New York State Regents Examination in Integrated Algebra

Standard Setting Technical Report Addendum

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April 28, 2009
Addendum

In the addendum to the standard setting technical report for the Regents Examination in Integrated Algebra, more details are provided about the development of achievement level descriptors (ALDs) at the standard setting. In addition, the selection process for standard setting panelists and the educational experience and qualifications of the panelists are further described.

**Item Mapping Standard Setting—Achievement Level Descriptors (ALDs)** (page 6 and page 20)

In the standard setting technical report titled “New York State Regents Examination in Integrated Algebra—Standard Setting Technical Report,” the following paragraph is on page 6:

> Following the midmorning break, the two committees met in their separate conference rooms. Each committee began the process of reviewing achievement level descriptors. This process required several hours, and resulted in a set of descriptors for each achievement level (Level 1, Level 2, and Level 3).

On page 20 of the standard setting technical report, the logic of using the ALDs and the role ALDs played at the standard setting are further explained. In this section of the addendum, the detailed materials and processes in developing ALDs at the item mapping standard setting meeting are further presented.

There are three achievement levels for the Regents Examination in Integrated Algebra: Level 1 (0–64), Level 2 (65–84), and Level 3 (85–100). Level 1 indicates achievement below proficiency and is labeled “Not Passing.” Level 2 indicates proficient achievement and is labeled “Passing.” Level 3 indicates high or advanced achievement and is labeled “Passing with Distinction.”

General ALDs and Learning Standards were provided to all the panelists (see Appendixes A and B of the addendum). The panelists were first asked to review these ALDs and Learning Standards. Next, the panelists were asked to construct specific ALDs for each of the achievement levels for the Regents Examination in Integrated Algebra.

The panelists were reminded that the main purpose behind reviewing general ALDs and constructing specific ALDs was to operationalize the achievement levels to support the standard setting task. The goal was to gain a common understanding of what students should know and be able to do at each of the achievement levels in Integrated Algebra. Therefore, during the standard setting, when the panelists were asked to think about a student at the threshold of Level 2 (65–84) in Integrated Algebra, the panelists shared a common understanding regarding the specific skills the student should possess.
The panelists completed several steps in developing the specific ALDs. The panelists were asked to focus on what students should know and be able to do in each of the three achievement levels for Integrated Algebra. The panelists were also reminded that they should be focusing on all the students in New York State except those eligible for the alternate assessment. Next, the panelists met in small groups of five or six panelists and discussed the specific skills that students should demonstrate in each of the achievement levels. In addition, the panelists were instructed to think about the three major features that distinguish between students at the threshold between any two adjacent achievement levels.

After the small group discussions, all of the panelists participated in a large group discussion where a representative from each of the small groups presented the list of ALDs from his/her group. Panelists then worked as a large group to create a single list of course-specific ALDs. A notetaker summarized the discussions across the groups and the final list of ALDs was distributed to all the panelists before the training on standard setting. The facilitator at the item mapping standard setting meeting emphasized the importance of the ALDs and stated that when the panelists were making cut score recommendations, they should always refer back to the list of ALDs and focus on what students should know and be able to do in each of the achievement levels. Panelists dedicated approximately two hours to the construction of the specific ALDs.

In the next phase of the item mapping standard setting meeting, facilitators trained the panelists on the standard setting methodology and the panelists completed round one ratings. On the second day of the standard setting meeting, the panelists were shown results from round one, participated in discussions, and completed the next two rounds of ratings, as described in the full standard setting technical report.

The ALDs were used throughout the meeting when panelists were making ratings or discussing their rationale for recommending specific cut scores. As a final step, after all three rounds of ratings had been completed, the panelists in each of the standard setting committees revisited the ALDs. The final ALDs from both committees are provided in the Appendix C of this addendum.

**Item Mapping Standard Setting—Panelist Selection and Qualification** (page 17)

In the standard setting technical report, the following paragraph is on page 17:

Two committees of New York educators were convened June 23 and June 24, 2008, in Albany to recommend standards for the Regents Examination in Integrated Algebra. The first, Committee A, had 31 educators, and the second, Committee B, had 30 educators. The item mapping procedure was applied to recommend the cut scores.
In this section of the addendum, further details are provided about the selection process of the item mapping standard setting committees. Panelists’ expertise and experience are also summarized.

Educators were selected from across New York State to be reflective and representative of the diversity of the state according to the following criteria:

- Geographic location: North Country, Long Island, NYC, Lower and Mid-Hudson Valley, Capital Region, Central NY, and Western NY (see Table A_1)
- School district location: urban, suburban, or rural (see Tables 10 and 15)
- School district size: large, medium, or small (see Tables 9 and 14)
- Ethnicity representation: White, Hispanic, African American, American Indian or Alaska Native, Asian or Pacific Islander, or multiracial (see Table 7 and 12)
- Gender (see Tables 6 and 11)
- Educational expertise: mathematics teacher, special education teacher, bilingual teacher, curriculum/department/test coordinator, or mathematics department chair (see Table A_2)
- Years of educational experience (see Tables 8 and 13)

As the tables indicate, the distributions of panelists in both committees covered the state well in terms of geographic location, district location, and district size. With regard to demographics (ethnicity and gender), both committees consisted of fairly diverse groups. The panelists also brought with them different levels of expertise and experiences: there were NYS certified mathematics teachers, bilingual teachers, special education teachers, mathematics curriculum coordinators, and mathematics department chairs in both committees. Some of the panelists have been teaching for more than 20 years; some of the panelists have been in the field for less than five years. There was a good representation of educators from various levels of teaching experience, with the median years of experience being 14 in both committees. All the committee members are teaching or have taught different levels of math courses, including mathematics in Grades 6 – 8 and high school mathematics including Integrated Algebra, Mathematics A, Mathematics B, Precalculus, Calculus, etc.
Table A.1. Distribution of Geographic Locations of Panelists for Standard Setting.

<table>
<thead>
<tr>
<th>Location</th>
<th>Committee A</th>
<th>Committee B</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Country</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Long Island</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>NYC</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Lower and Mid Hudson Valley</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Capital Region</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Central NY</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Western NY</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Upstate Southern Tier</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table A.2. Education Expertise and Experience Distributions on the Two Committees.

<table>
<thead>
<tr>
<th>Expertise</th>
<th>Committee A</th>
<th>Committee B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics Teachers</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>Special Education Teachers</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Bilingual Teachers</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Curriculum/Department/Test Coordinator</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Math Department Chair</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

1 One of the panelists did not participate in the full two-day item mapping standard setting and therefore was excluded from all the reporting on standard setting.
### Achievement Level

<table>
<thead>
<tr>
<th>Not Passing</th>
<th>A <strong>not passing</strong> student is unable to demonstrate, on demand, proficiency in understanding the content and concepts required for commencement-level achievement in any or most of the learning standards and key ideas assessed.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A <strong>not passing</strong> student is unable to demonstrate on demand, proficiency in the skills required for commencement-level achievement in any or most of the learning standards and key ideas assessed.</td>
</tr>
<tr>
<td></td>
<td>A <strong>not passing</strong> student is unable to demonstrate, on demand, evidence of an ability to apply the content, concepts, and skills required to meet any or most of the demands of productive adult citizenship, the workplace, and postsecondary education.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Passing</th>
<th>A <strong>passing</strong> student is able to demonstrate, on demand, knowledge of the content and concepts required for commencement-level achievement in each of the learning standards and key ideas assessed.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A <strong>passing</strong> student is able to demonstrate, on demand, the skills required for commencement-level achievement in each of the learning standards and key ideas assessed.</td>
</tr>
<tr>
<td></td>
<td>A <strong>passing</strong> student is able to apply, on demand, the content, concepts, and skills required to meet the demands of productive adult citizenship, the workplace, and postsecondary education.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Passing with Distinction</th>
<th>A <strong>passing with distinction</strong> student is able to demonstrate, on demand, evidence of superior understanding of the content and concepts required for commencement-level achievement in each of the learning standards and key ideas assessed.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A <strong>passing with distinction</strong> student is able to demonstrate, on demand, evidence of superior skills required for commencement-level achievement in each of the learning standards and key ideas assessed.</td>
</tr>
<tr>
<td></td>
<td>A <strong>passing with distinction</strong> student is able to demonstrate, on demand, evidence of superior ability to apply the content, concepts, and skills required to meet the demands of productive adult citizenship, the workplace, and postsecondary education.</td>
</tr>
</tbody>
</table>
Appendix B

New York Regents Examination in Integrated Algebra
Learning Standard

Mathematics, Science, and Technology - Standard 3

Students will:

• understand the concepts of and become proficient with the skills of mathematics;

• communicate and reason mathematically;

• become problem solvers by using appropriate tools and strategies;

• through the integrated study of number sense and operations, algebra, geometry, measurement, and statistics and probability.
Appendix C

Regents Examination in Integrated Algebra
Standard Setting
Achievement Level Descriptors
Committee A Discussion Notes
June 23, 2008

A 0–64 Not Passing Student:
- Has limited number sense
- Has limited understanding of concepts or procedures
- Has limited understanding of basic mathematical vocabulary
- Struggles with numerical computation with/without calculator
- Is unable to express justifications
- Struggles to visualize/describe situations
- Is a numerical thinker, relies on calculator
- Needs diagram or expression, cannot create them independently
- Cannot provide justifications independently, needs to be led to justification
- Struggles with abstraction (symbols/variables)
- Is limited to one-step equation solving
- Is able to only classify graphs
- Knows only definitions of mean, median, and mode
- Needs much prompting and coaching to apply operations, needs concrete tasks

A 65–84 Passing Student:
- Has basic understanding of number sense, can apply properties
- Assesses reasonableness of answers
- Applies trial and error
- Demonstrates basic understanding of concepts
- Solidly understands basic mathematical vocabulary (e.g., “linear,” “sum”)
- Applies single strategies
- Applies simple transformations to/from symbolic form
- Completes statistical computations, recognizes graphs
- Translates at least single-step problem into equation and solves
- Knows what a sample space is
- Identifies a function from a graph, applies vertical line test
- Shows ranges so teachers know where the ranges are from
- Uses calculator effectively
- Has math literacy strategies
- Needs a little prompting for operations, then understands them
An 85–100 Passing with Distinction Student:

- Demonstrates understanding of problems in context and applies the correct procedure to acquire the correct solution
- Has an enhanced mathematical vocabulary
- Communicates concepts, procedures, and justifications effectively, using appropriate mathematical terminology; hits buzzwords in explanations
- Applies any strategy and uses a variety of appropriate strategies
- Uses technology effectively to assist in solving problems
- Appropriately models problems presented in context
- Solves algebraic/geometric problems by creating diagrams and equations
- Applies operations on radicals without calculator
- Justifies reasoning coherently
- Factors all expressions
- Handles multiple representations of data and computations
- Uses trigonometric functions to find sides and angles of triangles
- Translates problems from words and writes equations
- Determines whether something is a function from a table, mapping, equation, or graph
- Shows complete work
- Does not make careless mistakes
- Understands properties of numbers with flexibility to switch contexts
- Demonstrates full understanding of operations without prompting
- Is an “algebraic thinker”

What Defines the 64/65 Not Passing/Passing Threshold:

- Reading level and vocabulary
- Uses algorithmic thinking
- Has number sense/ability to use calculator
- Is willing to apply operations, has good basic skills, can begin to solve problems even if he or she cannot translate them, can analyze situations
- Knows formulas and definitions and can plug in numbers
- Relies on calculator
- Makes frequent mistakes
- Works problems backward as primary means of solving them

What Defines the 84/85 Passing/Passing with Distinction Threshold:

- Has ability to think abstractly
- Pays attention to detail
- Has strong grasp of problem-solving skills and strategies
- Reads for understanding
- Can translate verbal sentences
- Can speak math, knows definitions and formulas
- Will use multiple approaches, including use of calculator as opposed to relying on calculator
• Integrates process strands
• Works problems backward only as a secondary means for checking himself/herself

Additional Notes
One table commented that extended response items are needed to distinguish between 65–84 and 85–100 students.
A 0–64 Not Passing Student

- Lacks understanding, makes many conceptual errors compounded with computational errors
- Fails to or is unable to analyze for reasonableness of answer (e.g., puts down what is on calculator regardless of reasonableness)
- Attempts to answer few or no CR items
- Does not understand vocabulary (e.g., many reading errors)
- Provides little evidence of problem-solving plan
- Has certain level of incoherency involved with answers given (e.g., applies wrong rule)
- Has minimal understanding of mathematical terminology
- Uses calculator well but has no comprehension of solutions given
- Provides little to no supporting work
- Has false starts, trial-and-error attempts
- Sets up questions/problems, but not necessarily complete problems
- Solves simple problems (e.g., solve one- or two-step equations)
- Manipulates some equations (e.g. plug in numbers if given formula)
- Eliminates wildly wrong answers
- Solves counting problems
- Builds basic number sets and ordering
- Distinguishes between rational and irrational numbers
- Solves basic percentage problems
- Determines basic probability
- Writes/reads exponential notations
- Graphs points
- Identifies hypotenuse (basic grasp of Pythagorean theorem)
- Identifies shapes in two dimensions
- Crosses multiply
- Finds median and mode

A 65–84 Passing Student

- Makes computational errors, not conceptual
- Uses problem solving appropriate to problem, (e.g., knows steps and is able to do them)
- Reads and comprehends at grade level or better
- Understands mathematical vocabulary and symbols, 80%
• Reads, comprehends, communicates, and applies some algebra (e.g., write and solve linear equations, equalities and inequalities, factoring, single-variable equations with decimals)
• Excludes an answer as unreasonable
• Applies standard concepts
• Uses appropriate formulas for given problem
• Uses calculator
• Analyzes and solves problems with variety of strategies
• Connects/translates between written problems, coordinate planes, graphs, equalities, and equations
• Understands geometry connections and use appropriate formulas (e.g., find angle, perfect square, area, perimeter, volume)
• Collects, organizes, analyzes displays data, makes predictions with data
• Draws inferences between mathematics and real-life situations (e.g., use percentages, decimals, and fractions in real-life solutions, recognize real-life situations that can be modeled graphically)
• Demonstrates proficiency in basic statistics (e.g., probabilities, permutations)
• Graphs (e.g., y-intercept of a line, slope, perpendicular and parallel lines)
• Calculates percents, rate of change, percentage error, proportions, unit rate, and relative error
• Applies rules for rounding
• Performs operations and procedures with radicals and decimals
• Converts between units

A 85–100 Passing with Distinction Student

• Provides only responses that are mathematically correct and complete
• Displays solid use of mathematical concepts and their application (e.g., notation, symbolic language)
• Makes few or almost no conceptual and no computational errors
• Understands trigonometry
• Displays deliberate problem-solving strategy in work
• Executes solution proficiently
• Understands all aspects of lines
• Displays superior factoring, number sense, graphing
• Communicates, expresses, and justifies answers in correct mathematical terminology
• Solves systems of equations with multiple methods/solving strategies
• Thoroughly supports and justifies work in coherent and precise manner
• Checks for reasonableness of answers
• Demonstrates solid understanding of GCF (factoring as a whole)
• Solves quadratic equations
• Translates, solves, and understands inequalities
• Evaluates absent values
• Simplifies radicals
• Calculates by using scientific notation
• Understands polynomial operations
• Graphs any function, graphically represents word problems
• Models and communicates real-life situations with algebra
• Uses statistics to draw conclusions
• Demonstrates and interprets relationships among decimals, fractions, factors, percentages, and number sense

What Defines the 64/65 Not Passing/Passing Threshold:
• Basic understanding of the five content strands
• Reading comprehension at or above grade level
• Basic comprehension of mathematical terminology
• Ability to communicate mathematics of and justify correct answers
• Moderate problem-solving skills and their execution
• Attempting all MC and most CR items
• Lower number and fewer types of computational and conceptual errors
• Creating and solving linear equations
• Linear graphing

What Defines the 84/85 Passing/Passing with Distinction Threshold:
• Solid understanding of five content strands
• Understanding and applying mathematical literacy (e.g., expresses answers in correct mathematical terms)
• Ability to clearly communicate and thoroughly justify answers and solutions
• No computational and few or no conceptual errors
• Checking for reasonableness of answers
• Ability to solve by multiple methods
• Ability to graph all functions applicable to algebra
• Applying advanced integrated algebraic concepts