

ACTAAP

Arkansas Comprehensive Testing, Assessment, and Accountability Program

TEACHER HANDBOOK

ALGEBRA I END-OF-COURSE EXAMINATIONS

2012–2013 ADMINISTRATIONS

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Arkansas Department of Education

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The **Arkansas Comprehensive Testing, Assessment, and Accountability Program** (ACTAAP) includes *Mid-Year* and *Spring Algebra I End-of-Course Examinations* for students completing Algebra I or the equivalent for high school graduation credit. In addition to the Mid-Year administration, a *Fall Algebra I End-of-Course Examination* and Fall and Spring administrations of the Online Alternative Test for Algebra I were offered for students who were retesting in Algebra I. The examinations consist of questions that directly assess student knowledge. The Fall, Mid-Year, and Spring examinations consist of both multiple-choice and open-response questions while the online examinations consist of only multiple-choice questions. The development of the Algebra I End-of-Course Examinations was based on the *Arkansas Algebra I Mathematics Curriculum Framework*.

In January or May 2013, all students who had completed or were completing the required course work for Algebra I for high school graduation credit participated in the *Mid-Year* or *Spring Algebra I End-of-Course Examination*. Students retesting in Algebra I were also provided the opportunity to test with the *Fall* and/or *Mid-Year Algebra I End-of-Course Examination* and/or the Online Alternative Test for Algebra I. Results of the Algebra I End-of-Course Examination will be provided to all students, schools, and districts to be used as the basis for instructional change.

This handbook provides information regarding the scoring of student responses to the Algebra I open-response items. It describes the scoring procedures and the scoring criteria (rubrics) used to assess student responses. Copies of actual student responses are provided, along with scores given to those responses, to illustrate how the scoring criteria were applied to Algebra I open-response items.

Additional information about the Algebra I End-of-Course Examination is available through the Arkansas Department of Education. Questions can be addressed to the Office of Student Assessment at 501-682-4558.

SCORING STUDENT RESPONSES TO OPEN-RESPONSE ITEMS

The multiple-choice and open-response test items for the Algebra I End-of-Course Examination are developed with the assistance and approval of the Algebra I Content Advisory Committee. This committee comprises active Arkansas educators with expertise in Mathematics education. The Algebra I Content Advisory Committee develops and reviews multiple-choice and open-response items to ensure that they reflect the *Arkansas Algebra I Mathematics Curriculum Framework*.

While multiple-choice items are scored by machine to determine if the student chose the correct answer from four options, responses to open-response items must be scored by trained “readers” using a pre-established set of scoring criteria.

READER TRAINING

Readers are trained to score only one content area. Qualified readers for the Arkansas scoring will be those with a four-year college degree in mathematics, education, or related fields.

Before readers are allowed to begin assigning scores to any student responses, they go through intensive training. The first step in that training is for the readers to read the Algebra I open-response items as they appear in the test booklet and to respond—just as the student test takers are required to do. This step gives the readers some insight into how the students might have responded. The next step is the readers’ introduction to the scoring rubric. All of the specific requirements of the rubric are explained by the Scoring Director who has been specifically trained to lead the scoring group. Then responses (anchor papers) that illustrate the score points of the rubric are presented to the readers and discussed. The goal of this discussion is for the readers to understand why a particular response (or type of response) receives a particular score. After discussion of the rubric and anchor papers, readers practice scoring sets of responses that have been prescored and selected for use as training papers. Detailed discussion of the responses and the scores they receive follows.

After three or four of these practice sets, readers are given “qualifying rounds.” These are additional sets of prescored papers, and, in order to qualify, each reader scoring Algebra I responses must score in exact agreement on at least 80% of the responses. Readers who do not score within the required rate of agreement are not allowed to score the Algebra I End-of-Course Examination responses.

Once scoring of the actual student responses begins, readers are monitored constantly throughout the project to ensure that they are scoring according to the criteria. Daily and cumulative statistics are posted and analyzed, and Scoring Directors or Team Leaders reread selected responses scored by the readers. These procedures promote reliable and consistent scoring. Any reader who does not maintain an acceptable level of agreement is dismissed from the project.

SCORING PROCEDURES

All student responses to the Algebra I End-of-Course Examination open-response test items are scored independently by two readers. Those two scores are compared, and responses that receive scores that are non-adjacent (a “1” and a “3,” for example) are scored a third time by a Team Leader or the Scoring Director for resolution.

On the following pages, open-response items are presented as they appeared in the *2013 Mid-Year and Spring Algebra I End-of-Course Examinations*. The specific scoring rubric for each item and annotated responses for each score point of the rubric follows. The goal is for classroom teachers and their students to understand how responses are scored. It is hoped that this understanding will help students see what kind of performance is expected of them on the Algebra I End-of-Course Examination.

ALGEBRA I RESPONSES

ITEM A—2013 ALGEBRA I

- A. Amy records her fastest times at track practice each day in the table below.

Amy's Fastest Times

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Time (minutes)	2.8	2.6	2.2	2.3	2.1

At the end of every fifth day Amy finds her mean time for the 5 fastest runs over those days.

1. Find Amy's mean time for the 5 practices shown in the table. Show your work.
2. Amy wants to reduce her mean by at least 0.1 minutes. On Saturday she will run again. What does her time need to be in order to have a new five-run mean time for Tuesday through Saturday that is at least 0.1 minute less than the mean found in Part 1? Show your work.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

Item A Scoring Rubric—2013 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work. Correct unit label of "minutes" in Part 2.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" is assigned for the item.)

SOLUTION AND SCORING

4 points possible:

Part	Points
1	<p>1 point possible:</p> <p>1 point: Correct mean: 2.4 Correct procedure is shown and/or explained. Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • $\frac{2.8 + 2.6 + 2.2 + 2.3 + 2.1}{5} = \frac{12}{5} = 2.4$ • “I added up all the times and got 12. Then I divided by 5 and got 2.4” <p style="text-align: center;">OR</p> <p>½ point: • Correct mean: 2.4 Procedure is incomplete or missing</p> <p style="text-align: center;">Or</p> <ul style="list-style-type: none"> • Mean is incorrect due to 1 calculation or copy error Correct procedure is shown and/or explained

ITEM A SOLUTION AND SCORING—2013 ALGEBRA I

Part	Points
2	<p>3 points possible:</p> <p>3 points: Correct time: 2.3 (minutes) <i>Or correct answer based on an incorrect mean in Part 1</i> Correct procedure is shown and/or explained. Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • $2.4 - 0.1 = 2.3$ (not required) $\frac{2.6 + 2.2 + 2.3 + 2.1 + x}{5} = 2.3$ $9.2 + x = 11.5$ $x = 2.3$ • Guess & Check: $2.6 + 2.2 + 2.3 + 2.1 + 2.3 = 11.5$ $11.5 \div 5 = 2.3$ $2.4 - 0.1 = 2.3$ (not required) Saturday's time = 2.3 minutes <p>OR</p> <p>1½ points: • Correct time: 2.3 Procedure is incomplete or missing</p> <p>Or</p> <ul style="list-style-type: none"> • Time is incorrect due to a calculation or copy error Correct procedure is shown and/or explained <p>OR</p> <p>1 point: Saturday's time and the procedure to find it based on a <u>six-run mean time from Monday through Saturday</u> <i>May be based on incorrect mean from Part 1</i> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • $\frac{2.8 + 2.6 + 2.2 + 2.3 + 2.1 + x}{6} = 2.3$ $12.0 + x = 13.8$ $x = 1.8$

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 4

<u>Part 1</u>		Points
Correct answer with Correct procedure:	“Amy’s mean time between Monday and Friday is 2.4 minutes ” “added up scores... $2.8 + 2.6 + 2.2 + 2.3 + 2.1 = 12$ divided by 5 days $\rightarrow 5 = \boxed{2.4}$ ”	1
<u>Part 2</u>		Points
Correct answer with Correct procedure:	“Amy’s time needs to be 2.3 minutes or less.” $2.4 - 0.1 = 2.3$ $2.3 \times 5 = 11.5$ $2.6 + 2.2 + 2.3 + 2.1 = 9.2$ $\frac{-9.2}{\boxed{2.3}}$	3
Total Points		4

①

2.8	}	added up scores
2.6		
2.2		
2.3		
2.1		

divided by 5 days $\rightarrow \frac{12}{5} = \boxed{2.4}$

Amy's mean time between Monday and Friday is 2.4 minutes

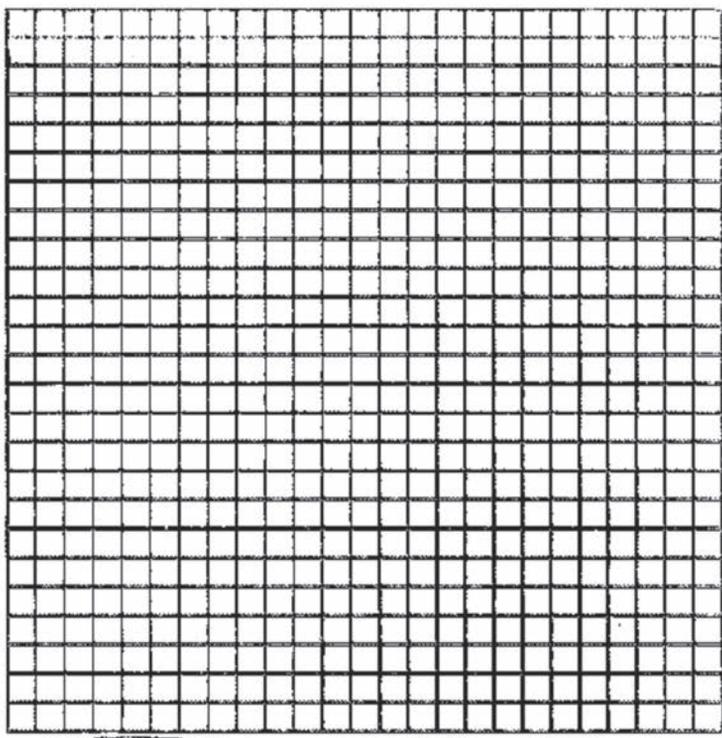
②

2.4	}	2.3
- 0.1		
$2.3 \times 5 = 11.5$		
$\frac{-9.2}{\boxed{2.3}}$		

2.6
2.2
2.3
+ 2.1

9.2

Amy's time needs to be 2.3 minutes or less.



are I took out Monday's score because she is finding out the mean for 5 days which are Tuesday thru Saturday.

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 3

<u>Part 1</u>		Points
Correct answer with Incomplete procedure:	“Mean time = 2.4 min” Sets up addition of the 5 times and stops	1/2
<u>Part 2</u>		Points
Correct answer with Correct procedure: (Guess & Check)	<u>2.3</u> Tries “3” and gets an average of “2.44 = too high” $2.6 + 2.2 + 2.1 + \boxed{2.3} = 11.5/5 = 2.3 = \text{good}$ <i>(Running = 's are acceptable)</i>	3
Total Points		3 1/2

1.) $2.8 + 2.6 + 2.2 + 2.3 + 2.1 = 12.2$
 $12.2 / 5 = 2.44$
 Mean time = 2.4 min

2.) $2.6 + 2.2 + 2.3 + 2.1 + 3 = 12.2 / 5 = 2.44 = \text{too high}$
 $2.6 + 2.2 + 2.3 + 2.1 + \boxed{2.3} = 11.5 / 5 = 2.3 = \text{good}$

SCORE POINT: 2

<u>Part 1</u>		Points
Correct answer with Missing procedure:	“mean = 2.4” Lists given run times	½
<u>Part 2</u>		Points
Correct answer with Missing procedure:	“Amy would have 2(to) run a 2.3 to reduce her running score...”	1½
Total Points		2

1.
2.8, 2.6, 2.2,
2.3, 2.1,
mean = 2.4

Amy would
have 2 run
a 2.3 to
reduce her
running
score for the week.

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 1

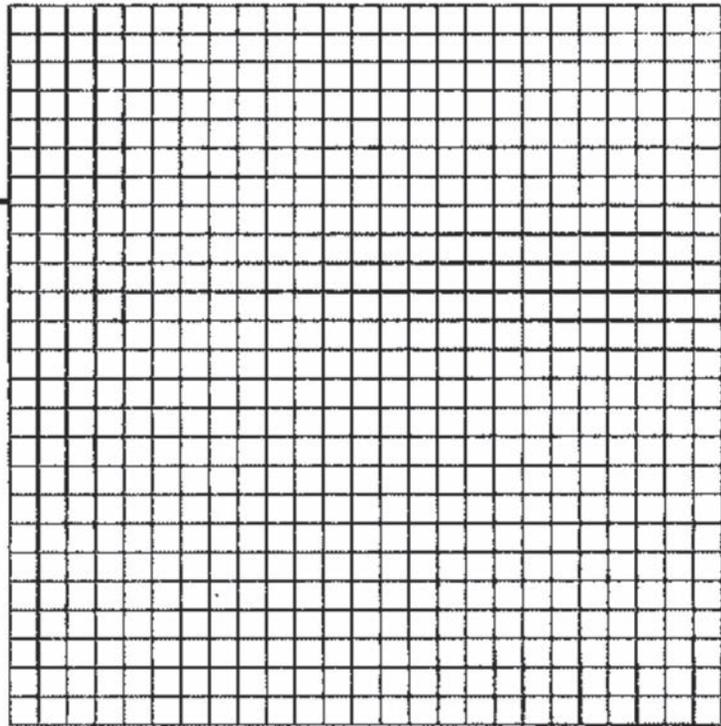
<u>Part 1</u>		Points
Correct answer with Correct procedure:	2.4 Adds Monday-Friday times, divides the sum by 5	1
<u>Part 2</u>		Points
Incorrect answer with Insufficient procedure:	2.0 seconds "I guessed then checked it in the calculator."	-
Total Points		1

$$1. - 2.8 + 2.6 + 2.2 + 2.3 + 2.1$$

$$= 12 \div 5 = 2.4$$

2.0 seconds.

I guessed then checked
it in the calculator.



ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

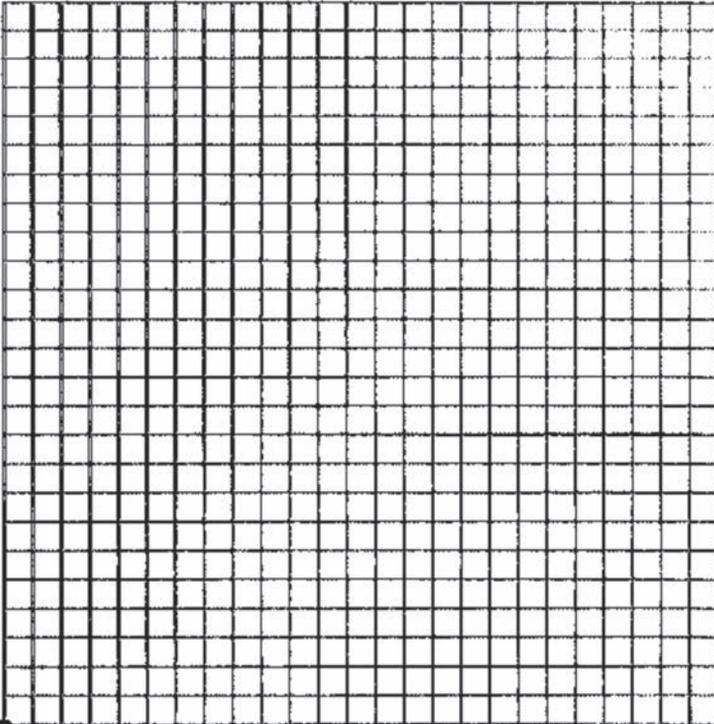
SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect answer with Incorrect procedure:	12 minutes Lists Monday-Friday times and the sum	-
<u>Part 2</u>		Points
Incorrect answer with Incorrect procedure:	"Her time needs to be 2.5..." $2.1 + .4 = 2.5$ min	-
Total Points		0

1.)

2.8, 2.6, 2.2, 2.3, 2.1

= 12 minutes



2.) Amy's mean = $12 - 0.1 = 11.9$

Her time needs to be, 2.5 because

$2.1 + .4 = 2.5$ min

$2.8 - 2.4 = .4$ $2.6 - 2.2 = .4$ $2.2 - 2.3 = -.1$ $2.3 - 2.1 = .2$

ITEM B—2013 ALGEBRA I

- B.** The length of a rectangular field is 45 meters greater than its width.
1. Write an equation to find the perimeter, P , of the field. Be sure to identify your variables.
 2. If the perimeter of the field is 450 meters, how wide is the field? Show your work and/or explain your answer.
 3. What is the area of the field? Show your work and/or explain your answer.

BE SURE TO LABEL YOUR RESPONSES 1, 2, AND 3.

Item B Scoring Rubric—2013 Algebra I

Score	Description
4	The student earns 5 points. The response contains no incorrect work. Correct unit label of “square meters” in Part 3.
3	The student earns $3\frac{1}{2} - 4\frac{1}{2}$ points.
2	The student earns 2 – 3 points.
1	The student earns $\frac{1}{2} - 1\frac{1}{2}$ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

ITEM B SOLUTION AND SCORING—2013 ALGEBRA I

SOLUTION AND SCORING

5 points possible:

Part	Points
1	<p>1 point possible:</p> <p>1 point: Correct equation: $P = 2[w + (w + 45)]$ or $P = 4w + 90$ $w = \text{width}$ or equivalent</p> <p style="margin-left: 40px;"><i>Note: Variables may be identified on a diagram</i></p> <p style="text-align: center;">OR</p> <p>½ point: • Correct equation, variable(s) not identified</p> <p style="margin-left: 40px;">Or</p> <p style="margin-left: 40px;">• Correct expression with variable(s) identified</p>
2	<p>2 points possible:</p> <p>1 point: Correct answer: 90 (<i>meters</i>) <i>Or correct answer based on Part 1 equation/expression</i></p> <p style="text-align: center;">AND</p> <p>1 point: Correct and complete procedure shown or explained <i>Work may contain 1 calculation or copy error</i> Give credit for the following or equivalent: Ex. $P = 4w + 90$ $450 = 4w + 90$ $360 = 4w$ $w = 90 \text{ m}$</p>
3	<p>2 points possible:</p> <p>1 point: Correct answer: 12,150 (m^2) <i>Or correct answer based on Part 2</i></p> <p style="text-align: center;">AND</p> <p>1 point: Correct and complete procedure shown or explained <i>Work may contain 1 calculation or copy error</i> Give credit for the following or equivalent: Ex. $A = lw$ $l = w + 45 = 90 + 45 = 135 \text{ m}$ (<i>not required</i>) $A = 90 \times 135 = 12,150 \text{ m}^2$</p>

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 4

Part 1		Points
Correct equation:	$P = 2(w + 45) + 2w$ $w + 45 = \text{length}$ $w = \text{width}$ (variables identified)	1
Part 2		Points
Correct answer:	90 meter = w	1
Correct procedure:	$450 = 2(w + 45) + 2w, \dots, 450 = 4w + 90$ $\frac{360}{4} = \frac{4w}{4}$	1
Part 3		Points
Correct answer:	12,150 meter ²	1
Correct procedure:	$\text{length} = 90 + 45 = 135 \text{ meters}$ (not required) $A = 90 \cdot 135 =$	1
Total Points		5

① $P = \text{perimeter}$ $P = 2(w + 45) + 2w$
 $w + 45 = \text{length}$
 $w = \text{width}$

② $P = 2(w + 45) + 2w$
 $450 = 2(w + 45) + 2w$
 $450 = 2w + 90 + 2w$
 $450 = 4w + 90$
 $\frac{360}{4} = \frac{4w}{4}$
 $90 \text{ meter} = w$

③ $A = \text{area} = \text{length} \cdot \text{width}$
 $\text{width} = 90 \text{ meters}$
 $\text{length} = 90 + 45 = 135 \text{ meters}$
 $A = 90 \cdot 135 = 12,150 \text{ meter}^2$

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 3

<u>Part 1</u>		Points
Correct expression:	$45 + x + 45 + x + x + x$ or $4x + 90$ (variables identified)	$\frac{1}{2}$
<u>Part 2</u>		Points
Correct answer:	$x = 90$ meters	1
Correct procedure:	Sets expression equal to 450 and solves	1
<u>Part 3</u>		Points
Incorrect answer:	$12,100 \text{ m}^2$ (due to a calculation error)	-
Correct procedure:	$A = lw = 135 \times 90 =$	1
Total Points		$3\frac{1}{2}$

1. Length = $45 + x$
 Width = $x = 90$ meters

$45 + 90 = 135$ meters

$45 + x + 45 + x + x + x$ or $4x + 90$

2. $4x + 90 = 450$
 $4x = 360$
 $x = 90$ meters

3. $A = lw \Rightarrow A =$

$$\begin{array}{r} 135 \\ \times 90 \\ \hline 000 \\ 1210x \\ \hline 12150 \end{array}$$

$A = 12,150 \text{ m}^2$

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 2

<u>Part 1</u>		Points
Incorrect equation:	$P = w + (w + 45)$	-

<u>Part 2</u>		Points
Correct answer: (Based on Part 1)	202.5 m = width	1
Correct procedure:	Substitutes 450 for Perimeter into Part 1 equation and solves	1

<u>Part 3</u>		Points
Incorrect answer:	20.1m = width	-
Incorrect procedure:	Sets <i>Area</i> equal to 450 and solves for the <i>width</i> (incorrectly)	-
Total Points		2

①  $w = \text{width}$

$P = w + (w + 45)$

②

$$\begin{array}{r} 450 = w + (w + 45) \\ -45 \quad \quad -45 \\ \hline 405 = 2w \\ \frac{405}{2} = \frac{2w}{2} \end{array}$$

202.5m = width

③

$$\begin{array}{r} 450 = (w + 45)w \\ 450 = w^2 + 45w \\ -45 \quad \quad -45 \\ \hline 405 = w^2 \\ \sqrt{405} = \sqrt{w^2} \\ 20.1m = \text{width} \end{array}$$

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 1

Part 1		Points
Incorrect equation:	$X = 45 + 450 \text{ m}$	-
Part 2		Points
Correct answer:	90 m	1
Missing procedure:		-
Part 3		Points
Incorrect answer:	20,250 m	-
Missing procedure:		-
Total Points		1

1. $X = 45 + 450 \text{ m}$

2. 90 m

3. 20,250 m

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect equation:	$P = 245 + 2450$	-
<u>Part 2</u>		Points
Incorrect answer:	180 meters width	-
Incorrect procedure:	$81,000/450$	-
<u>Part 3</u>		Points
Incorrect answer:	$A = 450$	-
Incorrect procedure:	$364,50000/81,000$	-
Total Points		0

1. $P = 245 + 2450$

2. $P = 2L + 2W$
 $P = 245 + 2W$
 $P = 81,000 \quad 81,000/450 = 180$
 the Rectangular field is
 180 meters width

3.

$A = LW$
 $A = 81,000 \times 450$
 $\sqrt{A} = 364,50000 / 81,000$
 $A = 450$

the Area of the Rectangular
 Field is 450 meters length
 and 180 meters width.

- C. In the table below, the water level of a bathtub is related to how many minutes the water has been running.

Water in Bathtub

Time Water Runs (in minutes)	Level of Water (in inches)
1	0.5
2	1.0
3	1.5
4	2.0
5	2.5
6	3.0
7	3.5

1. What are the domain and range values of this relationship?
2. Create a new table of values, beginning at 1 minute, that represents the water level changing at a rate of 1.5 inches per minute.
3. If the domain and/or range are affected by the rate change in Part 2, explain how they are affected.

BE SURE TO LABEL YOUR RESPONSES 1, 2, AND 3.

Item C Scoring Rubric—2013 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

ITEM C SOLUTION AND SCORING—2013 ALGEBRA I

SOLUTION AND SCORING

4 points possible:

Part	Points																
1	<p>2 points possible:</p> <p>1 point: Correct domain values: {1, 2, 3, 4, 5, 6, 7}</p> <p>OR</p> <p>½ point: Partially correct domain with 1 incorrect/missing value</p> <p>AND</p> <p>1 point: Correct range values: {0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5}</p> <p>OR</p> <p>½ point: Partially correct range with 1 incorrect/missing value</p>																
2	<p>1 point possible:</p> <p>1 point: Correct table Give credit for the following or equivalent: Ex.</p> <p style="text-align: center;">Water in Bathtub</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Time Water Runs (in minutes)</th> <th>Level of Water (in inches)</th> </tr> </thead> <tbody> <tr><td>1</td><td>1.5</td></tr> <tr><td>2</td><td>3.0</td></tr> <tr><td>3</td><td>4.5</td></tr> <tr><td>4</td><td>6.0</td></tr> <tr><td>5</td><td>7.5</td></tr> <tr><td>6</td><td>9.0</td></tr> <tr><td>7</td><td>10.5</td></tr> </tbody> </table> <p><i>Note: Full credit is awarded for a table that has the 1st three (or more) correct entries, with no incorrect entries</i> <i>Note: Full credit is awarded for a table that has the range values of (Level of Water): {0.5, 2.0, 3.5, 5.0, 6.5, 8.0, 9.5}</i></p> <p>OR</p> <p>½ point: • Partially correct table with 1 incorrect value</p> <p>Or</p> <p>• Table is incorrect due to 1 calculation error, all subsequent values are correct based on that 1 error</p>	Time Water Runs (in minutes)	Level of Water (in inches)	1	1.5	2	3.0	3	4.5	4	6.0	5	7.5	6	9.0	7	10.5
Time Water Runs (in minutes)	Level of Water (in inches)																
1	1.5																
2	3.0																
3	4.5																
4	6.0																
5	7.5																
6	9.0																
7	10.5																

ITEM C SOLUTION AND SCORING—2013 ALGEBRA I

Part	Points
3	<p>1 point possible:</p> <p>1 point: Correct explanation Give credit for the following or equivalent:</p> <p>Ex. “The domain values would not change, but the range values would. For example, for the same domain values of 1 to 7 minutes the range values would be {1.5, 3.0, 4.5, 6.0, 7.5, 9.0, 10.5}”</p> <p>Ex. “The range is affected. The values are tripled because the rate has tripled.”</p> <p><i>Note: A statement about the domain is not required since it does not change, however any statement made about it must be correct</i></p>

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 4

<u>Part 1</u>		Points
Correct domain:	"Domain - (1, 2, 3, 4, 5, 6, 7)"	1
Correct range:	"Range - (.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5)"	1
<u>Part 2</u>		Points
Correct table:	Complete table with the 7 correct values for Level of Water, {1.5, 3, 4.5, 6, 7.5, 9, 10.5}	1
<u>Part 3</u>		Points
Correct explanation:	"The domain will not change... The new range is (1.5, 3, 4.5, 6, 7.5, 9, 10.5)"	1
Total Points		4

① Domain - (1, 2, 3, 4, 5, 6, 7)
 Range - (.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5)

Time Water Runs (in minutes)	Level of Water (in inches)
1	1.5
2	3
3	4.5
4	6
5	7.5
6	9
7	10.5

$1.5x = y$

③ The domain will not change.
 The range will change.
 It will start at 1.5 and go up 1.5 each minute. The new range is (1.5, 3, 4.5, 6, 7.5, 9, 10.5)

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

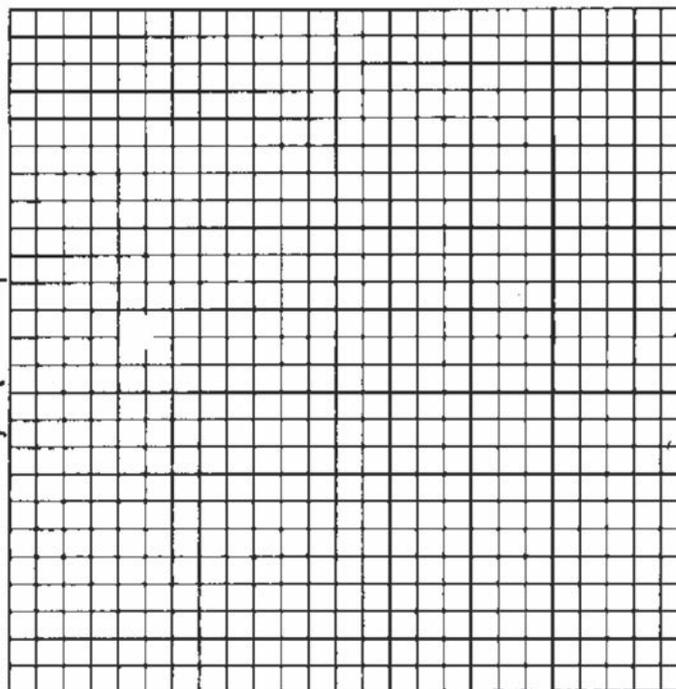
SCORE POINT: 3

<u>Part 1</u>		Points
Correct domain:	“Domain = 1, 2, 3, 4, 5, 6, 7”	1
Correct range:	“Range = 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5”	1
<u>Part 2</u>		Points
Correct table:	Complete table with the 7 correct values for Level of Water	1
<u>Part 3</u>		Points
Incorrect explanation:	“The domain & range are affected...” <i>Any statement made about the Domain must be correct</i>	-
Total Points		3

1) Domain = 1, 2, 3, 4, 5, 6, 7

Range = 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5

2) Time water runs (in minutes)	Level of Water (in inches)
1	1.0
2	3.0
3	4.5
4	4.0
5	7.5
6	9.0
7	10.5



3) The domain & range are affected by the rate change. The level of water is higher than it was when the rate was 0.5 inches per minute.

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 2

<u>Part 1</u>		Points
Correct domain:	"Domain = 1, 2, 3, 4, 5, 6, 7"	1
Incorrect range:	"Range = +.5" <i>Question asks for the "range values"</i>	-
<u>Part 2</u>		Points
Correct table:	Complete table with the 7 correct values for Level of Water	1
<u>Part 3</u>		Points
Incorrect explanation:	"They became higher..."	-
Total Points		2

① Domain = 1, 2, 3, 4, 5, 6, 7
Range = +.5

② water in Bath tub

Time water runs (minutes)	Level of water (inches)
1	1.5
2	3.0
3	4.5
4	6.0
5	7.5
6	9.0
7	10.5

③ They became higher by the minute, meaning the water's speed increases

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 1

<u>Part 1</u>		Points
Correct domain:	"Domain- (1, 2, 3, 4, 5, 6, 7)"	1
Incorrect range:	"Range- (-3, -6)"	-

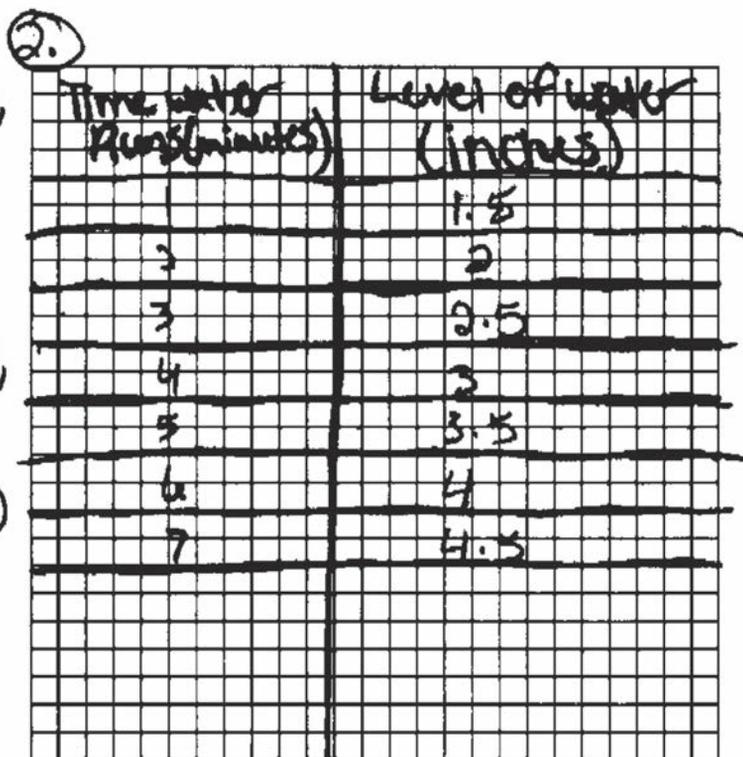
<u>Part 2</u>		Points
Incorrect table:	All entries incorrect beyond the 1 st	-

<u>Part 3</u>		Points
Incorrect explanation:	"The domain and Range were not effected they stayed the same"	-
Total Points		1

① Domain - (1, 2, 3, 4, 5, 6, 7)
Range - (-3, -6)

③ Domain - (1, 2, 3, 4, 5, 6, 7)
Range - (-3, -6)

The domain and Range were not effected they stayed the same.



ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect domain:	"2, 4, 6 they are equal."	-
Incorrect range:	"they are equal."	-
<u>Part 2</u>		Points
Incorrect table:	All entries incorrect beyond the 1 st	-
<u>Part 3</u>		Points
Incorrect explanation:	"They are not affected..."	-
Total Points		0

① 2, 4, 6 they are equal.

②

1	1.5
2	2.0
3	2.5
4	3.0
5	3.5
6	4.0
7	4.5

③ They are not affected they are still equal.

- D. Ski rentals are \$100 plus \$18 per hour, as shown in the table below.

Ski Rentals

Time (in hours)	Rental Cost
1	\$118
2	\$136
3	\$154
4	\$172

1. Write an equation that represents this data using function notation. Let x represent the time in hours and $f(x)$ represent the rental cost.
2. What would be $f(6)$? Show your work.
3. If $f(x) = 235$, what is x ? Show your work.

BE SURE TO LABEL YOUR RESPONSES 1, 2, AND 3.

Item D Scoring Rubric—2013 Algebra I

Score	Description
4	The student earns 5 points. The response contains no incorrect work.
3	The student earns 4 points.
2	The student earns 2 – 3 points.
1	The student earns 1 point, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

ITEM D SOLUTION AND SCORING—2013 ALGEBRA I

SOLUTION AND SCORING

5 points possible:

Part	Points
1	<p>1 point possible:</p> <p>1 point: Correct equation: $f(x) = 18x + 100$ or equivalent</p>
2	<p>2 points possible:</p> <p>1 point: Correct answer: 208 (dollars) Or correct answer based on Part 1 equation</p> <p>AND</p> <p>1 point: Correct and complete procedure shown or explained Work may contain 1 calculation or copy error Give credit for the following or equivalent: Ex. $f(6) = 18(6) + 100$ $= 108 + 100$ $= 208$</p>
3	<p>2 points possible:</p> <p>1 point: Correct answer: 7.5 (hours) Or correct answer based on Parts 1 and/or 2</p> <p>AND</p> <p>1 point: Correct and complete procedure shown or explained Work may contain 1 calculation or copy error Give credit for the following or equivalent: Ex. $f(x) = 235$ $235 = 18x + 100$ $135 = 18x$ $7.5 = x$</p> <p>Ex. “Guess & Check” $x = 7.5$ (required) $18(7.5) + 100 = 135 + 100 = 235$ (required) $18(7) + 100 = 226$ (not required) $18(8) + 100 = 244$</p>

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 4

<u>Part 1</u>		Points
Correct equation:	$F(x) = 18x + 100$	1
<u>Part 2</u>		Points
Correct answer:	$F(6) = 208$	1
Correct procedure:	$F(6) = 18(6) + 100 = 108 + 100 =$	1
<u>Part 3</u>		Points
Correct answer:	$x = 7.5$	1
Correct procedure:	"Guess & Check" $F(7.5) = 18(7.5) + 100 = 235$ Extra "Guesses" of 6, 6.2, 7, & 8 shown not to "Check" (not required)	1
Total Points		5

1. $F(x) = 18x + 100$

2. $F(6) = 18x + 100$
 $F(6) = 18(6) + 100$
 $F(6) = 108 + 100$
 $F(6) = 208$

3. $f(x) = 235$

$f(x) = 18(x) + 100$ $f(x) = 235$
 $f(6) = 18(6) + 100$ $f(6) = 208x$
 $f(6.2) = 18(6.2) + 100$ $f(6.2) = 211.6x$
 $f(7) = 18(7) + 100$ $f(7) = 226x$
 $f(8) = 18(8) + 100$ $f(8) = 244x$
 $f(7.5) = 18(7.5) + 100$ $f(7.5) = 235 \checkmark$

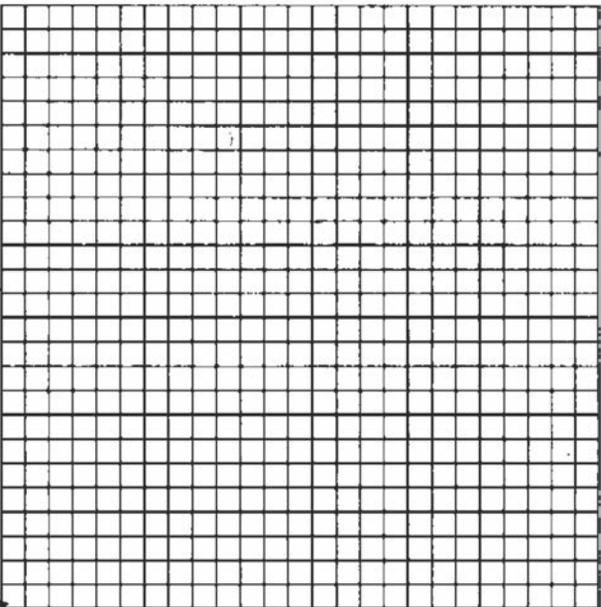
If $f(x) = 235$
 then $x = 7.5$
 because
 $f(7.5) = 18(7.5) + 100$
 is equal to
 $f(7.5) = 235$

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 3

<u>Part 1</u>		Points
Correct equation:	$F(x) = 18x + 100$	1
<u>Part 2</u>		Points
Incorrect answer:	$F(6) = 200$ (due to a calculation error)	-
Correct procedure:	$F(6) = 18(6) + 100 = 108 + 100 = 200$ (Calc. err.)	1
<u>Part 3</u>		Points
Correct answer:	$x = 7.5$ hours	1
Correct procedure:	Sets $F(x)$ equal to 235 and solves for x	1
Total Points		4

1.) $x = \text{hours}$
 $F(x)$ rental cost
 $F(x) = 18x + 100$
 price plus \$100 per hour.



2.) $F(x) = 18x + 100$
 $F(6) = 18(6) + 100$
 $F(6) = 108 + 100$
 $F(6) = 200$

3.) $F(x) = 235$
 $F(x) = 18x + 100$
 $235 = 18x + 100$
 -100
 $135 = 18x$
 $\frac{135}{18} = \frac{18x}{18}$
 $x = 7.5 \text{ hours}$

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 2

<u>Part 1</u>		Points
Correct equation:	$f(x) = 18x + 100$	1
<u>Part 2</u>		Points
Incorrect answer:	$6 = 18x + 100$	-
Missing procedure:		-
<u>Part 3</u>		Points
Correct answer:	$x = 7.5$	1
Correct procedure:	Sets $f(x)$ equal to 235 and solves for x	1
Total Points		3

\$100 plus \$18 per hr

1.
 $f(x) = 18x + 100$

2.
 $6 = 18x + 100$

3.
 $235 = 18x + 100$
 $-100 \quad -100$
 $135 =$

$$\begin{array}{r} -235 \\ 100 \\ \hline 135 \end{array}$$

$$\begin{array}{r} 18 \\ \times 7.5 \\ \hline 135 \end{array}$$

$235 = 18(7.5) + 100$
 $235 = 135 + 100$
 $235 = 235$

$x = 7.5$

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

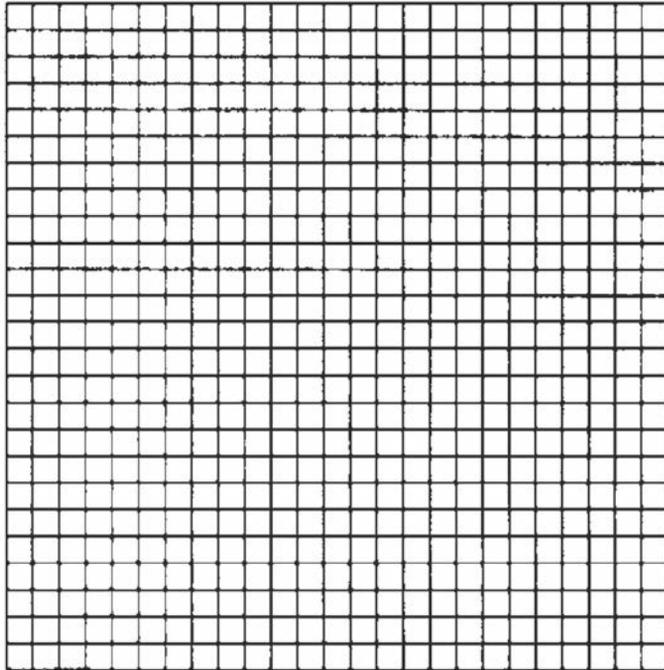
SCORE POINT: 1

<u>Part 1</u>		Points
Incorrect equation:	$y = \$18x + 100$ (not written using function notation)	-
<u>Part 2</u>		Points
Correct answer:	" $f(6)$ would be 208 ..."	1
Missing procedure:		-
<u>Part 3</u>		Points
Incorrect answer:	" x would be 9..."	-
Incorrect procedure:	"...because $226 - 9 = 235$ "	-
Total Points		1

① $y = \$18x + 100$

② $f(6)$ would be 208 rental cost.

③ $f(x) = 235$
 x would be 9 because $226 - 9 = 235$



ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

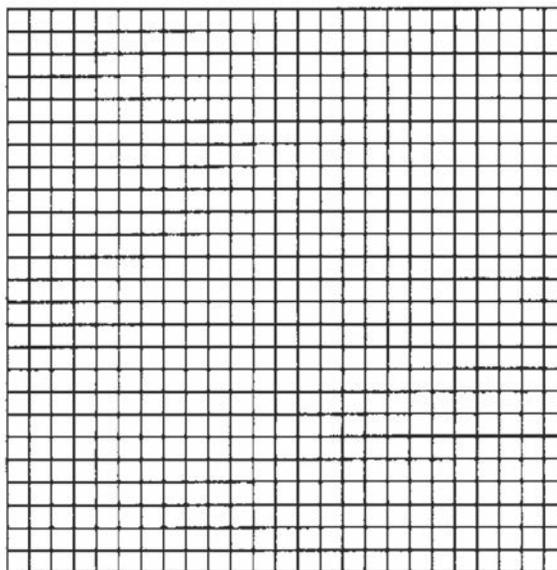
SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect equation:	$f(x) = 1x + 118$	-
<u>Part 2</u>		Points
Incorrect answer(s):	<i>No credit is awarded for multiple answers</i>	-
Incorrect procedure(s):	<i>f(6) is computed for 4 different equations. The equation that results in the expected answer of 208 is solved incorrectly</i>	-
<u>Part 3</u>		Points
Incorrect answer:	"...so $x = 235$ just like f "	-
Missing procedure:		-
Total Points		0

1)
 $f(x) = 1x + 118$

2)
 ①
 $f(6) = 1(6) + 118$
 $f(6) = 124$

② $f(6) = 2(6) + 130$
 $f(6) = 208$
 ③ $f(6) = 3(6) + 154$
 $f(6) = 172$
 ④ $f(6) = 4(6) + 172$
 $f(6) = 196$



3) describing what f is so $x = 235$ just like f .

ITEM E—2013 ALGEBRA I

- E. 1. Copy the table below into your answer document. Using the function $f(x) = x^2 - 1$, complete the table.

x	y
-2	
-1	
$-\frac{1}{2}$	
0	
$\frac{1}{2}$	
1	
2	

- Use the grid in your answer document to graph the function $f(x) = x^2 - 1$. Label both axes. Plot and label the vertex.
- Write the function that represents the reflection of $f(x) = x^2 - 1$ across the x -axis.
- On the same grid, graph the function from Part 3.

BE SURE TO LABEL YOUR RESPONSES 1, 2, 3, AND 4.

Item E Scoring Rubric—2013 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

SOLUTION AND SCORING

4 points possible:

Part	Points																
1	<p>1 point possible:</p> <p>1 point: Correct and complete table, as shown below:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr> <td>-2</td> <td>3</td> </tr> <tr> <td>-1</td> <td>0</td> </tr> <tr> <td>-1/2</td> <td>-3/4</td> </tr> <tr> <td>0</td> <td>-1</td> </tr> <tr> <td>1/2</td> <td>-3/4</td> </tr> <tr> <td>1</td> <td>0</td> </tr> <tr> <td>2</td> <td>3</td> </tr> </tbody> </table> <p style="text-align: center;">OR</p> <p>1/2 point: Table contains 6 correct values of y and 1 incorrect/missing value of y</p>	x	y	-2	3	-1	0	-1/2	-3/4	0	-1	1/2	-3/4	1	0	2	3
x	y																
-2	3																
-1	0																
-1/2	-3/4																
0	-1																
1/2	-3/4																
1	0																
2	3																
2	<p>1 point possible:</p> <p>1 point: Correct graph, as shown below: Or correct graph of a quadratic function based on incorrect table in Part 1 Note: Part 4 parabola is included</p> <div style="text-align: center;"> </div> <p><u>Graph must include:</u></p> <ul style="list-style-type: none"> • Correctly labeled axes (1 or both missing = 1 error) • Consistent intervals (1 error per axis) • Correctly graphed parabola: All points (that are plotted) are correct (1 error per point) & connected by a curve, arrows are included (1 error) • Correctly labeled vertex (missing = 1 error) <p style="text-align: center;">OR</p> <p>1/2 point: Graph contains 1 error but is otherwise correct Ex: Parabola is correctly graphed, but arrows are missing Ex: Axes not labeled, but graph is otherwise correct</p>																

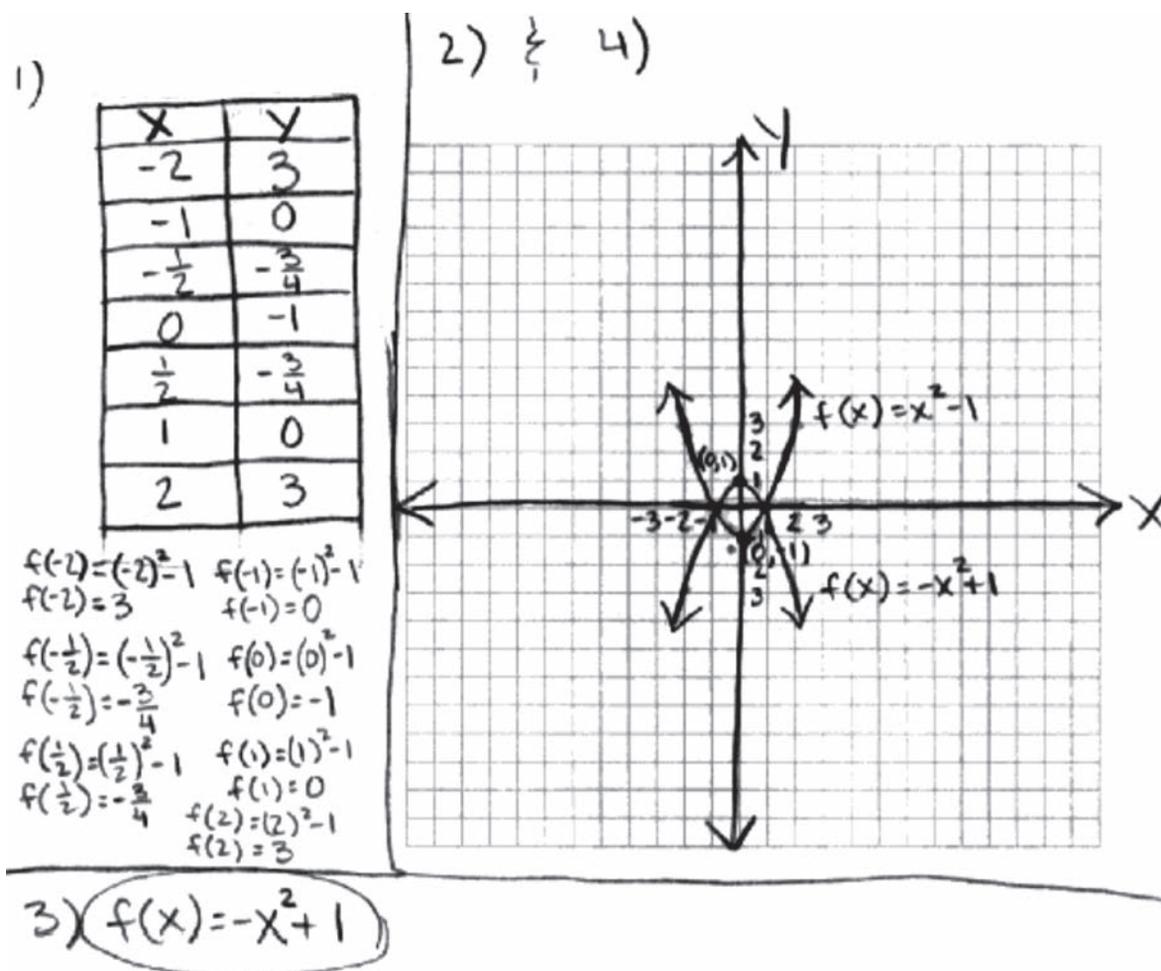
ITEM E SOLUTION AND SCORING—2013 ALGEBRA I

Part	Points
3	<p>1 point possible:</p> <p>1 point: Correct answer: $f(x) = -x^2 + 1$ or equivalent Ex. $y = -(x^2 - 1)$</p>
4	<p>1 point possible:</p> <p>1 point: Correct reflection of quadratic function from Part 2: See above graph Or correct graph of incorrect quadratic function given in Part 3 Note: The prompt does not require labeling the graph as Part 4 The Part 2 graph is distinguished by the labeling of the vertex</p> <p>OR</p> <p>½ point: Graph contains 1 error but is otherwise correct Ex. Parabola is correctly graphed, but arrows are missing Ex. 1 point is plotted incorrectly, but graph is otherwise correct Note: If plotted on the same axes, no further reduction is made for missing labels or inconsistent intervals from Part 2</p>

ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 4

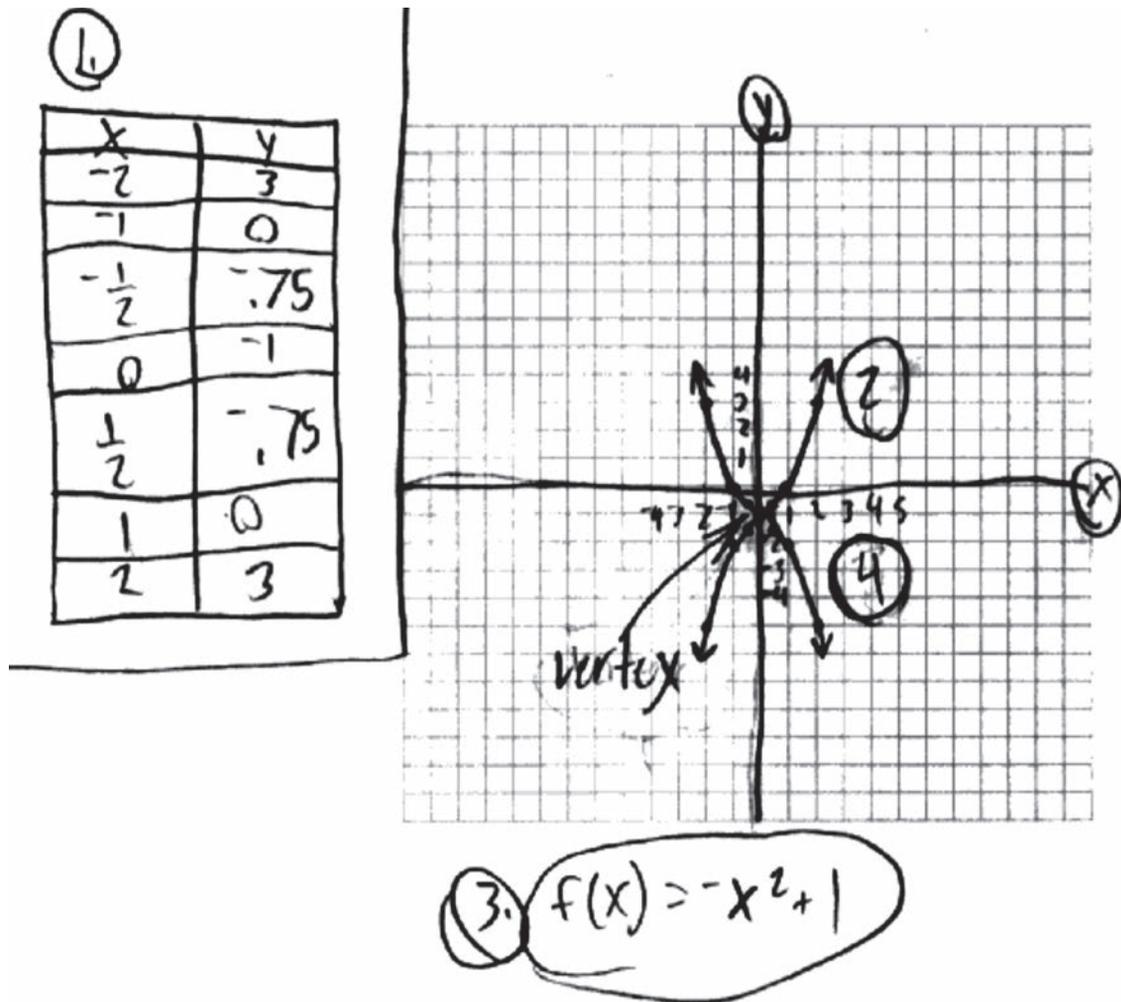
<u>Part 1</u>		Points
Correct table:	7 correct values for y: $\{3, 0, -\frac{3}{4}, -1, -\frac{3}{4}, 0, 3\}$	1
<u>Part 2</u>		Points
Correct graph:	Axes labeled, consistent intervals, parabola is correctly graphed, vertex is labeled "(0, -1)"	1
<u>Part 3</u>		Points
Correct answer:	$f(x) = -x^2 + 1$	1
<u>Part 4</u>		Points
Correct graph:	Function is correctly graphed	1
Total Points		4



ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 3

<u>Part 1</u>		Points
Correct table:	7 correct values for y: {3, 0, -.75, -1, -.75, 0, 3}	1
<u>Part 2</u>		Points
Correct graph:	Axes labeled, consistent intervals, parabola is correctly graphed, vertex is labeled "vertex"	1
<u>Part 3</u>		Points
Correct answer:	$f(x) = -x^2 + 1$	1
<u>Part 4</u>		Points
Incorrect graph:	Graph of $f(x) = -x^2 - 1$ is drawn	-
Total Points		3



ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

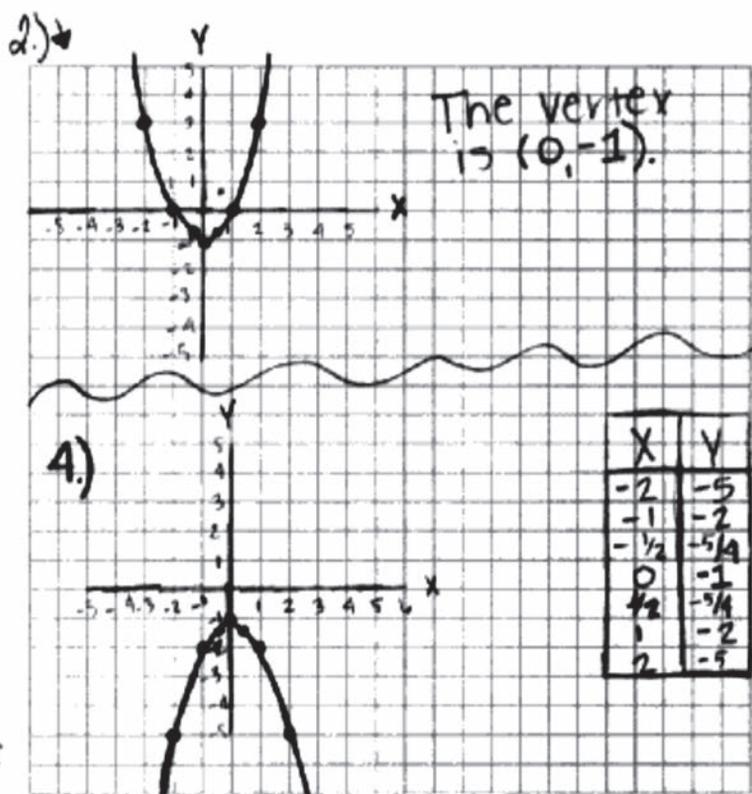
SCORE POINT: 2

<u>Part 1</u>		Points
Correct table:	7 correct values for y: $\{3, 0, -\frac{3}{4}, -1, -\frac{3}{4}, 0, 3\}$	1
<u>Part 2</u>		Points
Partially correct graph:	Axes labeled, consistent intervals, vertex is labeled “The vertex is (0, -1)”, <i>parabola is missing arrows (1 error)</i>	$\frac{1}{2}$
<u>Part 3</u>		Points
Incorrect answer:	$f(x) = -x^2 - 1$	-
<u>Part 4</u>		Points
Partially correct graph: (Based on Part 3)	Graph of the function given in Part 3 <i>missing arrows (1 error)</i>	$\frac{1}{2}$
Total Points		2

X	Y
-2	3
-1	0
-1/2	-3/4
0	-1
1/2	-3/4
1	0
2	3

$(-2)^2 - 1 = 3$
 $(-1)^2 - 1 = 0$
 $(-1/2)^2 - 1 = -3/4$
 $(0)^2 - 1 = -1$
 $(1/2)^2 - 1 = -3/4$
 $(1)^2 - 1 = 0$
 $(2)^2 - 1 = 3$

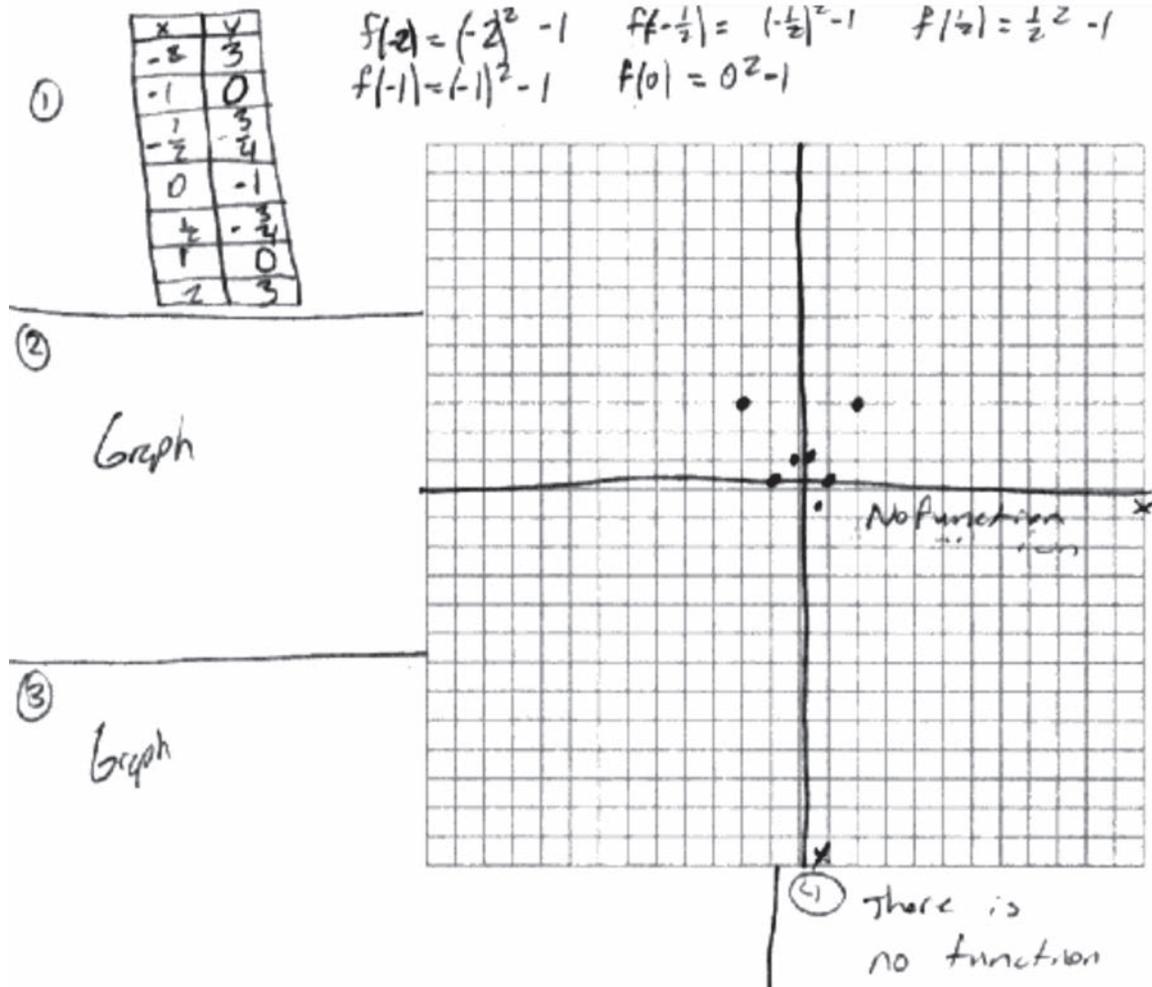
3. $f(x) = -x^2 - 1$ is the function when reflected across the x-axis.



ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 1

<u>Part 1</u>		Points
Correct table:	7 correct values for y: $\{3, 0, -\frac{3}{4}, -1, -\frac{3}{4}, 0, 3\}$	1
<u>Part 2</u>		Points
Incorrect graph:	Function not graphed (no credit for plotting points only)	-
<u>Part 3</u>		Points
Missing answer:	"Graph"	-
<u>Part 4</u>		Points
Missing graph:	"There is no function"	-
Total Points		1



ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 0

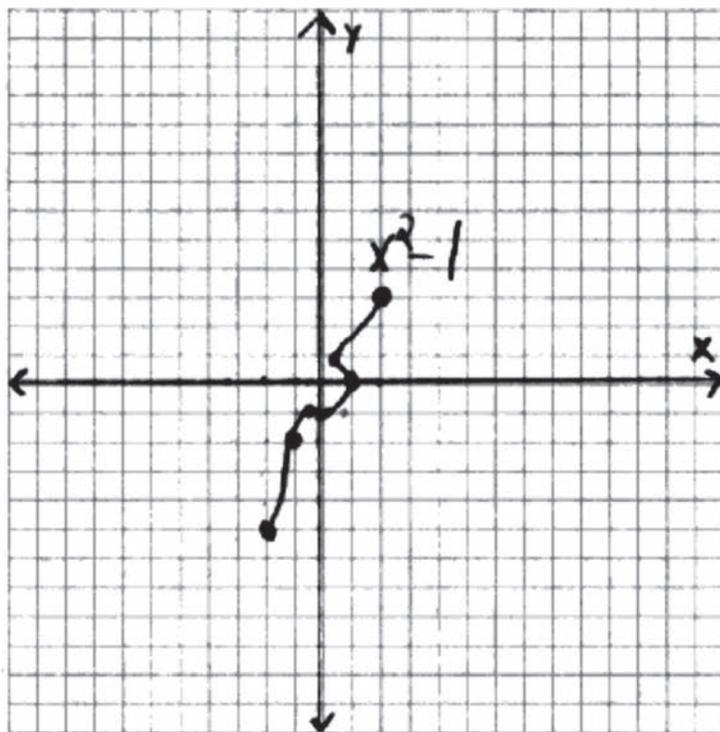
<u>Part 1</u>		Points
Incorrect table:	4 incorrect values for y: $\{-5, -2, -\frac{1}{4}, \dots, \frac{1}{3}, \dots\}$	-
<u>Part 2</u>		Points
Incorrect graph:	$(-\frac{1}{2}, -\frac{1}{4})$ & $(\frac{1}{2}, \frac{1}{3})$ plotted incorrectly, points connected in wrong order, arrows missing	-
<u>Part 3</u>		Points
Missing answer:		-
<u>Part 4</u>		Points
Missing graph:		-
Total Points		0

①

x	y
-2	-5
-1	2
$-\frac{1}{2}$	$\frac{1}{4}$
0	-1
$\frac{1}{2}$	$\frac{1}{3}$
1	0
2	3

③

②



④

ITEM F—2013 ALGEBRA I

F. The orbital period of a comet depends on the average distance from the Sun, r , and the eccentricity of the orbit, e .

1. If a comet is an average of 6.0×10^{17} cm from the Sun, and $e = 1.5 \times 10^{13}$ cm, calculate the ratio $\frac{r}{e}$. Express your answer in scientific notation.
2. The time in years, T , it takes an object to orbit the Sun can be found using the equation $T = \sqrt{\left(\frac{r}{e}\right)^3}$. Calculate the number of years, T , it takes the comet to orbit the Sun. Show all of your work and leave your answer in scientific notation.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

Item F Scoring Rubric—2013 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 points.
2	The student earns 2 points.
1	The student earns 1 point, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank – No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

ITEM F SOLUTION AND SCORING—2013 ALGEBRA I

SOLUTION AND SCORING

4 points possible:

Part	Points
1	<p>2 point possible:</p> <p style="margin-left: 40px;">2 point: Correct answer: 4.0×10^4 <i>Note: No other answers are acceptable</i> <i>Work is not required</i></p> <p style="text-align: center; margin: 10px 0;">OR</p> <p style="margin-left: 40px;">1 point: Answer of: 4×10^4 <i>(equivalent to the correct answer but does not have 2 significant digits)</i></p>
2	<p>2 points possible:</p> <p style="margin-left: 40px;">2 points: Correct answer: 8.0×10^6 (years) <i>Or correct answer, written in scientific notation, based on an incorrect answer in Part 1</i> Correct procedure is shown and/or explained Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • $T = \sqrt{(4.0 \times 10^4)^3} = \sqrt{64 \times 10^{13}} = 8.0 \times 10^6$ <p style="text-align: center; margin: 10px 0;">OR</p> <p style="margin-left: 40px;">1 point: • Correct answer: 8.0×10^6 <i>Procedure is incomplete or missing, but not incorrect</i></p> <p style="margin-left: 40px;">Or</p> <ul style="list-style-type: none"> • Answer of: 8×10^6 <i>(equivalent to the correct answer but does not have 2 significant digits)</i> Correct procedure is shown and/or explained <p style="margin-left: 40px;">Or</p> <ul style="list-style-type: none"> • Answer is incorrect due to 1 calculation or copy error, but is <i>correctly written in scientific notation</i> Correct procedure is shown and/or explained <p style="margin-left: 40px;">Or</p> <ul style="list-style-type: none"> • Answer of : 8,000,000 Correct procedure is shown and/or explained

ITEM F SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 4

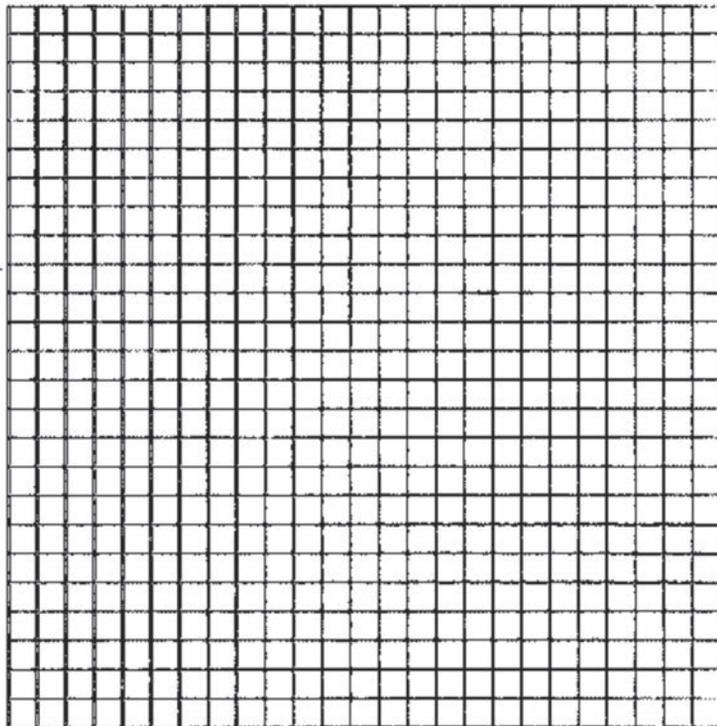
<u>Part 1</u>		Points
Correct answer:	4.0×10^4	2
<u>Part 2</u>		Points
Correct answer with Correct procedure:	8.0×10^6 years $T = \sqrt{\left(\frac{6.0 \times 10^{17}}{1.5 \times 10^{13}}\right)^3} = \dots = \sqrt{64 \times 10^{12}} =$	2
Total Points		4

① distance from sun = r
 Electricity orbit = e
 Calculate ratio $\frac{r}{e}$
 $= \frac{6.0 \times 10^{17}}{1.5 \times 10^{13}}$
 $= 4.0 \times 10^4$

$$\begin{array}{r} 4.0 \\ 1.5 \overline{) 6.0} \\ \underline{-6.0} \\ 0 \end{array}$$

② T = time in years
 $T = \sqrt{\left(\frac{r}{e}\right)^3}$
 $T = \sqrt{\left(\frac{6.0 \times 10^{17}}{1.5 \times 10^{13}}\right)^3}$
 $T = \sqrt{\frac{216 \times 10^{51}}{3.375 \times 10^{39}}}$
 $T = \sqrt{64 \times 10^{12}}$
 $T = 8.0 \times 10^6$

$\frac{4811}{-39}$
 $\frac{12}{12}$
 The number of years it takes it takes the comet to orbit the sun would be 8.0×10^6 years.



ITEM F SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 3

<u>Part 1</u>		Points
Correct answer:	$\frac{4.0 \times 10^4}{1}$	2
<u>Part 2</u>		Points
Equivalent answer with Correct procedure:	8×10^6 (equivalent answer, but does not have 2 significant digits) $T = \sqrt{\left(\frac{6.0 \times 10^{17}}{1.5 \times 10^{13}}\right)^3}$ $T = \sqrt{6.4 \times 10^{13}}$	1
Total Points		3

① $\frac{r}{e}$

$\frac{6.0 \times 10^{17}}{1.5 \times 10^{13}}$

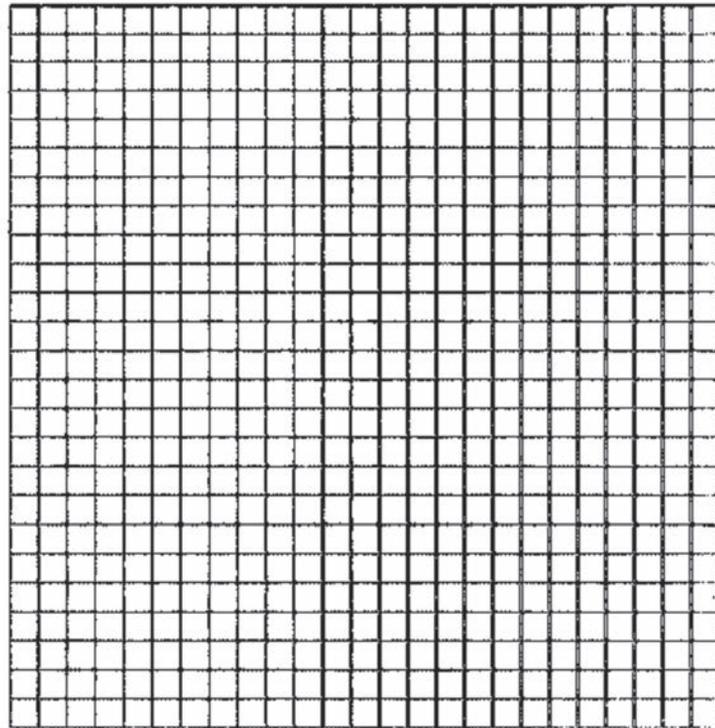
$\frac{4.0 \times 10^4}{1}$

② $T = \sqrt{\left(\frac{r}{e}\right)^3}$

$T = \sqrt{\left(\frac{6.0 \times 10^{17}}{1.5 \times 10^{13}}\right)^3}$

$T = \sqrt{6.4 \times 10^{13}}$

$T = 8 \times 10^6$



ITEM F SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 2

<u>Part 1</u>		Points
Incorrect answer:	4.0×10^{20}	-
<u>Part 2</u>		Points
Correct answer (Based on Part 1) with Correct procedure:	$T = 8.0 \times 10^{30}$ time in years $T = \sqrt{(4.0 \times 10^{20})^3}$ (from Part 1) $T = \sqrt{(6.4 \times 10^{61})}$	2
Total Points		2

① $\frac{6.0 \times 10^{17}}{2}$ average distance

6.0×10^{17} half average

Ratio = $\frac{R}{c}$

$e = 1.5 \times 10^{18}$ cm

$\frac{6.0 \times 10^{17}}{2}$ half average

$e = 1.5 \times 10^{18}$ cm

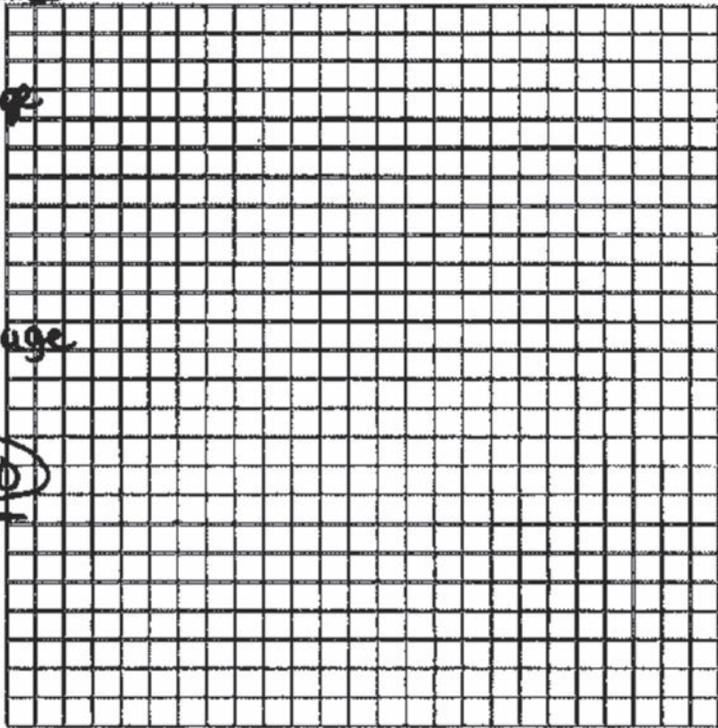
$4.0 \times 10^{20} = \text{Ratio}$

② $T = \sqrt{\left(\frac{R}{c}\right)^3}$

$T = \sqrt{(4.0 \times 10^{20})^3}$

$T = \sqrt{(6.4 \times 10^{61})}$

$T = 8.0 \times 10^{30}$ time in years



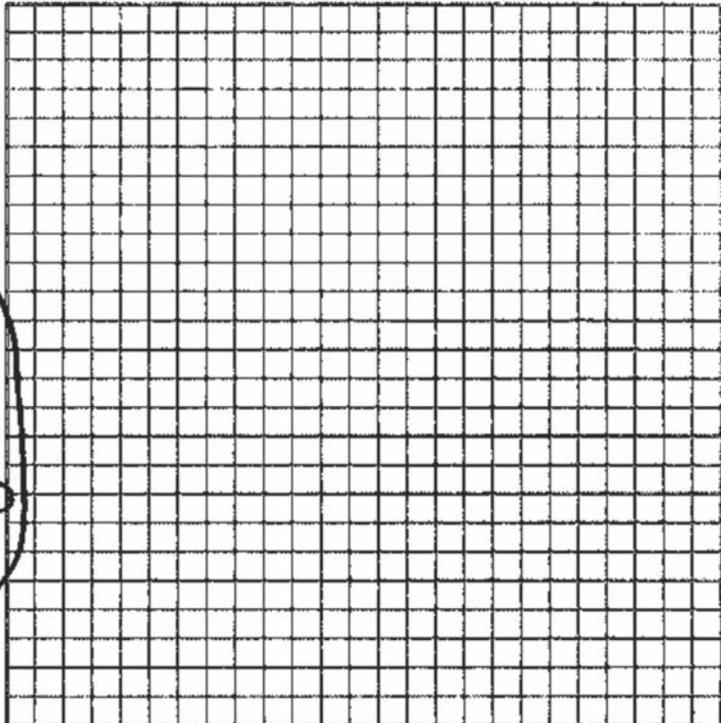
ITEM F SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 1

<u>Part 1</u>		Points
Incorrect answer:	4.0×10^{30}	-
<u>Part 2</u>		Points
Equivalent answer with Correct procedure:	$T = 8 \times 10^6$ (equivalent answer, but does not have 2 significant digits) $T = \sqrt{\left(\frac{6.0 \times 10^{17}}{1.5 \times 10^{13}}\right)^3} = 8,000,000$	1
Total Points		1

1.
 $\frac{r}{e} = \frac{6.0 \times 10^{17} \text{ cm}}{1.5 \times 10^{13} \text{ cm}}$
 $4^{30} = 4.0 \times 10^{30}$

2.
 $T = \sqrt{\left(\frac{r}{e}\right)^3}$
 $T = \sqrt{\left(\frac{6.0 \times 10^{17}}{1.5 \times 10^{13}}\right)^3} = 8,000,000$
 $T = 8 \times 10^6$



ITEM F SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect answer:	1.692665944 : 1.946195068	-
<u>Part 2</u>		Points
Incorrect answer with Missing procedure:	8 ⁴⁵ years <i>No evidence of correct procedure beyond substitution</i>	-
Total Points		0

1.

$$4.0 \times 10^{17} =$$

$$1.692665944$$

$$1.5 \times 10^{13} =$$

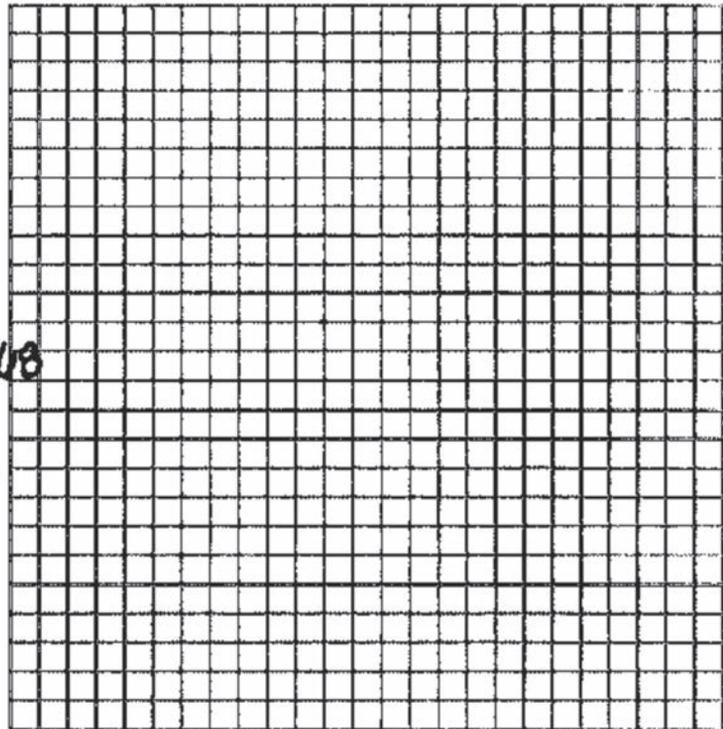
$$1.946195068$$

$$1.692665944 : 1.946195068$$

2.

$$\left(\frac{4.0 \times 10^{17}}{1.5 \times 10^{13}} \right)^3$$

$$= 8^{45} \text{ years}$$



- G.** The width of a rectangular field is 125 yards and the length of the field is 350 yards. A scale drawing of the field needs to be drawn such that 1 inch represents 25 yards.
1. Find the length and width, in inches, of the field in the scale drawing. Show or explain your work.
 2. Write a fraction that represents the ratio of the area of the model in square inches to the area of the field in square yards.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

Item G Scoring Rubric—2013 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

ITEM G SOLUTION AND SCORING—2013 ALGEBRA I

SOLUTION AND SCORING

4 points possible:

Part	Points
1	<p>2 points possible:</p> <p>½ point: Correct length: 14 (in.)</p> <p>AND</p> <p>½ point: Correct procedure is shown and/or explained <i>Work may contain 1 calculation or copy error</i> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • $\frac{1}{25} = \frac{l}{350}$ $25l = 350$ $l = \#$ • $\frac{350}{25} = \#$ <p>AND</p> <p>½ point: Correct width: 5 (in.)</p> <p>AND</p> <p>½ point: Correct procedure is shown and/or explained <i>Work may contain 1 calculation or copy error</i> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • $\frac{1}{25} = \frac{w}{125}$ $25w = 125$ $w = \#$ • $\frac{125}{25} = \#$ <p><i>Note: If the dimensions in Part 1 are unidentified: The work can be used as identification. Or The first value will be assumed to be the length and the second value to be the width since they are asked for in that order (“Find the length and width...”).</i> <i>Or If found on a diagram, the “long side” will be considered the length and the “short side” will be considered the width.</i></p>

ITEM G SOLUTION AND SCORING—2013 ALGEBRA I

Part	Points
2	<p>2 points possible:</p> <p>2 points: Correct answer: $\frac{1}{625}$ or $\frac{70}{43750}$ or equivalent</p> <p style="padding-left: 100px;"><i>Or correct answer based on an incorrect length and/or width in Part 1</i></p> <p style="padding-left: 100px;"><i>Note: Work is not required</i></p> <p style="padding-left: 100px;"><i>Note: Fraction does not need to be reduced to lowest terms</i></p> <p style="text-align: center;">OR</p> <p>1 point: • Correct ratio (<i>not in fraction form</i>): 70 : 43750 or equivalent</p> <p style="padding-left: 100px;">Or</p> <p style="padding-left: 100px;">• Reciprocal of correct fraction: $\frac{43750}{70}$ or equivalent</p>

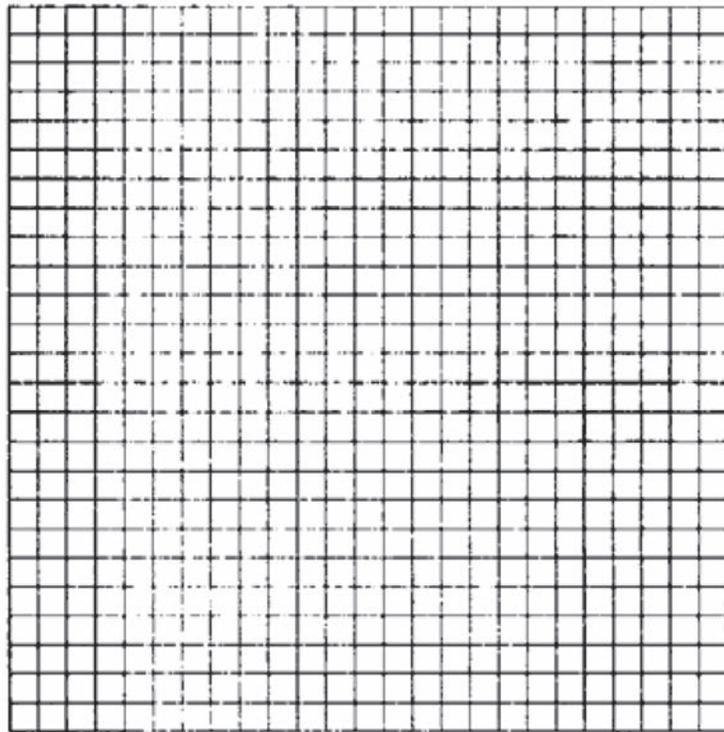
ITEM G SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 4

<u>Part 1</u>		Points
Correct length:	14 inches = Length	½
Correct procedure:	Sets up proportion and solves	½
Correct width:	5 in = width	½
Correct procedure:	Sets up proportion and solves	½

<u>Part 2</u>		Points
Correct fraction:	$\frac{70}{43750} = \frac{1}{625}$	2
Total Points		4

$\textcircled{1}$ 1 in = 25 yards
 $\frac{25}{1} \times \frac{125}{w}$
 $\frac{125}{25} = \frac{25w}{75}$
 5 in = width
 $\frac{350}{L} \times \frac{25}{1}$
 $350 \cdot 1 = 25L$
 $\frac{350}{25} = \frac{25L}{25}$
 14 inches = Length



$\textcircled{2}$ $A = LW$ $A = LW$
 $A = 14 \cdot 5$ $A = 125 \cdot 350$
 $A = 70 \text{ in}^2$ $A = 43750 \text{ yd}^2$ $\frac{70}{43750} = \frac{1}{625}$

ITEM G SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

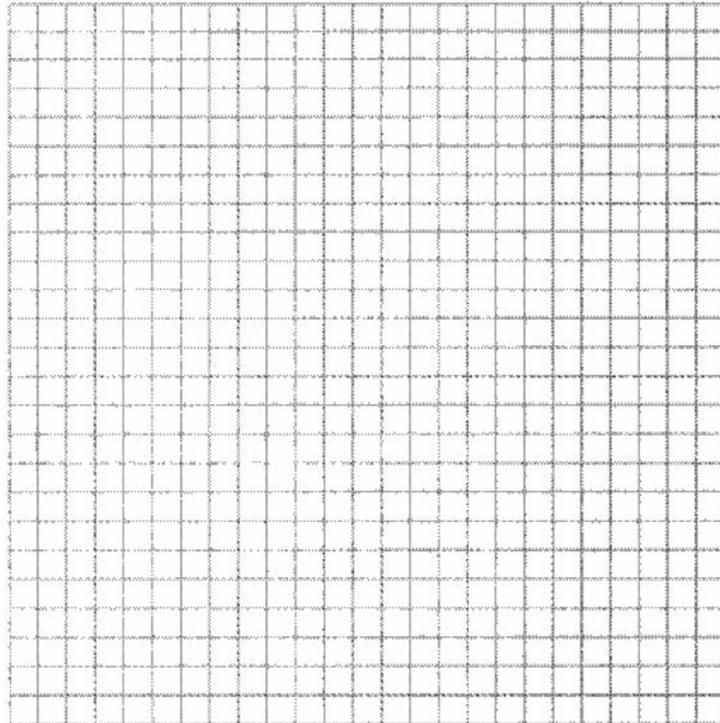
SCORE POINT: 3

<u>Part 1</u>		Points
Correct length:	length: 14 inches	$\frac{1}{2}$
Missing procedure:		-
Correct width:	width: 5 inches	$\frac{1}{2}$
Missing procedure:		-

<u>Part 2</u>		Points
Correct fraction:	$\frac{70}{43750}$	2
Total Points		3

① width: 5 inches
length: 14 inches

② $\frac{70}{43750}$



ITEM G SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 2

<u>Part 1</u>		Points
Correct length:	$L = 14 \text{ in}$	$\frac{1}{2}$
Correct procedure:	$L = \frac{350}{25}$	$\frac{1}{2}$
Correct width:	$W = 5 \text{ in}$	$\frac{1}{2}$
Correct procedure:	$W = \frac{125}{25}$	$\frac{1}{2}$

<u>Part 2</u>		Points
Missing fraction:	<i>An incorrect ratio is given, not in fraction form</i>	-
Total Points		2

1.

$L = \frac{350}{25}$ $w = \frac{125}{25}$

$L = 14 \text{ in}$ $w = 5 \text{ in}$

2.

$5 \text{ in}^2 = 125 \text{ yd}^2$

$5 : 25$

$5 \text{ in}^2 : 25 \text{ yd}^2$

Not drawn to scale

SCORE POINT: 1

<u>Part 1</u>		Points
Correct length:	14 inches	$\frac{1}{2}$
Missing procedure:		-
Correct width:	5 inches	$\frac{1}{2}$
Missing procedure:		-

<u>Part 2</u>		Points
Missing fraction:	<i>An incorrect ratio is given, not in fraction form</i>	-
Total Points		1

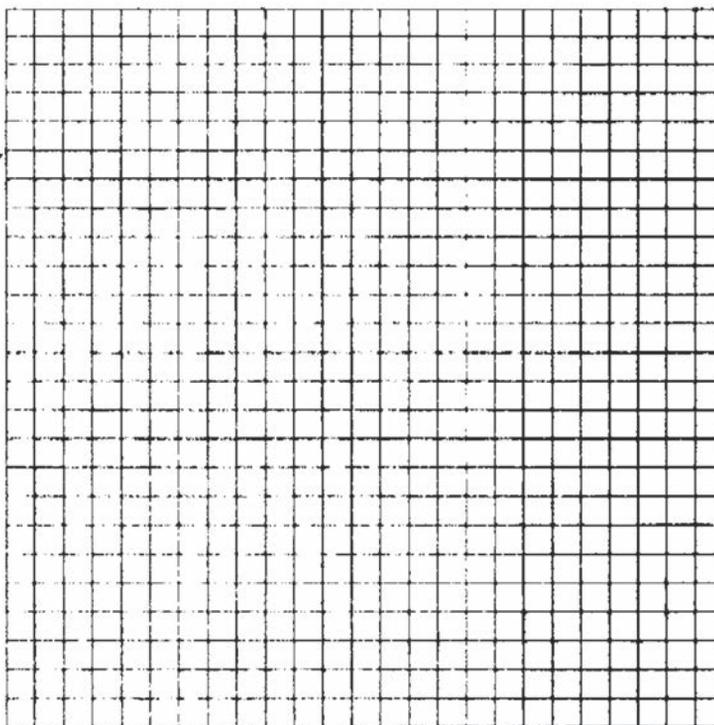
1) width = 5 inches

length = 14 inches

2) $43750^{\text{sq}} \text{ yds.}$

1750 inches ?

$43750 : 1750$?



ITEM G SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

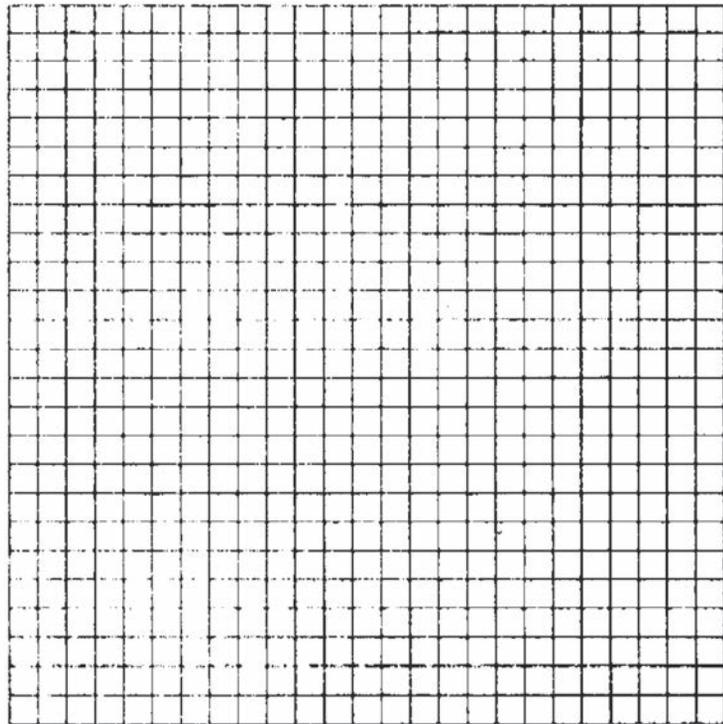
SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect length:	950 inches	-
Incorrect procedure:	<i>Finds perimeter of the field and calls it "The length"</i>	-
Missing width:		-
Missing procedure:		-

<u>Part 2</u>		Points
Missing fraction:	<i>Incorrectly finds "The area of the rectangular field"</i>	-
Total Points		0

①. The length of the rectangular field is 950 inches
 $2(350) + 2(125)$
 950

②. The area of the rectangular field is 6,2500f
 $2(350) 700$
 $2(125) 250$
 $700 + 250 =$
 62500



- H.** Peter wants to make a rectangular table for his dining room. Because of the dimensions of the room, the table’s length will be 1 foot more than 2 times its width.
1. Write an equation for the length (l), in feet, of the table, in terms of the width (w), in feet, of the table.
 2. Write an equation for the area (a), in square feet, of the table, in terms of the width (w), in feet, of the table.
 3. If the area of the table is 15 square feet, what are the width and length of the table? Show your work and/or explain your answer.

BE SURE TO LABEL YOUR RESPONSES 1, 2, AND 3.

Item H Scoring Rubric—2013 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work. Correct unit labels of “feet” in Part 3.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

ITEM H SOLUTION AND SCORING—2013 ALGEBRA I

SOLUTION AND SCORING

4 points possible:

Part	Points
1	<p>1 point possible:</p> <p>1 point: Correct equation: $l = 2w + 1$</p> <p>OR</p> <p>½ point: Correct expression: $2w + 1$</p>
2	<p>1 point possible:</p> <p>1 point: Correct equation: $a = w(2w + 1)$ or $a = 2w^2 + w$ <i>Or correct equation based on Part 1</i></p> <p>OR</p> <p>½ point: Correct expression: $w(2w + 1)$ or $2w^2 + w$ <i>Or correct expression based on Part 1</i></p>
3	<p>2 points possible:</p> <p>1 point: Correct dimensions: $w = \frac{5}{2}$ or 2.5 (ft) & $l = 6$ (ft) <i>Or correct dimensions based on incorrect NON-LINEAR equation/expression from Part 2</i></p> <p>AND</p> <p>1 point: Correct and complete procedure shown and/or explained <i>Work may contain 1 calculation or copy error</i> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> Using Factoring: $2w^2 + w = 15$ $2w^2 + w - 15 = 0$ $(2w - 5)(w + 3) = 0$ $2w - 5 = 0 \quad 2w = 5 \quad w = 2.5 \quad l = 2(2.5) + 1 = 6$ $w + 3 = 0 \quad w = -3 \quad (\text{reject})$ Using the Quadratic Formula: $w = \frac{-1 \pm \sqrt{1 - 4[2(-15)]}}{4} = \frac{-1 \pm \sqrt{121}}{4} = \frac{10}{4} \text{ or } \frac{-12}{4} \quad (\text{reject})$ $l = 2(2.5) + 1 = 6$ Using “Guess and Check” : $w = 2.5,$ $(2.5 \times 2) + 1 = 6 = l \quad (\text{All steps required})$ $2.5 \times 6 = 15 = a$

ITEM H SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 4

<u>Part 1</u>		Points
Correct equation:	length = $2w + 1$	1
<u>Part 2</u>		Points
Correct equation:	area = $(2w + 1)w$	1
<u>Part 3</u>		Points
Correct dimensions:	width = 2.5 ft length = 6 ft	1
Correct procedure:	$w = \frac{-1 \pm \sqrt{121}}{4}$; $w = \frac{-1 + 11}{4} = 2.5$; $w = \frac{-1 - 11}{4} = -3$ length = $2(2.5) + 1$	1
Total Points		4

1.
the length = $2w + 1$
the width = w ft.

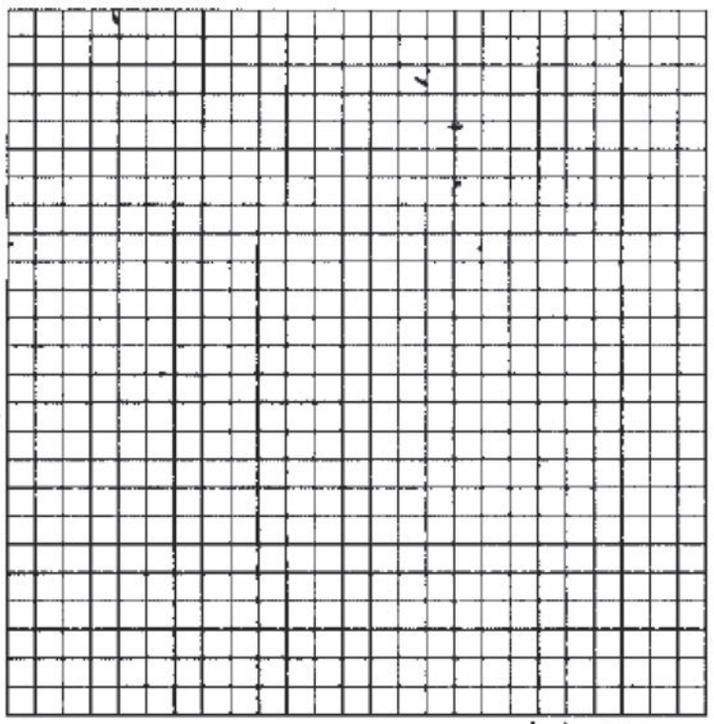
2.
the area = $(2w + 1)w$
the length \nearrow width \nearrow

3.
 $15 = (2w + 1)w$
 $15 = 2w^2 + w$
 $\frac{-15}{-15} \quad \frac{-15}{-15}$
 $0 = 2w^2 + w - 15$

$$w = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$w = \frac{-1 \pm \sqrt{121}}{4}$$

the width = 2.5 ft
the length = $2(2.5) + 1$
the length = 6 ft



$w = \frac{-1 + 11}{4}$ $w = \frac{-1 - 11}{4}$ ← can't have a negative deninition.
 $w = -3$

$15 = 2.5 \times 6$
 $15 = 15 \checkmark$

ITEM H SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 3

<u>Part 1</u>		Points
Correct equation:	$L = 2W + 1\text{ft}$	1
<u>Part 2</u>		Points
Incorrect equation:	$A = 2Wx \cdot Lx + 1\text{ft}$	-
<u>Part 3</u>		Points
Correct dimensions:	$W = 2.5$ $L = 6$	1
Correct procedure: (Guess & Check)	$2.5 \times 2 = 5 + 1\text{ft} = 6$ (<i>running = 's are acceptable</i>) $6 \cdot 2.5 = 15 \text{sq.ft.}$	1
Total Points		3

1) width - W
length - L

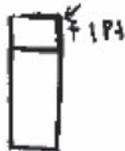
$$L = 2W + 1\text{ft}$$

2) $A = 2Wx \cdot Lx + 1\text{ft}$

3) 15 sq. ft.

$$W = 2.5$$

$$L = 6$$



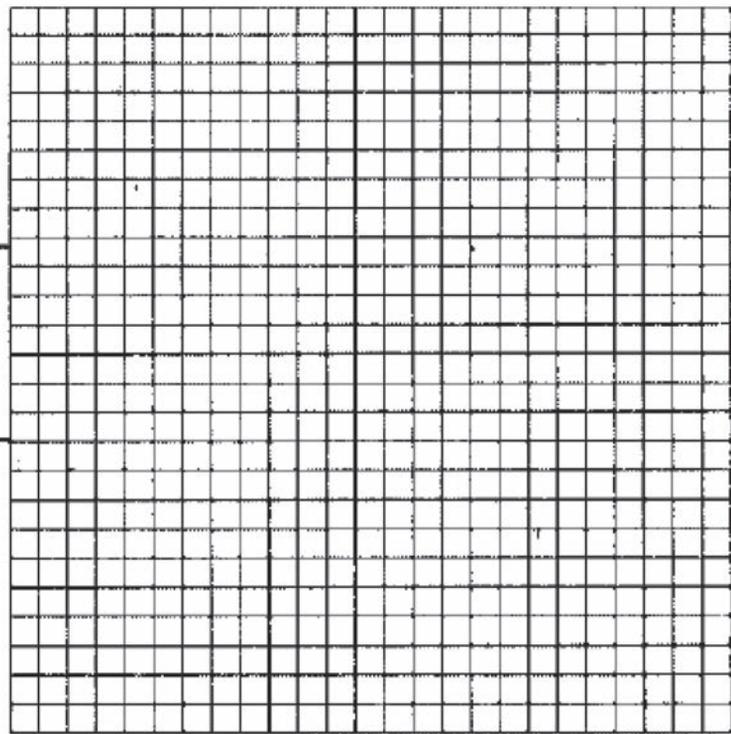
$$2.5 \times 2 = 5 + 1\text{ft} = 6$$

$$A = L \cdot W$$

$$L = 6$$

$$W = 2.5$$

$$6 \cdot 2.5 = 15 \text{sq. ft.}$$



ITEM H SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 2

<u>Part 1</u>		Points
Correct equation:	$l = (2w) + 1$	1
<u>Part 2</u>		Points
Correct equation:	$a = w \cdot (2w + 1)$	1
<u>Part 3</u>		Points
Incorrect dimensions:	$w = 2.25 \text{ ft}$ $l = 6.5 \text{ ft}$	-
Incorrect procedure:	$\frac{15}{2} - 1 = 6.5$ $\frac{6.5}{2} - 1 = 2.25$	-
Total Points		2

① $l = (2w) + 1$

② $a = w \cdot (2w + 1)$

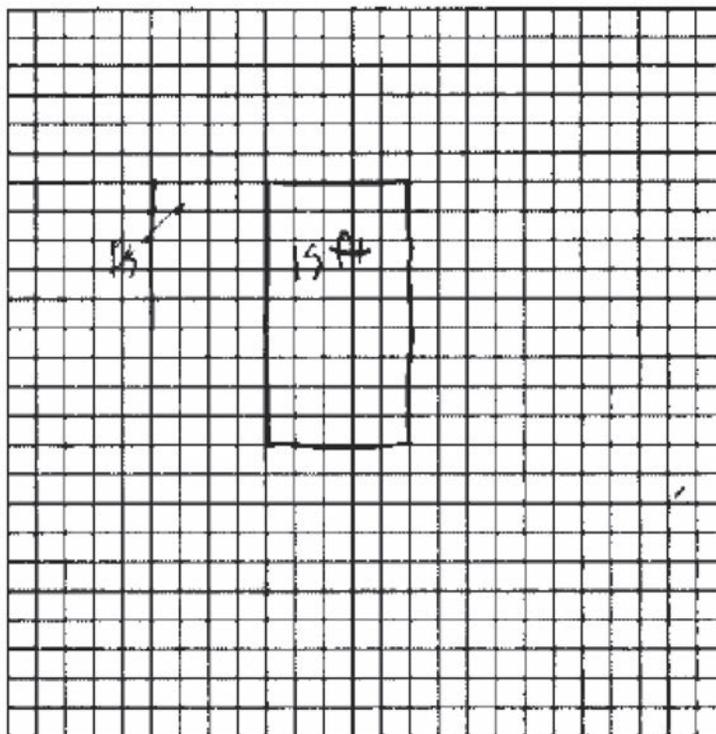
③ 15

$a = lw$ $\frac{15}{2} - 1 = 6.5$

$\frac{6.5}{2} - 1 = 2.25$

$2.25(6.5) = 15$

$w = 2.25 \text{ ft}$
 $l = 6.5 \text{ ft}$



ITEM H SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 1

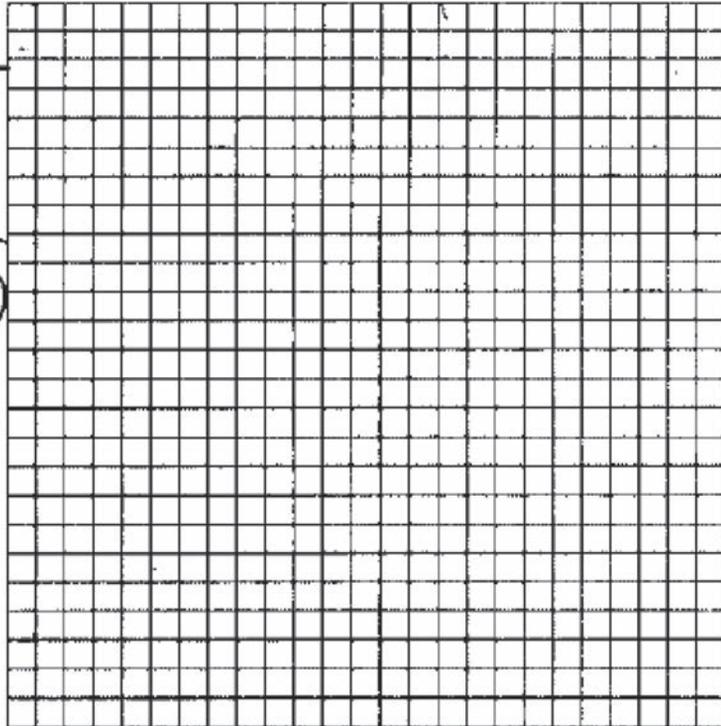
<u>Part 1</u>		Points
Incorrect equation:	$l = w^2 + 1$	-
<u>Part 2</u>		Points
Correct equation: (Based on Part 1)	$a = w(w^2 + 1)$	1
<u>Part 3</u>		Points
Incorrect dimensions:	$w = 3.25 \text{ ft}$ $l = 22.5 \text{ ft}$	-
Incorrect procedure:	$w = \frac{15 \text{ ft}^2}{w^2 + 1}$ $l = \frac{15 \text{ ft}^2}{w}$	-
Total Points		1

① $l = w^2 + 1$

② $a = w(w^2 + 1)$

③ $w = \frac{15 \text{ ft}^2}{w^2 + 1} = 3.25 \text{ ft}$

$l = \frac{15 \text{ ft}^2}{w} = 22.5 \text{ ft}$



ITEM H SAMPLE RESPONSES AND ANNOTATIONS—2013 ALGEBRA I

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect equation:	$x = l + 2w$	-
<u>Part 2</u>		Points
Incorrect equation:	$A = l^2 + 2w^2$	-
<u>Part 3</u>		Points
Incorrect dimensions:	$l = 5 \text{ ft}$ $w = 3 \text{ ft}$	-
Missing procedure:		-
Total Points		0

1) $x = l + 2w$

2) $A = \text{Area}$
 $A = l^2 + 2w^2$

3) The $l = 5 \text{ ft}$
 The $w = 3 \text{ ft}$

$l = \text{Length}$
 $w = \text{Width}$

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Arkansas Comprehensive Testing, Assessment, and Accountability Program

DEVELOPED FOR THE ARKANSAS DEPARTMENT OF EDUCATION, LITTLE ROCK, AR 72201

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