



Arkansas Comprehensive Testing, Assessment, and Accountability Program

Teacher Handbook

Algebra I End-of-Course Examination

April 2007 Administration

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Arkansas Department of Education

Teacher Handbook—2007 Algebra I

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The **Arkansas Comprehensive Testing, Assessment, and Accountability Program (ACTAAP)** includes an April End-of-Course Examination for students completing Algebra I or the equivalent by the end of the spring 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 End-of-Course Examination*.

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

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 to Algebra I open-response items.

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

Scoring Student Responses Open-Response Items—2007 Algebra I

The multiple-choice and open-response test items for the *Algebra I April 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, open-response items must be scored by trained “readers” using a pre-established set of scoring criteria.

Reader Training

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

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

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

Scoring Procedures

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

On the following pages, open-response items are presented as they appeared in the April 2007 *Algebra I 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 End-of-Course Examination*.

ALGEBRA I RESPONSES

Item A—2007 Algebra I

- A. Ten students were asked to estimate the number of minutes they spent studying for the last chapter test. The table below shows the data.

Survey of Ten Students in an Algebra I Class										
Time Spent Studying (minutes)	10	15	15	20	25	30	30	40	45	45
Test Scores (percent)	67	64	72	74	80	80	76	84	90	82

1. On the grid provided in your answer document, plot the data in a scatterplot. Let x represent the time spent studying and y represent the test scores. Draw a line of best fit for your scatterplot.
2. Describe the correlation of the data as being either a strong positive, weak positive, strong negative, weak negative, or having no correlation. Give reasons for your answer.
3. **Estimate** the test score of a student who studied for one hour. Explain your answer.

Item A Scoring Rubric—2007 Algebra I

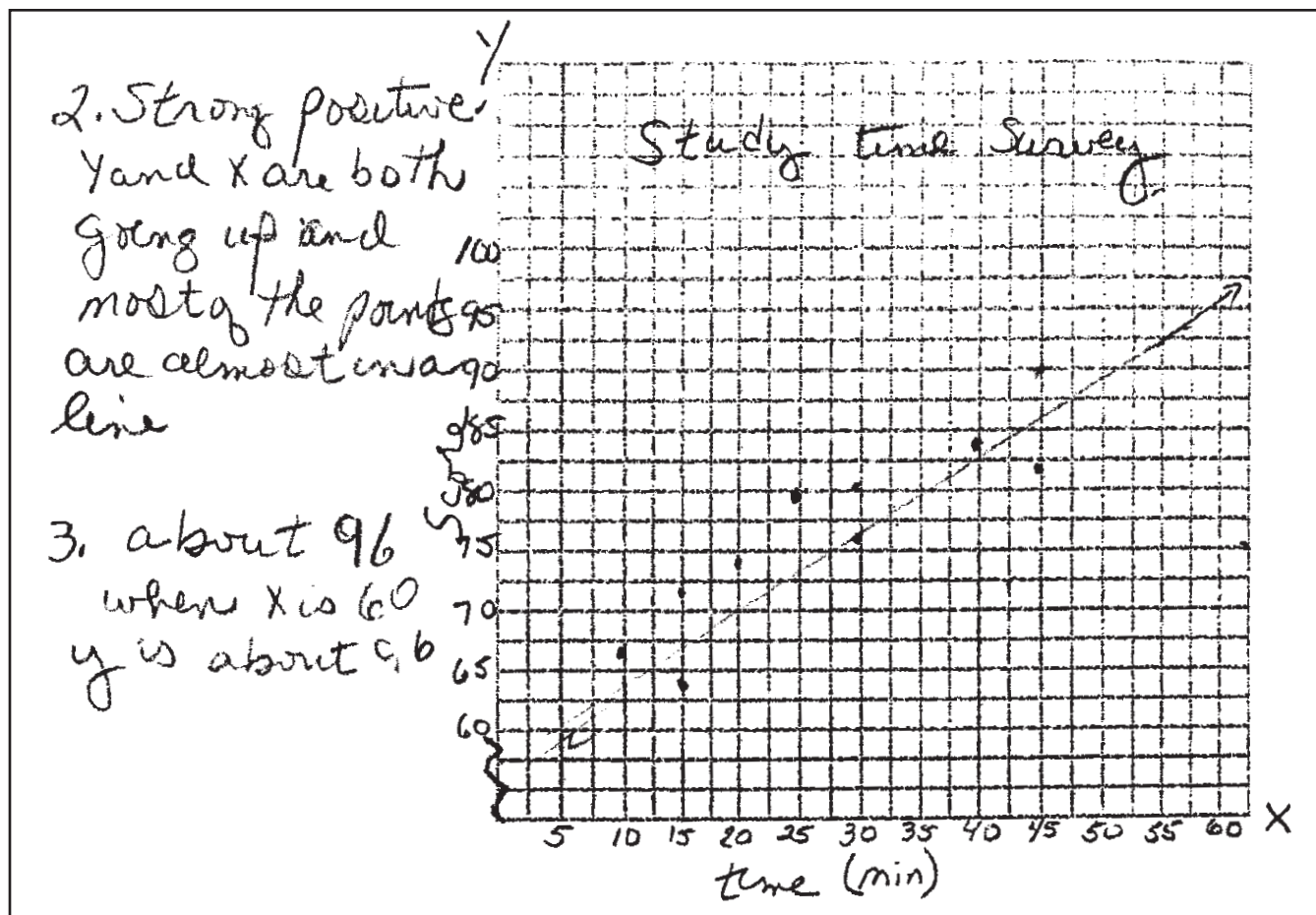
SCORE	DESCRIPTION
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3–3 ½ points.
2	The student earns 2–2 ½ points.
1	The student earns ½–1 ½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank—No Response.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

Solution and Scoring

Part	Points																						
1	2 points possible 2 points: Correct and complete scatterplot with line of best fit, as shown below. Give credit for the following: • All points plotted correctly. • The x- and y-axes are labeled. • Intervals are consistent on both axes. <table border="1"> <caption>Data points from the scatterplot</caption> <thead> <tr> <th>Time Studying (minutes)</th> <th>Test Scores (percent)</th> </tr> </thead> <tbody> <tr><td>10</td><td>68</td></tr> <tr><td>15</td><td>65</td></tr> <tr><td>15</td><td>72</td></tr> <tr><td>20</td><td>75</td></tr> <tr><td>25</td><td>80</td></tr> <tr><td>30</td><td>78</td></tr> <tr><td>30</td><td>82</td></tr> <tr><td>40</td><td>85</td></tr> <tr><td>45</td><td>82</td></tr> <tr><td>45</td><td>90</td></tr> </tbody> </table> OR 1 point: Scatterplot incomplete (minor omission) but otherwise correct. Ex: One label missing. Ex: One point not plotted. OR 1 point: Scatterplot contains one error. Ex: Inconsistent interval(s) on x- and/or y- axis. Ex: One point plotted incorrectly. Note: Do not give credit for scatterplot if a line of best fit is not drawn. Plotting points in Quadrant 1 is a lower grade level skill. Note: Title is not required (even for a score of 4).	Time Studying (minutes)	Test Scores (percent)	10	68	15	65	15	72	20	75	25	80	30	78	30	82	40	85	45	82	45	90
Time Studying (minutes)	Test Scores (percent)																						
10	68																						
15	65																						
15	72																						
20	75																						
25	80																						
30	78																						
30	82																						
40	85																						
45	82																						
45	90																						
2	1 point possible $\frac{1}{2}$ point: Correct answer: Strong Positive. AND $\frac{1}{2}$ point: Correct and complete explanation. Do not give credit for incomplete explanations. Give credit for the following or equivalent: • A positive correlation exists when both variables increase. The correlation is strong because the points are close to a straight line.																						

Solution and Scoring (continued)

Points	
1 point possible	
1 point:	Correct estimate: Approximately 95(%); (will accept 90 – 100), and Correct and complete procedure: Line of best fit is extended and explanation is included. Give credit for the following or equivalent: • According to the line of best fit (must be extended to $x = 60$), the x-coordinate of 60 minutes corresponds to the y-coordinate value of about 95, or • The line of best fit is extended to $x = 60$ and some reference is made to correct y coordinate. Ex: “The line goes through (60, 97).”
OR	
½ point:	Correct estimate: Approximately 95(%) (accept 90–100) with missing or incomplete, but not incorrect, procedure. If procedure is shown and/or explained, it must refer to the line of best fit. Ex: “About 94.” Ex: “98 because I used the line of best fit,” but the line has not been extended to $x = 60$. OR Incorrect estimate due to misreading of the graph but procedure is correct. Ex: The line of best fit is extended to $x = 60$ and (60, 90) is on the graph but student’s estimate is 95. Note: Do not give credit for estimate if it is clear that it is not based on the line of best fit or if the line of best fit is incorrect. Ex: “93 because the longer you study the better you do.” Ex: “96 because it goes up a little then down but it’s mostly higher.” [Uses given table only.]



SCORE: 4

Part 1:

Points

Scatterplot correct and complete:

All points are plotted correctly
Intervals are consistent
Axes are labeled

2

Line of best fit drawn correctly:

Part 2:

Correct answer:

Strong positive

$\frac{1}{2}$

Correct and complete procedure:

“y and x are both going up and most of points are almost in a line”

$\frac{1}{2}$

Part 3:

Correct answer and explanation:

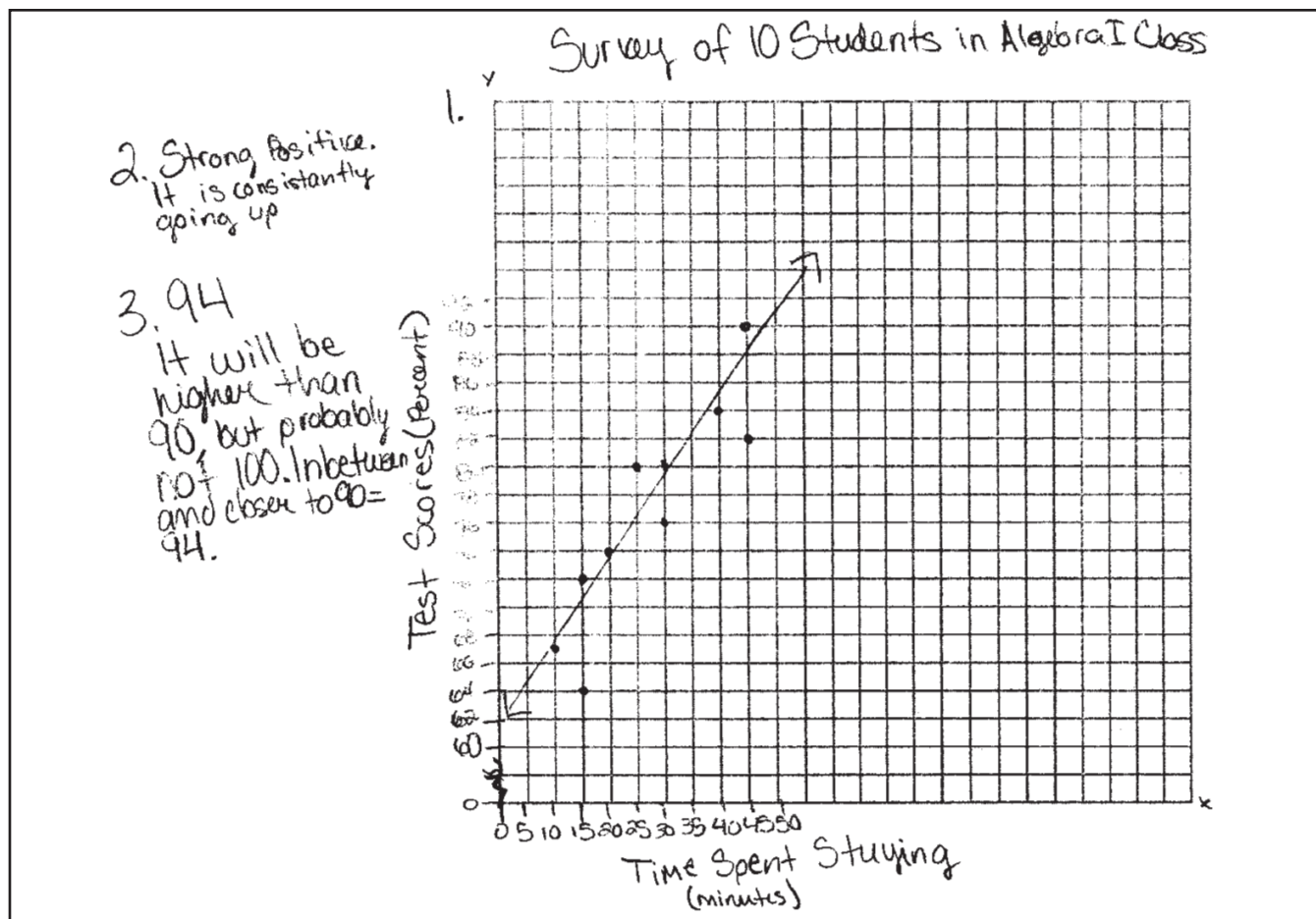
About 96

1

“when x is 60 y is about 96”

TOTAL POINTS:

4



SCORE: 3

Part 1:

Points

Scatterplot correct and complete:

All points are plotted correctly
Intervals are consistent
Axes are labeled

2

Line of best fit drawn correctly:

Part 2:

Correct answer:

Strong positive

$\frac{1}{2}$

Incomplete explanation:

"It is constantly going up"

—

Part 3:

Correct answer

94

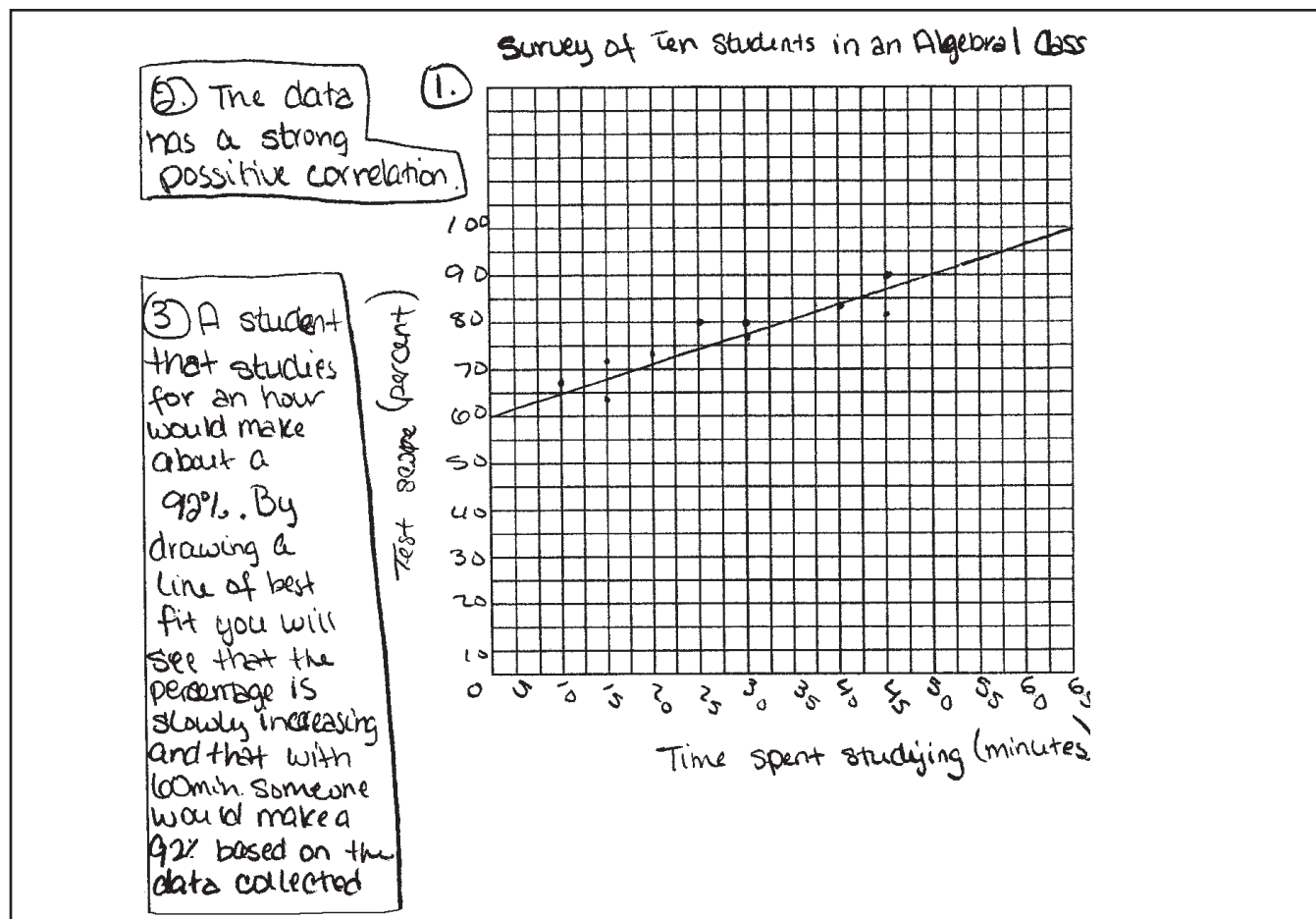
$\frac{1}{2}$

with incomplete procedure:

Line is not extended to 60 minutes

TOTAL POINTS:

3



SCORE: 2

Part 1:

Scatterplot partially correct:

Inconsistent intervals are on both axes
All points plotted correctly
Axes are labeled

Points

1

Line of best fit drawn correctly:

Part 2:

Correct answer:

Strong positive

$\frac{1}{2}$

Explanation missing:

—

Part 3:

Incorrect answer

92%

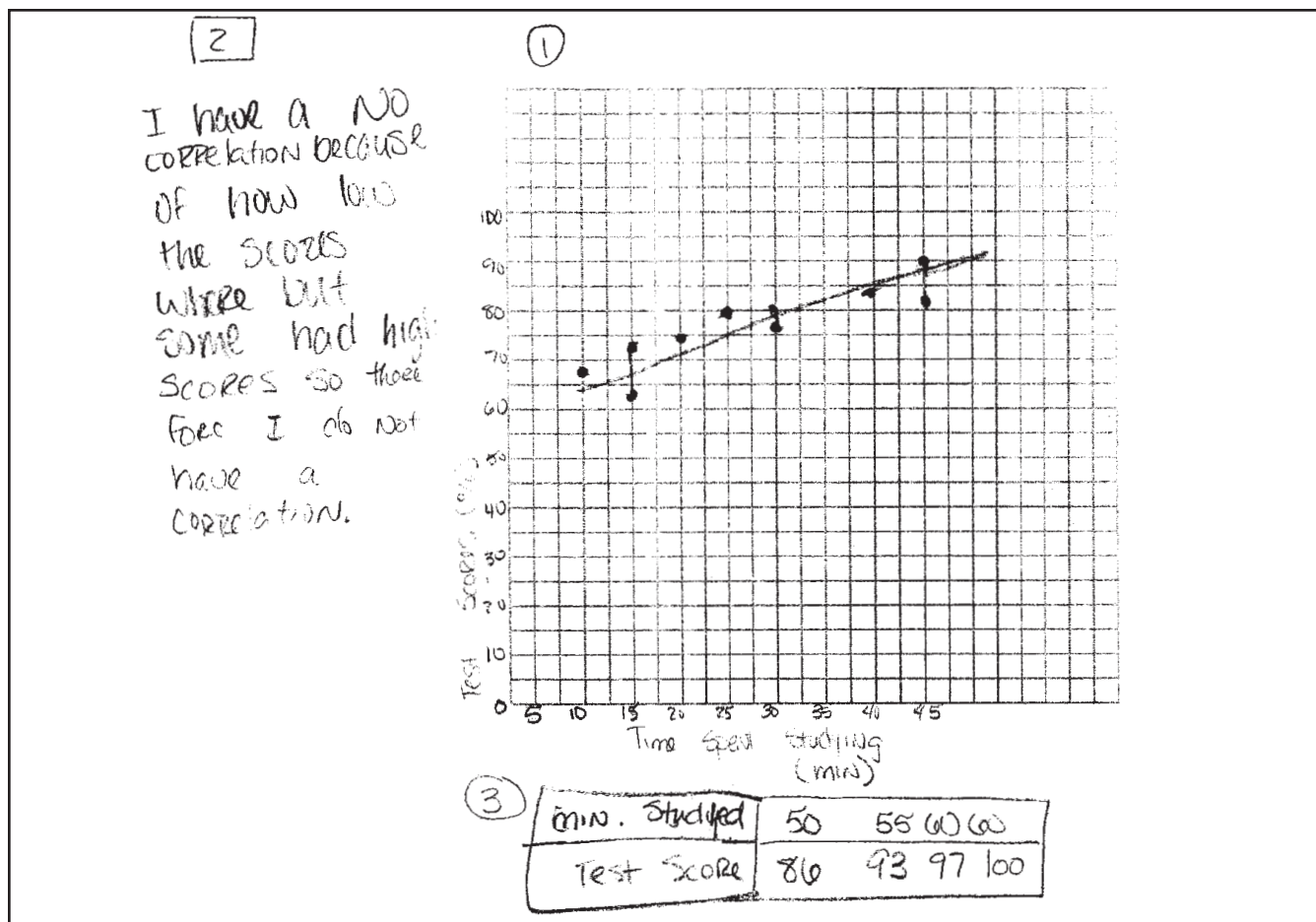
with correct explanation:

Line extended and contains (60, 97).

$\frac{1}{2}$

TOTAL POINTS:

2



SCORE: 1

Part 1:

Scatterplot partially correct:

Inconsistent intervals on x-axis
All points are plotted correctly
Axes are labeled

Points

1

Line of best fit drawn correctly:

Part 2:

Incorrect answer:

No correlation

—

Part 3:

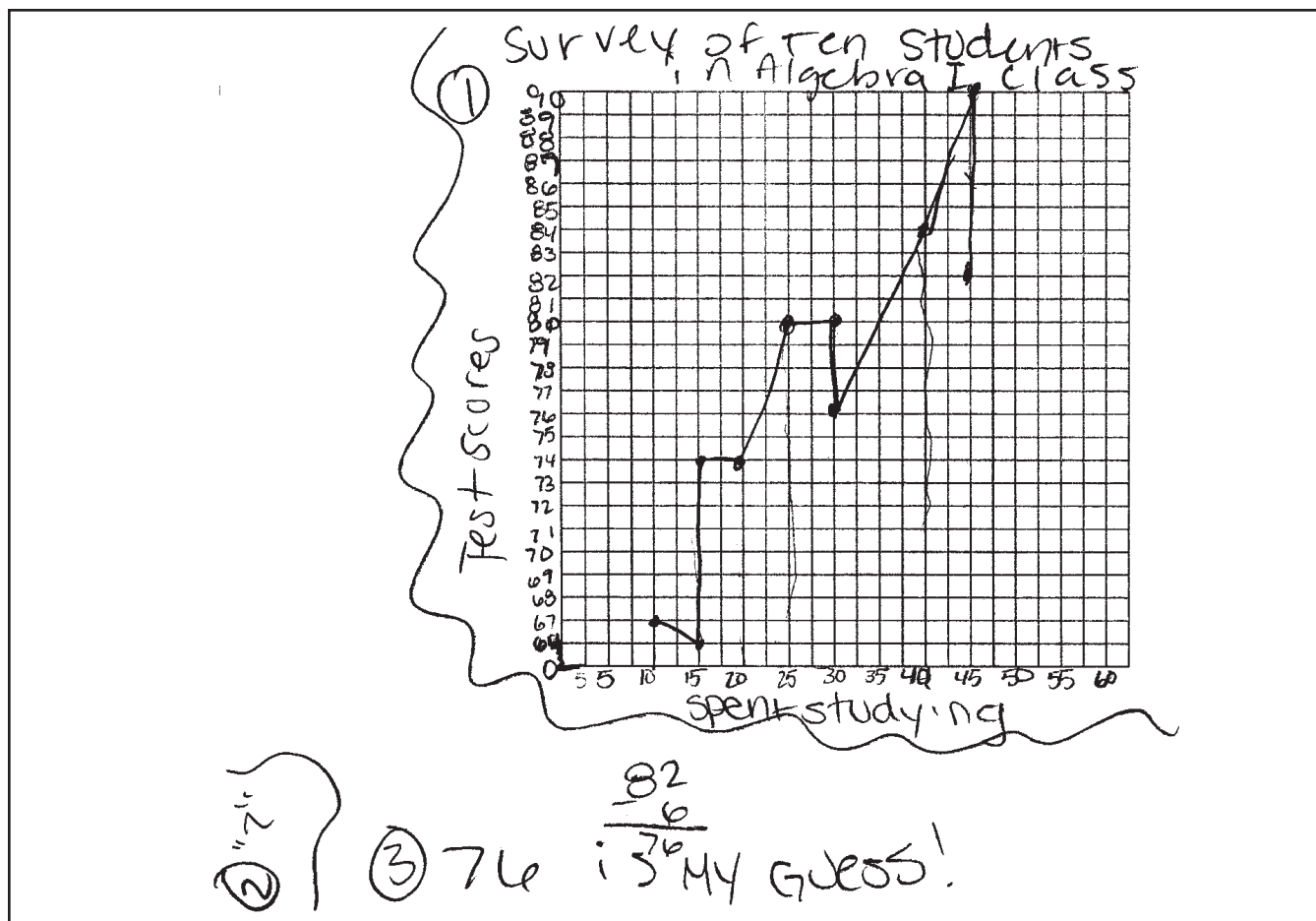
Incorrect answer:

min. 60 60
Test score 97 100

—

TOTAL POINTS:

1



SCORE: 0

Part 1:

Incorrect:

Line of best fit is incorrect

Points

—

Part 2:

Answer missing:

—

Part 3:

Incorrect answer
and explanation:

76

$82 - 6 = 76$

—

TOTAL POINTS:

0

Item B—2007 Algebra I

- B.** Maria is buying school pictures. The basic package is \$50 plus \$3 for additional wallet-size pictures. The equation to find her total bill is $50 + 3n = c$, where n = number of additional wallet-size pictures needed, and c = total cost.

1. Copy the table below into your answer document. Complete the table.

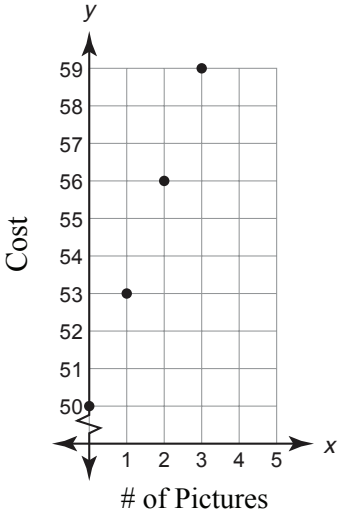
n	c
0	
1	
2	
3	

2. On the grid provided in your answer document, graph the coordinates from the table. Does the graph show a function or non-function relationship? Explain your answer.

Item B Scoring Rubric—2007 Algebra I

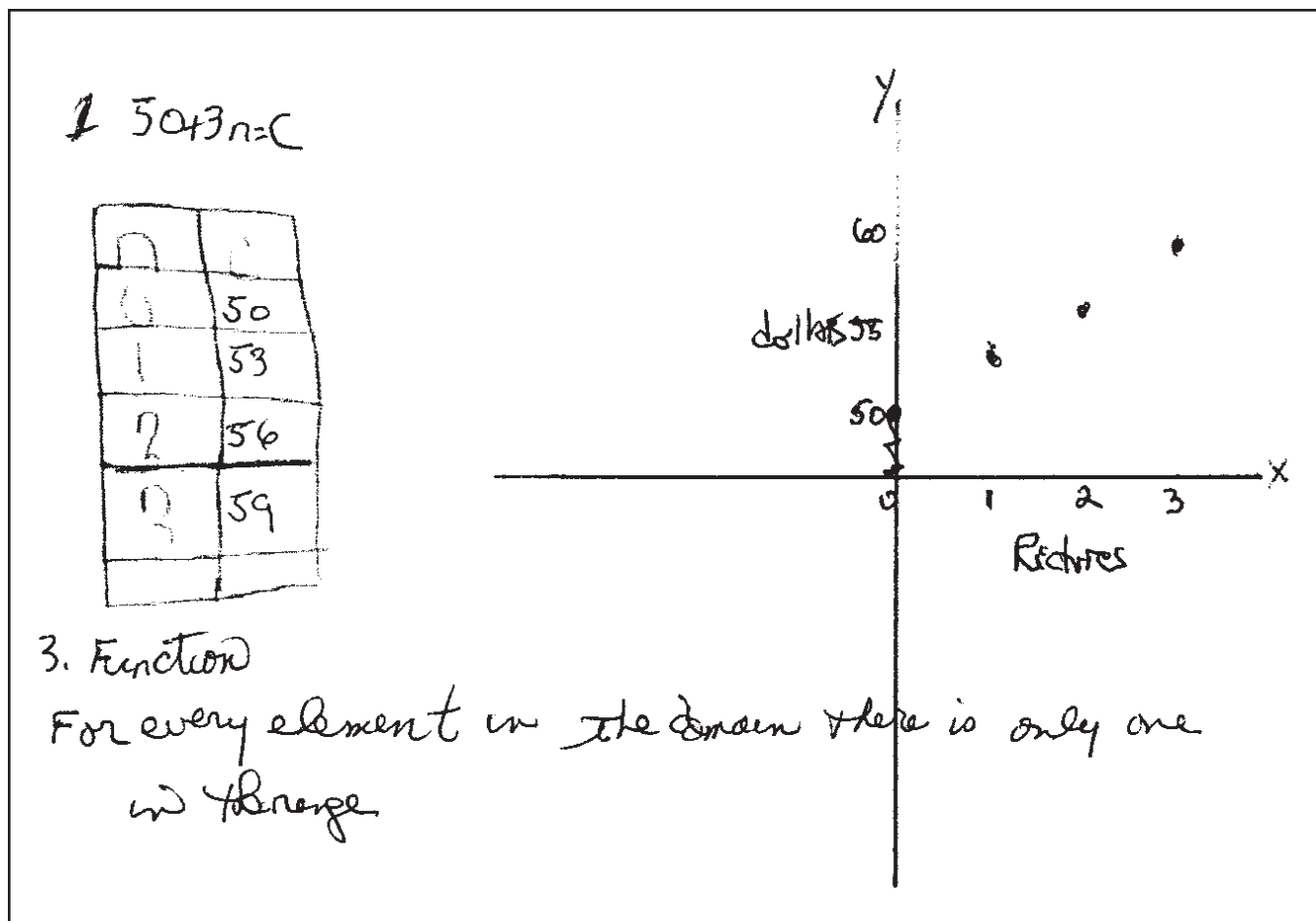
SCORE	DESCRIPTION
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 points.
2	The student earns 2 points.
1	The student earns 1 point, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank—No Response. A score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

Solution and Scoring

Part	Points										
1	1 point possible 1 point: Table is correct and complete, as shown below: (Work is not required.) <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th><i>n</i></th><th><i>c</i></th></tr> </thead> <tbody> <tr> <td>0</td><td>50</td></tr> <tr> <td>1</td><td>53</td></tr> <tr> <td>2</td><td>56</td></tr> <tr> <td>3</td><td>59</td></tr> </tbody> </table>	<i>n</i>	<i>c</i>	0	50	1	53	2	56	3	59
<i>n</i>	<i>c</i>										
0	50										
1	53										
2	56										
3	59										
2	2 points possible 2 points: Graph is correct and complete based on Part 1 table. Graph must contain all of the following: • 4 points correctly plotted. • <i>n</i>-axis labeled # of pictures, intervals consistent. • <i>c</i>-axis labeled cost, intervals consistent. Note: <i>x</i>-axis may just be labeled “<i>n</i>” and <i>y</i>-axis may just be labeled “<i>c</i>.” Axes may not be reversed.  OR 1 point: Graph contains the following (one or two errors): • Graph is based on at least three correct #'s in Part 1, but one point is incorrectly plotted, <i>n</i>- and/or <i>c</i>-axis isn't labeled, or • Graph is based on at least three correct #'s in Part 1. All points are correctly plotted but are connected. Note: No credit awarded if there are more than 2 errors Ex: Points are correctly plotted but connected, interval(s) inconsistent, axes not labeled.										

Solution and Scoring (continued)

Part	Points
3	1 point possible 1 point: Correct answer with correct and complete explanation, or correct answer/explanation based on incorrect graph. Give credit for the following or equivalent: Ex: “This is a function because ... • no two points lie on the same vertical line,” or • it passes the vertical line test,” or • each value of $n(x)$ has a single value of $c(y)$,” or • for each element in the domain there is exactly one element in the range.” Note: No credit for correct answer, “function” if there is either no valid explanation or if the explanation is vague or incomplete. The explanation must refer to the graph. Ex: “This is a function because ... • the x-axis doesn’t repeat itself,” or • the more pictures you sell, the higher the price,” or • none of the x-coordinates are the same.”



SCORE: 4

Part 1:

Correctly completed table:

Points

1

Part 2:

Correct and complete graph:

Four points correctly plotted
Consistent intervals
Axes labeled

2

Part 3:

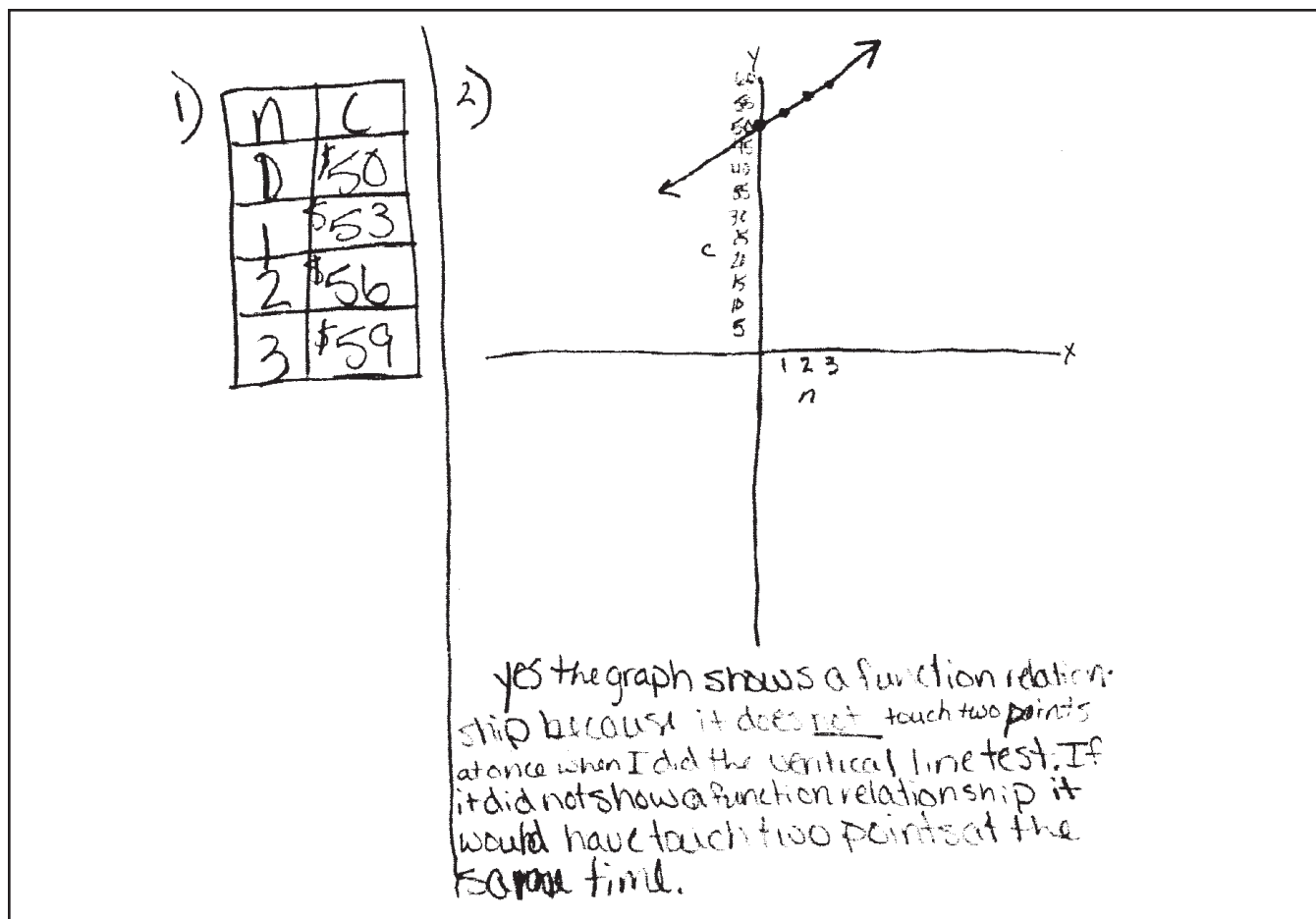
Correct answer and explanation:

Function
“For every element in the domain there is only one in the range”

1

TOTAL POINTS:

4



SCORE: 3

Part 1:

Correctly completed table:

Points

1

Part 2:

Partially correct graph:

Four points correctly plotted but connected
Consistent intervals
Axes labeled

1

Part 3:

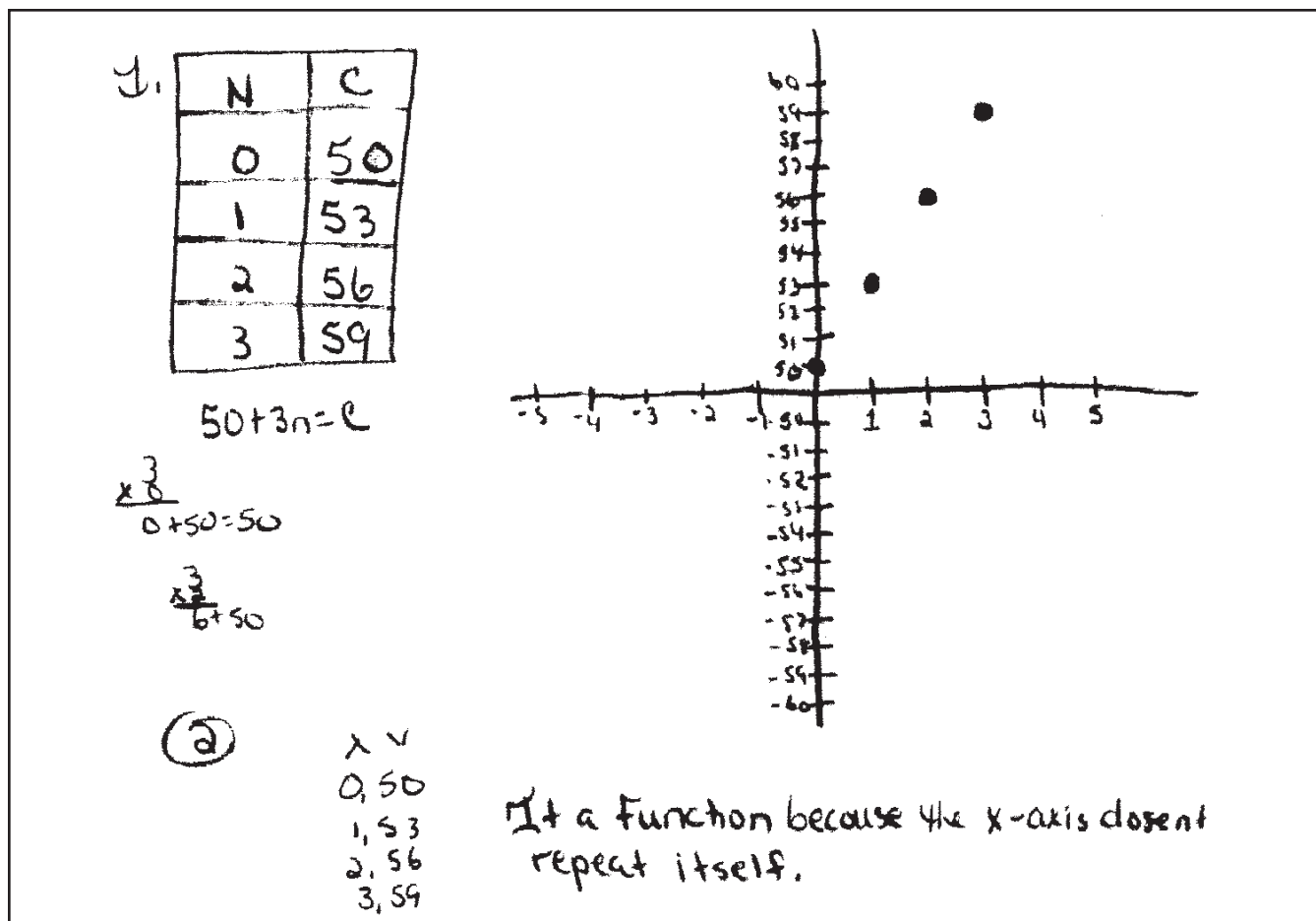
Correct answer and explanation:

Function
“does not touch two points at once when I did the vertical line test.”

1

TOTAL POINTS:

3



SCORE: 2

Part 1:

Points

Correctly completed table:

1

Part 2:

Partially correct graph:

Four points correctly plotted
Intervals inconsistent on y-axis
Axes are not labeled

1

Part 3:

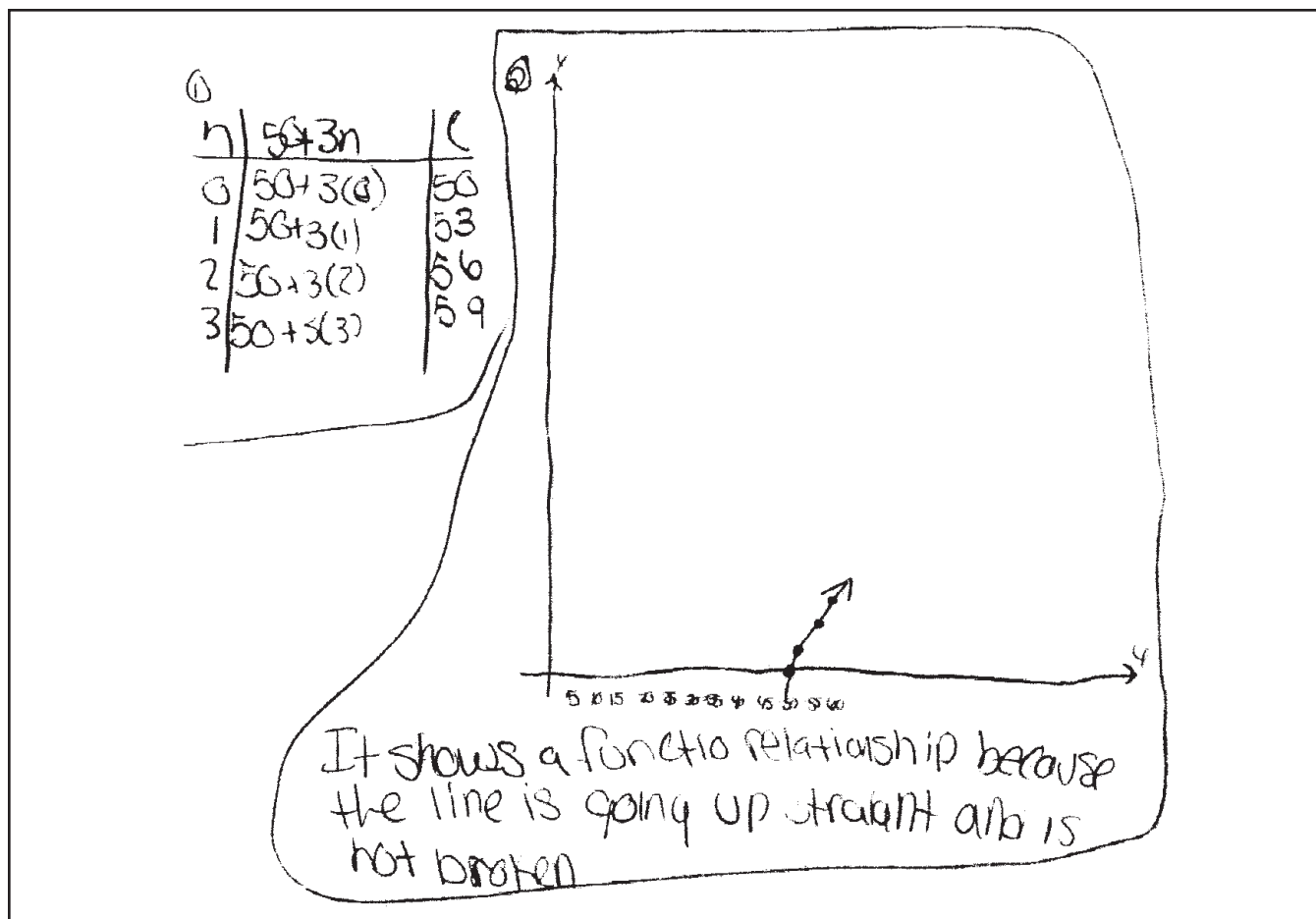
Correct answer with
incorrect explanation:

Function
"x-axis doesn't repeat itself."

—

TOTAL POINTS:

2



SCORE: 1

Part 1:

Correctly complete table:

Points

1

Part 2:

Incorrect graph:

Axes are reversed

—

Part 3:

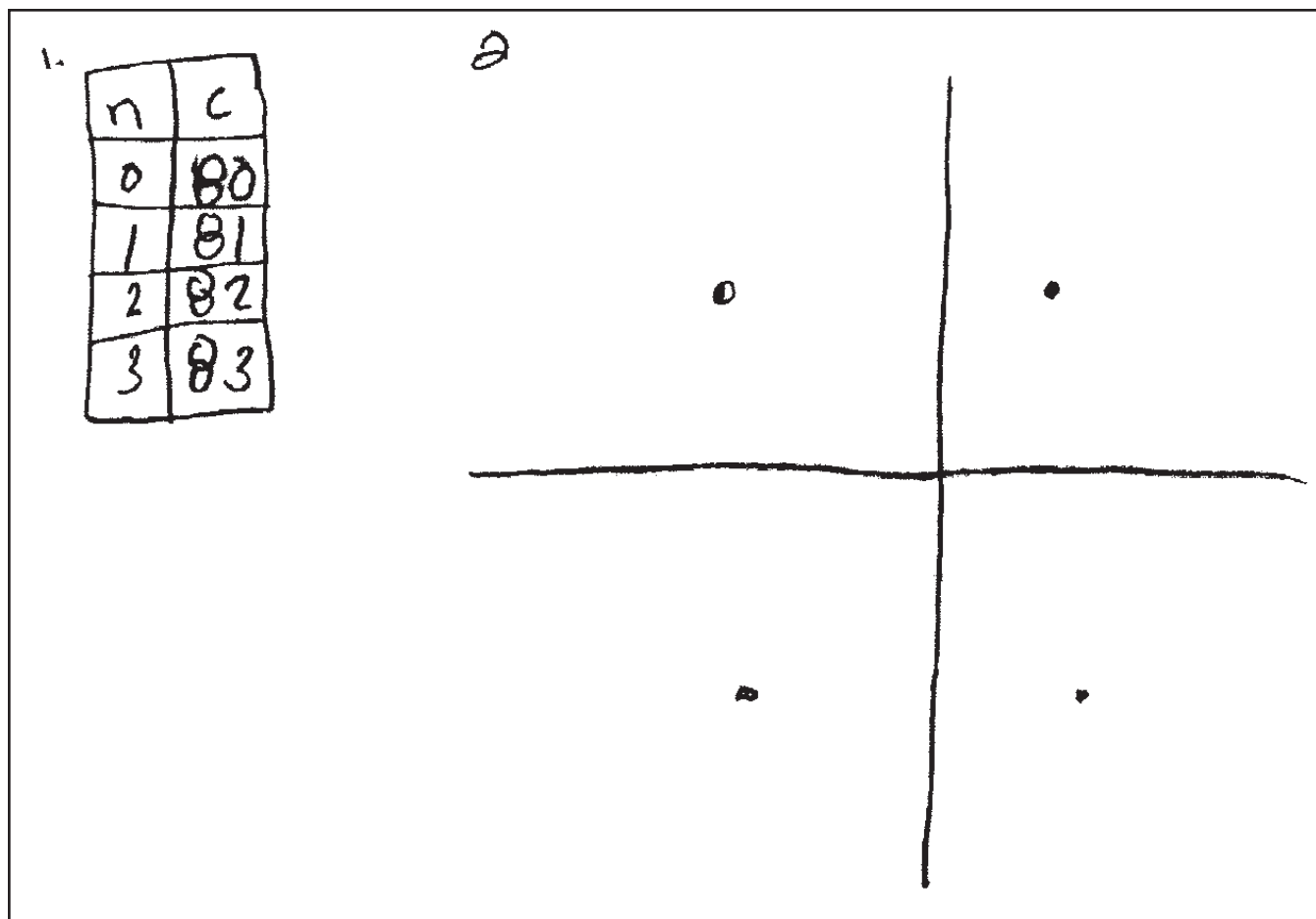
Correct answer with
incorrect explanation:

Function
“the line is going up straight”

—

TOTAL POINTS:

1



SCORE: 0

Part 1:

Incorrect table:

Points

—

Part 2:

Incorrect graph:

—

Part 3:

Missing answer and explanation:

—

TOTAL POINTS:

0

Item C—2007 Algebra I

C. An ant weighs approximately 4.0×10^{-3} grams.

1. An ant can carry between 15 and 25 times its body weight. Determine the range of weights, in grams, that an ant can carry. Express your answers in scientific notation. Show and/or explain all of your work even if you use mental math or a calculator.

A sandwich at a picnic is made of the ingredients below.

Ingredient	Weight
2 slices of bread	28 grams each
peanut butter	35 grams
jelly	21 grams

2. Determine the total weight of the sandwich, in grams. Express the weight of the sandwich in scientific notation. Determine how many ants it would take to carry the sandwich if each ant carried the minimum amount possible. Show and/or explain all of your work even if you use mental math or a calculator.

Item C Scoring Rubric—2007 Algebra I

SCORE	DESCRIPTION
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3–3 ½ points.
2	The student earns 2–2 ½ points.
1	The student earns ½–1 ½ 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.)

Solution and Scoring

Part	Points
1	2 points possible ½ point: Correct minimum in Scientific Notation: 6.0×10^{-2}. AND ½ point: Correct procedure shown and/or explained. Work may contain a calculation or copy error. Give credit for the following or equivalent: • $15 \times 4.0 \times 10^{-3} = 60 \times 10^{-3}$, or • $15 \times .004 = .06$ AND ½ point: Correct maximum in Scientific Notation: 1.0×10^{-1}. AND ½ point: Correct procedure shown and/or explained. Work may contain a calculation or copy error. Give credit for the following or equivalent: • $25 \times 4.0 \times 10^{-3} = 100 \times 10^{-3}$, or • $25 \times .004 = .1$
2	2 points possible 1 point: Correct # of ants: 1867, 1870, 1.87×10^3, 1.9×10^3, or 1900, <u>or</u> correct answer based on incorrect minimum in Part 1. AND 1 point: Correct and complete procedure shown and/or explained. Weight of sandwich must be given in Scientific Notation. Work may contain a calculation, copy, or rounding error or may be based on an incorrect minimum in Part 1. Give credit for the following or equivalent: • Weight of sandwich = 1.12×10^2 $2(28) + 35 + 21 = 112$ (not required) $\frac{\text{Weight of sandwich}}{\text{Minimum from Part 1}} = \#$ Ex: $\frac{1.12 \times 10^2}{.06} = \#$ Ex: $112 \div .06 = 1866.66$ OR ½ point: Give credit for any of the following: • Work is correct and complete but weight of sandwich is not given in Scientific Notation, or • Correct weight of sandwich is given in Scientific Notation (1.12×10^2); incorrect procedure to find # of ants or procedure missing, or • Correctly divides incorrect sandwich weight by .06 or incorrect minimum from Part 1. Ex: Sandwich weight = 84 grams, $84 \div .06 = 1400$ ants.

[1]

$$\begin{array}{r} 0.004 \times \frac{0.004}{15} = 0.06g \\ 0.004 \times \frac{0.004}{25} = 0.1g \end{array}$$

between 6.0×10^{-2} and 1.0×10^{-1}

G = grams

An ant can carry anywhere between 6.0×10^{-2} grams and 1.0×10^{-1} grams, which is 15 to 25 times its own body weight!

[2]

$$\begin{array}{r} 28g \\ \times 2 \\ \hline 56g \end{array} + 35g = 91g + 21g = 112g$$

G = grams

Sandwich
 1.12×10^2

weight of sandwich
 1.12×10^2

$0.06 \overline{) 112g} = 1866.6$

In order to carry the sandwich it would take 1,867 ants [carrying their minimum weight (6.0×10^{-2} grams) to carry the 1.12×10^2 grams sandwich! We found this out by dividing the weight of the sandwich by the min. weight that the ants could carry!

SCORE: 4

Part 1:

Points

Correct minimum:	6.0×10^{-2}	$\frac{1}{2}$
Correct and complete procedure:	$.004 \times 15 = .06g$	$\frac{1}{2}$
Correct maximum:	1.0×10^{-1}	$\frac{1}{2}$
Correct and complete procedure:	$.004 \times 25 = .1g$	$\frac{1}{2}$

Part 2:

Correct answer:	1867 ants	1
Correct and complete procedure:	Weight of sandwich is expressed in Scientific Notation 28 $\times 2$ $56 + 35 = 91 + 21 = 112$ grams $112g = 1.12 \times 10^2$ $\begin{array}{r} 1866.6 \\ .06 \overline{) 112.00} \end{array}$	1

TOTAL POINTS:

4

① 4.0×10^{-3} grams = the ants weight

4.0×10^{-3} grams = .004

$\times \frac{.004 \text{ grams}}{25 \text{ times the ants weight}}$
 $\times \frac{.004 \text{ grams}}{15 \text{ times the ants body weight}}$
 $\times \frac{.004 \text{ grams}}{.06 \text{ grams}}$
 $\times \frac{.004 \text{ grams}}{.1 \text{ grams}}$

The ants range of carrying weight is between 6.0×10^{-8} grams and 1.0×10^{-1} grams.

② Weight of sandwich

bread 28 grams x 2 pieces of bread
 peanut 35 grams
 butter 21 grams
 jelly

$\begin{array}{r} .28 \\ 2 \\ \hline 56 \\ +35 \\ \hline 91 \\ +21 \\ \hline 112 \text{ grams} \end{array}$

Ants to Carry

The minimum weight an ant can carry is .06 gram, so divide the weight of the sandwich by the strength of the ant.

$\frac{112 \text{ grams}}{.06} = 1867$

It would take 1,867 ants to carry the peanut butter sandwich!

SCORE: 3

Part 1:

Correct minimum:	6.0×10^{-2}
Correct and complete procedure:	$.004 \times 15 = .06$
Correct maximum:	1.0×10^{-1}
Correct and complete procedure:	$.004 \times 25 = .1$

Points

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

Part 2:

Correct answer:	1867 ants
Incomplete procedure:	Sandwich weight is not expressed in Scientific Notation

1
 $\frac{1}{2}$

$$\frac{1867}{.06} \overline{) 112}$$

TOTAL POINTS:

3½

1. An ant weighs approx. $4.0 \cdot 10^{-3}$ grams.
 In order to find how much weight it
 can carry I must find its real weight.
 $4.0 \cdot 10^{-3} \cdot 0.001 = 0.004$
 If an ant can carry 15 times its body weight
 I just need to multiply 15 times .004.
 $15 \cdot .004 = .06 \text{ grams}$
 If an ant can also carry 25 times its body weight
 I just need to multiply 25 times .004.
 $25 \cdot .004 = .10 \text{ grams}$
 Therefore when an ant is carrying 15 times its weight its
 carrying $6.0 \cdot 10^{-2}$ grams. Also, when an ant is carrying 25 times its
 weight its carrying $1.0 \cdot 10^{-1}$ grams. The range of weight between the
 two is $4.0 \cdot 10^{-2}$ grams.

2. Total Weight of the Sandwich
 in Grams
 2 Slices of Bread = $28g \cdot 2$
 peanut butter = 35g
 jelly = 21g
 Bread: $56g + 35g + 21g = 112g$
 The sandwich weighs $1.12 \cdot 10^2$ grams.
 If each ant were able to carry
 its own body weight (.004g), then
 all that is needed to be done is
 to divide the sandwich's weight
 (112g) by (.004g), the ant's weight.
 $112g \div .004g =$
 $28,000$ ants would be
 needed to carry the
 sandwich if they each
 carried their own body weight.

SCORE: 2

Part 1:

Points

Correct minimum:	$6.0 \cdot 10^{-2}$ grams	$\frac{1}{2}$
Correct procedure:	$15 \cdot .004 = .06$ grams	$\frac{1}{2}$
Correct maximum expressed incorrectly:	$10 \cdot 10^{-2}$ grams	—
Correct and complete procedure:	$25 \cdot .004 = .10$ grams	$\frac{1}{2}$

Part 2:

Incorrect answer:	28,000 ants	—
Procedure partially correct:	Correctly expresses sandwich weight $28 \cdot 2 = 56$, $56 + 35 + 21 = 112g$ $1.12 \cdot 10^2$	$\frac{1}{2}$
Procedure for # of ants incorrect:	$112 \div .004 = \#$	

TOTAL POINTS:

2

An ant can carry 1/100 of its body weight
 slices of bread weighs 28 grams each
 Peppermint butter weighs 35 grams
 Jelly weighs 21 grams

Ant weighs 100 L

Range = 25

Range = 35

2, $28 + 28 + 35 + 21 = 112$ grams

Total amount weighed

$112 \div 106 = 1866.66$

It would take 1,867 ants
 To carry the sandwich
 So the answer is 1,867 ants

SCORE: 1

Part 1:

Incorrect range: 25 and 35
 Procedure missing: $56 - 21 = 35$

Points

—
 —

Part 2:

Correct answer: 1867 ants
 Incomplete procedure: Sandwich weight is not expressed
 in Scientific Notation
 $28 + 28 + 35 + 21 = 112$
 $112 \div .06 = \#$

1
 $\frac{1}{2}$

TOTAL POINTS:

1½

4.0×10^{-3}
 1.) 040 040
 $\times 15$ $\times 25$
 600 grams 1000 grams
 Between 600 and 1000 grams
 2.) 2 slices of bread 28 grams each = 56 grams
 peanut butter = 35 grams
 jelly = 21 grams
 $56 + 35 + 21 = 112 \text{ grams}$

SCORE: 0**Part 1:**

Incorrect minimum:	600 grams
Incorrect procedure:	$40 \times 15 = \#$
Incorrect maximum:	1000 grams
Incorrect procedure:	$40 \times 25 = \#$

Points

—
—
—
—

Part 2:

Answer missing:	
Procedure incomplete:	Sandwich weight is not expressed in in Scientific Notation $56 + 35 + 21 = 112 \text{ grams}$

—
—

TOTAL POINTS:**0**

Item D—2007 Algebra I

- D.** A corporation offered its new president a salary of \$50,000.00 per year for 5 years. In addition to the yearly salary, the president can choose one of the two incentive plans below.
- a yearly increase in salary of 5.5% each year, beginning the 2nd year
 - a yearly increase in salary of 2,900.00 each year, beginning the 2nd year
1. The president needs help in deciding which incentive plan to take. Make a table showing the amount the president would make each year for 5 years under each of the incentive plans. Show all of your work.
 2. What would the president's total salary be under each plan, cumulatively, for the entire 5-year period? Which plan would you recommend?

Item D Scoring Rubric—2007 Algebra I

SCORE	DESCRIPTION
4	The student earns 5 points. The response contains no incorrect work.
3	The student earns 4 points.
2	The student earns 2–3 points.
1	The student earns 1 point, or some minimal understanding is shown. Ex: Correct total for each plan are given in Part 2 but recommendation is missing or incorrect.
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.)

Solution and Scoring

Part	Points																																		
1	4 points possible 1 point: Correct salaries for years 1–5 for Plan 1 (+5.5%/year) as shown in the table below. AND 1 point: Correct procedure shown and/or explained. Amounts may be rounded to the nearest dollar or truncated. Work may contain one or two calculation, copy, or rounding errors. Give credit for the following or equivalent: <table><tr><td>•</td><td><table><tr><th>Year</th><th>Salary</th><th>Accept</th></tr><tr><td>1</td><td>50,000</td><td>50,000</td></tr><tr><td>2</td><td>1.055 (50,000) =</td><td>52,750</td></tr><tr><td>3</td><td>1.055 (52,750) =</td><td>55,651.25</td></tr><tr><td>4</td><td>1.055 (55,651.25) =</td><td>58,712.07</td></tr><tr><td>5</td><td>1.055(58,712.07) =</td><td>61,941.23</td></tr></table></td></tr></table> Be aware that there may be calculation errors even if the numbers are in the correct range. Or • “I multiplied 50,000 by .055 and added the product to 50,000. Then I multiplied 52,750 by .055 and added that, and so on.” AND 1 point: Correct salaries for years 1–5 for Plan 2 (+ \$2,900/year) as shown in the table below. AND 1 point: Correct procedure shown and/or explained. Work may contain a calculation error. Give credit for the following or equivalent: <table><tr><td>•</td><td><table><tr><th>Year</th><th>Salary</th></tr><tr><td>1</td><td>50,000</td></tr><tr><td>2</td><td>50,000 + 2,900 = 52,900</td></tr><tr><td>3</td><td>52,900 + 2,900 = 55,800</td></tr><tr><td>4</td><td>55,800 + 2,900 = 58,700</td></tr><tr><td>5</td><td>58,700 + 2,900 = 61,600</td></tr></table></td></tr></table> Or • “The first year was 50,000 so I added 2,900 to that and got 52,900 for the second year. Then I just kept adding 2,900 to the last year to get the next.” Note: For both Part 1 procedures, work needs to be shown or explained for at least one table entry beyond the first year, with a statement that the procedure used continues.	•	<table><tr><th>Year</th><th>Salary</th><th>Accept</th></tr><tr><td>1</td><td>50,000</td><td>50,000</td></tr><tr><td>2</td><td>1.055 (50,000) =</td><td>52,750</td></tr><tr><td>3</td><td>1.055 (52,750) =</td><td>55,651.25</td></tr><tr><td>4</td><td>1.055 (55,651.25) =</td><td>58,712.07</td></tr><tr><td>5</td><td>1.055(58,712.07) =</td><td>61,941.23</td></tr></table>	Year	Salary	Accept	1	50,000	50,000	2	1.055 (50,000) =	52,750	3	1.055 (52,750) =	55,651.25	4	1.055 (55,651.25) =	58,712.07	5	1.055(58,712.07) =	61,941.23	•	<table><tr><th>Year</th><th>Salary</th></tr><tr><td>1</td><td>50,000</td></tr><tr><td>2</td><td>50,000 + 2,900 = 52,900</td></tr><tr><td>3</td><td>52,900 + 2,900 = 55,800</td></tr><tr><td>4</td><td>55,800 + 2,900 = 58,700</td></tr><tr><td>5</td><td>58,700 + 2,900 = 61,600</td></tr></table>	Year	Salary	1	50,000	2	50,000 + 2,900 = 52,900	3	52,900 + 2,900 = 55,800	4	55,800 + 2,900 = 58,700	5	58,700 + 2,900 = 61,600
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Solution and Scoring (continued)

Part	Points
2	1 point possible 1 point: Response contains all of the following or equivalent: • Correct total for Plan 1: (\$) 279,054.55 or correct total based on incorrect amounts in Part 1. Work is not required. • Correct total for Plan 2: (\$) 279,000 or correct total based on incorrect amounts in Part 1. Work is not required. • Correct plan is recommended (based on Part 1 amounts). No reason for recommendation is required beyond having correct totals, but if one is given, it may not be incorrect. Ex: Plan 1—\$279,054.55, Plan 2—\$279,000. “...so pick Plan 1 because he’ll make more money each year.” (Does not receive credit.) Note: Give credit for “Plan 1 pays \$54.55 more,” or correct difference based on incorrect amount(s) in Part 1.

Item D Sample Responses and Annotations—2007 Algebra I

1.

5.5% increase	2,900 increase
50,000	50,000
52,750	52,900
55,651.25	55,800
58,712.09	58,700
+ 61,941.23	61,600
Total 279,054.55	279,000

50,000	50,000
x 0.055	+ 2,900
2,750	52,900
50,000	52,900
+ 2,750	+ 2,900
52,750	55,800
so on	

2. It would be \$279,054.55 in the 5.5% each year increase and \$279,000 in the \$2,900 each year increase. The 5.5% each year increase because it pays \$54.55 more.

SCORE: 4

Part 1:

Correct table for Plan 1:

Correct procedure:

$$\begin{array}{r} 50,000 \\ \times .055 \\ \hline 2,750 \end{array}$$

$$\begin{array}{r} 50,000 \\ \underline{+ 2,750} \\ 52,750 \text{ so on} \end{array}$$

Points

1

1

Correct table for Plan 2:

Correct procedure:

$$\begin{array}{r} 50,000 \\ +2,900 \\ \hline 52,900 \\ +2,900 \\ \hline 55,800 \text{ so on} \end{array}$$

1

1

Part 2:

Correct total for Plan 1:

\$279,054.55

1

Correct total for Plan 2:

\$279,000

Correct answer:

"The 5.5% each year increases"

TOTAL POINTS:

5

1st plan = a yearly increase in salary of 5.5% each year, beginning the 2nd year.

2nd plan = a yearly increase in salary of \$2,900.00 each year, beginning the 2nd year.

1 st plan		For plan 1 I multiplied each year by 5.5% then I added that amount back to the year before it to come up with the next years salary	2 nd plan		For plan 2 I added \$2,900 to each year to get the next years salary.
years	salary		years	salary	
1	50,000.00		1	50,000.00	
2	52,750.00		2	52,900.00	
3	55,651.25		3	53,190.00	
4	58,712.07		4	56,090.00	
5	61,941.23		5	58,990.00	

② 1st plan

50,000.00
52,750.00
55,651.25
58,712.07
61,941.23
<u>\$279,054.55</u>

2nd plan

50,000.00
52,900.00
53,190.00
56,090.00
58,990.00
<u>\$271,170.00</u>

For the total 5 years with plan 1 the president would make a total of \$279,054.55. With plan 2 the president would make a total of \$271,170.00. Plan 1 is the plan that I would recommend because you will receive \$7,884.55 more than plan 2.

SCORE: 3

Part 1:

Points

Correct table for Plan 1:

1

Correct and complete procedure: "For Plan 1 I multiplied each year by 5.5% then added that amount back to the year before...."

1

Incorrect table for Plan 2: Year 3 – 53,190

–

Correct and complete procedure: "I added \$2,900 to each year to get the next years salary."

1

Part 2:

Correct total for Plan 1: \$279,054.55

1

Correct total for Plan 2 (based on incorrect amounts in Part 1): \$271,170

Correct answer: Plan 1

TOTAL POINTS:

4

1. Year 1 - 50,000.00
 Year 2 - 52,750.00
 Year 3 - 55,651.25
 Year 4 - 58,712.06
 Year 5 - 61,941.23
279,054.54

Year 1 - 50,000.00
 Year 2 - 52,900.00
 Year 3 - 55,810.00
 Year 4 - 58,700.00
 Year 5 - 61,600.00
279,000.00

The 5.5% increase is more as a total so if it was the president it would take the 5.5% increase.

2. The 5.5% would be 279,054.54 and the 2,900.00 would be 279,000.00.

SCORE: 2

Part 1:

Correct answer for both plans:

Points

2

Procedure missing for both plans:

—

Part 2:

Correct total for Plan 1: 279,054.54

1

Correct total for Plan 2: 279,000

Correct answer: 5.5% increase

TOTAL POINTS:

3

①	year 1	year 2	year 3	year 4	year 5
5.5%	50,000	77,500	77,500	77,500	77,900
2,900	50,000	52,900	52,900	52,900	52,900
50,000	50,000	50,000			
x .55	+ 27,500	+ 2,900			
27,500	77,500	52,900			

②	50,000	50,000	I would recommend the first incentive (5.5%) because this person would earn more money over a 5 year plan.
	77,500	52,900	
	77,500	52,900	
	77,500	52,900	
	77,500	52,900	
	77,500	52,900	
	+ 77,500	261,600	
	360,000		
	5 years	5 years	

SCORE: 1

Part 1:

Incorrect table for Plan 1:

Year 2—77,500

Points

Incorrect procedure:

50,000

x.55

27,500 etc.

Incorrect table for Plan 2:

Year 3—52,900

Incorrect procedure for Plan 2:

\$2,900

Raise in 2nd year only.

Part 2:

Correct total for Plan 1 (based on Part 1):

\$360,000

Correct total for Plan 2 (based on Part 1):

261,600

Correct answer (based on Part 1 amounts):

First incentive (5.5%)

TOTAL POINTS:

1

1 st Plan	years	income	2 nd Plan	y	i
	1	50,000		1	50,000
	2	100,000		2	102,900
	3	825,000		3	155,800
	4	481,250		4	208,700
	5	26,743,750		5	261,600

2. for the 1st plan it would be 26,743,750 for income, and for the 2nd plan it would be 261,600 for the income. and I would recommend the 1st plan.

SCORE: 0

Part 1:

Incorrect table for Plan 1:

Procedure missing:

Incorrect table for Part 2:

Procedure missing:

Points

—
—
—
—

Part 2:

Totals missing for both plans:

Uses 5th year values:

—

TOTAL POINTS:

0

Item E—2007 Algebra I

- E.** A charity organization gets 1 pledge for every 15 people it calls.
1. Write a proportion of pledges per people called, where x is the number of pledges, and y is the number of people called.
 2. If the organization calls 450 people in one month, how many pledges does it receive? Show your work and/or explain your answer.
 3. If the monthly goal is 150 pledges, how many calls will the organization have to make? Show your work and/or explain your answer.

Item E Scoring Rubric—2007 Algebra I

SCORE	DESCRIPTION
4	The student earns 6 points. The response contains no incorrect work.
3	The student earns 5 points.
2	The student earns 3–4 points.
1	The student earns 1–2 points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank – No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)

Solution and Scoring

Part	Points
1	2 points possible 2 points: Correct proportion. Give credit for the following or equivalent: • $\frac{1}{15} = \frac{x}{y}$, or • $\frac{y}{15} = x$, or • $1 : 15 :: x : y$. OR 1 point: Correct equation <u>NOT</u> expressed as a proportion. Give credit for the following or equivalent: • $y = 15x$, or • $x = y \div 15$
2	2 points possible 1 point: Correct answer: 30 (pledges). AND 1 point: Correct and complete procedure. Work may be based on incorrect answer in Part 1 or may contain one calculation error. Give credit for the following or equivalent: • $\frac{1}{15} = \frac{x}{450}$, $15x = 450$, $x = \#$, or • $450 \div 15 = \#$, or • $15 \times 30 = 450$ (guess and check). Note: If guess and check is used, 30 must be explicitly stated as the guess or obvious from work shown. No credit for guess and check procedure if guess is incorrect. Ex: Guess is 20 and procedure is $15 \times 20 = 450$ (receives no credit).
3	2 points possible 1 point: Correct answer: 2250 (calls). AND 1 point: Correct and complete procedure. Work may be based on incorrect answer in Part 1 or may contain one calculation error. Give credit for the following or equivalent: • $\frac{1}{15} = \frac{150}{y}$, $y = 150 \times 15$, $y = \#$, or • $150 \times 15 = \#$, or • $\frac{2250}{15} = 150$ (guess and check). Note: No credit for guess and check procedure if guess is incorrect.

① $\frac{1 \text{ pledge}}{15 \text{ people called}} = \frac{x}{y}$

② $\frac{1 \text{ pledge}}{15 \text{ people called}} = \frac{x}{450}$
 $\frac{15x}{15} = \frac{450}{15}$
 $x = 30 \text{ pledges}$

③ $\frac{1 \text{ pledge}}{15 \text{ people called}} = \frac{150}{y}$
 $\frac{1y}{1} = \frac{2250}{1}$
 $y = 2250 \text{ calls}$

SCORE: 4

Part 1:

Correct proportion:

$$\frac{1 \text{ (pledge)}}{15 \text{ (calls)}} = \frac{x}{y}$$

Points

2

Part 2:

Correct answer:

30 pledges

1

Correct and complete procedure:

$$\frac{1}{15} = \frac{x}{450}, x = \#$$

1

Part 3:

Correct answer:

2250 calls

1

Correct and complete procedure:

$$\frac{1}{15} = \frac{150}{y}, y = \#$$

1

TOTAL POINTS:

6

Charity organization pledges

1) 1 out of every 15 people make a pledge.
 $\frac{x}{y} = \frac{1}{15}$ ← # of pledges
 ← # of people contacted.

2) $\frac{x}{450}$ $450 \div 15 = 10$ $\frac{10}{450}$ you will get 10 pledges if you call 450 people.

3) $\frac{150}{y}$ $150 \cdot 15 = 2250$ $\frac{150}{2250}$ you will have to make 2250 calls to get 150 pledges.

15 calls for 1 pledge.

SCORE: 3

Part 1:

Correct proportion:

$$\frac{x}{y} = \frac{1}{15}$$

Points

2

Part 2:

Incorrect answer due to calculation error:

10

—

Correct and complete procedure:

$$\frac{450}{15} = (\text{calculation error})$$

1

Part 3:

Correct answer:

2250

1

Correct and complete procedure:

$$150 \cdot 15 = \#$$

1

TOTAL POINTS:

5

1. 1:15 $\frac{x}{1} = \frac{y}{15}$ $x = \# \text{ of pledges}$
 $y = \# \text{ of ppl called}$

$\frac{30}{2} \overline{) 450}$
 they would get 30 pledges for
 calling 450 people

$\frac{10}{3} \overline{) 150}$
 they would have to call 15 different
 people 10 times.

SCORE: 2

Part 1:

Correct proportion:

$$\frac{x}{1} = \frac{y}{15}$$

Points

2

Part 2:

Correct answer:

30

1

Correct and complete procedure:

$$15 \overline{) 450}$$

1

Part 3:

Incorrect answer:

10

—

Incorrect procedure:

$$15 \overline{) 150}$$

—

TOTAL POINTS:

4

1) 15:1

2) It would get 30 Pledges by the Proportion Above

3) $15 \overline{) 2350}$ It would take the organization
calling 2350 people to get all
their pledges

SCORE: 1

Part 1:

Proportion Missing

15 : 1

Points

—

Part 2:

Correct answer:

30 pledges

1

Correct and complete procedure:

$15 \overline{) 450} = \#$

1

Part 3:

Incorrect answer:

2350

—

Incorrect procedure:

Guess and check but no credit since
guess is incorrect

—

$15 \overline{) 2350} = 150$

TOTAL POINTS:

2

1. x is the number of pledges and y is the number of people called.

$$10x + 15y = 150yx$$

2. The organization has 375 pledges

3. They will have to make 11 calls because if you add 15 11 times you will get 150.

SCORE: 0

Part 1:

Points

Incorrect equation:

$$10x * 15y = 150yx$$

—

Part 2:

Incorrect answer:

375

—

Procedure missing:

—

Part 3:

Incorrect answer:

11 calls

—

Incorrect procedure:

“add 15 11 times”

—

TOTAL POINTS:

0



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