**or**

[1] Appropriate work is shown, but one conceptual error is made, but an appropriate number of arrangements is stated.

**or**

[1]  $\frac{10!}{3!3!2!}$  or an equivalent expression is written, but no further correct work is shown.

**or**

[1] 50,400, but no work is shown.

[0]  $10! = 3,628,800$  is 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.

(31) [2]  $\frac{\sqrt{6}}{4}$  or  $\frac{\sqrt{3}}{2\sqrt{2}}$ , and appropriate work is shown.

[1] Appropriate work is shown, but one computational error is made, but an appropriate answer is written in simplest radical form.

**or**

[1] Appropriate work is shown, but one conceptual error is made, but an appropriate answer is written in simplest radical form.

**or**

[1] Appropriate work is shown, but the answer is not expressed in simplest radical form.

**or**

[1]  $\frac{\sqrt{3}}{2}$  and  $\frac{\sqrt{2}}{2}$  or  $\frac{1}{\sqrt{2}}$  are written, but no further correct work is shown.

**or**

[1]  $\frac{\sqrt{6}}{4}$ , but no work is shown.

[0] The answer is expressed as a decimal.

**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) [2] 141, and appropriate algebraic work is shown.
- [1] Appropriate work is shown, but one computational or rounding error is made, but an appropriate angle measure is stated.
- or***
- [1] Appropriate work is shown, but one conceptual error is made, but an appropriate angle measure is stated.
- or***
- [1] 141, but a method other than algebraic is used.
- or***
- [1] 141, 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.
- (33) [2]  $-900a^2$ , and appropriate work is shown.
- [1] Appropriate work is shown, but one computational or simplification error is made.
- or***
- [1] Appropriate work is shown, but one conceptual error is made.
- or***
- [1]  $-900a^2$ , 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) [2]  $\cos^2 x$ , and appropriate work is shown.
- [1] Appropriate work is shown, but one substitution or simplification error is made.
- or***
- [1] Appropriate work is shown, but one conceptual error is made.
- or***
- [1]  $\cos^2 x$ , 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.

(35) [2] 0.173, and appropriate work is shown.

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

*or*

[1] Appropriate work is shown, but one conceptual error is made, but an appropriate probability is stated.

*or*

[1]  ${}^7C_3\left(\frac{1}{4}\right)^3\left(\frac{3}{4}\right)^4$  or an equivalent expression is written, but no further correct work is shown.

*or*

[1] 0.173, 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 4 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(36) [4]  $5 \pm 2\sqrt{3}$ , and appropriate algebraic work is shown.

[3] Appropriate work is shown, but one computational or simplification error is made, but appropriate values of  $x$  are stated.

*or*

[3] Appropriate work is shown to find  $\frac{10 \pm 4\sqrt{3}}{2}$  or  $\frac{10 \pm \sqrt{48}}{2}$ , but no further correct work is shown.

*or*

[3] Appropriate work is shown, but the answers are expressed as decimals.

[2] Appropriate work is shown, but two or more computational or simplification errors are made, but appropriate values of  $x$  are stated.

*or*

[2] Appropriate work is shown, but one conceptual error is made, but appropriate values of  $x$  are stated.

*or*

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

*or*

[2] Appropriate work is shown to find  $(x - 5)^2 = 12$ , but no further correct work is shown.

*or*

[2]  $5 \pm 2\sqrt{3}$ , but a method other than algebraic is used.

[1] Appropriate work is shown, but one conceptual error and one computational or simplification error are made, but appropriate values of  $x$  are stated.

*or*

[1]  $x^2 - 10x + 13 = 0$  is written, but no further correct work is shown.

*or*

[1]  $5 \pm 2\sqrt{3}$ , but no work is shown.

[0]  $10x - x^2 = 13$  is written, 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.

- (37) [4] 44, and appropriate work is shown.
- [3] Appropriate work is shown, but one computational or rounding error is made, but an appropriate area is stated.
- [2] Appropriate work is shown, but two or more computational or rounding errors are made, but an appropriate area is stated.
- or***
- [2] Appropriate work is shown, but one conceptual error is made, but an appropriate area is stated.
- or***
- [2] Appropriate work is shown to find  $AE$  or  $CE$ , or both, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made, but an appropriate area is stated.
- or***
- [1] An appropriately drawn and labeled diagram is shown, and a correct substitution into the Law of Sines is made, but no further correct work is shown.
- or***
- [1] 44, 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.

- (38) [4] 6 and 4, and appropriate work is shown.
- [3] Appropriate work is shown, but one computational error is made, but an appropriate number of scores and interquartile range are stated.
- or***
- [3] Appropriate work is shown to find 6 and  $Q_1 = 37$  and  $Q_3 = 41$ , but the values are not subtracted.
- or***
- [3] Appropriate work is shown, but the sample standard deviation (6.2) is used instead of the population standard deviation (5.9), but an appropriate number of scores and interquartile range are stated.
- [2] Appropriate work is shown, but two or more computational errors are made, but an appropriate number of scores and interquartile range are stated.
- or***
- [2] Appropriate work is shown, but one conceptual error is made, but an appropriate number of scores and interquartile range are stated.
- or***
- [2] Appropriate work is shown to find either 6 or 4, but no further correct work is shown.
- or***
- [2] Mean, population standard deviation,  $Q_1$  and  $Q_3$  are stated correctly.
- [1] Appropriate work is shown, but one conceptual error and one computational error are made, but an appropriate number of scores and interquartile range are stated.
- or***
- [1] Mean and population standard deviation are stated correctly.
- or***
- [1] 6 and 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.
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## Part IV

For this question, use the specific criteria to award a maximum of 6 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(39) [6] 0,  $-4$ , and  $\pm 2i$ , and appropriate algebraic work is shown.

[5] Appropriate work is shown, but one computational or factoring error is made, but appropriate solutions are stated.

*or*

[5] Appropriate work is shown to find three solutions, but no further correct work is shown.

[4] Appropriate work is shown, but two computational or factoring errors are made, but appropriate solutions are stated.

*or*

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

[3] Appropriate work is shown, but three or more computational or factoring errors are made, but appropriate solutions are stated.

*or*

[3] Appropriate work is shown, but one conceptual error is made, but appropriate solutions are stated.

*or*

[3] Appropriate work is shown to find  $x(x^2 + 4)(x + 4) = 0$  or  $(x^3 + 4x)(x + 4) = 0$ , but no further correct work is shown.

*or*

[3] 0,  $-4$ , and  $\pm 2i$ , but a method other than algebraic is used.

[2] Appropriate work is shown, but one conceptual error and one computational or factoring error are made, but appropriate solutions are stated.

*or*

[2] Appropriate work is shown to find  $-4$ , but no further correct work is shown.

*or*

[2]  $x^3(x + 4) + 4x(x + 4) = 0$  or  $x(x^2(x + 4) + 4(x + 4)) = 0$  is written, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and two or more computational or factoring errors are made, but appropriate solutions are stated.

*or*

[1] Appropriate work is shown to find 0, but no further correct work is shown.

*or*

[1]  $x(x^3 + 4x^2 + 4x + 16) = 0$  is written, but no further correct work is shown.

*or*

[1] 0, -4, and  $\pm 2i$ , 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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## Map to Core Curriculum

Content Strands	Item Numbers
Number Sense and Operations	14, 15, 19
Algebra	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, 36, 37, 39
Measurement	2
Statistics and Probability	1, 16, 17, 30, 35, 38

### Regents Examination in Algebra 2/Trigonometry June 2013

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

**The *Chart for Determining the Final Examination Score for the June 2013 Regents Examination in Algebra 2/Trigonometry* will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Friday, June 14, 2013. Conversion charts provided for previous administrations of the Regents Examination in Algebra 2/Trigonometry 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.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm>.
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.