Tennessee Comprehensive Assessment Program

TCAP/CRA 2013

6

Task 4 Scoring Guide

Packing Crates Task

4. Packing Crates Task Scoring Guide

The CCSS for Mathematical Content (3 points)

6.EE.A.1 Writes 2 equations or expressions to represent the volume of the large box. One of the equations or expressions must contain exponents. The student may write: _____

- $V = 10^3$
- $V = 10^2 \times 10$
- $V = 10 \times 10 \times 10$
- $V = 2^3 \times 5^3 = 8 \times 125$
- $V = (2 \times 5) \times (2 \times 5) \times (2 \times 5) = (2 \times 5)^3$
- $V = 5 \times (5 \times (5 \times (2 \times 2 \times 2))) = 5 \times (5 \times (5 \times 8)) = 5 \times (5 \times 40) = 5 \times 200$

(1 Point)

6.RP.A.1 Writes a ratio or uses ratio language to give the ratio of the sides of the crates or of the volumes. May use an incorrect volume determined in part a. _____

(1 Point)

6.RP.A.3 Uses ratio and/or rate reasoning to compare the ratio 1:5 to the ratio of the volumes of the 2 crates. _____

(1 Point)

Total Content Points _____

The CCSS for Mathematical Practice (1 point)

MP1 Makes sense of the problem by finding or using the correct volumes to show that the volume of the small packing crate to the volume of the large packing crate is not the same as 1:5. _____

(1 Point)

(MP1: Make sense of problems and persevere in solving them.)

Total Practice Points _____

Total Awarded Points _____

The CCSS for Mathematical Content Addressed in This Task

Build fractions from unit fractions by applying and extending previous understanding of operations on whole numbers.

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

6.EE.A.1 Write and evaluate numerical expressions involving whole-number exponents.

The CCSS for Mathematical Practice*

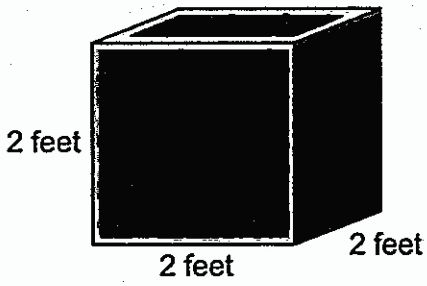
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

*Gray text indicates Mathematical Practices that are not addressed in this task.

Students' responses to a mathematical task provide evidence of what they understand and are able to do in relation to the standards and practices. Across tasks, this cumulative evidence shows students' understanding and abilities within a domain. When students do not respond completely to all parts of a task, they provide insufficient evidence of their mathematical understanding and abilities and therefore do not fully demonstrate the expectations of the standards and practices aligned with that task.

Task 4. Packing Crates Task

Kyle works for a company that makes large packing crates for moving and storage. The smallest packing crate that his company makes is 2 feet on all sides.



Since Kyle knows that to find the volume of this packing crate he can multiply the length times the width times the height ($l \times w \times h$), he writes the expression $2 \times 2 \times 2$ to represent the volume. He also knows that this is equivalent to writing 2^3.

The largest crate his company makes is 10 feet on all sides.

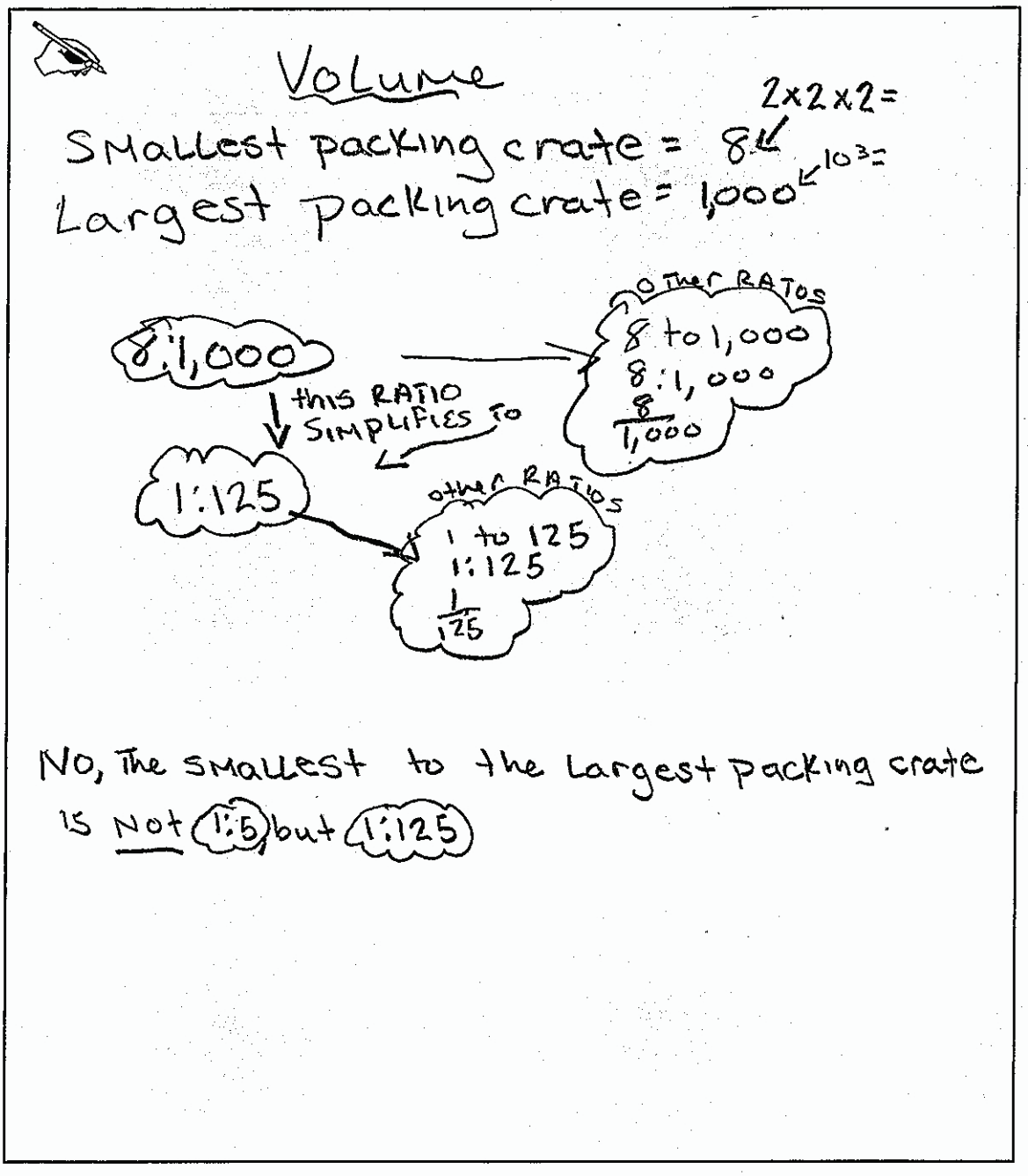
a. Write 2 different equations to represent the volume of the largest packing crate made by Kyle's company. One of the equations must use exponents.

1) length, width, height $10 \times 10 \times 10 = 1{,}000$

2) $10^3 = 1000$ (exponent) volume $(L \times W \times h)$

Litho#: 664980

b. Is the ratio of the volumes of the smallest packing crate to the largest packing crate 1:5? Use ratios and/or ratio language to explain why or why not.



Guide 1 Litho 664980

Total Content Points: 3 (6.EE.A.1, 6.RP.A.1, 6.RP.A.3)

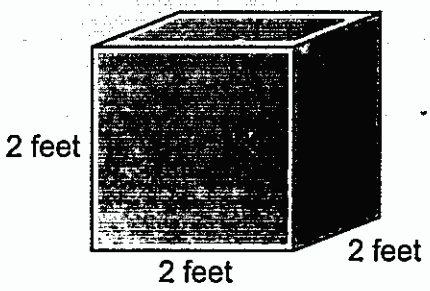
Total Practice Points: 1 (MP1)

In this response, the student writes two equations, one with an exponent, that correctly represent the volume of the large crate ($10 \times 10 \times 10 = 1{,}000$; $10^3 = 1{,}000$) (6.EE.A.1). In Part B, the student writes a ratio (8:1000) to compare the two volumes (6.RP.A.1). This ratio is simplified (8:1000 to 1:125) to prove that the ratio of the crates' volumes is not 1:5 (6.RP.A.3). The student finds the correct volumes of both crates and shows that the ratio of the volumes does not equal 1:5 (MP1).

Total Awarded Points: 4 out of 4

Task 4. Packing Crates Task

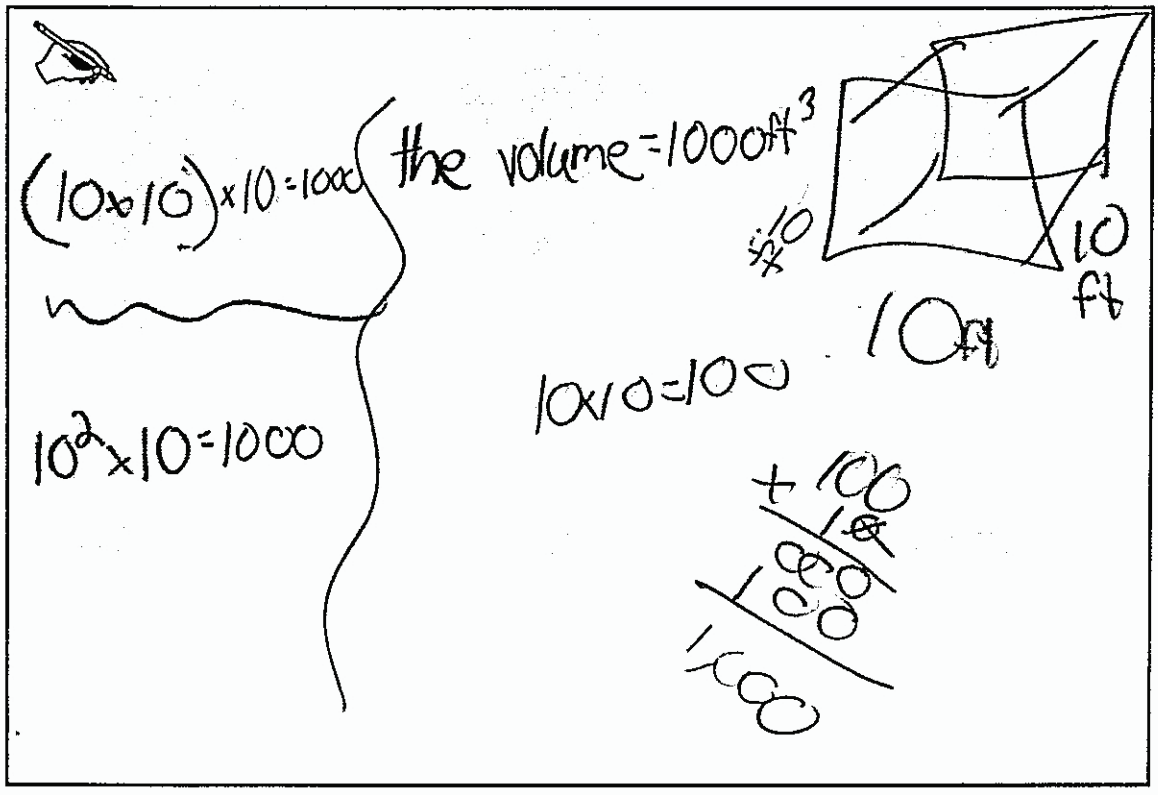
Kyle works for a company that makes large packing crates for moving and storage. The smallest packing crate that his company makes is 2 feet on all sides.



Since Kyle knows that to find the volume of this packing crate he can multiply the length times the width times the height ($l \times w \times h$), he writes the expression $2 \times 2 \times 2$ to represent the volume. He also knows that this is equivalent to writing 2^3.

The largest crate his company makes is 10 feet on all sides.

a. Write 2 different equations to represent the volume of the largest packing crate made by Kyle's company. One of the equations must use exponents.



Litho#: 646978

A-2b

b. Is the ratio of the volumes of the smallest packing crate to the largest packing crate 1:5? Use ratios and/or ratio language to explain why or why not.

no, its 1:125, you divide, the volume of the smallest crate(8) by the largest crate(1000) and you get 125 which 8÷8 = 1 so the ratio is 1:125 not 1:5!

$$\frac{8}{1000} \div \frac{8}{8} = \frac{1}{125}$$

Guide 2 Litho 646978

Total Content Points: 3 (6.EE.A.1, 6.RP.A.1, 6.RP.A.3)

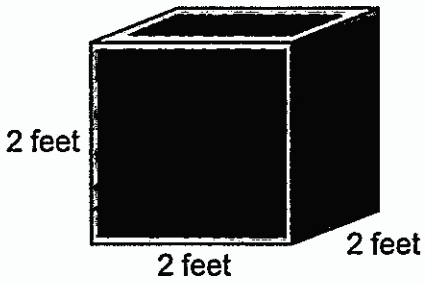
Total Practice Points: 1 (MP1)

In this response, the student writes two equations, one with an exponent, that correctly represent the volume of the large crate ((10 × 10) × 10 = 1,000; 10^2 × 10 = 1,000) (6.EE.A.1). In Part B, the student writes a ratio (8:1000) to compare the volume of the small crate to the volume of the large crate (6.RP.A.1). The student then simplifies this ratio (8:1000 = 1:125) and correctly compares it to the ratio stated in the task ("the ratio is 1:125 not 1:5") (6.RP.A.3). The student finds the correct volumes of both crates and shows that the ratio of the volumes (8:1000 = 1:125) does not equal 1:5 (MP1).

Total Awarded Points: 4 out of 4

Task 4. Packing Crates Task

Kyle works for a company that makes large packing crates for moving and storage. The smallest packing crate that his company makes is 2 feet on all sides.



Since Kyle knows that to find the volume of this packing crate he can multiply the length times the width times the height ($l \times w \times h$), he writes the expression $2 \times 2 \times 2$ to represent the volume. He also knows that this is equivalent to writing 2^3.

The largest crate his company makes is 10 feet on all sides.

a. Write 2 different equations to represent the volume of the largest packing crate made by Kyle's company. One of the equations must use exponents.

Small box
2
2
x 2
4
8

large box
10
10
x 10
100
1000
1000

8 : 1000
8
1000

Litho#: 643595

A-3b

b. Is the ratio of the volumes of the smallest packing crate to the largest packing crate 1:5? Use ratios and/or ratio language to explain why or why not.

81000 ÷ 2 = 41500 ÷ 2 = 2:250

2:250 ÷ 2 1 : 125 ≠ 1:5 No

because I worked it out and it is not the same

Litho#: 643595

Guide 3 Litho 643595

Total Content Points: 2 (6.RP.A.1, 6.RP.A.3)

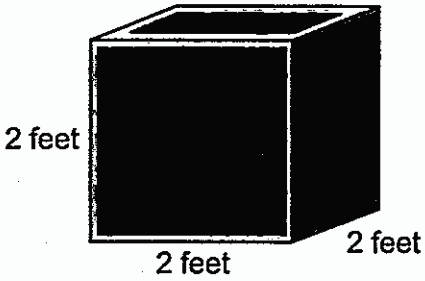
Total Practice Points: 1 (MP1)

In this response, the student does not follow instructions to write two equations representing the volume of the large crate, but does include extra calculations to answer Part B (no credit for 6.EE.A.1). In Part B, the student writes the ratio to compare the volume of the small crate to the volume of the large crate (8:1000), simplifies this ratio (8:1000 to 1:125), and correctly compares it to the ratio given in the task ($1:125 \neq 1:5$) (6.RP.A.1, 6.RP.A.3). By finding the correct volumes of both crates and showing that the ratio of these volumes does not equal 1:5, the student makes sense of the problem (MP1).

Total Awarded Points: 3 out of 4

Task 4. Packing Crates Task

Kyle works for a company that makes large packing crates for moving and storage. The smallest packing crate that his company makes is 2 feet on all sides.



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The largest crate his company makes is 10 feet on all sides.

a. Write 2 different equations to represent the volume of the largest packing crate made by Kyle's company. One of the equations must use exponents.

① 10 x 10 x 10 = 1000 feet
② 10^3 = 1000 feet

1000 feet is the tallest crate they made in the company.

Litho#: 667761

A-4b

b. Is the ratio of the volumes of the smallest packing crate to the largest packing crate 1:5? Use ratios and/or ratio language to explain why or why not.

1 8 to 1000

8

1000

NO cause the biyest crate is 1000 and the smallest crate is 8

8 to 1000

Guide 4 Litho 667761

Total Content Points: 2 (6.EE.A.1, 6.RP.A.1)

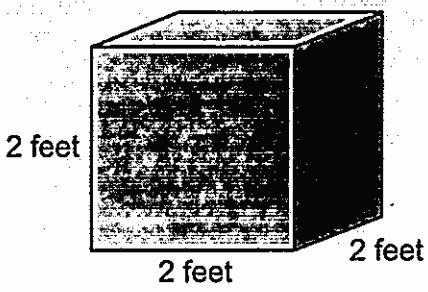
Total Practice Points: 1 (MP1)

In this response, the student correctly writes two equations, one with an exponent, to represent the volume of the large crate ($10 \times 10 \times 10 = 1{,}000$; $10^3 = 1{,}000$) (6.EE.A.1). The student writes a ratio of the volume of the small crate to the volume of the large crate $\left(\frac{8}{1000}\right)$ (6.RP.A.1). However, the student does not specifically compare the ratio 1:5 to the ratio of the volumes of the two crates (no credit for 6.RP.A.3). The student does make sense of the problem by correctly determining the volumes of the crates and indirectly stating that the ratio of the volumes is not 1:5 because "the [biggest] crate is 1000 and the smallest crate is 8"(MP1).

Total Awarded Points: 3 out of 4

Task 4. Packing Crates Task

Kyle works for a company that makes large packing crates for moving and storage. The smallest packing crate that his company makes is 2 feet on all sides.



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The largest crate his company makes is 10 feet on all sides.

a. Write 2 different equations to represent the volume of the largest packing crate made by Kyle's company. One of the equations must use exponents.

$10 \times 10 \times 10 = 1{,}000$

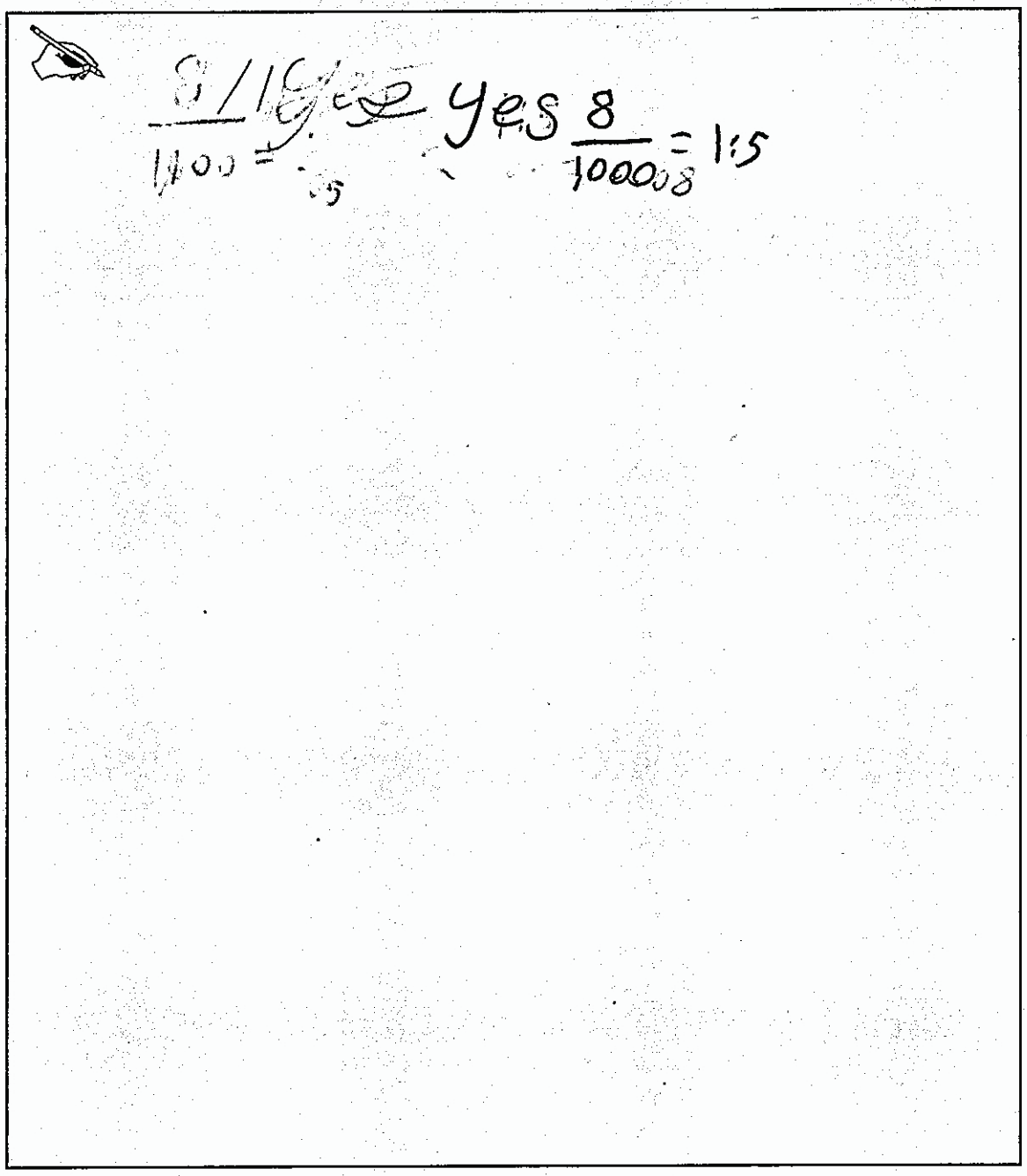
Or

$10^3 = 1{,}000$

Litho#: 647474

A-5b

b. Is the ratio of the volumes of the smallest packing crate to the largest packing crate 1:5? Use ratios and/or ratio language to explain why or why not.



Litho#: 647474

Guide 5 Litho 647474

Total Content Points: 2 (6.EE.A.1, 6.RP.A.1)

Total Practice Points: 0

In this response, the student writes two equations, one with an exponent, that represent the volume of the large crate ($10 \times 10 \times 10 = 1{,}000$; $10^3 = 1{,}000$) (6.EE.A.1). The student writes a ratio to compare the two volumes $\left(\frac{8}{1000}\right)$ (6.RP.A.1). However, the student neglects to work out the ratios mathematically, thus incorrectly concludes they are equivalent, and this error indicates that the student has not made sense of the problem (no credit for 6.RP.A.3, no credit for MP1).

Total Awarded Points: 2 out of 4

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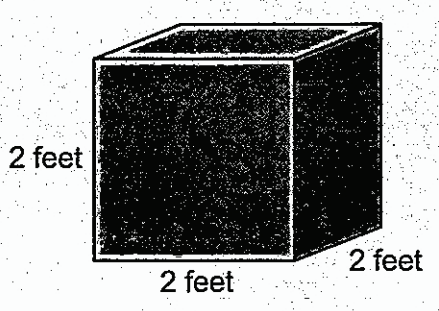

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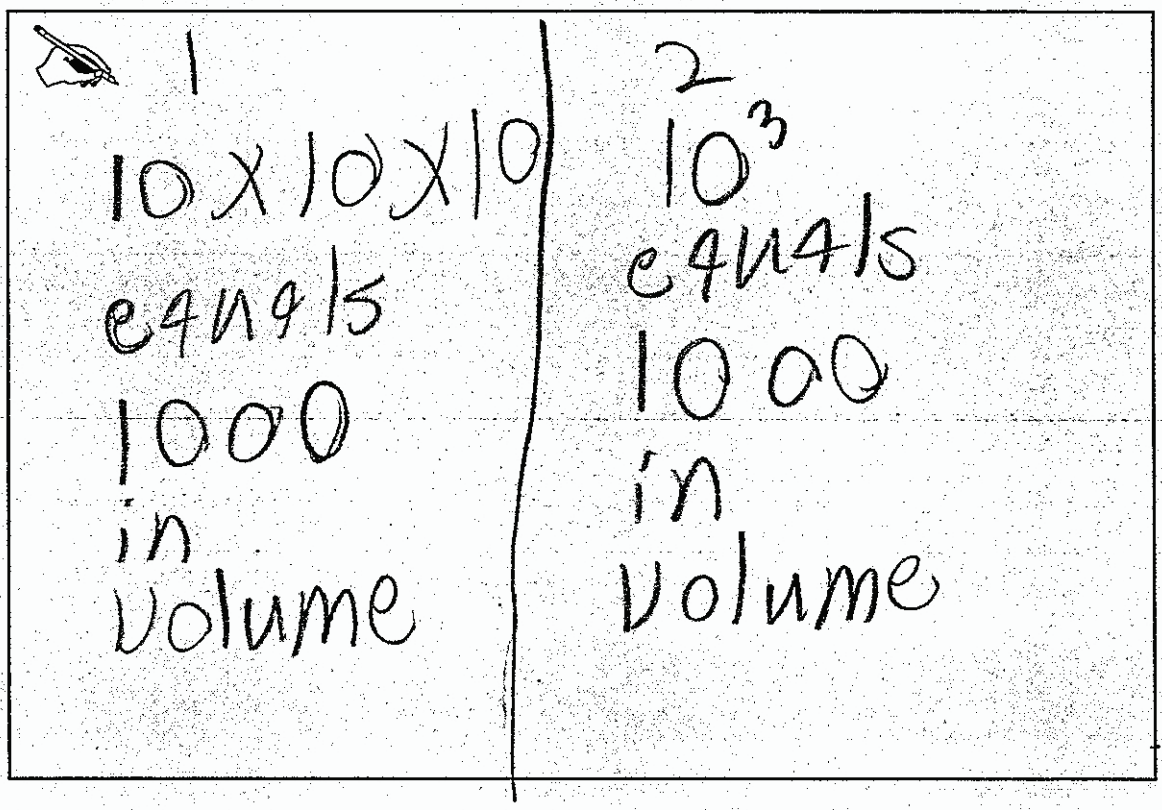
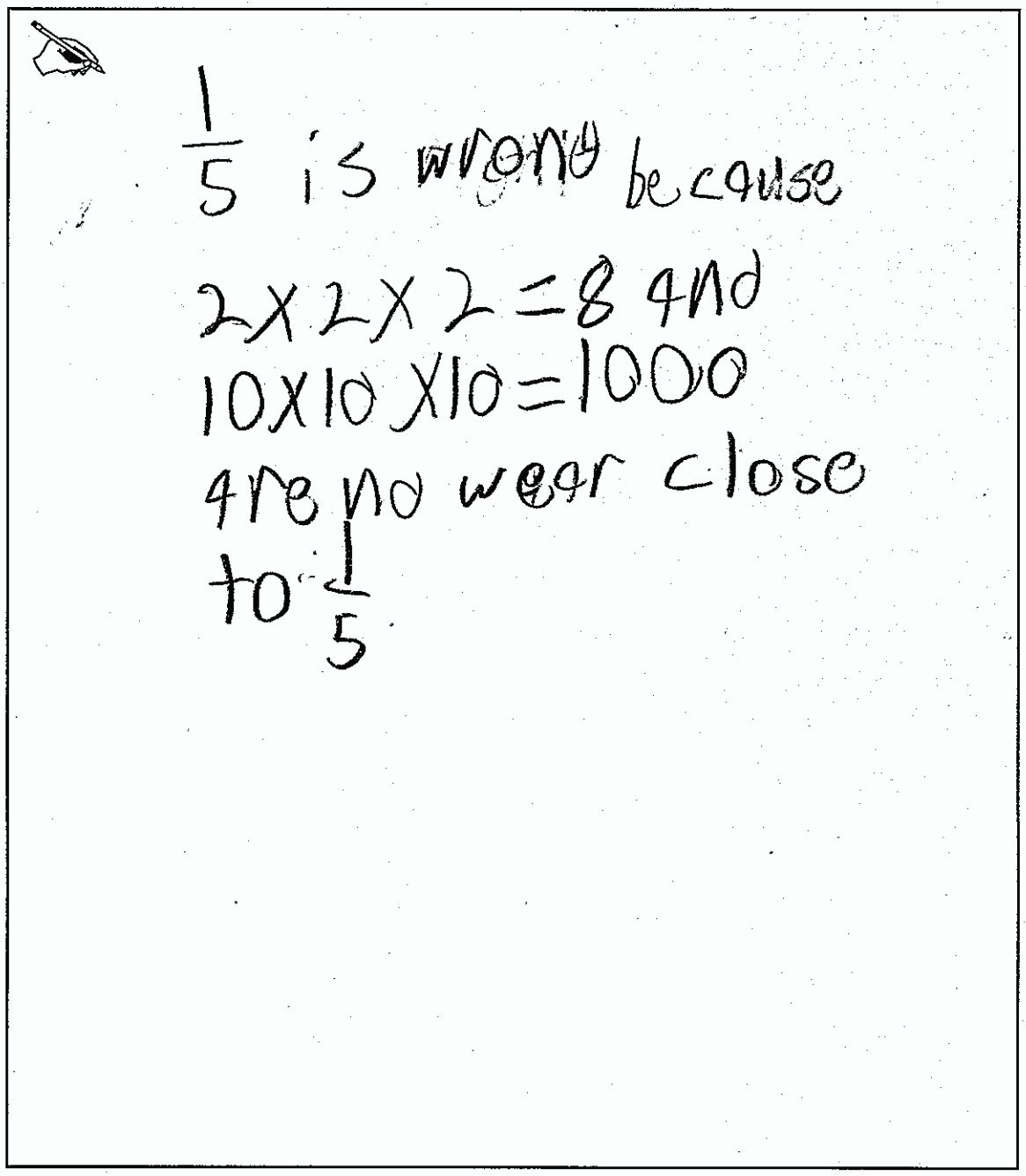


Litho#: 664997

A-6b

b. Is the ratio of the volumes of the smallest packing crate to the largest packing crate 1:5? Use ratios and/or ratio language to explain why or why not.



Litho#: 664997

Guide 6 Litho 664997

Total Content Points: 1 (6.EE.A.1)

Total Practice Points: 1 (MP1)

In this response, the student writes two equations, one with an exponent, that represent the volume of the large crate ($10 \times 10 \times 10 = 1{,}000$; $10^3 = 1{,}000$) (6.EE.A.1). The student does not make a ratio comparing the volume of the small crate to volume of the large crate (no credit for 6.RP.A.1). The student does not use ratio and/or rate reasoning to specifically compare the ratio of the volumes of the two crates to 1:5 (no credit for 6.RP.A.3). However, the student makes sense of the problem by determining the volumes of the crates (8, 1000) and stating "$\frac{1}{5}$ is wrong" because the volumes of the crates are "[nowhere] close to $\frac{1}{5}$." (MP1).

Total Points Awarded: 2 out of 4

Task 4. Packing Crates Task

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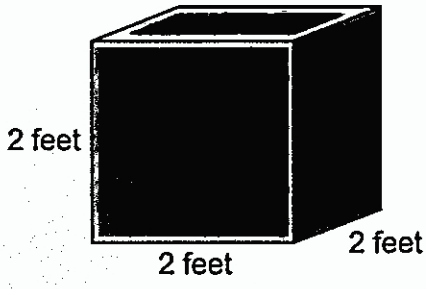

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The largest crate his company makes is 10 feet on all sides.

a. Write 2 different equations to represent the volume of the largest packing crate made by Kyle's company. One of the equations must use exponents.

$10 \times 10 \times 10 = 1000$

10^3

Litho#: 648388

A-7b

b. Is the ratio of the volumes of the smallest packing crate to the largest packing crate 1:5? Use ratios and/or ratio language to explain why or why not.

no becaus there more bigger crates

Litho#: 648388

Guide 7 Litho 648388

Total Content Points: 1 (6.EE.A.1)

Total Practice Points:

In this response, the student writes an equation ($10 \times 10 \times 10 = 1000$) and an expression with an exponent (10^3) to represent the volume of the large crate (6.EE.A.1). The student does not give the ratio of the two volumes of the two crates (no credit for 6.RP.A.1). The student does not use ratios and/or rate reasoning to compare the ratio of the volumes of the two crates to 1:5 (no credit for 6.RP.A.3). The lack of work showing a comparison between the ratio of the volumes and 1:5 shows the student has not made sense of the task (no credit for MP1).

Total Awarded Points: 1 out of 4

Task 4. Packing Crates Task

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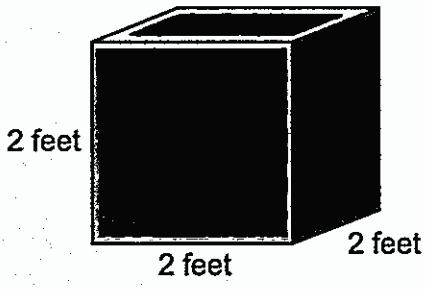

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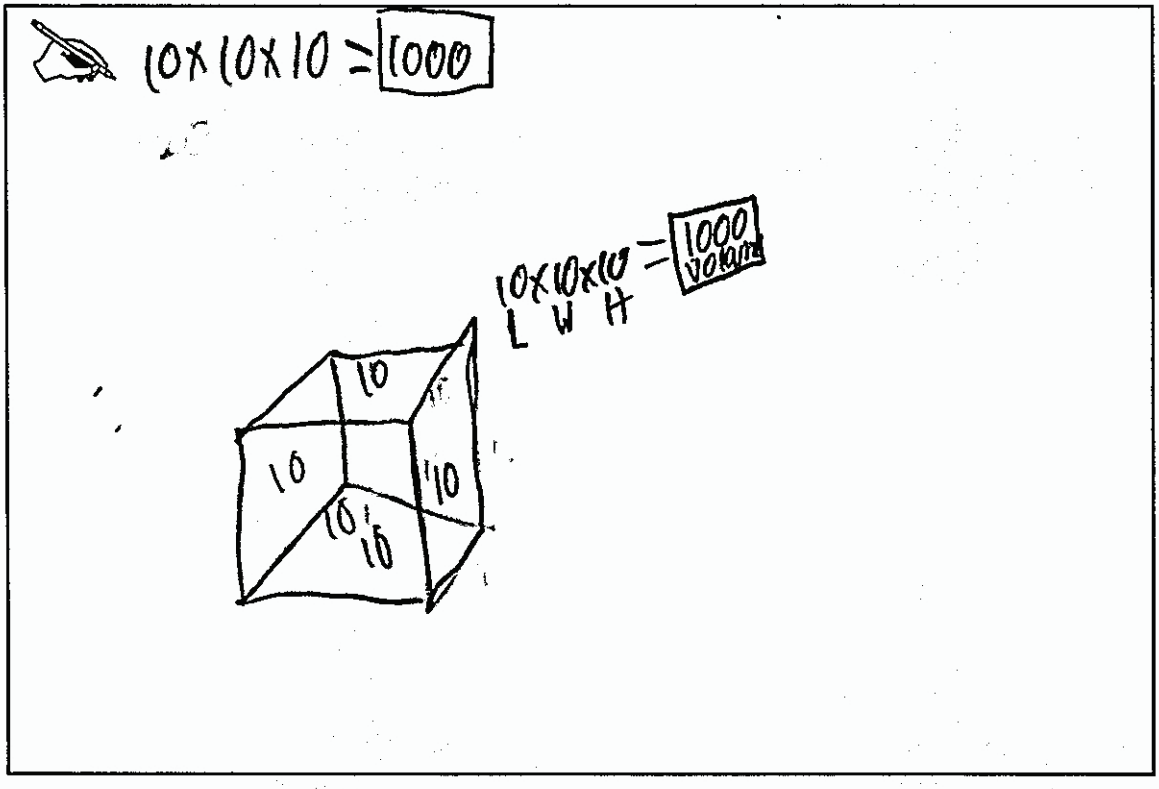
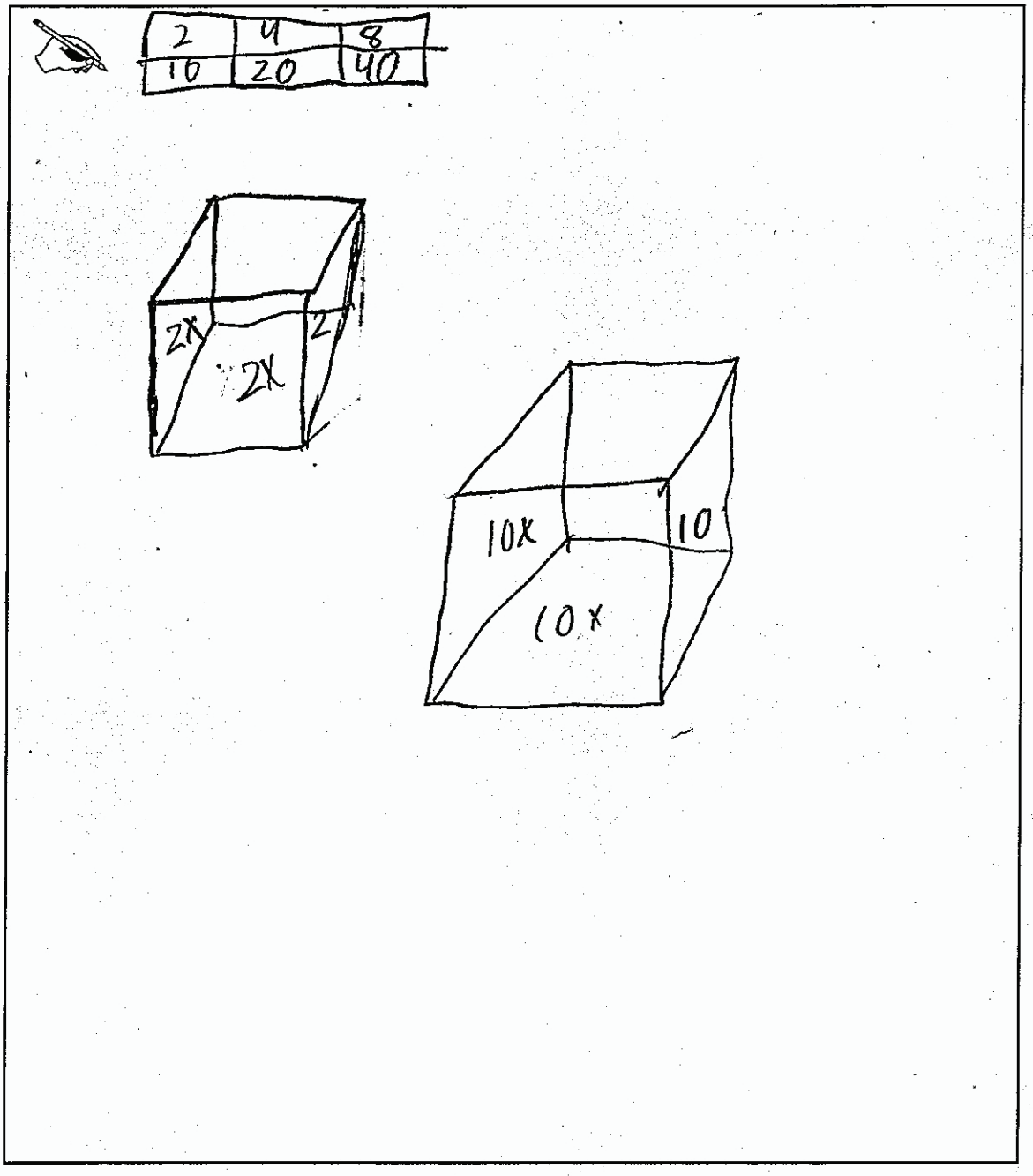


Litho#: 648406

A-8b

b. Is the ratio of the volumes of the smallest packing crate to the largest packing crate 1:5? Use ratios and/or ratio language to explain why or why not.



Litho#: 648406

Guide 8 Litho 648406

Total Content Points: 1 (6.RP.A.1)

Total Practice Points: 0

In this response, the student only writes one correct equation to represent the volume of the large crate ($10 \times 10 \times 10 = 1{,}000$) (no credit for 6.EE.A.1). In Part B, the student does write a ratio by using the size of the side of the smaller crate and the size of the side of the larger crate, and scales this ratio up $\left(\frac{2}{10}, \frac{4}{20}, \frac{8}{40}\right)$ (6.RP.A.1). The student does not use ratio and/or rate reasoning to compare the ratio of the volumes of the two crates (no credit for 6.RP.A.3). Because the student does not find the volume of the small crate and does not provide a ratio of the volumes to compare to 1:5, the student has not demonstrated complete understanding of the problem (no credit for MP1).

Total Awarded Points: 1 out of 4

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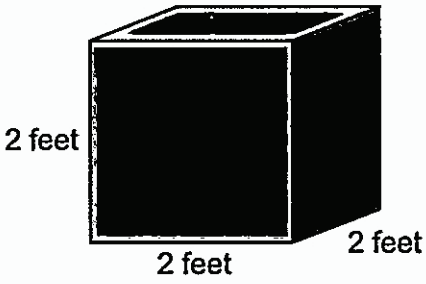

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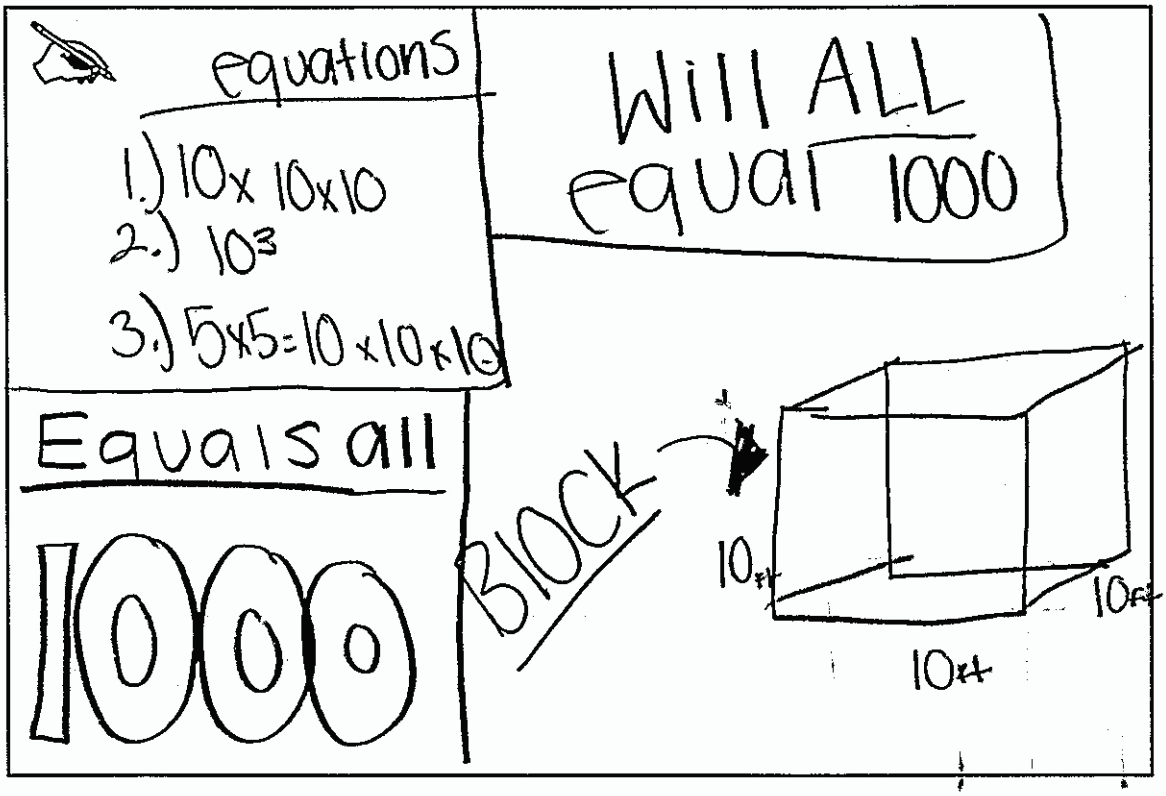
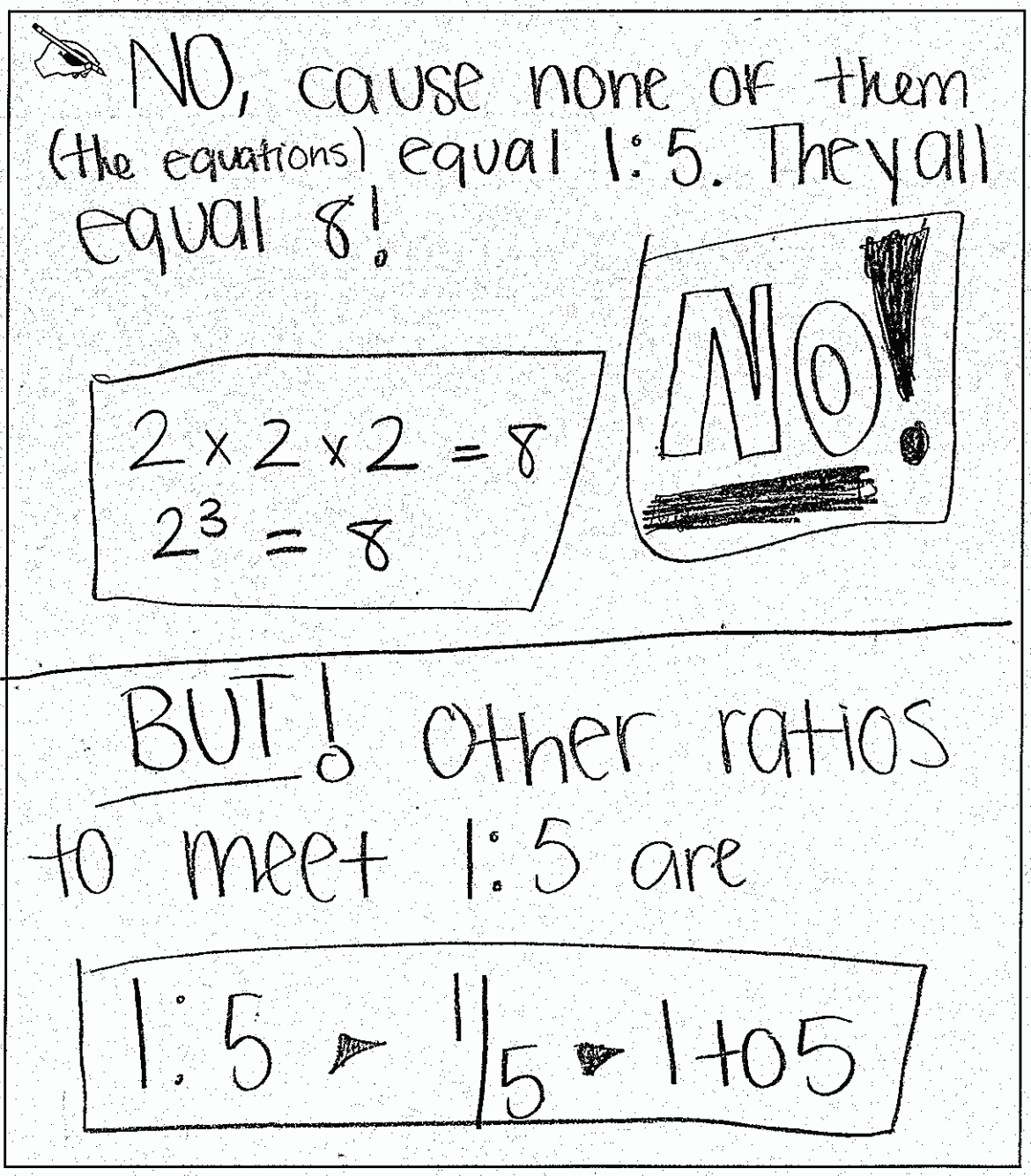


Litho#: 667703

A-9b

b. Is the ratio of the volumes of the smallest packing crate to the largest packing crate 1:5? Use ratios and/or ratio language to explain why or why not.



Litho#: 667703

Guide 9 Litho 667703

Total Content Points: 1 (6.EE.A.1)

Total Practice Points: 0

In this response, the student writes two expressions, one with an exponent ($10 \times 10 \times 10$; 10^3), to represent the volume of the large crate, and states equivalence of these to 1000 ("will all equal 1,000") (6.EE.A.1). A third equation given ($5 \times 5 = 10 \times 10 \times 10$) is incorrect, but does not count against the student in the context of this content standard. The student does not connect the pieces to produce a ratio from the volumes, which were correctly calculated for both crates (no credit for 6.RP.A.1). The gaps in reasoning prevent the student from making a comparison to the ratio given in the task (no credit for 6.RP.A.3). Thus, the student has not completely made sense of the problem (no credit for MP1).

Total Awarded Points: 1 out of 4

Task 4. Packing Crates Task

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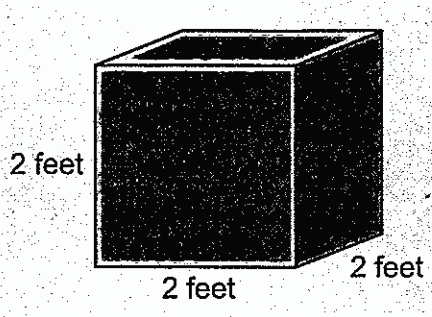

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The largest crate his company makes is 10 feet on all sides.

a. Write 2 different equations to represent the volume of the largest packing crate made by Kyle's company. One of the equations must use exponents.

103 or 10:10

largest Paking crates
V=1,000
Smallest Paking crate
V=8

Litho#: 692358

A-10b

b. Is the ratio of the volumes of the smallest packing crate to the largest packing crate 1:5? Use ratios and/or ratio language to explain why or why not.

NO, b/c The Largest paking crates v=1,000 and the smallest paking crates v=8, so 1:5 is Nither the smallest or the largest paking crates. b/c of the reasoning.

Litho#: 692358

Guide 10 Litho 692358

Total Content Points: 0

Total Practice Points: 0

In this response, the student writes only one expression (10^3) to represent the volume of the large crate (no credit for 6.EE.A.1). The student does not write a ratio or use ratio language comparing the volumes of the two crates (no credit for 6.RP.A.1). The student does not use the volumes of the two crates to support a logical comparison to the ratio 1:5 (no credit for 6.RP.A.3); thus the student does not demonstrate making sense of the problem (no credit for MP1).

Total Awarded Points: 0 out of 4