IMAGINING the possibilities. MAKING THEM HAPPEN.

Indiana Department of Education

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Indiana Superintendent of Public Instruction

ISTEP+: Grade 6

Mathematics

Released Part 1 Applied Skills (open-ended) Items and Scoring Notes

Introduction

The *ISTEP+* Spring 2016 test was administered to Indiana students in Grades 3-8 and 10. The test included two parts: Part 1 was given in March, and Part 2 took place in late April and early May. Part 1 contained Applied Skills test questions (also referred to as open-ended items) that were hand scored by trained evaluators, and Part 2 was machine scored. Scores for Part 1 and Part 2 are combined to generate a student's total score.

Test results, as well as images of the Applied Skills student responses, are available online, and schools are expected to discuss results with parents and students. As a springboard for these conversations and to serve as a resource for teachers, the Indiana Department of Education has created this document, which consists of the following:

- a brief description of the types of questions on the test
- a short summary of scoring rules utilized by the trained evaluators
- a copy of the rubrics—or scoring guides—used by evaluators to score student responses
- a copy of the released Applied Skills questions *("released" means the items are posted on the web and are no longer secure; therefore, the released test items can be discussed and used with students as future practice items)*
- anchor papers—or sample student responses—used by evaluators to distinguish between score points

Notes:

- The Part 1 open-ended questions are released when test results are made available.
- It is important to keep in mind that the majority of a student's score is calculated from items in Part 2. Since Part 2 items are secure and are not released, they are not included in this document.

Question Types

This document addresses questions from *ISTEP+ Part 1. Students* demonstrate their knowledge and understanding by responding to items that are open-ended, providing written responses in a short-answer or essay-type format.

Part 1 consists of the following test question types: Constructed-Response (CR), Extended-Response (ER), and a Writing Prompt (WP). Item types vary by subject area. Math, Science, and Social Studies include CR and ER items. English/Language Arts includes CR and WP test questions.

Scoring

The questions on *ISTEP+* Part 1 are scored by evaluators who must have a four-year college degree and pass a series of qualifying tests. Prior to scoring student responses, evaluators receive extensive training to ensure that student responses are scored accurately and consistently.

For Part 1 of *ISTEP+*, each question is scored according to a rubric, or scoring guide. Rubrics clearly define the requirements for each score point. A set of student responses representing all of the score points on a rubric are selected as samples—called anchor papers—and are used as clear examples of specific score points. Anchor papers are presented within this document.

ISTEP+ Part 1: Mathematics		
Question Type	**Score Reporting Categories**	**Scoring Method**
Constructed-Response (CR)	Number Sense Computation Algebra and Functions Geometry and Measurement Mathematical Process	2-pt. CR Content Rubric (Grades 3-8, 10) 2-pt. CR Process Rubric (Grades 3-8, 10)
Extended-Response (ER)	Number Sense Computation Algebra and Functions Geometry and Measurement Mathematical Process	3-pt. ER Content Rubric (Grades 3-8, 10) 3-pt. ER Process Rubric (Grades 3-8, 10)

If a student's response is unable to be scored, it is assigned one of the following condition codes:

- **A** Blank/No Response/Refusal
- **B** Illegible
- **C** Written predominantly in a language other than English
- **D** Insufficient response/Copied from text
- **E** Response not related to test questions or scoring rule (not applied to Mathematics questions)

More information is available regarding assessment topics on the Office of Student Assessment homepage at http://www.doe.in.gov/assessment.

Constructed-Response Rubric

Content Rubric	
2	A score of two indicates a **thorough understanding** of the mathematical concepts embodied in the task. The response • shows algorithms, computations, and other content related work executed correctly and completely.
1	A score of one indicates a **partial understanding** of the mathematical concepts embodied in the task. The response • contains errors in the execution of algorithms, computations, and/or other content related work.
0	A score of zero indicates **limited or no understanding** of the mathematical concepts embodied in the task.
Process Rubric	
2	A score of two indicates a **thorough understanding** of the problem-solving concepts embodied in the task. The response • shows an appropriate strategy to solve the problem, and the strategy is executed correctly and completely. • identifies all important elements of the problem and shows a complete understanding of the relationships among them. • provides clear and complete explanations and/or interpretations when required.
1	A score of one indicates a **partial understanding** of the problem-solving concepts embodied in the task. The response contains one or more of the following errors. The response • shows an appropriate strategy to solve the problem. However, the execution of the strategy contains errors and/or is incomplete. • identifies some of the important elements of the problem and shows a general understanding of the relationships among them. • provides incomplete, partial, or unclear explanations and/or interpretations when required.
0	A score of zero indicates **limited or no understanding** of the problem-solving concepts embodied in the task.

<u>Clarification and Implementation Guidance</u>

- Correct answers ONLY, on all parts of the problem with no work shown, will receive a maximum of 1 point in content and a maximum of 1 point in Process.
- A student can receive the top score point in Process if the strategy used would result in a correct answer even though the response contains computational errors.
- A student can receive the top score point in Process if an error made in the “content” portion is used with an appropriate strategy to solve the problem.

Extended-Response Rubric

	Content Rubric
3	A score of three indicates a **thorough understanding** of the mathematical concepts embodied in the task. The response • shows algorithms, computations, and other content related work executed correctly and completely.
2	A score of two indicates a **partial understanding** of the mathematical concepts embodied in the task. The response • shows an attempt to execute algorithms, computations, and other content related work correctly and completely; computation errors or other minor errors in the content related work may be present.
1	A score of one indicates a **limited understanding** of the mathematical concepts embodied in the task. The response • contains major errors, or only a partial process. • contains algorithms, computations, and other content related work which may only be partially correct.
0	A score of zero indicates **no understanding** of the mathematical concepts embodied in the task.
	Process Rubric
3	A score of three indicates a **thorough understanding** of the problem-solving concepts embodied in the task. The response • shows an appropriate strategy to solve the problem, and the strategy is executed correctly and completely. • identifies all important elements of the problem and shows a complete understanding of the relationships among them. • provides clear and complete explanations and/or interpretations when required.
2	A score of two indicates a **partial understanding** of the problem-solving concepts embodied in the task. The response contains one or more of the following errors. The response • shows an appropriate strategy to solve the problem. However, the execution of the strategy lacks an essential element. • identifies some of the important elements of the problem and shows a general understanding of the relationships among them. • provides incomplete or unclear explanations and/or interpretations when required.
1	A score of one indicates a **limited understanding** of the problem-solving concepts embodied in the task. The response contains one or more of the following errors. The response • shows an appropriate strategy to solve the problem. However, the execution of the strategy is applied incorrectly and/or is incomplete. • shows a limited understanding of the relationships among the elements of the problem. • provides incomplete, unclear, or omitted explanations and/or interpretations when required.
0	A score of zero indicates **no understanding** of the problem-solving concepts embodied in the task.

Clarification and Implementation Guidance

- Correct answers ONLY, on all parts of the problem with no work shown, will receive a maximum of 2 points in content and a maximum of 2 points in Process.
- A student can receive the top score point in Process if the strategy used would result in a correct answer even though the response contains computational errors.
- A student can receive the top score point in Process if an error made in the “content” portion is used with an appropriate strategy to solve the problem.

Item #1

Constructed-Response

Constructed-Response
Standard 1: Number Sense
Standard 6: Mathematical Process

Question 1

1. Cindy can paint an area of 96 square feet in 20 minutes.

Part A

How many square feet can Cindy paint in 1 HOUR?

Show All Work

Answer _____ square feet

Part B

Cindy is painting the walls of a room that have a total area of 240 square feet. It will take her 45 minutes to prepare the walls for painting. She will paint the walls with 2 coats of paint.

How many minutes will it take Cindy to prepare and paint the walls with 2 coats of paint?

Show All Work

Answer _____ minutes

Exemplary Response:

- 288 square feet

AND

- 145 minutes

AND

- Sample Process:

96 x 3 = 288

240/96 = 2.5
2.5 x 20 = 50 minutes

50 + 50 + 45 = 145 minutes

OR

- Other valid process

Question 1, Sample A – Number Sense Score Point 2; Process Score Point 2

1 Cindy can paint an area of 96 square feet in 20 minutes.

Part A

How many square feet can Cindy paint in 1 HOUR?

Show All Work

$$\begin{array}{r} 96 \\ \times\ 3 \\ \hline 288 \end{array}$$

Answer 288 square feet

Part B

Cindy is painting the walls of a room that have a total area of 240 square feet. It will take her 45 minutes to prepare the walls for painting. She will paint the walls with 2 coats of paint.

How many minutes will it take Cindy to prepare and paint the walls with 2 coats of paint?

Show All Work

45

$$96\overline{)240}\ 2.5$$

$$\begin{array}{r} 20 \\ \times\ 2.5 \\ \hline 50 \end{array} \qquad \begin{array}{r} 50 \\ \times\ 2 \\ \hline 100 \end{array} \qquad \begin{array}{r} 100 \\ +\ 45 \\ \hline 145 \end{array}$$

Answer 145 minutes

Scoring Notes: The response demonstrates a thorough understanding of number sense by finding the correct square footage and having a valid setup in Part A and a correct amount of time (in minutes) with a valid setup for Part B. The response demonstrates a thorough understanding of mathematical process. This response receives two points for content and two points for process.

Question 1, Sample B – Number Sense Score Point 2; Process Score Point 1

1 Cindy can paint an area of 96 square feet in 20 minutes.

Part A

How many square feet can Cindy paint in 1 HOUR?

Show All Work

96 × 3 = 288 20×3=60

Answer 288 square feet

Part B

Cindy is painting the walls of a room that have a total area of 240 square feet. It will take her 45 minutes to prepare the walls for painting. She will paint the walls with 2 coats of paint.

How many minutes will it take Cindy to prepare and paint the walls with 2 coats of paint?

Show All Work

50 + 45 = 95

96 × 2 = 192

96.0 × 2.5 = 148.00 + 192.00 = 240.00

20.0 × 2.5 = 10.00 + 40.00 = 50.00

Answer 95 minutes

Scoring Notes: The response demonstrates a thorough understanding of number sense by determining the correct square footage with a valid setup and mathematical process in Part A. The response demonstrates a partial understanding of mathematical process in part B by not doubling the amount of time to apply one coat of paint to the wall. The answer in Part B is correct based on an incorrect process. This response receives two points for content and one point for process.

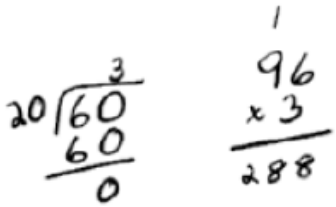
Question 1, Sample C – Number Sense Score Point 1; Process Score Point 2

1 Cindy can paint an area of 96 square feet in 20 minutes.

Part A

How many square feet can Cindy paint in 1 HOUR?

Show All Work



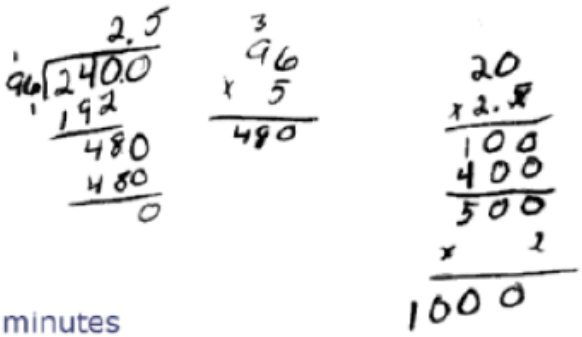
Answer 288 square feet

Part B

Cindy is painting the walls of a room that have a total area of 240 square feet. It will take her 45 minutes to prepare the walls for painting. She will paint the walls with 2 coats of paint.

How many minutes will it take Cindy to prepare and paint the walls with 2 coats of paint?

Show All Work



Answer 1,045 minutes

Scoring Notes: The response demonstrates a thorough understanding of number sense by finding the correct square footage and having a valid setup in Part A; however, in Part B, a computation error in calculating the number of minutes to paint two coats indicates only a partial understanding of number sense. The response demonstrates a thorough understanding of mathematical with a valid process to determine the amount of time (in minutes) in part B. This response receives one point for content and two points for process.

Question 1, Sample D – Number Sense Score Point 1; Process Score Point 1

1 Cindy can paint an area of 96 square feet in 20 minutes.

Part A

How many square feet can Cindy paint in 1 HOUR?

Show All Work

96 in 20

96
x60
288

60 mins in hour

20 x3=60

Answer 288 square feet

Part B

Cindy is painting the walls of a room that have a total area of 240 square feet. It will take her 45 minutes to prepare the walls for painting. She will paint the walls with 2 coats of paint.

How many minutes will it take Cindy to prepare and paint the walls with 2 coats of paint?

Show All Work

45 ÷ 4 = 11.25
x 2.00
90.

Answer 90 minutes

Scoring Notes: The response demonstrates a thorough understanding of number sense in determining the correct square footage with a valid setup in Part A. Part A demonstrates a thorough understanding of the mathematical process. The response demonstrates limited to no understanding of number sense in part B as the time (in minutes) is incorrect and the setup is invalid. Part B also shows no understanding of the mathematical process. This response receives one point for content and one point for process.

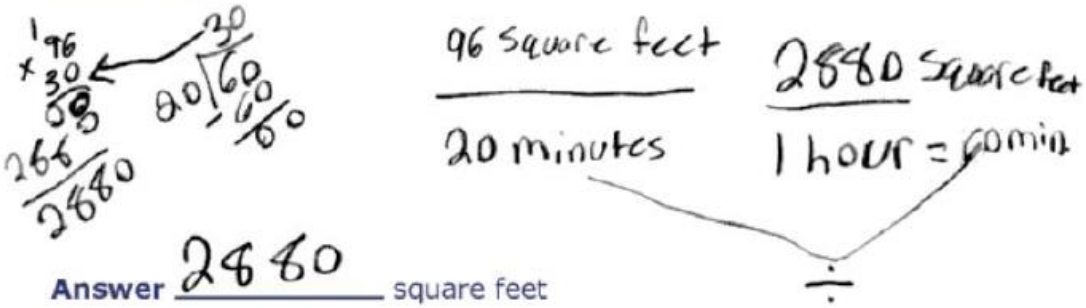
Question 1, Sample E – Number Sense Score Point 0; Process Score Point 1

1 Cindy can paint an area of 96 square feet in 20 minutes.

Part A

How many square feet can Cindy paint in 1 HOUR?

Show All Work



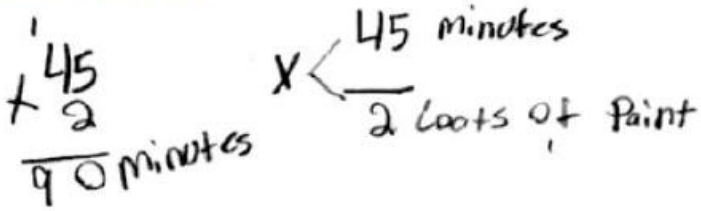
Answer 2880 square feet

Part B

Cindy is painting the walls of a room that have a total area of 240 square feet. It will take her 45 minutes to prepare the walls for painting. She will paint the walls with 2 coats of paint.

How many minutes will it take Cindy to prepare and paint the walls with 2 coats of paint?

Show All Work



Answer 90 minutes

Scoring Notes: The response demonstrates a partial understanding of number sense in trying to determine the correct square footage with a valid setup and mathematical process in Part A. However, a computational error is made in calculating the square footage, which results in an incorrect answer for the square footage that can be painted in one hour. The response demonstrates no understanding of number sense and mathematical process in part B as the time (in minutes) is incorrect and the setup is invalid. This response receives zero points for content and one point for process.

Question 1, Sample F – Number Sense Score Point 0; Process Score Point 0

1 Cindy can paint an area of 96 square feet in 20 minutes.

Part A

How many square feet can Cindy paint in 1 HOUR?

Show All Work

$$\begin{array}{r} 96 \\ +\ 60 \\ \hline 156 \end{array}$$

Answer 156 square feet

Part B

Cindy is painting the walls of a room that have a total area of 240 square feet. It will take her 45 minutes to prepare the walls for painting. She will paint the walls with 2 coats of paint.

How many minutes will it take Cindy to prepare and paint the walls with 2 coats of paint?

Show All Work

$$\begin{array}{r} {}^{1}45 \\ \times\ 2 \\ \hline 90 \end{array}$$

Answer 90 minutes

Scoring Notes: The response demonstrates no understanding of number sense in trying to determine the correct square footage with an invalid setup and an incorrect mathematical process in Part A. The response also demonstrates no understanding of number sense in part B as the time (in minutes) is incorrect and the setup is invalid. There is no understanding of the mathematical process in Part B. This response receives zero points for content and zero points for process.

Item #2

Constructed-Response

Constructed-Response
Standard 4: Geometry and Measurement
Standard 6: Mathematical Process

Question 2

2. A company is shipping a motorcycle in a box with the dimensions $4\frac{2}{3}$ feet by $3\frac{3}{4}$ feet by 8 feet. The box also contains packing material to help protect the motorcycle.

Part A

What is the volume, in cubic feet, of the box?

Show All Work

Answer _____ cubic feet

Part B

Use your answer from the first part of the question and the information below to help you determine the cost of the packing material in the box.

- The box is completely filled with the motorcycle and packing material.
- The motorcycle uses 86 cubic feet of the volume inside the box.
- The weight of the packing material is 0.8 pound per cubic foot.
- The packing material costs $3.00 per pound.

What is the cost, in dollars, of the packing material in the box?

Show All Work

Answer $ _____

Exemplary Response:

- 140 cubic feet

AND

- $129.60

AND

- Sample Process

  (14/3) x (15/4) x 8 = 1680/12 = 140 cubic feet

  140 – 86 = 54 cubic feet
  0.8 x 54 = 43.2 pounds
  $3 x 43.2 = $129.60

OR

- Other valid process

Question 2, Sample A – Geometry and Measurement Score Point 2; Process Score Point 2

A company is shipping a motorcycle in a box with the dimensions $4\frac{2}{3}$ feet by $3\frac{3}{4}$ feet by 8 feet. The box also contains packing material to help protect the motorcycle.

Part A

What is the volume, in cubic feet, of the box?

Show All Work

Answer 140 cubic feet

$4\frac{2}{3} \times 3\frac{3}{4} \times 8$

$\frac{14}{3} \times \frac{15}{4} \times 8$

$\frac{210}{12} \times \frac{8}{1} = \frac{1680}{12}$

140
12) 1680
12
48
48
00
0
0

Part B

Use your answer from the first part of the question and the information below to help you determine the cost of the packing material in the box.

- The box is completely filled with the motorcycle and packing material.
- The motorcycle uses 86 cubic feet of the volume inside the box.
- The weight of the packing material is 0.8 pound per cubic foot.
- The packing material costs $3.00 per pound.

What is the cost, in dollars, of the packing material in the box?

Show All Work

140 cubic ft

motorcycle takes up 86

140
- 86
54

54
x.8 per pound
43.2

43.2
x3.00
000
0000
129600
129.600

$129.6

Answer $129.60

Scoring Notes: The response indicates a thorough understanding of how to find the volume of a right rectangular prism with fractional edge lengths by correctly converting the two mixed fractions to improper fractions and multiplying the three dimensions to find the correct volume in Part A, with a valid setup and mathematical process. The response in Part B indicates a thorough understanding of the mathematical process related to the task by correctly calculating the cost of the packing material. This is done by determining the volume of the packing material. Multiplying the volume of the packing material by its density in order to obtain weight. The weight is then multiplied by the per pound cost. This response receives two points for content and two points for process.

Question 2, Sample B – Geometry and Measurement Score Point 2; Process Score Point 1

A company is shipping a motorcycle in a box with the dimensions $4\frac{2}{3}$ feet by $3\frac{3}{4}$ feet by 8 feet. The box also contains packing material to help protect the motorcycle.

Part A

What is the volume, in cubic feet, of the box?

Show All Work

$4\frac{2}{3} = \frac{14}{3}$

$3\frac{3}{4} = \frac{15}{4}$

$\frac{14}{3} \times \frac{15}{4}$ $\frac{210}{12} \times \frac{8}{1}$ $\frac{1680}{12} = 140$

$210 \times 8 = 1680$

$15 \times 14 = 60 + 150 = 210$

Answer 140 cubic feet

Part B

Use your answer from the first part of the question and the information below to help you determine the cost of the packing material in the box.

- The box is completely filled with the motorcycle and packing material.
- The motorcycle uses 86 cubic feet of the volume inside the box.
- The weight of the packing material is 0.8 pound per cubic foot.
- The packing material costs $3.00 per pound.

What is the cost, in dollars, of the packing material in the box?

Show All Work

140 have
- 86 uses
54

67.5
× 3.00
202.5

0.8) 54.00
48
60
56
40

Answer $ 202.5

Scoring Notes: The response indicates a thorough understanding of how to find the volume of a right rectangular prism with fractional edge lengths by correctly converting the two mixed fractions to improper fractions and multiplying the three dimensions to find the correct volume in Part A with a valid mathematical process. The response in Part B indicates a partial understanding of the mathematical process related to the task by correctly calculating the volume of the packing material. However, the density of the packing material is not multiplied by the volume, but rather the volume is divided by the density which is an incorrect process. The quotient of volume and density is then correctly multiplied by the cost per pound in order to determine the cost of packing materials in the box. This response receives two points for content and one point for process.

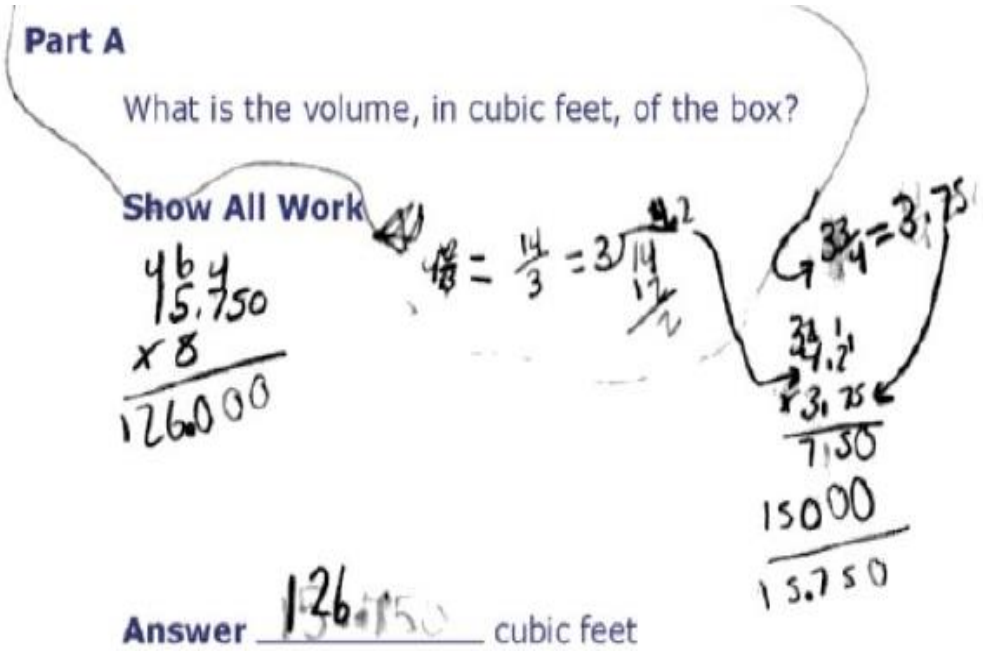
Question 2, Sample C – Geometry and Measurement Score Point 1; Process Score Point 2

A company is shipping a motorcycle in a box with the dimensions $4\frac{2}{3}$ feet by $3\frac{3}{4}$ feet by 8 feet. The box also contains packing material to help protect the motorcycle.

Part A

What is the volume, in cubic feet, of the box?

Show All Work



Answer 126.750 cubic feet

Part B

Use your answer from the first part of the question and the information below to help you determine the cost of the packing material in the box.

- The box is completely filled with the motorcycle and packing material.
- The motorcycle uses 86 cubic feet of the volume inside the box.
- The weight of the packing material is 0.8 pound per cubic foot.
- The packing material costs $3.00 per pound.

What is the cost, in dollars, of the packing material in the box?

Show All Work

$$\begin{array}{r} 126 \\ -\ 86 \\ \hline 40 \end{array} \qquad \begin{array}{r} 3 \\ 40 \\ \times\ 0.8 \\ \hline 00 \\ 320 \\ \hline 320 \end{array} \qquad \begin{array}{r} 32 \\ \times\ 3 \\ \hline 96 \end{array}$$

Answer $ 96

Scoring Notes: The response indicates a partial understanding of how to find the volume of a right rectangular prism with fractional edge lengths by converting the two mixed fractions to decimals and then multiplying the three dimensions together to find the volume in Part A. A computational error is made in determining the volume of the box. The mathematical process in Part A is valid. This incorrect box volume is used in Part B to determine the volume of the packing material. Multiplying the volume of the packing material by its density is done in order to obtain the weight. The weight is then multiplied by the per pound cost. No errors were made in Part B other than using an incorrect response from Part A as the volume of the box. This results in an error in the cost. This response receives one point for content and two points for process.

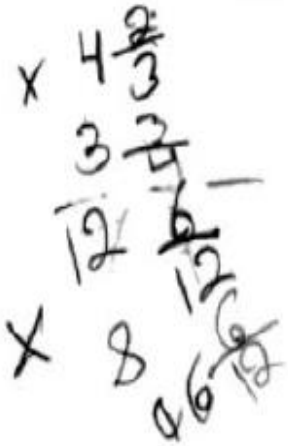
Question 2, Sample D – Geometry and Measurement Score Point 1; Process Score Point 1

A company is shipping a motorcycle in a box with the dimensions $4\frac{2}{3}$ feet by $3\frac{3}{4}$ feet by 8 feet. The box also contains packing material to help protect the motorcycle.

Part A

What is the volume, in cubic feet, of the box?

Show All Work



Answer $96\frac{1}{2}$ cubic feet

Part B

Use your answer from the first part of the question and the information below to help you determine the cost of the packing material in the box.

- The box is completely filled with the motorcycle and packing material.
- The motorcycle uses 86 cubic feet of the volume inside the box.
- The weight of the packing material is 0.8 pound per cubic foot.
- The packing material costs $3.00 per pound.

What is the cost, in dollars, of the packing material in the box?

Show All Work

$96\frac{1}{2}$
-86
$10\frac{1}{2}$

$\overset{2}{1}0\frac{1}{2}$
$\times\ 3$
$\$32$

Answer $ 32

Scoring Notes: The response indicates a partial understanding of how to find the volume of a right rectangular prism with fractional edge lengths. In Part A, the process of multiplying length by width by height is correct, but there are computational mistakes in finding the volume. This incorrect box volume is then used in Part B. The process of calculating the packing material volume and the cost are done correctly (if whole number rounding is assumed), but then the volume of packing material is never multiplied by its density for an incorrect mathematical process. As a result, the response receives one point for content and one point for process.

Question 2, Sample E – Geometry and Measurement Score Point 0; Process Score Point 1

A company is shipping a motorcycle in a box with the dimensions $4\frac{2}{3}$ feet by $3\frac{3}{4}$ feet by 8 feet. The box also contains packing material to help protect the motorcycle.

Part A

What is the volume, in cubic feet, of the box?

Show All Work

Cubic feet = square feet

$4\frac{2}{3} \times 3\frac{3}{4} \times 8$

$4\frac{8}{12} + 3\frac{9}{12} = 7\frac{17}{12} = 8\frac{5}{12} \times 8$

$\frac{12}{96} + 5$

$\frac{101}{12} + 8 = \frac{104}{12}$

Answer 104 cubic feet

Part B

Use your answer from the first part of the question and the information below to help you determine the cost of the packing material in the box.

- The box is completely filled with the motorcycle and packing material.
- The motorcycle uses 86 cubic feet of the volume inside the box.
- The weight of the packing material is 0.8 pound per cubic foot.
- The packing material costs $3.00 per pound.

What is the cost, in dollars, of the packing material in the box?

Show All Work

109 cubic feet box

motorcycle only uses 86 cubic feet

23 cubic feet left

0.8 of a pound per cubic foot

23.0 × 0.8 = 18.40

18.4

3.00 per pound

18.40 ÷ 3.00

Answer $ 6.00

6.00
3.0 | 18.40
18
00
00
0

Scoring Notes: The response indicates little to no understanding of how to find the volume of a right rectangular prism with fractional edge lengths in Part A. The length and width of the box were added together instead of being multiplied. Then this sum was multiplied by the height to determine the box volume instead of simply multiplying length by width by height. It also appears there was some attempt to convert feet to inches, so there is an incorrect mathematical process in Part A. Part B indicates partial understanding of the mathematical process related to the task by correctly finding the volume of the packing material based upon the Part A response. This volume is then multiplied by the density to determine the weight of the packing material. However, instead of multiplying the weight by the per pound cost, the weight is incorrectly divided by the per pound cost. This response receives zero points for content and one point for process.

Question 2, Sample F – Geometry and Measurement Score Point 0; Process Score Point 0

A company is shipping a motorcycle in a box with the dimensions $4\frac{2}{3}$ feet by $3\frac{3}{4}$ feet by 8 feet. The box also contains packing material to help protect the motorcycle.

Part A

What is the volume, in cubic feet, of the box?

Show All Work

$4\frac{2}{3} = \frac{8}{12}$

$3\frac{3}{4} = \frac{9}{12}$

$7\frac{17}{12} = 8\frac{5}{12}$

4 4, 8, 12, 16, 20

3 3, 6, 9, 12, 15

$8\frac{5}{12}$

$\times 8$

$67\frac{4}{12}$

$67\frac{4}{12}$ simplify $= 67\frac{1}{3}$

Answer $67\frac{1}{3}$ cubic feet

Part B

Use your answer from the first part of the question and the information below to help you determine the cost of the packing material in the box.

- The box is completely filled with the motorcycle and packing material.
- The motorcycle uses 86 cubic feet of the volume inside the box.
- The weight of the packing material is 0.8 pound per cubic foot.
- The packing material costs $3.00 per pound.

What is the cost, in dollars, of the packing material in the box?

Show All Work

$$\begin{array}{r} {}^{4}86 \\ \times 0.8 \\ \hline 688 \\ 000 \\ \hline 68.8 \end{array}$$

Answer $ 68.08

Scoring Notes: The response indicates little to no understanding of how to find the volume of a right rectangular prism with fractional edge lengths in Part A. The length and width of the box were added together instead of being multiplied. Then this sum was multiplied by the height to determine the box volume instead of simply multiplying length by width by height. Part A demonstrates little to no understanding of the mathematical process. The response in Part B indicates no understanding of the mathematical process related to the task by incorrectly calculating the cost of the packing material. The motorcycle's volume was used instead of determining the volume available for the packing material. The per pound cost of the packing material is not even applied. This response receives zero points for content and zero points for process.

Item #3

Constructed-Response

Constructed-Response
Standard 2: Computation
Standard 6: Mathematical Process

Question 3

3. Roger's work to evaluate an expression is shown.

Expression: $2(1 + 3)^3 - 5^2$

Step 1: $2(4)^3 - 5^2$

Step 2: $\left(8^3\right) - 5^2$

Step 3: $24 - 10$

Step 4: 14

Part A

Describe ALL errors Roger made in his work.

_____

_____

_____

_____

Part B

Evaluate the expression. $2(1 + 3)^3 - 5^2$

Show All Work

Answer _____

Exemplary Response:

- In step 2, Roger multiplied 2 and 4 to get 8. He should have taken 4 cubed and then multiplied that result (64) by 2, which equals 128. Based upon what was already written, in step 3, Roger should have cubed 8 (equals 512) instead of taking 8 x 3 (equals 24). Also, Roger should have squared 5 (equals 25) instead of taking 5 x 2 (equals 10).

OR

- Other valid explanation

AND

- 103

AND

- Sample Process:

$2(1 + 3)^3 - 25$
$2(4)^3 - 25$
$2(64) - 25$
$128 - 25$
103

OR

- Other valid process

Question 3, Sample A – Computation Score Point 2; Process Score Point 2

Roger's work to evaluate an expression is shown.

Expression: $2(1 + 3)^3 - 5^2$

Step 1: $2(4)^3 - 5^2$

Step 2: $(8^3) - (5^2)$

Step 3: $24 - 10$

Step 4: 14

Part A

Describe ALL errors Roger made in his work.

Rogers first error was that he multiplied before doing exponents. His exponents were the wrong answers. He did 5·2 instead of 5·5. He did 8·3 instead of 8·8·8.

Part B

Evaluate the expression. $2(1 + 3)^3 - 5^2$

Show All Work

Step 1: $2(1+3)^3 - 5^2$

Step 2: $2(4)^3 - 5^2$

Step 3: $2(64) - 25$

Step 4: $128 - 25$

Step 5: $\boxed{103}$

Answer 103

Scoring Notes: The response indicates a thorough understanding of the mathematical process involving order of operations in Part A. The error of multiplication before performing exponents was noted. Also cited is treating the exponents as factors instead of using them correctly as powers. The response also indicates a thorough understanding of order of operations in the computation for Part B. PEMDAS is properly applied. A correct answer is provided. This response receives two points for content and two points for process.

Question 3, Sample B – Computation Score Point 2; Process Score Point 0

Roger's work to evaluate an expression is shown.

Expression: $2(1 + 3)^3 - 5^2$

Step 1: $2(4)^3 - 5^2$

Step 2: $(8^3) - 5^2$

Step 3: $24 - 10$

Step 4: 14

Part A

Describe ALL errors Roger made in his work.

On step 2 its sopose to look like this- 2(64)-5². On step 3 its sopose to look like 128-25. The final answer would be 103.

Part B

Evaluate the expression. $2(1 + 3)^3 - 5^2$

Show All Work

$2(1+3)^3 - 5^2$

$2(4)^3 - 5^2$

$2(64) - 25$

$128 - 25$

103

Answer 103

Scoring Notes: The response indicates little to no understanding of the mathematical process involving order of operations in Part A. No specific errors are mentioned. The Part A response is a worded version of Part B. The response indicates a thorough understanding of order of operations in computation for Part B. PEMDAS is properly applied. A correct answer is provided. This response receives two points for content and zero points for process.

Question 3, Sample C – Computation Score Point 1; Process Score Point 2

Roger's work to evaluate an expression is shown.

Expression: $2(1 + 3)^3 - 5^2$

Step 1: $2(4)^3 - 5^2$

Step 2: $(8^3) - 5^2$

Step 3: $24 - 10$

Step 4: 14

Part A

Describe ALL errors Roger made in his work.

The first error was step two when he did 2×4 in stead he should have done 4×4×4 the 5×5 so she would have 62-25 so the answer would be 37

Part B

Evaluate the expression. $2(1 + 3)^3 - 5^2$

Show All Work

$2(4^3) - 5^2$

$\times 62 - 25$

2

124

$0 \times 2 \times 4 \times 4$

-25

99

Answer 99

Scoring Notes: The response indicates a thorough understanding of the mathematical process of order of operations in Part A. The first error correctly mentioned is that of multiplying instead of applying the exponent. Treating the exponents as factors instead of using them correctly as powers is also cited. The response indicates a partial understanding of the order of operations in computation for Part B. Although the addition inside parenthesis is correctly performed first, there is a computational error which results in an incorrect answer. This response receives one point for content and two points for process.

Question 3, Sample D – Computation Score Point 1; Process Score Point 0

Roger's work to evaluate an expression is shown.

Expression: $2(1 + 3)^3 - 5^2$

Step 1: $2(4)^3 - 5^2$

Step 2: $(8^3) - 5^2$

Step 3: $24 - 10$

Step 4: 14

Part A

Describe ALL errors Roger made in his work.

He dont go in order while doing his work
Parenthesis go first the exponents

Part B

Evaluate the expression. $2(1 + 3)^3 - 5^2$

Show All Work

$2(1+3)^3 - 5^2$
$2(4)^3 - 5^2$
$2(64) - 5^2$

$2(64) - 25$
$128 - 125$
3

$64 \times 2 = 128$

$128 - 125 = 5$

Answer 3

Scoring Notes: The response indicates no understanding of the mathematical process involving order of operations in Part A. Only the first part of PEMDAS is written down. No specific error in a step is mentioned. The response indicates a partial understanding of the order of operations in computation for Part B. A transcription error results in an incorrect answer. This response receives one point for content and zero points for process.

Question 3, Sample E – Computation Score Point 0; Process Score Point 1

Roger's work to evaluate an expression is shown.

Expression: $2(1 + 3)^3 - 5^2$

Step 1: $2(4)^3 - 5^2$

Step 2: $(8^3) - 5^2$

Step 3: $24 - 10$

Step 4: 14

Part A

Describe ALL errors Roger made in his work.

In step 3 Roger multiplied 8x3 instead of doing 8x8x8. In step 3 he multiplied 5x2 instead of doing 5x5.

Part B

Evaluate the expression. $2(1 + 3)^3 - 5^2$

Show All Work

$2(4)^3 - 5^2$

$8^3 - 5^2$

$512 - 25$

487

Answer 487

Scoring Notes: The response indicates a partial understanding of the mathematical process involving order of operations in Part A. The multiplication before taking exponents error is not mentioned. However, treating the exponents as factors instead of using them correctly as powers is cited. The response indicates little understanding of the order of operations in computation for Part B. Although the addition inside parentheses is correctly performed first, exponents are not applied before multiplication occurs, which does not follow PEMDAS. An incorrect answer is given. This response receives zero points for content and one point for process.

Question 3, Sample F – Computation Score Point 0; Process Score Point 0

Roger's work to evaluate an expression is shown.

Expression: $2(1 + 3)^3 - 5^2$

Step 1: $2(4)^3 - 5^2$

Step 2: $(8^3) - 5^2$

Step 3: $24 - 10$

Step 4: 14

Part A

Describe ALL errors Roger made in his work.

Roger left out The 2 you Have to do exponents first 4x3=12 – 10 = 2x2=4

Part B

Evaluate the expression. $2(1 + 3)^3 - 5^2$

Show All Work

2+ 4x3=12 – 5x2 =10
2+12 – 10 = 4
14 – 10 = 4

Answer 4

Scoring Notes: The response indicates little to no understanding of the mathematical process involved with order of operations in Part A. Only the exponents in PEMDAS are listed. No specific error in a step is mentioned. The response indicates little to no understanding of the order of operations in computation for Part B. The addition inside of parentheses is correctly done first, but the exponents are incorrectly treated as factors, resulting in an incorrect answer. This response receives zero points for content and zero points for process.

Item #4

Extended-Response

Extended-Response
Standard 3: Algebra and Functions
Standard 6: Mathematical Process

Question 4

Micah mows lawns. He earns $35 for each lawn he mows.

Part A

Complete the table by entering the amount Micah earns given the number of lawns he mows.

Mowing Lawns

Number of Lawns Mowed	Amount Earned
1	35
2	
3	105
4	140
5	

Part B

Write an equation that can be used to determine the amount of money Micah earns for mowing any number of lawns.

Part C

Explain what each variable represents in your equation.

[Insert 2 full rules]

Part D

Micah also trims bushes for an extra cost of $2 for every 5 bushes. Next week, Micah has 34 lawns to mow and 105 bushes to trim on his schedule.

If Micah completes all his work next week, how much money, in dollars, will he earn?

Show All Work

Answer $ _____

Exemplary Response:

- Write a valid equation (a = 35n or 35n = a) in Part B and correctly define the variables *[(n) equals the number of lawns to be mowed; (a) equals the dollar amount Roger earned*] in Part C.

- Other valid explanation

AND

- $70, $175 (Part A)

- $1232 (Part D)

AND

- Sample Process:

  Using a = 35n, when n = 2 then a = $35(2) = $70
  Using a = 35n, when n = 5 then a = $35(5) = $175

OR

- Other valid process

AND

- Sample Process:

  $35(34) = $1190

  105/5 = 21
  21($2) = $42

  $1232 = $1190 + $42

OR

- Other valid process

Question 4, Sample A – Algebra and Functions Score Point 3; Process Score Point 3

4 Micah mows lawns. He earns $35 for each lawn he mows.

Part A

Complete the table by entering the amount Micah earns given the number of lawns he mows.

Mowing Lawns

Number of Lawns Mowed	Amount Earned
1	$ 35
2	$70
3	$105
4	$140
5	$175

Part B

Write an equation that can be used to determine the amount of money Micah earns for mowing any number of lawns.

Equation 35 x n = a

Part C

Explain what each variable represents in your equation.

The variable (n) means the number of lawns he mowed and (a) is the amount of money he earned

Part D

Micah also trims bushes for an extra cost of $2 for every 5 bushes. Next week, Micah has 34 lawns to mow and 105 bushes to trim on his schedule.

If Micah completes all his work next week, how much money, in dollars, will he earn?

Show All Work

$$\begin{array}{r} 35 \\ \times\ 34 \\ \hline \$1190 \end{array} \qquad \begin{array}{r} 105 \\ \div\ 5 \\ \hline 21 \end{array} \qquad \begin{array}{r} 21 \\ \times\ 2 \\ \hline \$42 \end{array} \qquad \begin{array}{r} 1190 \\ +\ 42 \\ \hline \$1232 \end{array}$$

Answer $ 1232

Scoring Notes: The response indicates a thorough understanding of how to write a valid equation in Part B and correctly define the variables in Part C. The response indicates a thorough understanding of the mathematical process related to the task by providing a complete and correct table in Part A based upon a correct equation (Part B) and variable definitions (Part C). The equation is applied again along with a correct calculation involving the trimmed bushes. The dollars earned from the mowed lawns and the bush trimming is added together to correctly determine the money earned in Part D. Again, this is a thorough understanding of the mathematical process. This response receives three points for content and three points for process.

Question 4, Sample B – Algebra and Functions Score Point 3; Process Score Point 0

4 Micah mows lawns. He earns $35 for each lawn he mows.

Part A

Complete the table by entering the amount Micah earns given the number of lawns he mows.

Mowing Lawns

Number of Lawns Mowed	Amount Earned
1	$ 35
2	$70
3	$105
4	$140
5	$165

$35 \times 2 = 70$ $35 \times 3 = 165$

Part B

Write an equation that can be used to determine the amount of money Micah earns for mowing any number of lawns.

Equation $35x = y$

~~Let x represent the number of lawns mowed~~
~~by y represent the amount of money~~
~~earned~~

Part C

Explain what each variable represents in your equation.

-Let x represent the number of lawns mowed
-Let y represent the amount of money earned.

Part D

Micah also trims bushes for an extra cost of $2 for every 5 bushes. Next week, Micah has 34 lawns to mow and 105 bushes to trim on his schedule.

If Micah completes all his work next week, how much money, in dollars, will he earn?

Show All Work

$$\begin{array}{r} {}^{1}34 \\ \times\ 35 \\ \hline 170 \\ +\ 1020 \\ \hline 1190 \end{array}$$

$3500 + 105(2)$
$1190 + 230$
1420

$$\begin{array}{r} {}^{1}105 \\ \times\ 2 \\ \hline 230 \end{array}$$

$$\begin{array}{r} {}^{1}1190 \\ +\ 230 \\ \hline 1420 \end{array}$$

Answer $ 1420

Scoring Notes: The response indicates a thorough understanding of how to write a valid equation in Part B and how to correctly define the variables in Part C. The response indicates a limited understanding of the mathematical process related to the task by providing an incorrect table in Part A. The lawn mowing equation is correctly applied in Part D. However, in Part D, the process of calculating the dollars earned from bush trimming is not done correctly, and there is a calculation error as well. This response receives three points for content and zero points for process.

Question 4, Sample C – Algebra and Functions Score Point 2; Process Score Point 3

4 Micah mows lawns. He earns $35 for each lawn he mows.

Part A

Complete the table by entering the amount Micah earns given the number of lawns he mows.

Mowing Lawns

Number of Lawns Mowed	Amount Earned
1	$ 35
2	$70
3	$105
4	$140
5	$175

① 35
35
70

② 140
+ 35
175

Part B

Write an equation that can be used to determine the amount of money Micah earns for mowing any number of lawns.

Equation ~~35 x L~~ = 35 x b = amount earned

Part C

Explain what each variable represents in your equation.

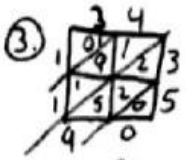
35 represents $35 Micah earns for every lawn. b represents the number of lawns he mowed.

Part D

Micah also trims bushes for an extra cost of $2 for every 5 bushes. Next week, Micah has 34 lawns to mow and 105 bushes to trim on his schedule.

If Micah completes all his work next week, how much money, in dollars, will he earn?

Show All Work

1. 1 lawn = 35$
2. 5 bushes = 2$
3. 
4. $1,190
5. 21 ; 5)105 ; 10 ; 05
6. 21 × 2 = 42
7. 1,190 + 42 = 1,232

Answer $ 1,232

Scoring Notes: The response indicates a partial understanding of how to write a valid equation in Part B. The right side of the equation is not a variable. What is written in Part B is considered to be an expression. The one variable listed in Part B is correctly defined in Part C. The response indicates a thorough understanding of the mathematical process related to the task by providing a complete and correct table in Part A. In Part D, again there is a thorough understanding of the mathematical process. The money earned from mowing lawns is correct based upon the expression/equation in Part B and the calculation involving the trimmed bushes is correct with a valid setup. The dollars earned from the mowed lawns and the bush trimming is added together correctly to determine the money earned in Part D. This response receives two points for content and three points for process.

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Question 4, Sample D – Algebra and Functions Score Point 2; Process Score Point 2

4 Micah mows lawns. He earns $35 for each lawn he mows.

Part A

Complete the table by entering the amount Micah earns given the number of lawns he mows.

Mowing Lawns

Number of Lawns Mowed	Amount Earned
1	$ 35
2	$70
3	$105
4	$140
5	$175

135
x3
105

135
x2
$70

235
x5
$175

5

Part B

Write an equation that can be used to determine the amount of money Micah earns for mowing any number of lawns.

Equation 35y or x • 35=

Part C

Explain what each variable represents in your equation.

each variable represents the number of lawns he mowed

Part D

Micah also trims bushes for an extra cost of $2 for every 5 bushes. Next week, Micah has 34 lawns to mow and 105 bushes to trim on his schedule.

If Micah completes all his work next week, how much money, in dollars, will he earn?

Show All Work

$$\begin{array}{r} 34 \\ \times\ 35 \\ \hline 170 \\ +\ 1020 \\ \hline 1190 \end{array}$$

$21 \times 2 = \$42$

$$5\overline{)105} = 21$$

Answer $ 1190

Scoring Notes: The response indicates a partial understanding of how to write an equation in Part B as only two expressions were written. An equation was not written. The independent variable is correctly defined in Part C. The response indicates a partial understanding of the mathematical process related to the task by providing a complete and correct table in Part A and the correct steps to determine the money earned in Part D; however, the two amounts were not added together to obtain the correct total dollars earned. This response receives two points for content and two points for process.

Question 4, Sample E – Algebra and Functions Score Point 1; Process Score Point 3

4 Micah mows lawns. He earns $35 for each lawn he mows.

Part A

Complete the table by entering the amount Micah earns given the number of lawns he mows.

Mowing Lawns

Number of Lawns Mowed	Amount Earned
1	$ 35
2	$70
3	$105
4	$140
5	$175

Part B

Write an equation that can be used to determine the amount of money Micah earns for mowing any number of lawns.

Equation 6x35=m m=the amount the gets for mowing six lawns

Part C

Explain what each variable represents in your equation.

m = the amount he gets for mowing six lawns

Part D

Micah also trims bushes for an extra cost of $2 for every 5 bushes. Next week, Micah has 34 lawns to mow and 105 bushes to trim on his schedule.

If Micah completes all his work next week, how much money, in dollars, will he earn?

Show All Work

Answer $ 1,232

Scoring Notes: The response indicates a limited understanding of how to write an equation in Part B by writing an invalid equation but defining the variable correctly in Part C. The response indicates a thorough understanding of the mathematical process related to the task by providing a complete and correct table in Part A and the steps to determine the correct amount of money earned in Part D. This response receives one point for content and three points for process.

Question 4, Sample F – Algebra and Functions Score Point 1; Process Score Point 1

4 Micah mows lawns. He earns $35 for each lawn he mows.

Part A

Complete the table by entering the amount Micah earns given the number of lawns he mows.

Mowing Lawns

Number of Lawns Mowed	Amount Earned
1	$ 35
2	$70
3	$105
4	$140
5	$175

Part B

Write an equation that can be used to determine the amount of money Micah earns for mowing any number of lawns.

Equation 35 x m =

Part C

Explain what each variable represents in your equation.

The variable represents Micah and the number of lawns he mows.

Part D

Micah also trims bushes for an extra cost of $2 for every 5 bushes. Next week, Micah has 34 lawns to mow and 105 bushes to trim on his schedule.

If Micah completes all his work next week, how much money, in dollars, will he earn?

Show All Work

$$\begin{array}{r} 35 \\ \times 34 \\ \hline 140 \\ +1050 \\ \hline 1{,}190 \end{array}$$

$$5\overline{)105} = 21 \qquad 2\overline{)21} = 10\tfrac{1}{2} \qquad 0.05$$

$$\begin{array}{r} 1{,}190.0 \\ +\ 0.5 \\ \hline 1{,}190.5 \end{array}$$

Answer $ 1,190.5

Scoring Notes: The response indicates a limited understanding of how to write an equation in Part B by writing a valid expression, but not an equation, in Part B. Part C is incorrect. The response indicates a limited understanding of the mathematical process related to the task by providing an incorrect table in Part A. Only the first step to determine the amount of money earned is valid in Part D. This response receives one point for content and one for process.

Question 4, Sample G – Algebra and Functions Score Point 0; Process Score Point 3

4 Micah mows lawns. He earns $35 for each lawn he mows.

Part A

Complete the table by entering the amount Micah earns given the number of lawns he mows.

Mowing Lawns

Number of Lawns Mowed	Amount Earned
1	$ 35
2	$70
3	$105
4	$140
5	$175

Part B

Write an equation that can be used to determine the amount of money Micah earns for mowing any number of lawns.

Equation $35+$35=$70+$35=$105+$35=$140+$35=$175

Part C

Explain what each variable represents in your equation.

$35, $35 = $70

Part D

Micah also trims bushes for an extra cost of $2 for every 5 bushes. Next week, Micah has 34 lawns to mow and 105 bushes to trim on his schedule.

If Micah completes all his work next week, how much money, in dollars, will he earn?

Show All Work

$2 for every 5 bushes

$\begin{array}{r} 021 \\ 5\overline{)105} \end{array}$ $\quad \begin{array}{r} 21 \\ \times\ 2 \\ \hline \$42 \end{array}$

$42

$\begin{array}{r} 35 \\ \times\ 34 \\ \hline 140 \\ +1050 \\ \hline \$1190 \end{array}$ $\quad \begin{array}{r} \$1,190 \\ +\ \ 42 \\ \hline \$1,232 \end{array}$

Answer $ 1,232

Scoring Notes: The response indicates no understanding of how to write a valid equation in Part B, nor how to correctly define the variables in Part C. The response indicates a thorough understanding of the mathematical process related to the task by providing a complete and correct table in Part A. The correct steps are shown in determining the total amount of money earned in Part D. This response receives zero points for content and three points for process.

Question 4, Sample H – Algebra and Functions Score Point 0; Process Score Point 0

4 Micah mows lawns. He earns $35 for each lawn he mows.

Part A

Complete the table by entering the amount Micah earns given the number of lawns he mows.

Mowing Lawns

Number of Lawns Mowed	Amount Earned
1	$ 35
2	$130
3	$105
4	$140
5	$175

Part B

Write an equation that can be used to determine the amount of money Micah earns for mowing any number of lawns.

Equation $35 + L = $210

Part C

Explain what each variable represents in your equation.

$35 is what Micah gets payed for
L = lawan = $210.

Part D

Micah also trims bushes for an extra cost of $2 for every 5 bushes. Next week, Micah has 34 lawns to mow and 105 bushes to trim on his schedule.

If Micah completes all his work next week, how much money, in dollars, will he earn?

Show All Work

$67
+ $18
$85

6 < 35 35 > 10
6 < 35 35 > 10
12 35 20 12 32 35 $67

2 > 4
2
2 > 4
2 8
2 > 4
2 12
2 2
14
2
$18

Answer $ 85

Scoring Notes: The response indicates no understanding of how to write a valid equation in Part B. The variables are not correctly defined in Part C. The response indicates no understanding of the mathematical process related to the task by providing an incorrect table in Part A. No correct steps are shown in determining the total amount of money earned in Part D. This response receives zero points for content and zero points for process.