



Arkansas Comprehensive Testing, Assessment, and Accountability Program

# Teacher Handbook

## Algebra I Mid-Year End-of-Course Examination

**January 2007 Administration**

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**Arkansas Department of Education**



# Teacher Handbook—Algebra I

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## Introduction

The **Arkansas Comprehensive Testing, Assessment, and Accountability Program (ACTAAP)** includes a Mid-Year End-of-Course Examination for students completing Algebra I or the equivalent by the end of the first semester. The examination consists of multiple-choice and open-response questions that directly assess student knowledge. The *Arkansas Algebra I Mathematics Curriculum Framework* is the basis for the development of the *Algebra I Mid-Year End-of-Course Examination*.

In January 2007, all students who had completed or were completing the required course work for Algebra I by the end of the first semester participated in the *Algebra I Mid-Year End-of-Course Examination*. Results of the *Algebra I Mid-Year End-of-Course Examination* will be provided to all students, schools, and districts to be used as the basis for instructional change.

The handbook provides information about 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 in Algebra I open-response items.

Additional information about the *Algebra I Mid-Year End-of-Course Examination* is available through the Arkansas Department of Education. Questions can be addressed to Dr. Gayle Potter at 501-682-4558.

## Scoring Student Responses to Algebra I Open-Response Items

The multiple-choice and open-response test items for the *Algebra I Mid-Year End-of-Course Examination* are developed with the assistance and approval of the Algebra I Content Advisory Committee. This committee is composed of 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

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 pre-scored 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 pre-scored papers, and, in order to qualify, each reader must score in exact agreement on at least 80% of the responses and have no more than 5% non-adjacent agreement on the responses. Readers who do not score within the required rate of agreement are not allowed to score the *Algebra I Mid-Year 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 Mid-Year 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 January 2007 *Algebra I Mid-Year End-of-Course Examination*. 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 Mid-Year End-of-Course Examination*.

# **ALGEBRA I**

## **OPEN-RESPONSE ITEMS**

## Algebra I Item A

- A. The table below provides data about ticket sales, in millions of dollars, for two movies over the course of 6 weeks after their release dates.

| Week | Ticket Sales for Movie A | Ticket Sales for Movie B |
|------|--------------------------|--------------------------|
| 1    | 8                        | 34                       |
| 2    | 14.5                     | 30                       |
| 3    | 21                       | 26                       |
| 4    | 27.5                     | 22                       |
| 5    | 34                       | 18                       |
| 6    | 40.5                     | 14                       |

Week 0 represents the premiere weekend for each movie.

- On the grid provided in your answer document, plot and connect the points for the data for Movie A and Movie B. Be sure to label the axes, title the graph, and label the lines that correspond to each movie.
- Determine the equation for each line from Part 1. Explain what the slopes and the  $y$ -intercepts represent.
- When will both movies earn **approximately** the same amount of money in ticket sales? Explain your answer even if you use mental math or a calculator.

## Algebra I Item A Scoring Rubric

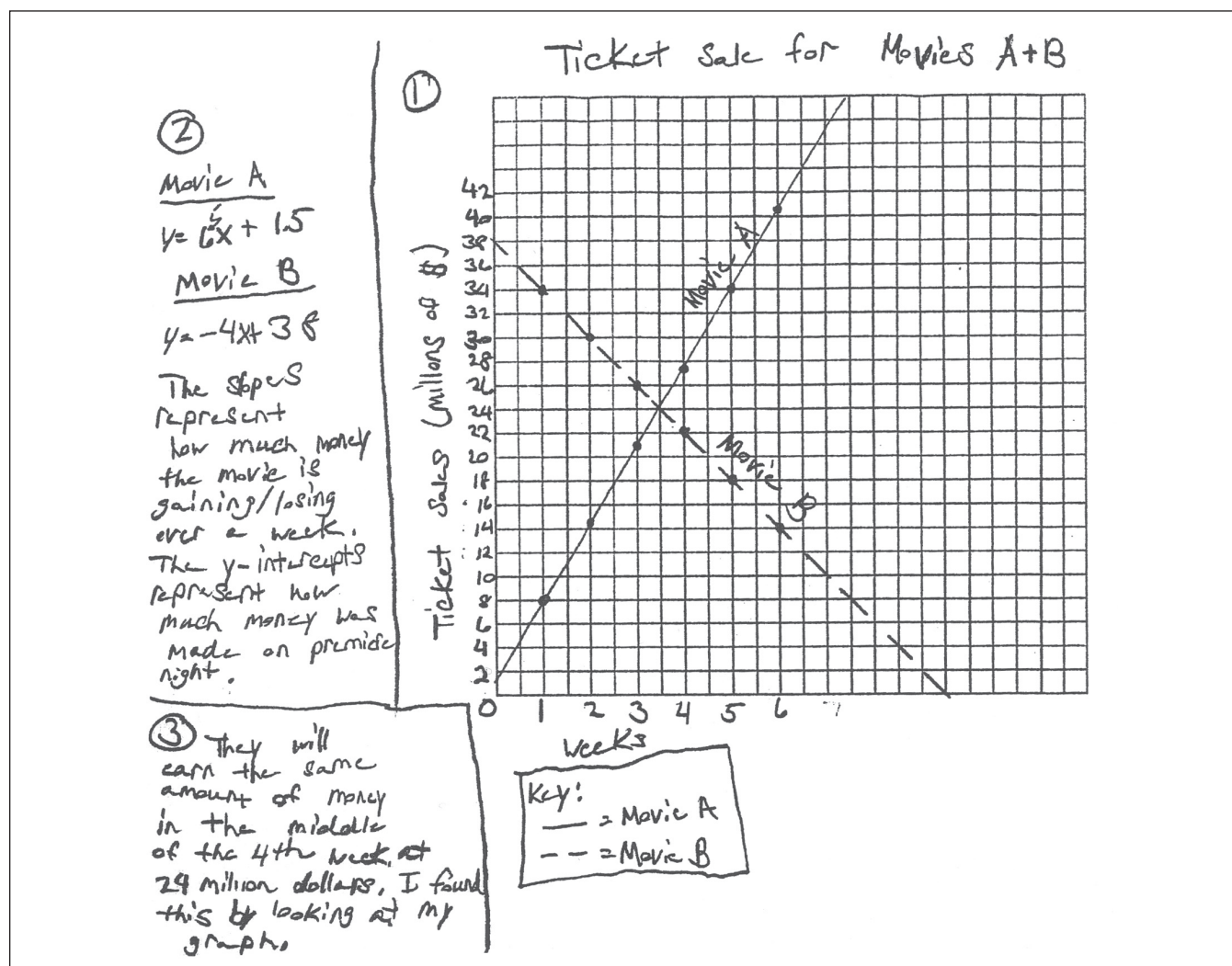
| SCORE    | DESCRIPTION                                                                                                                      |
|----------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>4</b> | The student earns 6 points. The response contains no incorrect work. The graph is titled in Part 1.                              |
| <b>3</b> | The student earns 4–5½ points.                                                                                                   |
| <b>2</b> | The student earns 2–3½ points.                                                                                                   |
| <b>1</b> | The student earns ½–1½ points or some minimal understanding is shown.                                                            |
| <b>0</b> | The student earns 0 points. No understanding is shown.                                                                           |
| <b>B</b> | Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.) |

# Algebra I Item A Solution and Scoring

| Part | Points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                    |                    |   |   |    |   |   |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|--------------------|---|---|----|---|---|----|---|----|----|---|----|----|---|----|----|---|----|----|---|----|----|
| 1    | <p><b>2 points possible</b></p> <p>2 points:      <b>Correct and complete graph that contains the following:</b></p> <ul style="list-style-type: none"><li>• Weeks (labeled) on x-axis, intervals are consistent.</li><li>• Total sales (labeled) on y-axis, intervals are consistent.</li><li>• 6 points for Movie A are correctly plotted and connected.</li><li>• 6 points for Movie B are correctly plotted and connected.</li><li>• Segments (or lines) are correctly identified as <i>A</i> or <i>B</i>.</li><li>• Graph is titled (required at the “4” level).</li></ul> <p>Note: Segments do not have to be extended to the y-axis.<br/>(Premier weekend may not be shown on the graph, but must be correct if represented.)</p> <div><p style="text-align: center;"><b>Ticket Sales for Movies A &amp; B</b></p><table><caption>Data points for Movie A and Movie B</caption><thead><tr><th>Week</th><th>Movie A (millions)</th><th>Movie B (millions)</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>38</td></tr><tr><td>1</td><td>8</td><td>34</td></tr><tr><td>2</td><td>16</td><td>30</td></tr><tr><td>3</td><td>24</td><td>26</td></tr><tr><td>4</td><td>32</td><td>22</td></tr><tr><td>5</td><td>40</td><td>18</td></tr><tr><td>6</td><td>48</td><td>14</td></tr></tbody></table></div> <p>OR</p> <p>1 ½ points:      <b>Graph contains 1 minor error or omission.</b><br/>Minor errors include:</p> <ul style="list-style-type: none"><li>• 1–2 points are incorrectly plotted or missing.</li><li>• Unlabeled axis or axes.</li></ul> <p>OR</p> <p>1 point:      <b>Graph contains 1 major error and/or minor error(s).</b><br/>Major errors include:</p> <ul style="list-style-type: none"><li>• Intervals are inconsistent on 1 or both axes.</li><li>• 3 points are plotted incorrectly.</li><li>• Points representing Week 1 are connected to the origin (Premier weekend is represented incorrectly).</li><li>• Line extends into Quadrant(s) 2, 3, and/or 4.</li><li>• Points are not connected.</li></ul> <p style="text-align: center;">or</p> <p><b>Axes are reversed with no other errors.</b></p> <p>OR</p> <p>½ point:      <b>Understanding of graphing is shown.</b><br/>Ex: Both movies are graphed with the majority of points correctly plotted.<br/>Note: Do not give credit for 2 separate line graphs or any other type of graph.</p> | Week               | Movie A (millions) | Movie B (millions) | 0 | 0 | 38 | 1 | 8 | 34 | 2 | 16 | 30 | 3 | 24 | 26 | 4 | 32 | 22 | 5 | 40 | 18 | 6 | 48 | 14 |
| Week | Movie A (millions)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Movie B (millions) |                    |                    |   |   |    |   |   |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
| 0    | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 38                 |                    |                    |   |   |    |   |   |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
| 1    | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 34                 |                    |                    |   |   |    |   |   |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
| 2    | 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 30                 |                    |                    |   |   |    |   |   |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
| 3    | 24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 26                 |                    |                    |   |   |    |   |   |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
| 4    | 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 22                 |                    |                    |   |   |    |   |   |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
| 5    | 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 18                 |                    |                    |   |   |    |   |   |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
| 6    | 48                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 14                 |                    |                    |   |   |    |   |   |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |

## Algebra I Item A Solution and Scoring

| Part | Points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2    | <p><b>3 points possible</b></p> <p>1 point: <b>Correct equation for Movie A.</b><br/> <math>y = 6.5x + 1.5</math> or equivalent<br/> (work is not required)</p> <p>AND</p> <p>1 point: <b>Correct equation for Movie B.</b><br/> <math>y = -4x + 38</math> or equivalent<br/> (work is not required)</p> <p>AND</p> <p>½ point: <b>Correct explanation for slopes.</b><br/> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> <li>• “The slopes represent the amount the ticket sales changed <b>each week</b>.”</li> </ul> <p>AND</p> <p>½ point: <b>Correct explanation for y-intercept.</b><br/> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> <li>• “The y-intercept represents the amount in ticket sales on the premier weekend.”</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 3    | <p><b>1 point possible</b></p> <p>½ point: <b>Correct estimate.</b><br/> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> <li>• “Somewhere between Week 3 and Week 4,” or</li> <li>• “About 3 ½ weeks,” or</li> <li>• “During week 4,” or</li> <li>• Correct estimate based on incorrect graph(s) in Part 1 or equations in Part 2.</li> </ul> <p>Note: Do not give credit for “Week 3” (too early) or “4 weeks” (too late).<br/> and</p> <p>½ point: <b>Correct explanation or procedure.</b><br/> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> <li>• “I looked at the graph and saw where they intersected,” or</li> <li>• “I looked at the chart and saw when the sales were about the same,” or</li> <li>• “Because they both made about 24 million,” or</li> <li>• Solves equations given in Part 2.</li> </ul> <p>OR</p> <p>½ point: <b>Acceptable estimate.</b><br/> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> <li>• “About the end of 6 weeks.”</li> </ul> <p>and</p> <p>½ point: <b>Correct explanation or procedure.</b><br/> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> <li>• “They both made about 144 (145) million dollars,” or</li> <li>• “They both sold about 144 (145) million tickets,” or</li> <li>• <math>8 + 14.5 + 21 + 27.5 + 34 + 40.5 = 145.5</math>, or</li> <li>• <math>34 + 30 + 26 + 22 + 18 + 14 = 144</math></li> </ul> |



**SCORE: 4**

**Part 1:**

**Points**

Correct & complete graph: All points are correctly plotted, segments drawn  
 Intervals are consistent on both axes  
 Axes are correctly labeled  
 Segments are identified

2

**Part 2:**

Correct equation for A:  $y = 6.5x + 1.5$   
 Correct equation for B:  $y = -4x + 38$   
 Correct exp. Slope: "... money the movie is gaining/losing over a week."  
 Correct exp. y-intercept: "... money was made on premier night."

1

1

1/2

1/2

**Part 3:**

Correct estimate: middle of 4th week  
 Correct explanation: both will earn 24 million

1/2

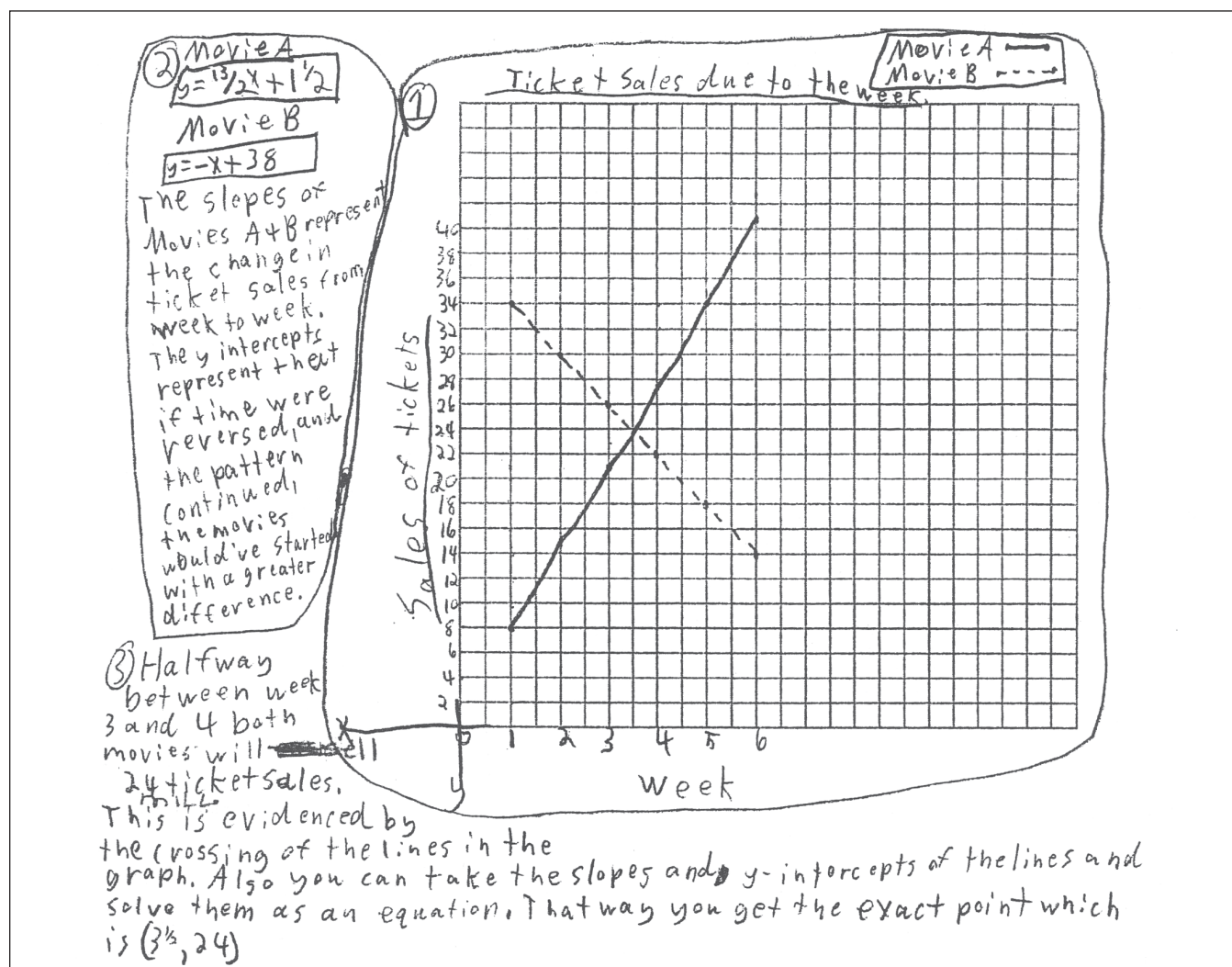
1/2

**TOTAL POINTS:**

6

Title for graph in Part 1 is included

# Algebra I Item A Sample Responses and Annotations



## SCORE: 3

### Part 1:

### Points

Correct & complete graph: All points are correctly plotted, segments drawn  
 Intervals are consistent on both axes  
 Axes are correctly labeled  
 Segments are identified

2

### Part 2:

Correct equation for A:  $y = \frac{13}{2}x + 1\frac{1}{2}$   
 Incorrect equation for B:  $y = -x + 38$   
 Correct exp. Slope: "... change in ticket sales from week to week."  
 Incorrect exp. y-intercept: ??

1

-

$\frac{1}{2}$

-

### Part 3:

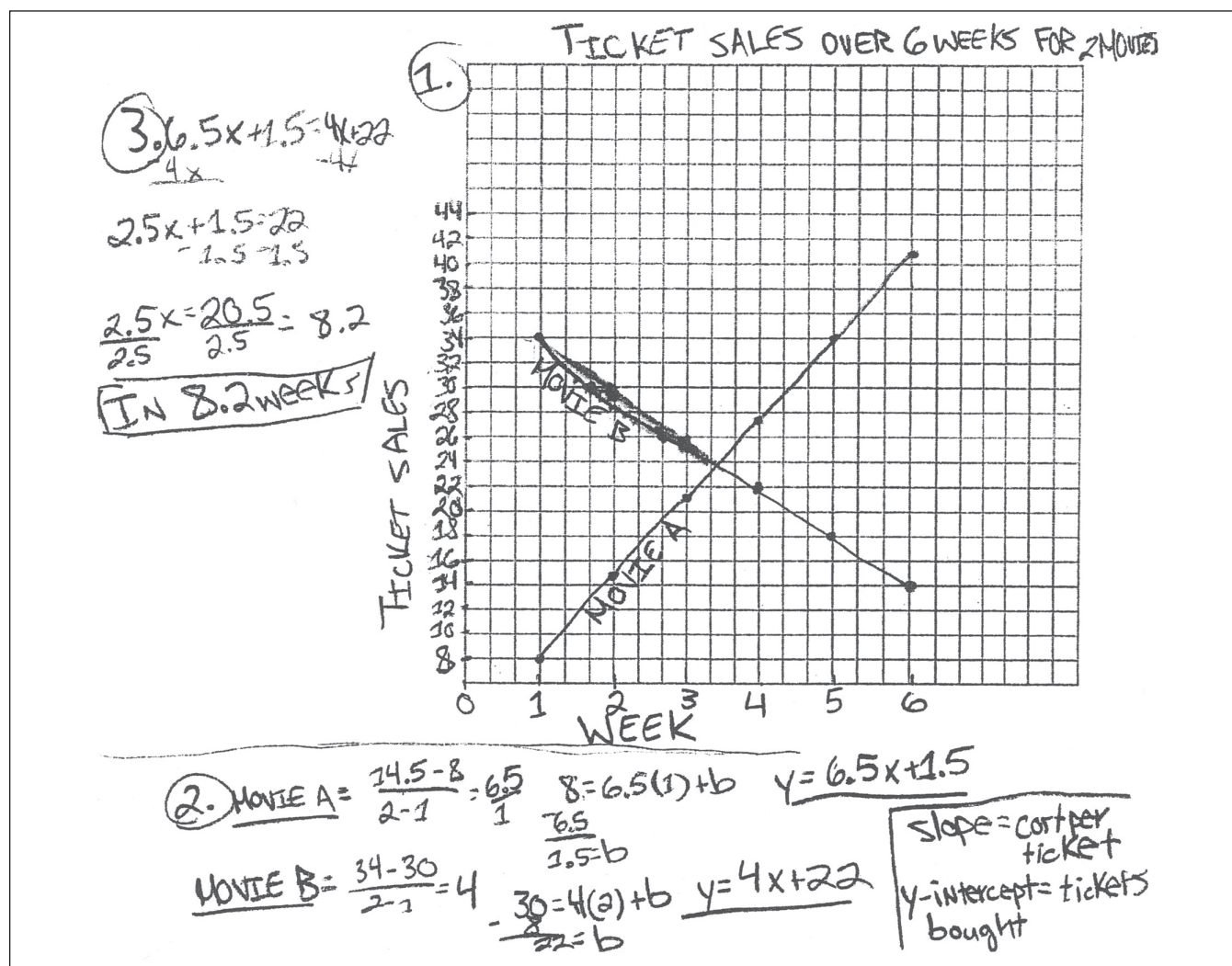
Correct estimate: Halfway between week 3 and 4  
 Correct explanation: "... crossing of the lines..."

$\frac{1}{2}$

$\frac{1}{2}$

TOTAL POINTS:

4  $\frac{1}{2}$



**SCORE: 2**

**Part 1:**

Graph has 1 major error: Intervals on y-axis are inconsistent  
All points are correctly plotted, segments drawn  
Axes are correctly labeled  
Segments are identified

**Points**

1

**Part 2:**

Correct equation for A:  $y = 6.5x + 1.5$   
Incorrect equation for B:  $y = 4x + 22$   
Incorrect exp. Slope: "cost per ticket"  
Incorrect exp. y-intercept: "tickets bought"

1

-

-

-

**Part 3:**

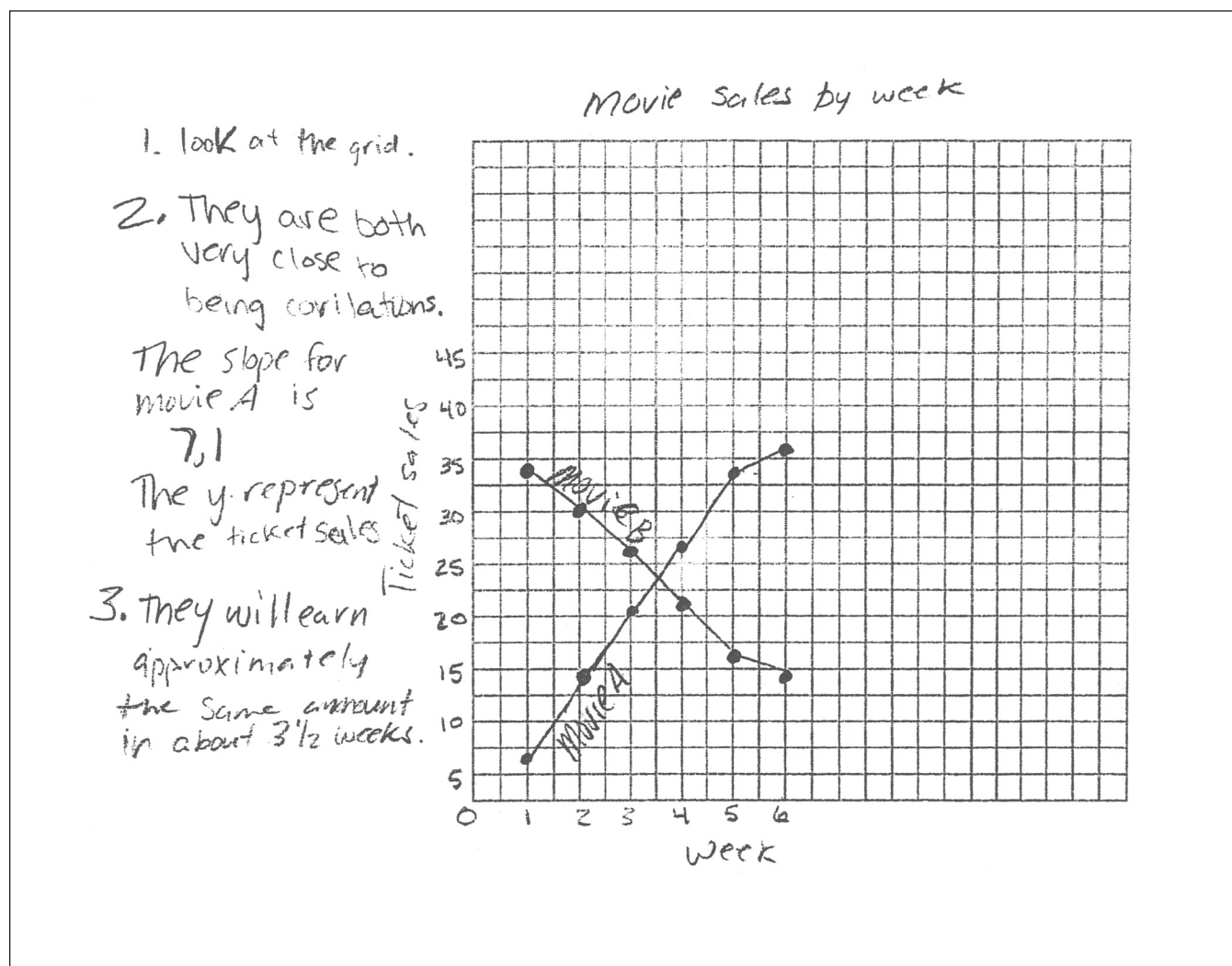
Correct estimate based on Part 2 equations: 8.2 weeks  
Correct procedure: Solves Part 2 equations

$\frac{1}{2}$

$\frac{1}{2}$

**TOTAL POINTS:**

3



**SCORE: 1**

**Part 1:**

Graph has 1 major error  
& minor errors:

Intervals on y-axis are inconsistent  
Week 6 (A), Week 5 (B) off  
Other points are correctly plotted, segments drawn  
Axes are correctly labeled  
Segments are identified

**Points**

1

**Part 2:**

Missing equation for A:

-

Missing equation for B:

-

Missing exp. Slope:

-

Incorrect exp. y-intercept: "... ticket sales"

-

**Part 3:**

Correct estimate:

"... about  $3\frac{1}{2}$  weeks"

$\frac{1}{2}$

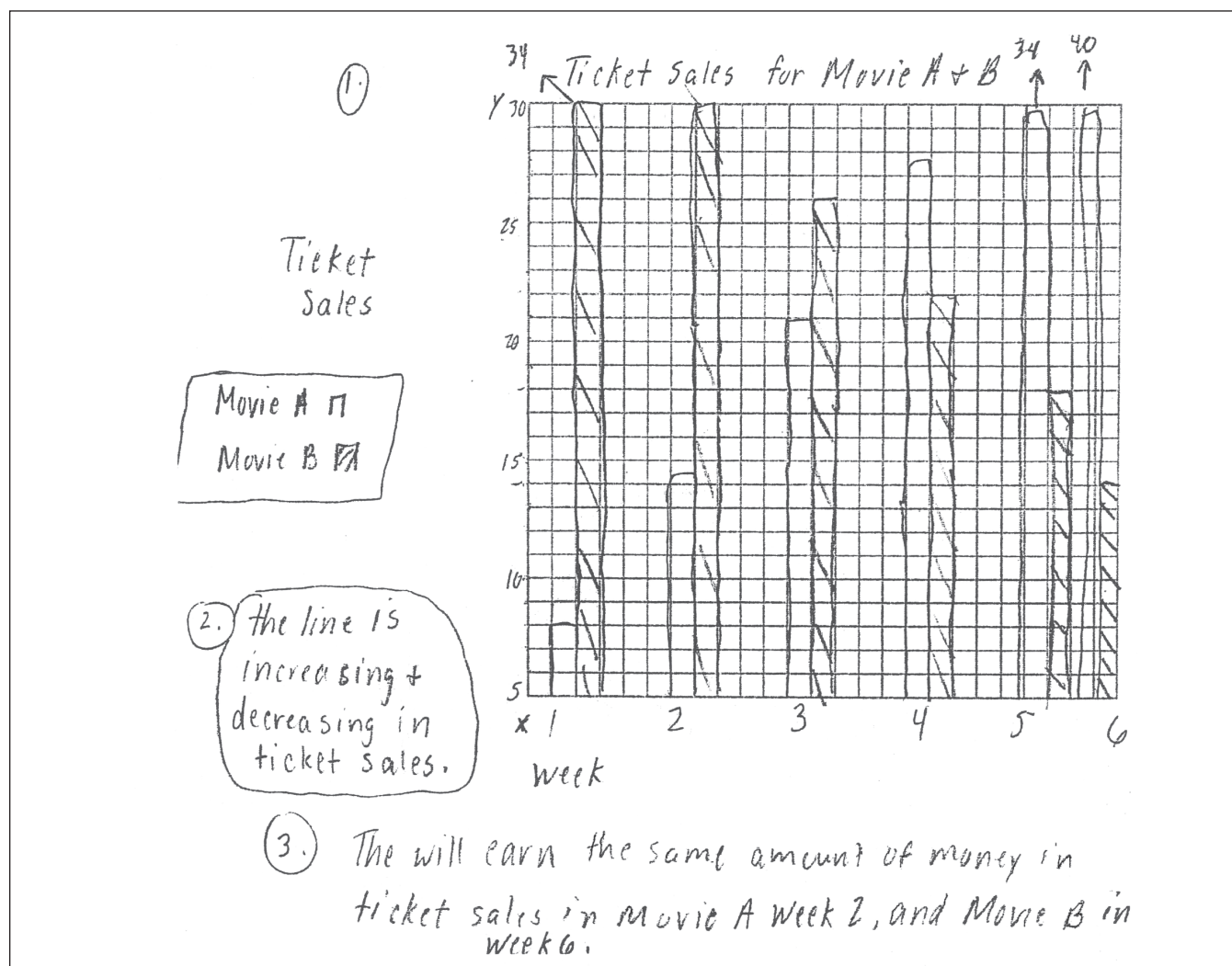
Missing explanation:

-

**TOTAL POINTS:**

**$1\frac{1}{2}$**

# Algebra I Item A Sample Responses and Annotations



**SCORE: 0**

## Part 1:

Incorrect graph:

Bar graph

**Points**

-

## Part 2:

Missing equation for A:

-

Missing equation for B:

-

Incorrect exp. Slope:

"the line is increasing and decreasing..."

-

Missing exp. y-intercept:

-

## Part 3:

Incorrect estimate:

Movie A week 2 and Movie B week 6

-

Missing explanation:

-

**TOTAL POINTS:**

**0**

## Algebra I Item B

**B.** From an altitude of 6,000 feet, a hot-air balloon rises at a rate of 110 feet per minute.

- Based on the information above, copy and complete the table below in your answer document. Show all of your work and/or explain your answer.

**Hot Air Balloon**

| Time<br>(minutes) | Height<br>(feet) |
|-------------------|------------------|
| 0                 |                  |
| 1                 | 6,110            |
| 2                 |                  |
| 3                 | 6,330            |
| 4                 |                  |

- What are the slope and y-intercept of the line that represents the altitude, in feet, of the balloon as a function of time, in minutes? Show all of your work and/or explain your answer.
- What is the height, in feet, of the balloon after 10 minutes? Show all of your work and/or explain your answer.

## Algebra I Item B Scoring Rubric

| SCORE    | DESCRIPTION                                                                                                                                                                                           |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>4</b> | The student earns 4 points. The response contains no incorrect work. The response contains no labels on either the slope or y-intercept in Part 2. The correct label of “feet” is included in Part 3. |
| <b>3</b> | The student earns 3–3½ points.                                                                                                                                                                        |
| <b>2</b> | The student earns 2–2½ points.                                                                                                                                                                        |
| <b>1</b> | The student earns ½–1½ points, or some minimal understanding is shown.<br>Ex. 2 correct heights in Part 1.                                                                                            |
| <b>0</b> | The student earns 0 points. No understanding is shown.                                                                                                                                                |
| <b>B</b> | Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)                                                                      |

# Algebra I Item B Solution and Scoring

| Part                   | Points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |  |                        |                       |   |       |   |       |   |       |   |       |   |       |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--|------------------------|-----------------------|---|-------|---|-------|---|-------|---|-------|---|-------|
| 1                      | <p><b>1 point possible</b></p> <p>½ point: <b>Table is correct and complete, as shown below.</b></p> <table border="1"> <thead> <tr> <th colspan="2">Hot Air Balloon</th> </tr> <tr> <th>x time<br/>(in minutes)</th><th>y height<br/>(in feet)</th></tr> </thead> <tbody> <tr> <td>0</td><td>6,000</td></tr> <tr> <td>1</td><td>6,110</td></tr> <tr> <td>2</td><td>6,220</td></tr> <tr> <td>3</td><td>6,330</td></tr> <tr> <td>4</td><td>6,440</td></tr> </tbody> </table> <p>AND</p> <p>½ point: <b>Correct and complete procedure shown and/or explained.<br/>Work may contain a calculation or copy error.</b><br/>Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> <li>• <math>6000 + 110 = 6110</math>, <math>6110 + 110 = 6220</math><br/><math>6220 + 110 = 6330</math>, <math>6330 + 110 = 6440</math>,<br/>or</li> <li>• “I started with 6000 ft. at 0 minutes, and added 110 to get the height at 1 minute. I kept adding 110 to that height to get the next height, etc.”</li> </ul> | Hot Air Balloon |  | x time<br>(in minutes) | y height<br>(in feet) | 0 | 6,000 | 1 | 6,110 | 2 | 6,220 | 3 | 6,330 | 4 | 6,440 |
| Hot Air Balloon        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |  |                        |                       |   |       |   |       |   |       |   |       |   |       |
| x time<br>(in minutes) | y height<br>(in feet)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |  |                        |                       |   |       |   |       |   |       |   |       |   |       |
| 0                      | 6,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |  |                        |                       |   |       |   |       |   |       |   |       |   |       |
| 1                      | 6,110                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |  |                        |                       |   |       |   |       |   |       |   |       |   |       |
| 2                      | 6,220                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |  |                        |                       |   |       |   |       |   |       |   |       |   |       |
| 3                      | 6,330                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |  |                        |                       |   |       |   |       |   |       |   |       |   |       |
| 4                      | 6,440                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |  |                        |                       |   |       |   |       |   |       |   |       |   |       |
| 2                      | <p><b>2 points possible</b></p> <p>½ point: <b>Correct slope: 110</b><br/>AND<br/>½ point: <b>Correct procedure shown and/or explained.</b><br/>Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> <li>• “Since the height rises 110 ft. per minute, the slope is 110,” or</li> <li>• Finds slope using any 2 points:<br/>Ex: <math>\frac{(6110-6000)}{1-0}=110</math></li> </ul> <p>AND</p> <p>½ point: <b>Correct y-intercept: 6000 or ( 0, 6000 )</b><br/>AND<br/>½ point: <b>Correct procedure shown and/or explained.</b><br/>Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> <li>• “Since the height is 6000 ft. at 0 minutes, the y-intercept is 6000,” or</li> <li>• 6000 because that is the starting altitude, or</li> <li>• Finds y-intercept (b) using <math>y = mx + b</math> or <math>y - y_1 = m(x - x_1)</math><br/>Ex: <math>y - 6110 = 110(x - 1)</math><br/><math>y - 6110 = 110x - 110</math><br/><math>y = 110x + 6000</math></li> </ul>  |                 |  |                        |                       |   |       |   |       |   |       |   |       |   |       |

## Algebra I Item B Solution and Scoring

| Part | Points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | <p><b>1 point possible</b></p> <p>½ point:      <b>Correct answer:</b> 7100 (ft)</p> <p>AND</p> <p>½ point:      <b>Correct procedure shown and/or explained.</b><br/> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> <li>• “Since the height rises 110 per minute, it will rise <math>10 ( 110 ) = 1100</math> in 10 minutes. So <math>6000 + 1100 = \#</math>,” or</li> <li>• <math>6000 + 10 ( 110 ) = 6000 + 1100 = \#</math>, or</li> <li>• Continues the ordered pairs or completes the table to 10 minutes:<br/> ( 4, 6440 ) ( 5, 6550 ) ( 6, 6660 ) ( 7, 6770 ) ( 8, 6880 ) ( 9, 6990 )<br/> ( 10, 7100 ), or</li> <li>• Writes an equation and solves for <math>y</math>:<br/> <math>y = 110x + 6000</math><br/> <math>y = 110(10) + 6000</math><br/> <math>y = 1100 + 6000</math><br/> <math>y = 7100</math></li> </ul> |

# Algebra I Item B Sample Responses and Annotations

① Hot Air Balloon

| Time (minutes) | Height (feet) |
|----------------|---------------|
| 0              | 6,000         |
| 1              | 6,110         |
| 2              | 6,220         |
| 3              | 6,330         |
| 4              | 6,440         |

6,000 ft = 0 min

6,000  
+ 110  
6,110 (1 min)

6,110  
+ 110  
6,220 (2 min)

6,220  
+ 110  
6,330 (3 min)

②

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{6220 - 6110}{2 - 1}$$

$$m = \frac{110}{1}$$

$$y = mx + b$$

$$y = 110x + b$$

$$6110 = 110(1) + b$$

$$6110 = 110 + b$$

$$-110 \quad -110$$

$$6000 = b$$

$$y = 110x + 6000$$

slope = 110  
y-inter = 6000  
m = slope  
b = y-intercept

③ Hot Air Balloon

| Time (min) | Height (feet) |
|------------|---------------|
| 1          | 6110          |
| 2          | 6220          |
| 3          | 6330          |
| 4          | 6440          |
| 5          | 6550          |
| 6          | 6660          |
| 7          | 6770          |
| 8          | 6880          |
| 9          | 6990          |
| 10         | 7100          |

You add 110 feet each time.

At 10 minutes, the hot air balloon will be at 7,100 feet.

$y = 110x + 6000$   
 $y = 110(10) + 6000$   
 $y = 7100$  feet

## SCORE: 4

### Part 1:

Correct answers: 6000, 6220, 6440  
 6000 + 110 = #  
 6110 + 110 = #  
 6330 + 110 = #

### Points

1/2  
1/2

### Part 2:

Correct slope: 110  
 Correct and complete procedure:  $\frac{6220 - 6110}{2 - 1}$   
 Correct y-intercept: 6000  
 Correct and complete procedure:  $y = mx + b$   
 $6110 = 100(1) + b$ ;  $b = 6000$

1/2  
1/2  
1/2  
1/2

### Part 3:

Correct answer: 7100 feet  
 Correct and complete procedure: Correctly completes table through time = 10 min.  
 Also substitutes 10 into  $y = mx + b$  and evaluates

1/2  
1/2

## TOTAL POINTS:

4

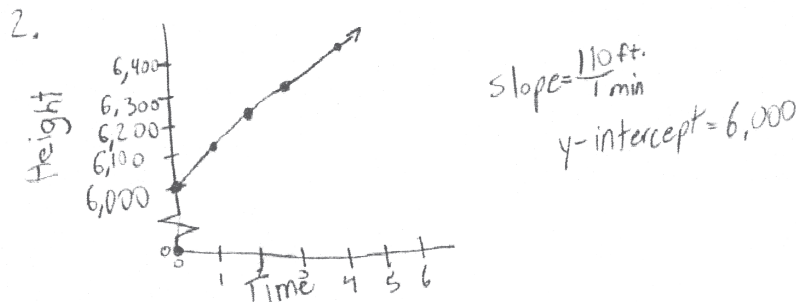
# Algebra I Item B Sample Responses and Annotations

1.

| Time | Height |
|------|--------|
| 0    | 6,000  |
| 1    | 6,110  |
| 2    | 6,220  |
| 3    | 6,330  |
| 4    | 6,440  |

{ ← start  
 +110  
 +110  
 +110  
 +110

the answers just changed by 110 ft. every minute.



3.

$$\begin{array}{r} 110 \\ \times 10 \\ \hline 1100 \end{array} \rightarrow \begin{array}{r} 1100 \\ + 6000 \\ \hline 7100 \text{ ft} \end{array}$$

## SCORE: 3

### Part 1:

|                                 |                                               |               |
|---------------------------------|-----------------------------------------------|---------------|
| Correct answers:                | 6000, 6220, 6440                              | $\frac{1}{2}$ |
| Correct and complete procedure: | Indicates addition of 110 ft for each minute. | $\frac{1}{2}$ |

### Part 2:

|                                 |                                    |               |
|---------------------------------|------------------------------------|---------------|
| Correct slope:                  | 110 ft./min.                       | $\frac{1}{2}$ |
| Missing procedure:              |                                    | -             |
| Correct y-intercept:            | 6000                               | $\frac{1}{2}$ |
| Correct and complete procedure: | Shows (0, 6000) is point on graph. | $\frac{1}{2}$ |

### Part 3:

|                                 |                                         |               |
|---------------------------------|-----------------------------------------|---------------|
| Correct answer:                 | 7100 ft                                 | $\frac{1}{2}$ |
| Correct and complete procedure: | $110 (10) = 1100$<br>$1100 + 6000 = \#$ | $\frac{1}{2}$ |

## TOTAL POINTS:

3  $\frac{1}{2}$

1.

| Time (minutes) | Height (feet) |
|----------------|---------------|
| 0              | 6000          |
| 1              | 6110          |
| 2              | 6220          |
| 3              | 6330          |
| 4              | 6440          |

I just added 110 to every number.

$$\begin{array}{r} 6110 \\ + 110 \\ \hline 6220 \end{array} \quad \begin{array}{r} 6220 \\ + 110 \\ \hline 6330 \end{array} \quad \begin{array}{r} 6330 \\ + 110 \\ \hline 6440 \end{array}$$

2. The slope is  $\frac{110}{1}$  The y intercept is 5000.

3.

$$\begin{array}{r} 6000 \text{ ft} \\ + 1100 \text{ ft} \\ \hline 7100 \text{ ft} \end{array}$$

$$110 \times 10 = 1100 \text{ ft.}$$

The balloon would reach 7,100 From 6,000 in 10 minutes.

**SCORE: 2**

**Part 1:**

Correct answers:

6000, 6220, 6440

**Points**

$\frac{1}{2}$

Correct and complete procedure:

States added 110 to every number,  
shows work for 2:  $6110 + 110 = \#$   
 $6300 + 110 = \#$

$\frac{1}{2}$

**Part 2:**

Correct slope:

110

$\frac{1}{2}$

Missing procedure:

-

Incorrect y-intercept:

5000

-

Missing procedure:

-

**Part 3:**

Correct answer:

7100 ft

$\frac{1}{2}$

Correct and complete procedure:

$110 \times 10 = 1100 \text{ ft}$   
 $6000 \text{ ft} + 1100 \text{ ft} = \#$

$\frac{1}{2}$

**TOTAL POINTS:**

**2  $\frac{1}{2}$**

# Algebra I Item B Sample Responses and Annotations

1.

| Hot Air Balloon |        |
|-----------------|--------|
| Time            | Height |
| 0               | 6,000  |
| 1               | 6,110  |
| 2               | 6,220  |
| 3               | 6,330  |
| 4               | 6,440  |

2. y-intercept is 6,000  
Slope is 0-4

3.

|      |       |
|------|-------|
| 4 -  | 6,440 |
| 5 -  | 6,550 |
| 6 -  | 6,660 |
| 7 -  | 6,770 |
| 8 -  | 6,880 |
| 9 -  | 6,990 |
| 10 - | 7,000 |

at 10 minutes it  
will be 7,000 feet

## SCORE: 1

### Part 1:

Correct answers: 6000, 6220, 6440

Missing procedure:

### Points

$\frac{1}{2}$

-

### Part 2:

Incorrect slope: 0 - 4

Missing procedure:

Correct y-intercept: 6000

Missing procedure:

-

-

$\frac{1}{2}$

-

### Part 3:

Incorrect answer: 7000 (due to calculation error)

Correct and complete procedure: Correctly completes table through 9 minutes.  $6990 + 110 = 7000$  calc. error

-

$\frac{1}{2}$

**TOTAL POINTS:**

**1  $\frac{1}{2}$**

① Hot Air Balloon

| Time (min) | Height (feet) |
|------------|---------------|
| 0          | 5,890         |
| 1          | 6,110         |
| 2          | 220           |
| 3          | 6,330         |
| 4          | 6,550         |

③  $6550 + 10 = 6560$

so the height in feet of the balloon after 10 min. is 6560

**SCORE: 0**

**Part 1:**

Incorrect answers: 5890, 220, 6550

Missing procedure:

**Part 2:**

Missing:

**Part 3:**

Incorrect answer: 6560

Incorrect procedure:  $6550 + 110 = \#$

**Points**

-

-

-

-

-

**TOTAL POINTS:**

**0**

## Algebra I Item C

- C. The choral students sold tubs of cookie dough to raise money. The variable  $g$  represents the number of tubs of cookie dough sold by George.
1. The choir treasurer sold 3 more than 2 times the number of tubs of cookie dough sold by George. Write an expression to represent the treasurer's sales in terms of George's sales,  $g$ .
  2. Julie's sales are represented by the variable  $j$ . Julie's sales were equal to 1 less than the square root of George's sales. Write an equation to represent Julie's sales,  $j$ , in terms of George's sales,  $g$ .
  3. José wrote the following expression to represent his sales:  $4(g - 2)$ . Translate the expression for José's sales into a verbal sentence.
  4. Sam's sales, represented by the variable  $s$ , were greater than José's sales but less than the treasurer's sales. Write an inequality, in terms of  $g$  and  $s$ , to represent Sam's sales.

## Algebra I Item C Scoring Rubric

| 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” assigned for the item.) |

# Algebra I Item C Solution and Scoring

| Part | Points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p><b>1 point possible</b></p> <p>1 point:        <b>Correct expression:</b> <math>2g + 3</math><br/> Accept: <math>2g + 3 =</math> Treasurer or Choir Treasurer or number Treasurer sold</p> <p>OR</p> <p><math>\frac{1}{2}</math> point:       <b>Correct equation:</b> <math>T = 2g + 3</math>, or<br/> <math>CT = 2g + 3</math>, or<br/> <math>C = 2g + 3</math>, or equivalent</p>                                                                                                                                                                                                                                                                                                                                                                                    |
| 2    | <p><b>1 point possible</b></p> <p>1 point:        <b>Correct equation:</b> <math>j = \sqrt{g} - 1</math></p> <p>OR</p> <p><math>\frac{1}{2}</math> point:       <b>Correct expression:</b> <math>\sqrt{g} - 1</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 3    | <p><b>1 point possible</b></p> <p>1 point:        <b>Correct translation.</b><br/> Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> <li>• “Jose sold 4 times the quantity George sold minus 2,” or</li> <li>• “Jose’s sales equals 4 times two less than George’s sales.”</li> </ul> <p>Do <u>NOT</u> give credit for:</p> <ul style="list-style-type: none"> <li>• “Jose sold two less than 4 times George’s sales,” or</li> <li>• “Jose sold 4 times <u>MORE</u> (than anything).”</li> </ul>                                                                                                                                                                                                                                         |
| 4    | <p><b>1 point possible</b></p> <p>1 point:        <b>Correct inequality:</b></p> <ul style="list-style-type: none"> <li>• <math>4(g - 2) &lt; s &lt; 2g + 3</math>, or</li> <li>• <math>2g + 3 &gt; s &gt; 4(g - 2)</math>,</li> </ul> <p>or</p> <p><b>Correct inequality based on incorrect Part 1 expression:</b></p> <ul style="list-style-type: none"> <li>• <math>4(g - 2) &lt; s &lt;</math> Part 1 expression</li> </ul> <p>OR</p> <p><math>\frac{1}{2}</math> point:       <b>Correct system of inequalities:</b></p> <ul style="list-style-type: none"> <li>• <math>4(g - 2) &lt; s</math><br/> <math>s &lt; 2g + 3</math>,</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• <math>s &gt; 4(g - 2)</math><br/> <math>s &lt; 2g + 3</math></li> </ul> |

①  $2g + 3$  2 times how many George sold plus 3.

②  $\sqrt{g} - 1 = j$  The square root of Georges sales minus one equals Julie's sales

③ Four times two less than Georges sales equals Jose's sales.

④  $4(g - 2) < s < 2g + 3$

**SCORE: 4**

**Part 1:**

Correct expression:

$$2g + 3$$

**Points**

1

**Part 2:**

Correct equation:

$$\sqrt{g} - 1 = j$$

1

**Part 3:**

Correct translation:

"Four times two less..."

1

**Part 4:**

Correct inequality:

$$4(g - 2) < s < 2g + 3$$

1

**TOTAL POINTS:**

4

- ①  $2g + 3$  - amount sold by treasurer
- ②  $j = \sqrt{g} - 1$  - amount sold by Julie
- ③ José sold 8 less than 4 times the amount that George sold.  $4(g-2)$   
 $4g - 8$
- ④  $s > 4(g-2)$   
 $s < 2g + 3$  ← Sam's sales

**SCORE: 3**

**Part 1:**

Correct expression:

$2g + 3$

**Points**

1

**Part 2:**

Correct equation:

$j = \sqrt{g} - 1$

1

**Part 3:**

Correct translation:

“José sold 8 less than 4 times the amount that George sold.”

1

**Part 4:**

Correct system of inequalities:

$s > 4(g - 2); s < 2g + 3$

$\frac{1}{2}$

**TOTAL POINTS:**

**$3 \frac{1}{2}$**

Response 1

$$g(2) + 3 = x$$

~~$x$  is the amount the choir treasurer raised~~

Response 2

$$j = \sqrt{g} - 1$$

Response 3

Jose sold four times as many as George minus 2.

Response 4

$$s < 2g + 3 \quad s > 4(g - 2)$$

**SCORE: 2**

**Part 1:**

Correct equation:

$x$  is amount choir treasurer raised  
 $g(2) + 3 = x$

**Points**

$\frac{1}{2}$

**Part 2:**

Correct equation:

$$j = \sqrt{g} - 1$$

1

**Part 3:**

Incorrect translation:

“Jose sold four times as many as George minus 2.”

-

**Part 4:**

Correct system of inequalities:

$$s < 2g + 3; s > 4(g - 2)$$

$\frac{1}{2}$

**TOTAL POINTS:**

2

①  $3 + 2g =$  The treasurer's sales

②  $\sqrt{g} - 1$

③ José sold 4 times George's sales

④  $S \geq J$

$S < T$

$S \geq G$

Sam's sales are greater than  
or equal to George's sales

**SCORE: 1**

**Part 1:**

Acceptable response:

$3 + 2g =$  treasurer's sales

**Points**

1

**Part 2:**

Correct expression:

$\sqrt{g} - 1$

$\frac{1}{2}$

**Part 3:**

Incorrect translation:

"José sold 4 times George's sales."

-

**Part 4:**

Incorrect system of inequalities:

$S > J$ ;  $S < T$ ;  $S \geq G$

-

**TOTAL POINTS:**

**1 ½**

1.  $g=x$      $x^2=H$      $H \times 3=5$

The clown treasure sold 5 tubes of cookie dough.

2.  $j=a$      $g=x$      $(x^2=y-1=a)$      $j=a$

3. 4 multiplied by  $(g-2)=C$   
 $(4 \times C = e)$

4. 5 is greater than José's but less than G.  
 $(G > 5) = 0$

**SCORE: 0**

**Part 1:**

Incorrect equation:

$g = x, x^2 = H$ , etc.

**Points**

-

**Part 2:**

Incorrect equation:

$j = a, g = x$ , etc.

-

**Part 3:**

Incorrect translation:

4 multiplied by  $(g-2) = C$   
 $4 \times C = e$

-

**Part 4:**

Incorrect inequality:

repeats prompt and  $(G > 5) = 0$

-

**TOTAL POINTS:**

**0**

## Algebra I Item D

**D.** Use the table below to answer the following.

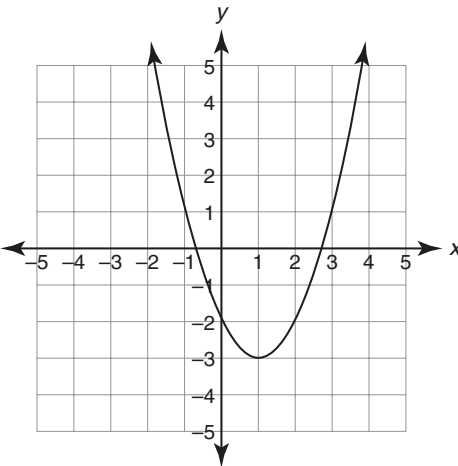
| $x$ | $y$ |
|-----|-----|
| -1  |     |
| 0   |     |
| 1   |     |
| 2   |     |
| 3   |     |

- Copy and complete the above table in your answer document for the equation  $y = x^2 - 2x - 2$ .
- On the grid provided in your answer document, graph the parabola containing the points in the table.
- What is the vertex of the parabola?
- Is the vertex a minimum or a maximum?

## Algebra I Item D Scoring Rubric

| SCORE    | DESCRIPTION                                                                                                                                                          |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>4</b> | The student earns 4 points. The response contains no incorrect work.                                                                                                 |
| <b>3</b> | The student earns 3–3½ points                                                                                                                                        |
| <b>2</b> | The student earns 2–2½ points.                                                                                                                                       |
| <b>1</b> | The student earns ½–1½ points or some minimal understanding is shown.<br>Ex: 4 out of 5 $y$ -values are correct in the table (Part 1) with no credit in other parts. |
| <b>0</b> | The student earns 0 points. No understanding is shown.                                                                                                               |
| <b>B</b> | Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)                                     |

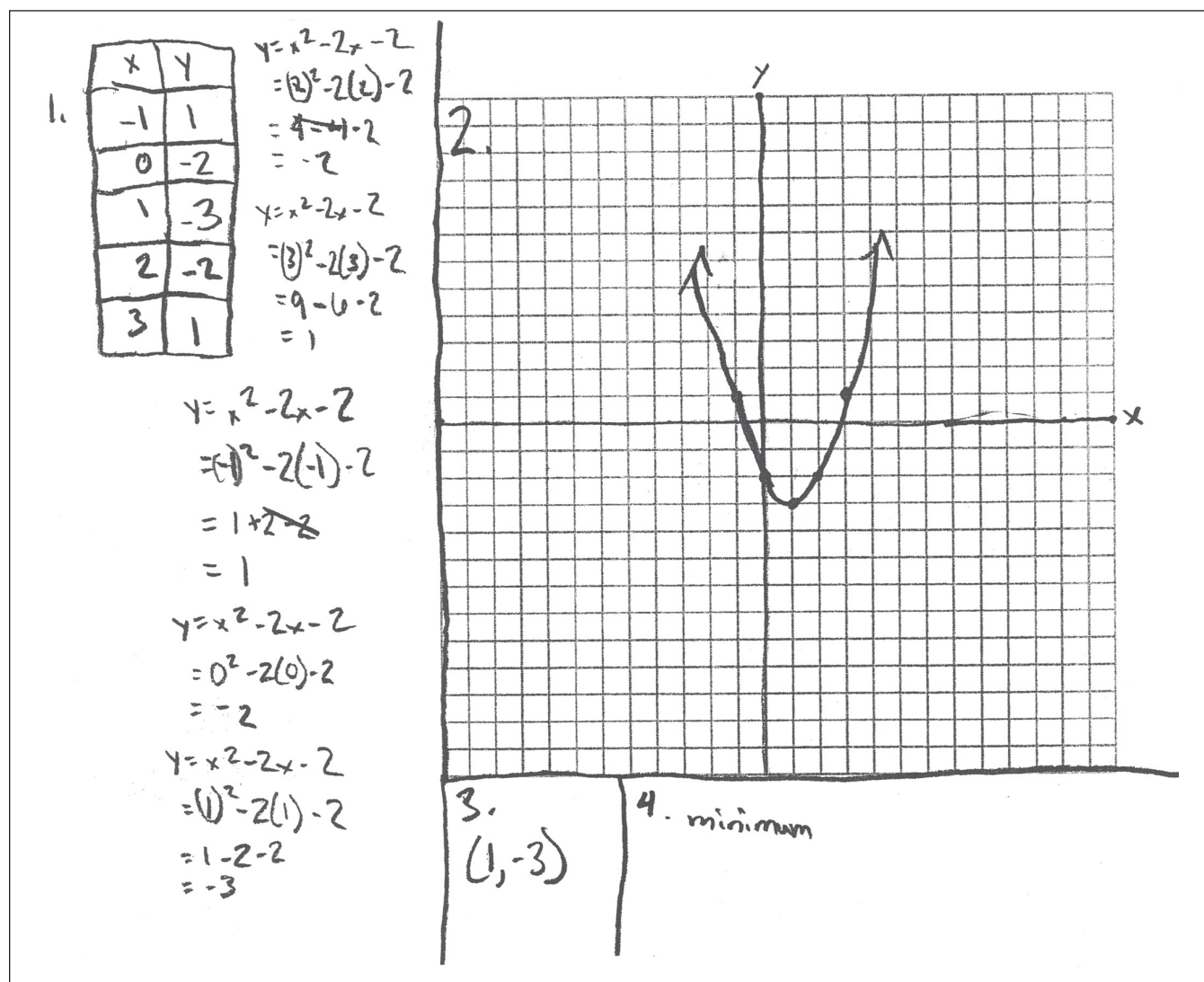
# Algebra I Item D Solution and Scoring

| Part | Points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |    |   |   |    |   |    |   |    |   |   |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|---|---|----|---|----|---|----|---|---|
| 1    | <p><b>1 point possible</b></p> <p>1 point: <b>Correctly completed table.</b><br/> Note: Work is not required.<br/> Give credit for the following:</p> <table border="1"> <thead> <tr> <th><math>x</math></th><th><math>y</math></th></tr> </thead> <tbody> <tr> <td>-1</td><td>1</td></tr> <tr> <td>0</td><td>-2</td></tr> <tr> <td>1</td><td>-3</td></tr> <tr> <td>2</td><td>-2</td></tr> <tr> <td>3</td><td>1</td></tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | $x$ | $y$ | -1 | 1 | 0 | -2 | 1 | -3 | 2 | -2 | 3 | 1 |
| $x$  | $y$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |    |   |   |    |   |    |   |    |   |   |
| -1   | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |    |   |   |    |   |    |   |    |   |   |
| 0    | -2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |    |   |   |    |   |    |   |    |   |   |
| 1    | -3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |    |   |   |    |   |    |   |    |   |   |
| 2    | -2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |    |   |   |    |   |    |   |    |   |   |
| 3    | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |    |   |   |    |   |    |   |    |   |   |
| 2    | <p><b>2 points possible</b></p> <p>2 points: <b>Correct and complete graph that contains the following:</b><br/> The graph may be based on the table (Part 1) with at most 1 incorrect <math>y</math>-value.</p> <ul style="list-style-type: none"> <li>• 5 points are correctly plotted and connected as a parabola.</li> <li>• Parabola has arrows.</li> <li>• Intervals are consistent.</li> </ul>  <p>OR</p> <p>1 point: <b>Graph contains 1 omission or error</b><br/> Give credit for the following:</p> <ul style="list-style-type: none"> <li>• 4 out of 5 points are correctly plotted and connected.</li> <li>• 5 points are correctly plotted and connected, but arrows are omitted.</li> <li>• 5 points are correctly plotted and connected, but interval(s) are inconsistent.</li> <li>• 5 points correctly plotted and connected, but axes are not drawn.</li> <li>• 5 points correctly plotted, but connected by segments.</li> <li>• Correct expected graph, but table contains 1 error.</li> </ul> <p>OR</p> <p><math>\frac{1}{2}</math> point: <b>Graph contains 2 omissions or errors</b><br/> Give credit for the following:</p> <ul style="list-style-type: none"> <li>• 4 out of 5 points are correctly plotted and connected, but arrows are omitted.</li> <li>• 5 points are correctly plotted but not connected.</li> </ul> |     |     |    |   |   |    |   |    |   |    |   |   |

## Algebra I Item D Solution and Scoring

| Part     | Points                                                                                                                                                                                                                                                                                          |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>3</b> | <p><b>½ point possible</b></p> <p>½ point:      <b>Correct vertex:</b> <math>(1, -3)</math> or <math>x = 1, y = -3</math></p> <p>Note: Give credit only if this is the vertex of the graph that is drawn. If the graph is not drawn, give credit if the vertex is from the table in Part 1.</p> |
| <b>4</b> | <p><b>½ point possible</b></p> <p>½ point:      <b>Correct answer:</b> minimum</p> <p>Note: Give credit only if there is some justification in either Part 1 or Part 2.</p>                                                                                                                     |

# Algebra I Item D Sample Responses and Annotations



**SCORE: 4**

**Part 1:**

Correctly completed table:

Work shown but not required

**Points**

1

**Part 2:**

Correct and complete graph:

5 points plotted and connected  
 Parabola has arrows  
 Intervals are consistent

2

**Part 3:**

Correct vertex:

(1, -3)

$\frac{1}{2}$

**Part 4:**

Correct answer:

minimum

$\frac{1}{2}$

**TOTAL POINTS:**

**4**

# Algebra I Item D Sample Responses and Annotations

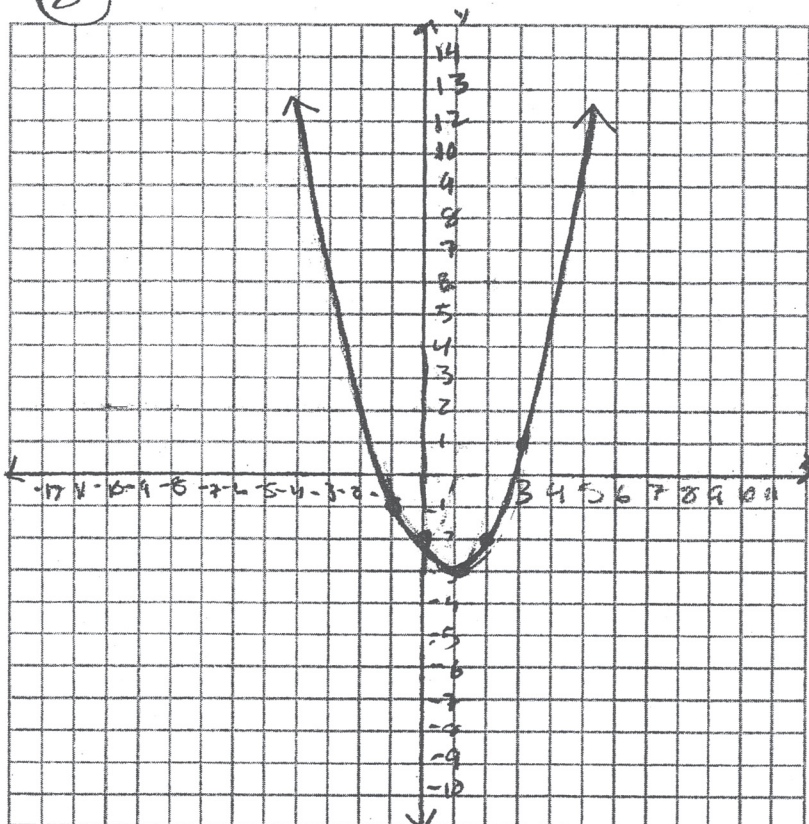
①

| x  | y  |
|----|----|
| -1 | -1 |
| 0  | -2 |
| 1  | -3 |
| 2  | -2 |
| 3  | 1  |

③ (1, -3)

④ the vertex is a minimum

②



**SCORE: 3**

**Part 1:**

Table has 1 incorrect entry:

When  $x = -1, y \neq -1$

**Points**

-

**Part 2:**

Correct and complete graph:

5 points correctly plotted and connected,  
based on Part 1 table with 1 incorrect entry  
Graph has arrows  
Intervals are consistent

2

**Part 3:**

Correct vertex:

(1, -3)

$\frac{1}{2}$

**Part 4:**

Correct answer:

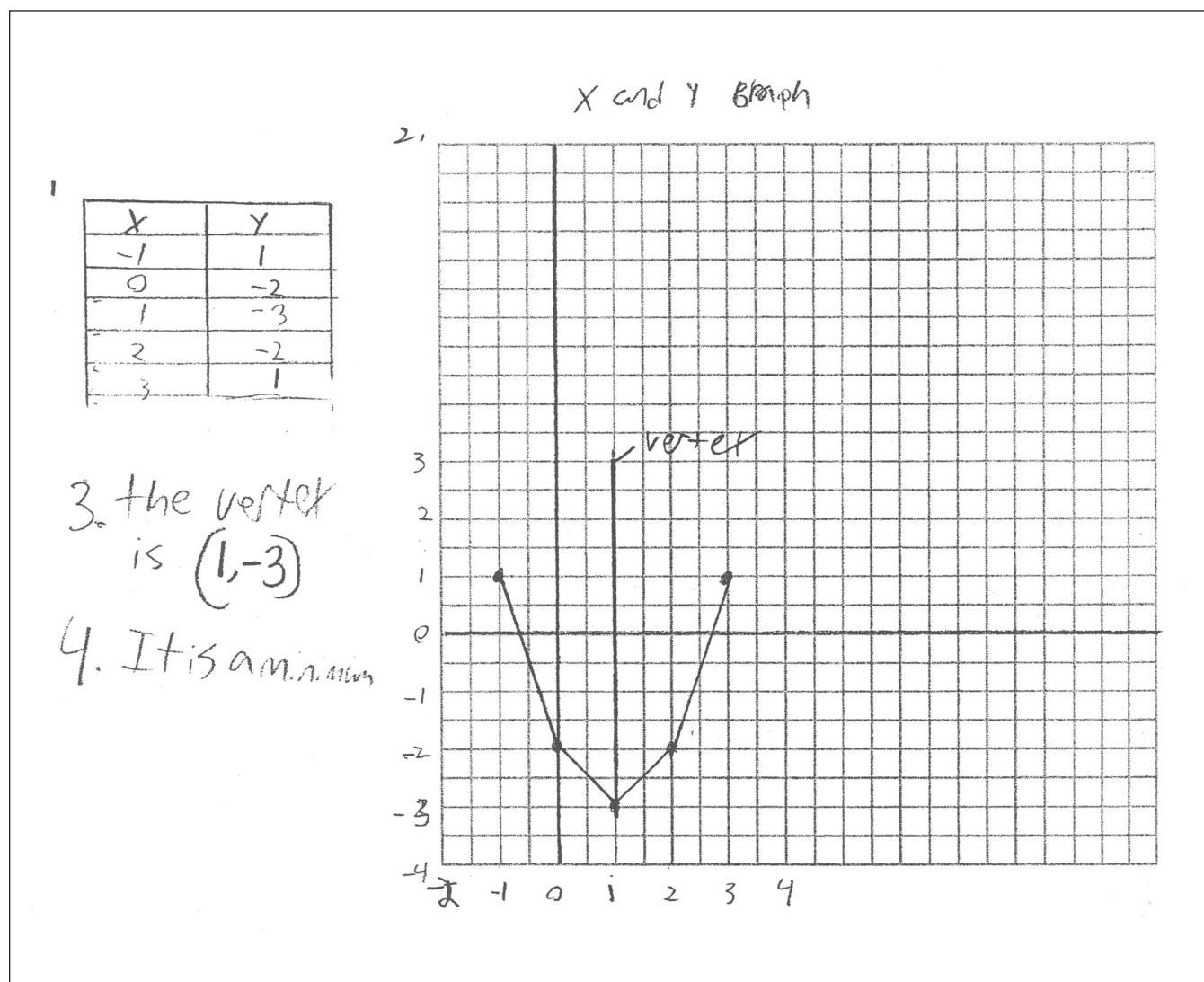
minimum

$\frac{1}{2}$

**TOTAL POINTS:**

**3**

# Algebra I Item D Sample Responses and Annotations



**SCORE: 2**

**Part 1:**

Correctly completed table:

**Points**

1

**Part 2:**

Partially correct graph:  
(2 errors)

5 points correctly plotted  
Points are connected with segments  
Arrows are missing  
Intervals are consistent

$\frac{1}{2}$

**Part 3:**

Correct vertex:

(1, -3)

$\frac{1}{2}$

**Part 4:**

Correct answer:

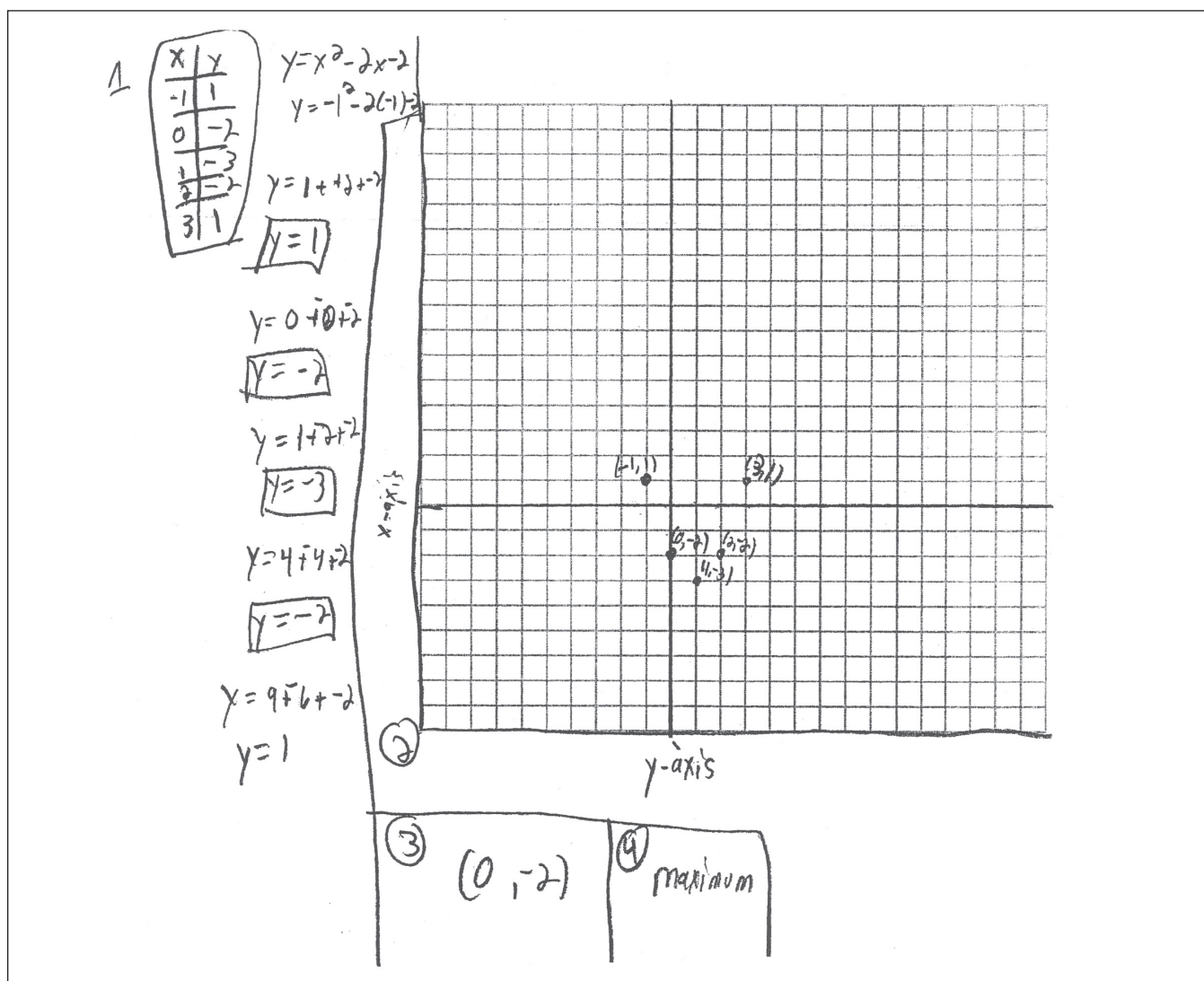
minimum

$\frac{1}{2}$

**TOTAL POINTS:**

**2  $\frac{1}{2}$**

# Algebra I Item D Sample Responses and Annotations



**SCORE: 1**

## Part 1:

Correctly completed table:

**Points**

1

## Part 2:

Incomplete graph:

5 points correctly plotted but not connected

1/2

## Part 3:

Incorrect vertex:

(0, -2)

-

## Part 4:

Incorrect answer:

maximum

-

**TOTAL POINTS:**

**1 1/2**

# Algebra I Item D Sample Responses and Annotations

1.

| X  | Y  |
|----|----|
| -1 | 0  |
| 0  | -1 |
| 1  | -2 |
| 2  | -3 |
| 3  | -3 |

4. It is minimum

**SCORE: 0**

**Part 1:**

Table incorrect (2 correct entries):

**Points**

-

**Part 2:**

Missing graph:

-

**Part 3:**

Missing vertex:

-

**Part 4:**

Correct answer, but not justified by table:

minimum

-

**TOTAL POINTS:**

**0**

## Algebra I Item E

- E. The sport shop store manager found that the number of jump ropes sold is a function of the price,  $p$ , shown in the function below.

$$f(p) = 450 - 8p^2$$

- Copy and complete the table below in your answer document. Describe how a change in price affects the number of jump ropes sold. Show and/or explain all of your work even if you use mental math or a calculator.

**Jump-Rope Sales**

|        |        |        |        |        |
|--------|--------|--------|--------|--------|
| $p$    | \$3.00 | \$3.50 | \$4.00 | \$4.50 |
| $f(p)$ |        |        |        |        |

- Determine the highest price, to the nearest cent, that the manager can charge and still sell at **least** 1 jump rope. Show and/or explain all of your work even if you use mental math or a calculator.

## Algebra I Item E Scoring Rubric

| SCORE    | DESCRIPTION                                                                                                                                                                                                                                                          |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>4</b> | The student earns 4 points. The response contains no incorrect work. The correct label of “\$” is included in Part 2.                                                                                                                                                |
| <b>3</b> | The student earns 3 points.                                                                                                                                                                                                                                          |
| <b>2</b> | The student earns 2 points.                                                                                                                                                                                                                                          |
| <b>1</b> | The student earns $\frac{1}{2}$ – $1\frac{1}{2}$ points or some minimal understanding is shown.<br>Ex: The response contains at least one correct answer in Part 1.<br>Ex: The response contains a correct description in Part 1 with incorrect table—work is shown. |
| <b>0</b> | The student earns 0 points. No understanding is shown.                                                                                                                                                                                                               |
| <b>B</b> | Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)                                                                                                                                     |

# Algebra I Item E Solution and Scoring

| Part   | Points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |        |        |        |        |        |     |     |     |     |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|-----|-----|-----|-----|
| 1      | <p><b>2 points possible</b></p> <p>2 points:      <b>4 correct amounts, as shown in table below:</b></p> <p>Jump Rope Sales</p> <table><tr><td><math>p</math></td><td>\$3.00</td><td>\$3.50</td><td>\$4.00</td><td>\$4.50</td></tr><tr><td><math>f(p)</math></td><td>378</td><td>352</td><td>322</td><td>288</td></tr></table> <p>and</p> <p><b>Correct description of how price affects sales.</b><br/>Give credit for the following or equivalent:<br/>“As the price goes up, sales go down.”</p> <p>and</p> <p><b>Correct and complete procedure shown or explained.</b><br/>Give credit for the following or equivalent:</p> <ul style="list-style-type: none"><li>• <math>f(3) = 450 - 8(3)^2 = \#</math> or <math>450 - 72 = \#</math></li><li>• <math>f(3.5) = 450 - 8(3.5)^2 = \#</math> or <math>450 - 98 = \#</math></li><li>• <math>f(4) = 450 - 8(4)^2 = \#</math> or <math>450 - 128 = \#</math></li><li>• <math>f(4.5) = 450 - 8(4.5)^2 = \#</math> or <math>450 - 162 = \#</math></li></ul> <p>OR</p> <p>1 point:      <b>4 correct amounts are shown and the procedure is correct and complete, but the description is missing, incorrect, or vague.</b></p> <p>or</p> <p><b>4 correct amounts are shown and the procedure is missing or incomplete, but not incorrect. The description may be missing, incorrect, or vague.</b></p> <p>or</p> <p><b>The procedure is correct and complete, but work contains 1 or 2 calculation errors. The description may be missing, incorrect, or vague.</b></p> | $p$    | \$3.00 | \$3.50 | \$4.00 | \$4.50 | $f(p)$ | 378 | 352 | 322 | 288 |
| $p$    | \$3.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | \$3.50 | \$4.00 | \$4.50 |        |        |        |     |     |     |     |
| $f(p)$ | 378                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 352    | 322    | 288    |        |        |        |     |     |     |     |
| 2      | <p><b>2 points possible</b></p> <p>1 point:      <b>Correct answer: \$7.49</b></p> <p>AND</p> <p>1 point:      <b>Correct and complete procedure shown or explained.</b><br/>Give credit for the following or equivalent. Work may contain a calculation error.</p> <p><math>1 = 450 - 8x^2</math><br/><math>8x^2 = 449</math><br/><math>x^2 = 56.125</math><br/><math>x = \#</math></p> <p>or</p> <p><b>Using guess and check: answer must be correct and explicitly stated or obviously based on work.</b><br/><u>Both</u> \$7.49 and \$7.50 must be used:<br/><math>450 - 8(7.49)^2 &gt; 1</math><br/><math>450 - 8(7.50)^2 = 0</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |        |        |        |        |        |        |     |     |     |     |

Algebra I Item E Sample Responses and Annotations

①

|        |        |        |        |        |
|--------|--------|--------|--------|--------|
| $p$    | \$3.00 | \$3.50 | \$4.00 | \$4.50 |
| $f(p)$ | 378    | 352    | 322    | 288    |

$f(p) = 450 - 8p^2$   
 $f(3) = 450 - 8(3)^2$   
 $f(3) = 450 - 72$   
 $f(3) = 378$   
 $f(3.50) = 450 - 8(3.50)^2$   
 $f(3.50) = 450 - 98$   
 $f(3.50) = 352$   
 $f(4) = 450 - 8(4)^2$   
 $f(4) = 450 - 128$   
 $f(4) = 322$   
 $f(4.50) = 450 - 8(4.50)^2$   
 $f(4.50) = 450 - 162$   
 $f(4.50) = 288$   
 If the price goes up the number of jump ropes sold goes down.

②

$$1 = 450 - 8p^2$$

$$-450 \quad -450$$

$$-449 = -8p^2$$

$$\frac{-449}{-8} = \frac{-8p^2}{-8}$$

$$p^2 = \sqrt{56.125}$$

$$p \approx 7.49$$

The most the manager can charge is \$7.49 to sell at least one jump rope.

**SCORE: 4**

**Part 1:**

**Points**

4 correct amounts:

378, 352, 322, 288

Correct description:

"If the price goes up the number of jump ropes sold goes down."

Correct and complete procedure:

Substitutes each value of  $p$  into equation and evaluates.

2

**Part 2:**

Correct answer:

\$7.49

Correct and complete procedure:

Sets  $f(p) = 1$  and solves  $1 = 450 - 8p^2$

2

**TOTAL POINTS:**

4

1)

|        |        |        |        |        |
|--------|--------|--------|--------|--------|
| $p$    | \$3.00 | \$3.50 | \$4.00 | \$4.50 |
| $f(p)$ | 378    | 352    | 322    | 288    |

$$f(p) = 450 - 8p^2$$

$$f(p) = 450 - 8(3)^2$$

$$f(p) = 450 - 8(9)$$

$$f(p) = 450 - 72$$

$$f(p) = 378$$

$$f(p) = 450 - 8p^2$$

$$f(p) = 450 - 8(45)^2$$

$$f(p) = 450 - 8(2025)$$

$$f(p) = 450 - 16200$$

$$f(p) = -15750$$

$$f(p) = 450 - 8p^2$$

$$f(p) = 450 - 8(35)^2$$

$$f(p) = 450 - 8(1225)$$

$$f(p) = 450 - 9800$$

$$f(p) = -9350$$

$$f(p) = 450 - 8p^2$$

$$f(p) = 450 - 8(4)^2$$

$$f(p) = 450 - 8(16)$$

$$f(p) = 450 - 128$$

$$f(p) = 322$$

A change in price affects the number of jump ropes sold because if you increase the price, the number of jump ropes sold decreases. If you decrease the price, the number of jump ropes sold increases.

2)

$$f(p) = 450 - 8p^2$$

$$f(p) = 450 - 8(7.49)^2$$

$$f(p) = 450 - 8(56.0001)$$

$$f(p) = 450 - 448.0008$$

$$f(p) = 1.9992$$

I basically did just guess and check with different amounts until I got the right number.

**SCORE: 3**

**Part 1:**

**Points**

4 correct amounts:

378, 352, 322, 288

Correct description:

"... if you increase the price, the number of jump ropes sold decreases..."

Correct and complete procedure:

Substitutes each value of  $p$  into equation and evaluates.

2

**Part 2:**

Correct answer:

\$7.49 – obvious from work shown

Incomplete procedure:

guess and check

Shows at least one will be sold at \$7.49, but does not show that none will be sold at \$7.50

1

**TOTAL POINTS:**

3

①  $f(p) = 450 - 8p^2$

|      |        |        |        |        |
|------|--------|--------|--------|--------|
| p    | \$3.00 | \$3.50 | \$4.00 | \$4.50 |
| f(p) | 378    | 352    | 322    | 288    |

$f(p) = 450 - 8(3.00)^2$

A change in price will lower the amount of jump ropes

②  $450 - 8(7.50)^2 = 0$   $450 - 8(7.45)^2 = 6$   
 $450 - 8(7.00)^2 = 58$   $450 - 8(7.49)^2 = 3$

To sell at least 1 jump at the least amount would be \$7.49

**SCORE: 2**

**Part 1:**

**Points**

4 correct amounts:

378, 352, 322, 288

Vague description:

"A change in price will lower the amount of jump ropes"

Incomplete procedure:

$f(p) = 450 - 8(3.00)^2$

1

**Part 2:**

Correct answer:

\$7.49

Incomplete procedure:

guess and check  
 Shows  $f(7.50) = 0$ , but does  
 not show  $f(7.49) > 1$

1

**TOTAL POINTS:**

2

# Algebra I Item E Sample Responses and Annotations

1.

|        |       |       |       |       |
|--------|-------|-------|-------|-------|
| $p$    | 13.00 | 13.50 | 14.00 | 14.50 |
| $f(p)$ | 378   | 352   | 322   | 288   |

$$f(p) = 450 - 8p^2$$

$$450 - 8(3)^2$$

$$450 - 8(9)$$

$$450 - 72$$

$$378$$

$$450 - 8(3.5)^2$$

$$450 - 8(12.25)$$

$$450 - 98$$

$$352$$

$$450 - 8(4)^2$$

$$450 - 8(16)$$

$$450 - 128$$

$$322$$

$$450 - 8(4.5)^2$$

$$450 - 8(20.25)$$

$$450 - 162$$

$$288$$

## SCORE: 1

### Part 1:

4 correct amounts: 378, 352, 322, 288

Missing description:

Correct and complete procedure: Substitutes each value of  $p$  into equation and evaluates.

### Points

1

### Part 2:

Missing answer and procedure:

-

TOTAL POINTS:

1

①

|      |        |        |        |        |
|------|--------|--------|--------|--------|
| P    | \$3.00 | \$3.50 | \$4.00 | \$4.50 |
| f(p) | 300    | 350    | 400    | 450    |

I just added fifty to everyone for example: I just took the period out. and made three dollars into three hundred jump ropes sale.

② The highest price I think that he can sell them at is \$3.00. Because nobody would pay from 3.50 to 4.50 dollars for a jump rope. You can sell one jump rope from 3 dollars on down to 1 dollar.

**SCORE: 0**

**Part 1:**

**Points**

4 incorrect answers: 300, 350, 400, 450

Missing description:

Incorrect procedure: "I just took the period out..."

-

**Part 2:**

Incorrect answer: \$3.00

Missing procedure:

-

**TOTAL POINTS:**

**0**







**Arkansas Comprehensive Testing, Assessment, and Accountability Program**

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