

Focus  
Standards  
and Claim

Claim 3  
6.RP.3.b

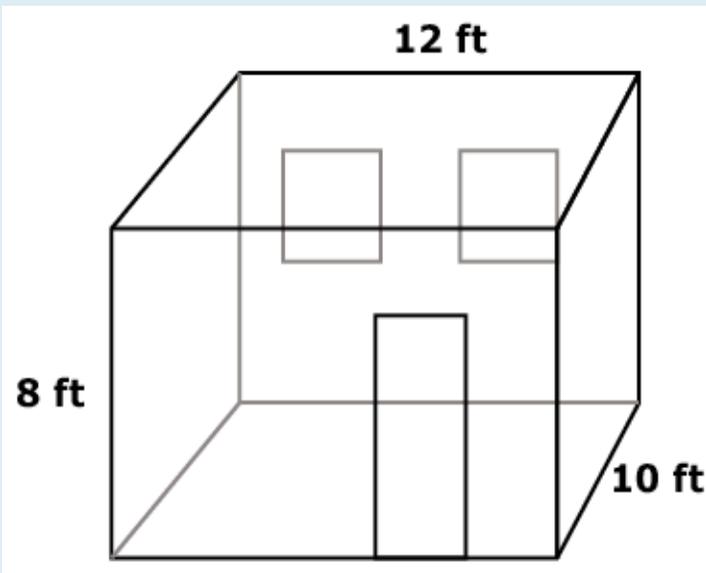
Stimulus

### Let's Paint a Room

Your friend Sam wants to paint her room. She wants to paint the ceiling white and the four walls purple.

You are helping Sam determine the cost and the amount of time needed to paint her room.

The room is shaped like a rectangular prism with a height of 8 feet, length of 12 feet, and width of 10 feet as shown.



Additional information about Sam's room:

- The door has an area of 22 square feet.
- The room has 2 square windows.
- Each window opening is 2 feet by 2 feet.

## Item Prompt

Sam and you are going to paint your room together.

Sam takes 10 minutes to paint 25 square feet.

It takes you 5 minutes to paint 25 square feet.

Sam says, "If we paint together, then it will take 15 minutes for us to cover 50 square feet."

Give an explanation to convince Sam that she is **incorrect**.

## Scoring Guide

SCORE	2 POINTS	1 POINT	0 POINTS
	Correct explanation	Elements of the explanation are correct, but the logic of the argument is fragmented or flawed.	All other responses.

## Sample Responses

### Student Sample A



Sam's explanation is incorrect. It would take 10 minutes to paint 50 square feet. If Sam and I painted at the same time I would finish first (5 minutes). Sam would finish 5 minute (after 10 minutes). After we both finish we would have covered 50 square feet in 10 minutes. It would take 10 min for 50 if she stopped painting. If she continued it would take 10 min for 75 ft.

#### SCORE RATIONALE

The student was able to refute Sam's claim by focusing on the time. Specifically, the explanation focuses on what could happen in 10 minutes: The student could paint 25 square feet and then stop, which would be 5 minutes of elapsed time. Sam could paint during this time, and then continue to paint for the remaining 5 minutes, which would result in completing 25 more square feet. Together, they would paint a total of 50 square feet in 10 minutes, as opposed to the 15 minutes claimed by Sam. Although there is not a lot of evidence of explicit reasoning about unit rates or how to handle two different constant rates, the student provided clear evidence of using the context to reason about the relevant quantities, including pointing out that 75 (square) feet could be covered in 10 minutes if both painters continued painting during the 10 minutes.

### Student Sample B



Alone it would take me 10 minutes to paint 50 square feet. With you alone it would take 20 minute just to paint 50 square feet. If we paint together for 15 minutes I would have painted 75 square feet, while you would have made 30 square feet. So if we work together for 15 minutes we would have painted 105 square feet.

#### SCORE RATIONALE

The student demonstrated that Sam is incorrect by focusing on the relevant rates. The response does include mathematical errors: The area covered by "you" in 15 minutes is incorrect (30 square feet), and as a result, the statement about the combined painted area is incorrect (105 square feet). However, there is strong evidence of reasoning about rates in context, including a clear understanding that in 15 minutes the student alone would have painted 75 square feet, and by working together for 15 minutes, Sam and the student would cover their combined total areas, which is a lot more than the 50 square feet in Sam's claim.

## Student Sample C



Sam's statement is wrong because she just added the time and the number of square feet. In reality Sam would paint 37.5 square feet and I'll paint 75 square feet. In 15 minutes we would paint 112.5 square feet.

### SCORE RATIONALE

This response provides clear evidence of reasoning successfully about the two different given constant rates. The student used the given painting rates for each person to correctly calculate the square feet each person would cover in 15 minutes. The student would paint 75 square feet in 15 minutes, while Sam would paint 37.5 square feet in the same amount of time. This totals more than the 50 square feet in Sam's claim.

## Student Sample D



When I am done painting my 25 she will still be painting so I will be painting another 25 square feet which will add up to 75 feet of area and then there will still be 5 more minutes so then I can paint another 25 which will add it up to 100 square feet.

### SCORE RATIONALE

Although the student only accounted for the area painted by himself/herself after the first 10 minutes of painting together ("there will still be 5 more minutes so then I can paint another 25"), the argument makes clear that more than 50 square feet will be painted in 15 minutes by both the student and Sam together. The response provides evidence of using the context to reason informally, but correctly, about the two different given rates and to coordinate these rates with appropriate time intervals. Note: This response could reasonably be given a score of 1 point, in part because the student did not address Sam's claim directly and the item is aligned to Claim 3. We gave the response full credit for being a clear and correct explanation that is well-reasoned within the context.

## Student Sample E



Sam is incorrect because if it takes us 5 minutes to paint 25 square feet, double of 25 is 50 and double of 5 is 10 so it would only take us 10 minutes to paint 50 square feet.

**SCORE RATIONALE**

This response addresses Sam's claim directly, and the student was correct in stating that it takes less than 15 minutes to paint 50 square feet. However, the student seemed to only take into account the amount painted by one person ("takes us 5 minutes to paint 25 square feet"); this is the rate for the student alone, and there is no consideration of Sam's painting rate.

## Student Sample F



Sam is incorrect because I would be done first, and it would only take 10 mins for 50 square feet.

**SCORE RATIONALE**

This response provides evidence of robust mathematical reasoning in context, and could arguably be given full credit. However, the explanation does not take into consideration Sam's painting rate, or a role for Sam at all. The first part of Sam's claim is, "If we paint together. . . ." The student seemed to ignore this premise, which is an important aspect of the situation.

## Student Sample G



Sam is incorrect because he/she takes 10 minutes to cover 25 square feet. It is not going to take 15 minutes because what if I take longer or we run out of paint.

**SCORE RATIONALE**

The student did not demonstrate why Sam is incorrect. The argument includes some mathematical reasoning, but relies on rather extraneous hypotheticals ("what if I take longer or we run out of paint").

**Student Sample H**

She is incorrect cause it will take 30 mins to cover 50 square feet.

**SCORE RATIONALE**

The student provided no evidence to explain or support the statement in his/her response.

**Student Sample I**

Sam would be incorrect because  $10 \times 5 = 50$  not 15. It would be 50.  $25 + 25$  is 50.

**SCORE RATIONALE**

This response includes fragmented mathematical reasoning and no evidence of understanding the significance of the given rates. It is unclear why the student multiplied the given painting times (" $10 \times 5 = 50$  not 15"), but perhaps this was an attempt to consider a product rather than a sum, since the context involves square feet.