ISTEP+: Grade 5
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 anchor papers (exemplars) and are used as clear examples of specific score points. Samples of anchor papers are presented within this document.

| ISTEP+ Part 1: Mathematics |  |  |
| :---: | :---: | :---: |
| Question Type | Score Reporting <br> Categories | Scoring Method |
|  |  |  |
|  | Computation |  |
| Constructed-Response (CR) | Algebraic Thinking |  |
|  | Geometry | 2-pt. CR Rubric |
|  | Measurement | (Grades 3-8, 10) |
|  | Mathematical Process |  |
| Extended Response (ER) | Computation |  |
|  | Algebraic Thinking | Geometry |
|  | Measurement | 3-pt. ER Rubric |
|  | Data Analysis | (Grades 3-8, 10) |
|  | Mathematical Process |  |

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.

A score of zero indicates limited or 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 1 point in content and a maximum of 1 point in Problem Solving.
- A student can receive the top score point in Problem Solving if the strategy used would result in a correct answer even though the response contains computation errors.
- A student can receive the top score point in Problem Solving 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.


## Problem-Solving 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 Problem Solving.
- A student can receive the top score point in Problem Solving if the strategy used would result in a correct answer even though the response contains computation errors.
- A student can receive the top score point in Problem Solving if an error made in the "content" portion is used with an appropriate strategy to solve the problem.


## Item \#1 <br> Constructed-Response

## Constructed-Response <br> Standard 5: Measurement Standard 7: Mathematical Process

## Question 1

1. Megan has a garden in the shape of a parallelogram, as shown.


## Part A

What is the area, in square yards, of the garden?
Show All Work

Answer $\qquad$ square yards

Part B
Megan will plant 5 pumpkin seeds for every 1 square yard in her garden. Pumpkin seeds cost $\$ 2$ for a package of 50 seeds. How much will it cost Megan to buy enough pumpkin seeds to plant in her garden?

Show All Work

Answer \$ $\qquad$

## Exemplary Response:

- 120 square yards

AND

- $\$ 24$
- Sample Process:
$\mathrm{A}=b h$
$\mathrm{A}=20 \times 6$
$A=120$ square yards
$120 \times 5=600$ seeds
$600 / 50=12$ packages
$12 \times \$ 2=\$ 24$


## Question 1, Sample A - Measurement Score Point 2; Process Score Point 2

## Part A

What is the area, in square yards, of the garden?

## Show All Work



Answer 120 square yards

## Part B

Megan will plant 5 pumpkin seeds for every 1 square yard in her garden. Pumpkin seeds cost $\$ 2$ for a package of 50 seeds.

How much will it cost Megan to buy enough pumpkin seeds to plant in her'garden?

Show All Work


Answer \$ 24

Scoring Notes: The response demonstrates a thorough understanding of finding the area of parallelograms by providing a valid setup and calculating the correct area in Part A. The response demonstrates a thorough understanding of reasoning quantitatively by providing a valid setup and calculating the correct cost in Part B. This response receives two points for content and two points for process.

## Question 1, Sample B - Measurement Score Point 2; Process Score Point 1

## Part A

What is the area, in square yards, of the garden?
Show All Work


Answer 1 ( $)$ square yards

## Part B

Megan will plant 5 pumpkin seeds for every 1 square yard in her garden. Pumpkin seeds cost $\$ 2$ for a package of 50 seeds.
How much will it cost Megan to buy enough pumpkin seeds to plant in her garden?

Show All Work

Answer $\$ 12$ dollars


Scoring Notes: The response demonstrates a thorough understanding of finding the area of parallelograms by providing a valid setup and calculating the correct area in Part A. The response demonstrates a partial understanding of reasoning quantitatively by calculating a correct cost based on an invalid setup for Part B (failed to multiply 12 by 2). This response receives two points for content and one point for process.

## Question 1, Sample C - Measurement Score Point 1; Process Score Point 0

## Part A

What is the area, in square yards, of the garden?

## Show All Work



## Part B

Megan will plant 5 pumpkin seeds for every 1 square yard in her garden. Pumpkin seeds cost $\$ 2$ for a package of 50 seeds.
How much will it cost Megan to buy enougfopumpkin seeds to plant in her garden?

Show All Work


Scoring Notes: The response demonstrates a partial understanding of finding the area of parallelograms by providing a correct setup in Part A. However, there is a transcription error because 12 is shown in the answer blank instead of 120. The response demonstrates a limited understanding of reasoning quantitatively by providing an invalid setup and calculating the cost incorrectly in Part B. This response receives one point for content and zero points for process.

# Question 1, Sample D - Measurement Score Point 1; Process Score Point 0 

Part A
29
What is the area, in square yards, of the garden?

Show All Work

Answer 120 square yards

## Part B

Megan will plant 5 pumpkin seeds for every 1 square yard in her garden. Pumpkin seeds cost $\$ 2$ for a package of 50 seeds.

How much will it cost Megan to buy enough pumpkin seeds to plant in her garden?

Show All Work


Answer \$ 6

Scoring Notes: The response demonstrates a partial understanding of finding the area of parallelograms by calculating the correct area. However, setup or work is shown for Part A. The response demonstrates a limited understanding of reasoning quantitatively by providing an invalid setup and calculating the cost incorrectly in Part B. This response receives one point for content and zero points for process.

## Question 1, Sample E - Measurement Score Point 0; Process Score Point 2

Part A
What is the area, in square yards, of the garden?
Show All Work


Answer $\qquad$ square yards

## Part B

Megan will plant 5 pumpkin seeds for every 1 square yard in her garden. Pumpkin seeds cost $\$ 2$ for a package of 50 seeds.

How much will it cost Megan to buy enough pumpkin seeds to plant in her garden?

## Show All Work



Answer \$ 240


Scoring Notes: The response demonstrates a limited understanding of finding the area of parallelograms by providing an invalid setup and calculating the area incorrectly in Part A. The response demonstrates a thorough understanding of reasoning quantitatively by providing a valid setup and calculating the correct cost in Part B based on the incorrect response from Part A. This response receives zero points for content and two points for process.

## Question 1, Sample F - Measurement Score Point 0; Process Score Point 0

## Part A

What is the area, in square yards, of the garden?
Show All Work


Answer 136 square yards

## Part B

Megan will plant 5 pumpkin seeds for every 1 square yard in her garden. Pumpkin seeds cost $\$ 2$ for a package of 50 seeds.

How much will it cost Megan to buy enough pumpkin seeds to plant in her garden?

Show All Work


Answer \$ 13

Scoring Notes: The response demonstrates a limited understanding of finding the area of parallelograms by providing an invalid setup and calculating the area incorrectly in Part A. The response demonstrates a limited understanding of reasoning quantitatively by providing an invalid setup and calculating the cost incorrectly in Part B based on the incorrect response from Part A. This response receives zero points for content and zero points for process.

# Item \#2 <br> Constructed-Response 

## Constructed-Response <br> Standard 6: Data Analysis Standard 7: Mathematical Process

## Question 2

2. The students in Mr. Warren's class record the number of miles they ride the bus to school each day on the line plot, as shown.

Number of Students


The data for Joseph, Zoey, and Sara have not been included on the line plot. Their data are given.

- Joseph rides the bus 9 miles each day.
- Zoey rides the bus 6 miles each day.
- Sara rides the bus 2 miles each day.


## Part A

Plot X's on the line plot above to include the data for Joseph, Zoey, and Sara.
Part B
Based on the line plot, what is the total number of students that ride the bus to school each day? Explain how you determined your answer.
$\qquad$
$\qquad$
$\qquad$

## Part C

What is the difference, in miles, between the farthest distance and the shortest distance a student rides the bus to school?

Answer $\qquad$ miles

## Exemplary Response:

## Number of Students



AND

- There are 20 students that ride the bus every day. Each X represents one student. There are 17 Xs on the graph and I added 3 more. That is a total of 20 students.
- Other valid explanation

AND

- 15 miles


## Question 2, Sample A - Data Analysis Score Point 2; Process Score Point 2



## Part A

Plot $\mathrm{X}^{\prime}$ s on the line plot above to include the data for Joseph, Zoey, and Sara.

## Part B

Based on the line plot, what is the total number of students that ride the bus to school each day? Explain how you determined your answer.
20 k os ride the bus to school each day. I added one $x$ to 2, 6 , and 9 , and then I added the all up.

## Part C

What is the difference, in miles, between the farthest distance and the shortest distance a student rides the bus to school?
Answer $\qquad$ miles

Scoring Notes: The response demonstrates a thorough understanding of representing and interpreting data by correctly plotting the Xs on the line plot in Part A and correctly identifying the number of students that ride the bus to school in Part B. The response demonstrates a thorough understanding of reasoning quantitatively by providing a valid explanation for how to find the total number of students in Part B and by finding the correct distance in Part C. This response receives two points for content and two points for process.

## Question 2, Sample B - Data Analysis Score Point 2; Process Score Point 1 Number of Students



## Part A

Plot X's on the line plot above to include the data for Joseph, Zoey, and Sara.

## Part B

Based on the line plot, what is the total number of students that ride the bus to school each day? Explain how you determined your answer.

$\qquad$
$\qquad$
$\qquad$

## Part C

What is the difference, in miles, between the farthest distance and the shortest distance a student rides the bus to school?

Answer $\qquad$ miles

Scoring Notes: The response demonstrates a thorough understanding of representing and interpreting data by correctly plotting the Xs on the line plot in Part A and correctly identifying the number of students that ride the bus to school in Part B. The response demonstrates a partial understanding of reasoning quantitatively by providing a valid explanation for how to find the total number of students in Part B, but the response fails to identify the number of miles in Part C. This response receives two points for content and one point for process.

## Question 2, Sample C - Data Analysis Score Point 1; Process Score Point 2



## Part A

Plot X's on the line plot above to include the data for Joseph, Zoey, and Sara.

## Part B

Based on the line plot, what is the total number of students that ride the bus to school each day? Explain how you determined your answer.

$\qquad$
$\qquad$

## Part C

What is the difference, in miles, between the farthest distance and the shortest distance a student rides the bus to school?
Answer 15 miles

Scoring Notes: The response demonstrates a partial understanding of representing and interpreting data by correctly identifying the number of students that ride the bus to school in Part B. However, the $X$ for 9 miles is plotted incorrectly in Part A. The response demonstrates a thorough understanding of reasoning quantitatively by providing a valid explanation for how to find the total number of students in Part B and by finding the correct distance in Part C. This response receives one point for content and two points for process.

## Question 2, Sample D - Data Analysis Score Point 1; Process Score Point 1



Part A
Plot X's on the line plot above to include the data for Joseph, Zoey, and Sara.

## Part B

Based on the line plot, what is the total number of students that ride the bus to school each day? Explain how you determined your answer.
20 is the total number of students that ride the bass to school each eloy, II known because reach $x=1$ student.

## Part C

What is the difference, in miles, between the farthest distance and the shortest distance a student rides the bus to school?

Answer 4.4 miles


#### Abstract

Scoring Notes: The response demonstrates a partial understanding of representing and interpreting data by correctly identifying the number of students that ride the bus to school in Part B. However, the $X$ for 9 miles is plotted incorrectly in Part $A$. The response demonstrates a partial understanding of reasoning quantitatively by providing a valid explanation for how to find the total number of students in Part B but incorrectly finding the distance in Part C. This response receives one point for content and one point for process.


## Question 2, Sample E - Data Analysis Score Point 0; Process Score Point 1



## Part A

Plot X's on the line plot above to include the data for Joseph, Zoey, and Sara.

## Part B

Based on the line plot, what is the total number of students that ride the bus to school each day? Explain how you determined your answer.


## Part C

What is the difference, in miles, between the farthest distance and the shortest distance a student rides the bus to school?
Answer 15 miles
Scoring Notes: The response demonstrates a limited understanding of representing and interpreting data by incorrectly plotting the Xs in the line plot in Part $A$ and by incorrectly identifying the number of students that ride the bus to school in Part B based on the line plot. The response demonstrates a partial understanding of reasoning quantitatively by finding the correct distance in Part C. However, the response provides an invalid explanation for how to find the total number of students in Part B. This response receives zero points for content and one point for process.

## Question 2, Sample F - Data Analysis Score Point 0; Process Score Point 0



## Part A

Plot X's on the line plot above to include the data for Joseph, Zoey, and Sara.

## Part B

Based on the line plot, what is the total number of students that ride the bus to school each day? Explain how you determined your answer.

$$
\begin{aligned}
& \frac{13 \text { becaus I counted from }}{2 \text { from } 22 \text { to get my answer. }} \\
& 13 \text { Kids. }
\end{aligned}
$$

## Part C

What is the difference, in miles, between the farthest distance and the shortest distance a student rides the bus to school?
Answer 21 miles

Scoring Notes: The response demonstrates a limited understanding of representing and interpreting data by incorrectly plotting the Xs in the line plot in Part A and by incorrectly identifying the number of students that ride the bus to school in Part B based on the line plot. The response demonstrates a limited understanding of reasoning quantitatively by providing an invalid explanation for how to find the total number of students in Part B and by finding the incorrect distance in Part C. This response receives zero points for content and zero points for process.

## Item \#3 <br> Constructed-Response

## Constructed-Response <br> Standard 4: Geometry Standard 7: Mathematical Process

## Question 3

3. Jamie sorts 6 shapes into three groups based on their angle measures. She places some shapes in more than one group, as shown.

| Group One | Group Two | Group Three |
| :---: | :---: | :---: |
| $\Delta \square \square \square$ | $\square \square \square$ |  |

Part A
Complete each sentence.
All of the shapes in Group One have at least one $\qquad$ angle.

All of the shapes in Group Two have at least one $\qquad$ angle.

All of the shapes in Group Three have at least one $\qquad$ angle.

## Part B

Ivan sorts the same 6 shapes into two groups, as shown, based on a characteristic of the sides of the shapes.

| Group One |  |  | Group Two |
| :--- | :--- | :--- | :--- |
| $\square$ | $\square$ | $\square$ | $\square$ |

Explain the rule Ivan used to sort the shapes into Group One.
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Exemplary Response:

- All of the shapes in Group One have at least one right angle.
- All of the shapes in Group Two have at least one acute angle.
- All of the shapes in Group Three have at least one obtuse angle.

AND

- Ivan put all the shapes with at least one pair of parallel sides in Group One.
- Other valid explanation


## Question 3, Sample A - Geometry Score Point 2; Process Score Point 2

## Part A

Complete each sentence.
All of the shapes in Group One have at least one right angle. All of the shapes in Group Two have at least one acute angle.

All of the shapes in Group Three have at least one obtuse angle.

## Part B

Ivan sorts the same 6 shapes into two groups, as shown, based on a characteristic of the sides of the shapes.

| Group One | Group Two |  |
| :---: | :---: | :---: |
| $\square$ | $\square$ | $\square$ |

Explain the rule Ivan used to sort the shapes into Group One.
The rule Ivan used to sort the shapesingroupone isedchishapen has at least 1 pair of parallel sides.

Scoring Notes: The response demonstrates a thorough understanding of identifying and classifying triangles by correctly completing each sentence in Part A. The response demonstrates a thorough understanding of looking for structure and constructing viable arguments by providing a valid explanation for the rule Ivan used to sort the shapes into Group One. This response receives two points for content and two points for process.

## Question 3, Sample B - Geometry Score Point 2; Process Score Point 0

## Part A

Complete each sentence.
All of the shapes in Group One have at least one right angle.
All of the shapes in Group Two have at least one acute angle. All of the shapes in Group Three have at least one obtuse angle.

## Part B

Ivan sorts the same 6 shapes into two groups, as shown, based on a characteristic of the sides of the shapes.

| Group One |  |  | Group Two |
| :--- | :--- | :--- | :--- |
| $\square$ | $\square$ | $\square$ | $\square$ |

Explain the rule Ivan used to sort the shapes into Group One.
Ivan sorted them by right angles and by obtuse anoles.

Scoring Notes: The response demonstrates a thorough understanding of identifying and classifying triangles by correctly completing each sentence in Part A. The response demonstrates a limited understanding of looking for structure and constructing viable arguments by providing an invalid explanation for the rule Ivan used to sort the shapes into Group One. This response receives two points for content and zero points for process.

## Question 3, Sample C - Geometry Score Point 1; Process Score Point 2

## Part A

Complete each sentence.
All of the shapes in Group One have at least one $\qquad$ angle.

All of the shapes in Group Two have at least one $\qquad$ angle. All of the shapes in Group Three have at least one acute.

## Part B

Ivan sorts the same 6 shapes into two groups, as shown, based on a characteristic of the sides of the shapes.

| Group One | Group Two |  |
| :---: | :---: | :---: |
| $\square$ | $\square$ | $\square$ |

Explain the rule Ivan used to sort the shapes into Group One.


Scoring Notes: The response demonstrates a partial understanding of identifying and classifying triangles by correctly completing two of the three sentences in Part A. The response demonstrates a thorough understanding of looking for structure and constructing viable arguments by providing a valid explanation for the rule Ivan used to sort the shapes into Group One. This response receives one point for content and two points for process.

## Question 3, Sample D - Geometry Score Point 1; Process Score Point 0

## Part A

Complete each sentence.
All of the shapes in Group One have at least one $\frac{\text { right }}{\text { right }}$ angle.
All of the shapes in Group Two have at least one
All of the shapes in Group Three have at least one $\qquad$ angle.

## Part B

Ivan sorts the same 6 shapes into two groups, as shown, based on a characteristic of the sides of the shapes.

| Group One |  |  | Group Two |
| :--- | :--- | :--- | :--- |
| $\square$ | $\square$ | $\square$ | $\square$ |

Explain the rule Ivan used to sort the shapes into Group One.
In group one the way he sorted it out is he
sorted it dut by the shapes that have Right angles.
$\qquad$
$\qquad$

Scoring Notes: The response demonstrates a partial understanding of identifying and classifying triangles by correctly completing two of the three sentences in Part A. The response demonstrates a limited understanding of looking for structure and constructing viable arguments by providing an invalid explanation for the rule Ivan used to sort the shapes into Group One. This response receives one point for content and zero points for process.

## Question 3, Sample E - Geometry Score Point 0; Process Score Point 2

## Part A

Complete each sentence.
All of the shapes in Group One have at least one right angle. All of the shapes in Group Two have at least one obtuse angle. All of the shapes in Group Three have at least one acute angle.

## Part B

Ivan sorts the same 6 shapes into two groups, as shown, based on a characteristic of the sides of the shapes.

| Group One |  |  | Group Two |
| :--- | :--- | :--- | :--- |
| $\square$ | $\square$ | $\square$ | $\square$ |

Explain the rule Ivan used to sort the shapes into Group One. The rue Ivan used was, each shape had to have a set of parelle lines.

[^0]Question 3, Sample F - Geometry Score Point 0; Process Score Point 0

## Part A

Complete each sentence.
All of the shapes in Group One have at least one right angle.
All of the shapes in Group Two have at least one 0 bugtuse angle.
All of the shapes in Group Three have at least one acute angle.

## Part B

Ivan sorts the same 6 shapes into two groups, as shown, based on a characteristic of the sides of the shapes.


Explain the rule Ivan used to sort the shapes into Group One.


Scoring Notes: The response demonstrates a limited understanding of identifying and classifying triangles by correctly completing only one sentence in Part A. The response demonstrates a limited understanding of looking for structure and constructing viable arguments by providing an invalid explanation for the rule Ivan used to sort the shapes into Group One. This response receives zero points for content and zero points for process.

## Item \#4 <br> Extended-Response

## Extended-Response <br> Standard 5: Measurement <br> Standard 7: Mathematical Process

## Question 4

4. Janet is building a play house using cardboard boxes. She has three boxes as described in the table.

| Box | Length <br> (feet) | Width <br> (feet) | Height <br> (feet) |
| :---: | :---: | :---: | :---: |
| A | 5 | 4 | 6 |
| B | 3 | 4 | 6 |
| C | 4 | 4 | 4 |

Part A
What is the total volume, in cubic feet, of the play house if Janet uses Box A and Box B?

Answer $\qquad$ cubic feet

Part B
Janet thinks that if she uses all three boxes, the total volume of the play house will be 278 cubic feet.

Is Janet correct? Use words, numbers, and/or symbols to support your answer.

Show AII Work
$\qquad$
$\qquad$
$\qquad$

## Part C

Janet's dad gives her more boxes. The table shows the number of each box Janet has now.

| Box | Number |
| :---: | :---: |
| A | 2 |
| B | 2 |
| C | 4 |

Janet uses a total of 4 boxes. The total volume of the 4 boxes is 328 cubic feet.

What are the 4 boxes Janet uses?
Show All Work

## Exemplary Response:

- 192 cubic feet

AND

- No, the total volume of the three boxes is 256 feet.

AND

- 1 A Box, 2 B Boxes, and 1 C Box
- Sample Process:

Volume of Box A: $4 \times 5 \times 6=120$ cubic feet
Volume of Box B: $3 \times 4 \times 6=72$ cubic feet
$120+72=192$ cubic feet
$4 \times 4 \times 4=64$ cubic feet
$192+64=256$ cubic feet
$328-256=72$
OR

- Other valid process

Question 4, Sample A - Measurement Score Point 3; Process Score Point 3
Part A
What is the total volume, in cubic feet, of the play house if Janet uses Box $A$ and Box B?

Answer 192 cubic feet

$$
\begin{aligned}
& (5 \times 4 \times 6)(3 \times 4) \times 6)+120 \\
& (20 \times 6)(12 \times 6)^{12}+72 \\
& 120
\end{aligned} \frac{72}{192}
$$

Part B
Janet thinks that if she uses all three boxes, the total volume of the play house will be 278 cubic feet.

Is Janet correct? Use words, numbers, and/or symbols to support your answer.

Show All Work

$$
\begin{gathered}
(4 \times 4) \times 4 \times 2 \\
(16 \times 4) \times \frac{2}{64} \\
64
\end{gathered}
$$

$$
\begin{array}{r}
192 \\
+\frac{64}{278} \\
\hline 256 \\
\hline 256 \\
\hline 22
\end{array}
$$



## Part C

Janet's dad gives her more boxes. The table shows the number of each box Janet has now.

| Box | Number |
| :---: | :---: |
| A | 2 |
| B | 2 |
| C | 4 |

Janet uses a total of 4 boxes. The total volume of the 4 boxes is 328 cubic feet.
What are the 4 boxes Janet uses?


## The four boxes Janet would need are ' 1 Box A, 2 Box Bs', and I box $C$.

Scoring Notes: The response demonstrates a thorough understanding of finding volume in real-world problems by finding the correct volume in Part A, the correct volumes for each box in Parts A and B, and the total volume of all three boxes in Part B. The response demonstrates a thorough understanding of reasoning quantitatively and constructing viable arguments by providing a valid explanation of why Janet is incorrect in Part B and by providing the correct number of boxes in Part $C$ with a valid setup. This response receives three points for content and three points for process.

Question 4, Sample B - Measurement Score Point 3; Process Score Point 2
Part A
What is the total volume, in cubic feet, of the play house if Janet uses Box $A$ and Box B?

Part B

Janet thinks that if she uses all three boxes, the total volume of the play house will be 278 cubic feet.

Is Janet correct? Use words, numbers, and/or symbols to support your answer.

we know from the frit 2 boxes was 192 cubic fec. So then you would $804 \times 4 \times 4=64 \mathrm{t}$
$192=256$ so she was wrong.

## Part C

Janet's dad gives her more boxes. The table shows the number of each box Janet has now.

| Box | Number |
| :---: | :---: |
| A | 2 |
| B | 2 |
| C | 4 |

Janet uses a total of 4 boxes. The total volume of the 4 boxes is 328 cubic feet.

What are the 4 boxes Janet uses?

Show All Work


## She would use boxes $A, B, C \not \subset$ cain.

Scoring Notes: The response demonstrates a thorough understanding of finding volume in real-world problems by finding the correct volume in Part $A$, the correct volumes for each box in Parts $A$ and $B$, and the total volume of all three boxes in Part B. The response demonstrates a partial understanding of reasoning quantitatively and constructing viable arguments by providing a valid explanation of why Janet is incorrect in Part $B$ and by providing a valid setup for Part C. However, the response does not provide the correct number of boxes that is supported by the setup in Part C. This response receives three points for content and two points for process.

## Question 4, Sample C - Measurement Score Point 2; Process Score Point 2

## Part A

What is the total volume, in cubic feet, of the play house if Janet uses Box A and Box B?

Answer 256 cubic feet

Part B


Janet thinks that if she uses all three boxes, the total volume of the play house will be 278 cubic feet.

Is Janet correct? Use words, numbers, and/or symbols to support your answer.

Show All Work


Janet is not correct because the volume of box a is 120 . The volume of bax $B$ is 72 . The va ane of bor $C$ is $64.120+72+64=256$. 256 is the total volume not 278 .

## Part C

Janet's dad gives her more boxes. The table shows the number of each box Janet has now.

| Box | Number |
| :---: | :---: |
| A | 2 |
| B | 2 |
| C | 4 |

## Janet uses a total of 4 boxes. The total volume of the 4 boxes is 328 cubic feet.



## Janet uses $1 \mathrm{Abox}, 1 \mathrm{Bbox}$, and 2 C boxes. I know this <br> because $120+64=184,184+144=328$,

Scoring Notes: The response demonstrates a partial understanding of finding volume in real-world problems by finding the correct volume of each individual box in Parts $A$ and $B$ and the correct total volume of all three boxes in Part B. However, the response incorrectly determined the volume of Boxes $A$ and $B$ combined in Part $A$. The response demonstrates a partial understanding of reasoning quantitatively and constructing viable arguments by providing a valid explanation of why Janet is incorrect in Part B and by providing a valid setup for Part C. However, the response does not provide the correct number of boxes that is supported by the setup in Part C. This response receives two points for content and two points for process.

Question 4, Sample D - Measurement Score Point 2; Process Score Point 1

Part A
What is the total volume, in cubic feet, of the play house if Janet uses Box $A$ and Box B?
Answer 120 cubic feet

Part B
Janet thinks that if she uses all three boxes, the total volume of the play house will be 278 cubic feet.

Is Janet correct? Use words, numbers, and/or symbols to support your answer.

| Show All work | $5 \times 4 \times 6=120$ |
| :--- | :--- |
| 16 |  |
| $\times \frac{12}{64} \times \frac{6}{79}$ | $3 \times 4 \times 6=+72$ |
| $64 \times 4 \times 4=\frac{64}{256}$ |  |

no she is not correct because
I did all of the multipacation
and add. sion on I 256 .

## Part C

Janet's dad gives her more boxes. The table shows the number of each box Janet has now.

| Box | Number |
| :---: | :---: |
| A | 2 |
| B | 2 |
| C | 4 |

Janet uses a total of 4 boxes. The total volume of the 4 boxes is 328 cubic feet.

What are the 4 boxes Janet uses?

## Show All Work

$$
5 \times 4 \times 6=120
$$



## She uses boxes $A+B$ because $5 \times 4 \times 6=120$ and $120 \times 4=460$ and that's close enos

Scoring Notes: The response demonstrates a partial understanding of finding volume in real-world problems by finding the correct volumes for each box in Part B and the total volume of all three boxes in Part B. However, the response incorrectly determines the volume of Boxes $A$ and $B$ in Part $A$. The response demonstrates a limited understanding of reasoning quantitatively and constructing viable arguments with a valid explanation of why Janet is incorrect in Part B but an invalid setup and incorrect number of boxes in Part $C$. This response receives two points for content and one point for process.

Question 4, Sample E - Measurement Score Point 1; Process Score Point 1


What is the total volume, in cubic feet, of the play house if Janet uses Box A and Box B?
Answer 18 cubic feet

## Part B

Janet thinks that if she uses all three boxes, the total volume of the play house will be 278 cubic feet.

Is Janet correct? Use words, numbers, and/or symbols to support your answer.

Show All Work


## Part C

Janet's dad gives her more boxes. The table shows the number of each box Janet has now.

| Box | Number |
| :---: | :---: |
| A | 2 |
| B | 2 |
| C | 4 |

Janet uses a total of 4 boxes. The total volume of the 4 boxes is 328 cubic feet.

What are the 4 boxes Janet uses?

Show All Work



Scoring Notes: The response demonstrates a limited understanding of finding volume in real-world problems by correctly determining the volume of two of the three boxes in Parts $A$ and $B$. The response also incorrectly determines the total volume of Boxes $A$ and $B$ in Part $A$. The response demonstrates a limited understanding of reasoning quantitatively and constructing viable arguments with a valid explanation of why Janet is incorrect in Part B. (The conclusion is still valid even with an incorrect total volume for all three boxes.) The response provides an invalid setup for Part $C$ and does not describe which four boxes Janet uses. This response receives one point for content and one point for process.

Question 4, Sample F - Measurement Score Point 1; Process Score Point 0

| Box | Length <br> (feet) | Width <br> (feet) | Height <br> (feet) |
| :---: | :---: | :---: | :---: |
| A | 5 | 4 | 6 |
| B | 3 | 4 | 6 |
| C | 4 | 4 | 4 |

## Part A

What is the total volume, in cubic feet, of the play house if Janet uses Box A and Box B?
Answer 192 cubic feet
i) 2


Janet thinks that if she uses all three boxes, the total volume of the play house will be 278 cubic feet.

Is Janet correct? Use words, numbers, and/or symbols to support your answer.

## Show All Work



## Part C

Janet's dad gives her more boxes. The table shows the number of each box Janet has now.

| Box | Number |
| :---: | :---: |
| A | 2 |
| B | 2 |
| C | 4 |

Janet uses a total of 4 boxes. The total volume of the 4 boxes is 328 cubic feet.

What are the 4 boxes Janet uses?

## Show All Work

Scoring Notes: The response demonstrates a limited understanding of finding volume in real-world problems by correctly determining the total volume of Boxes $A$ and $B$ in Part A only. The response demonstrates limited or no understanding of reasoning quantitatively and constructing viable arguments with an invalid explanation of why Janet is incorrect in Part B and failure to complete any portion of Part C. This response receives one point for content and zero points for process.

Question 4, Sample G - Measurement Score Point 0; Process Score Point 1

| Box | Length <br> (feet) | Width <br> (feet) | Height <br> (feet) |
| :---: | :---: | :---: | :---: |
| A | 5 | 4 | 6 |
| B | 3 | 4 | 6 |
| C | 4 | 4 | 4 |

## Part A

What is the total volume, in cubic feet, of the play house if Janet uses Box A and Box B?

Answer 8,640 cubic feet $\frac{x, 6}{1,440} \frac{x}{8640}$

## Part B

$$
5 \times 3=15 \times 4=60 \times 4=240 \times 6=1440 \times 6=8,640
$$

Janet thinks that if she uses all three boxes, the total volume of the play house will be 278 cubic feet.

Is Janet correct? Use words, numbers, and/or symbols to support your answer.


## Part C

Janet's dad gives her more boxes. The table shows the number of each box Janet has now.

| Box | Number |
| :---: | :---: |
| A | 2 |
| B | 2 |
| C | 4 |

Janet uses a total of 4 boxes. The total volume of the 4 boxes is 328 cubic feet.

What are the 4 boxes Janet uses?


$\square$
Janet use boxes $A, B L$ and another $B$ as also.

> Scoring Notes: The response demonstrates limited or no understanding of finding volume in real-world problems by determining an incorrect total volume of Boxes A and B in Part A, an incorrect total volume of all three boxes in Part B, and an incorrect volume for each box individually. The response demonstrates a limited understanding of reasoning quantitatively and constructing viable arguments with an invalid explanation of why Janet is incorrect in Part B. The response does correctly determine the number of boxes needed in Part C but does not have a valid process to support that answer. This response receives zero points for content and one point for process.

## Question 4, Sample H - Measurement Score Point 0; Process Score Point 0

Janet is building a play house using cardboard boxes. She has three boxes as described in the table.

| Box | Length <br> (feet) | Width <br> (feet) | Height <br> (feet) |
| :---: | :---: | :---: | :---: |
| A | 5 | 4 | 6 |
| B | 3 | 4 | 6 |
| C | 4 | 4 | 4 |



## Part A

What is the total volume, in cubic feet, of the play house if Janet uses Box A and Box B?
Answer 28 cubic feet


## Part B

Janet thinks that if she uses all three boxes, the total volume of the play house will be 278 cubic feet.

Is Janet correct? Use words, numbers, and/or symbols to support your answer.

Show All Work

$$
\begin{array}{r}
278 \\
+\quad 15 \\
\hline 293
\end{array}
$$



## Part C

Janet's dad gives her more boxes. The table shows the number of each box Janet has now.

| Box | Number |
| :---: | :---: |
| A | 2 |
| B | 2 |
| C | 4 |

Janet uses a total of 4 boxes. The total volume of the 4 boxes is 328 cubic feet.

What are the 4 boxes Janet uses?


Scoring Notes: The response demonstrates limited or no understanding of finding volume in real-world problems by determining an incorrect total volume of Boxes $A$ and B in Part A, an incorrect total volume of all three boxes in Part B, and an incorrect volume for each box individually. The response demonstrates limited or no understanding of reasoning quantitatively and constructing viable arguments with an invalid explanation of why Janet is incorrect in Part $B$ and by providing an invalid setup and number of boxes in Part C. This response receives zero points for content and zero points for process.


[^0]:    Scoring Notes: The response demonstrates a limited understanding of identifying and classifying triangles by correctly completing only one sentence in Part A. The response demonstrates a thorough understanding of looking for structure and constructing viable arguments by providing a valid explanation for the rule Ivan used to sort the shapes into Group One. This response receives zero points for content and two points for process.

