Task: Art Task	**5th Grade**

Mrs. Fox, the art teacher at Eastside Elementary school, has an empty space on her wall 6 ft. x $3\frac{1}{3}$ ft. She was given some white tiles that measure $\frac{1}{3}$ ft by $\frac{1}{3}$ ft. She wants her 175 fifth grade students to each design and paint a tile to be hung in the empty space on the wall

1. Will there be enough room in the designated space to hang all 175 tiles? Justify your answer with a picture or a diagram.

2. What is the area of the space Mrs. Fox wants to fill? Justify your answer with words, diagrams, or an equation.

Teacher Notes

Tiles are not sold in$\frac{1}{3}$ ft by $\frac{1}{3}$ ft dimensions. However, for the purpose of this task to address the desired standard, the tiles are measured this way.

Also, the tiles are to be placed without grout between them. The edges are meant to touch.

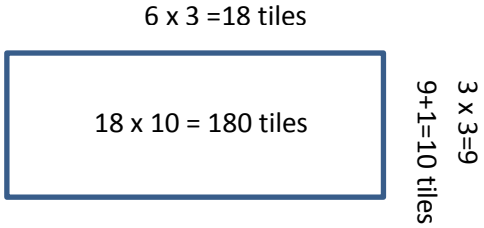
Common Core State Standards for Mathematical Content	**Common Core State Standards for Mathematical Practice**
5.NF.B.4a Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. *For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)* 5.NF.B.4b Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.	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. 6. Attend to precision. 7. Look for and make use of structure.

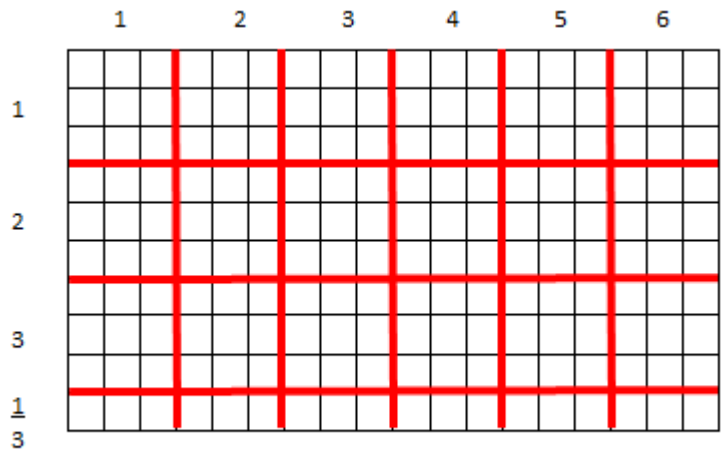
Essential Understandings/NCTM Resources

- Each multiplicative expression developed in the context of a problem situation has an accompanying explanation, and different representations and ways of reasoning about a situation can lead to different expressions or equations.

- The interpretations of the operations on rational numbers are essentially the same as those on whole numbers, but some interpretations require adaptation, and the algorithms are different.

Explore Phase

Possible Solution Paths	**Assessing and Advancing Questions**
Question 1: The student may realize that there are 3 thirds in a whole foot. Thus, for the length of the space, 6 x 3=18 so 18 tiles will fit along the length of the space. Similarly, for the width 3 x 3 =9 plus one more to make the 1/3 means that 10 tiles will fit along the width. 18 x 10=180. Thus the 175 tiles will fit in the designated space.  	Assessing Question: • How many thirds are in a whole? • Can you explain how you calculated how many tiles would fit along the length of the space? The width? • Can you explain your model? Advancing Question: • Can you find another way to get the 180 tiles?
Question 1: The student may draw in the tiles showing 3 within each foot counting the 180 tiles.	Assessing Question: • Can you explain your model? • How did you compute that there is room for 180 tiles? Advancing Question: • Can you write an equation to represent your work?

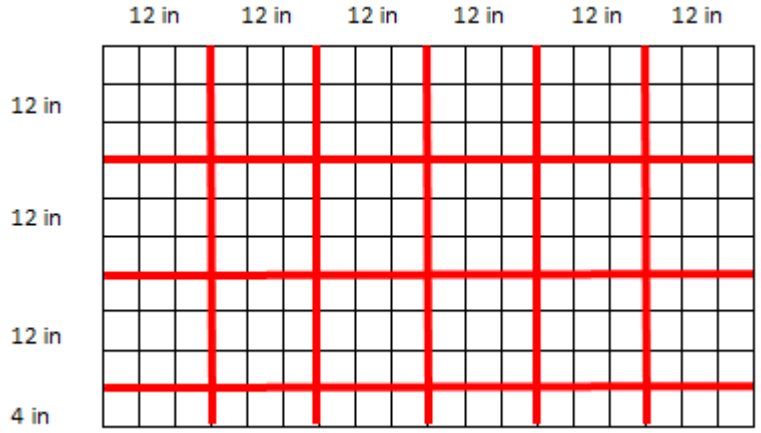


Thus the 175 would fit.

Question #1:
The student may change all measurements to inches. This makes each tile 4 inches by 4 inches.

The wall would be 6 feet x 12 inches which would be 72 inches long.
It would be 3 x 12 =36 inches plus 4 more to be 40 inches wide.

72/4=18 and 40/4=10 giving 18 x 10=180 tiles
Thus the 175 would fit.

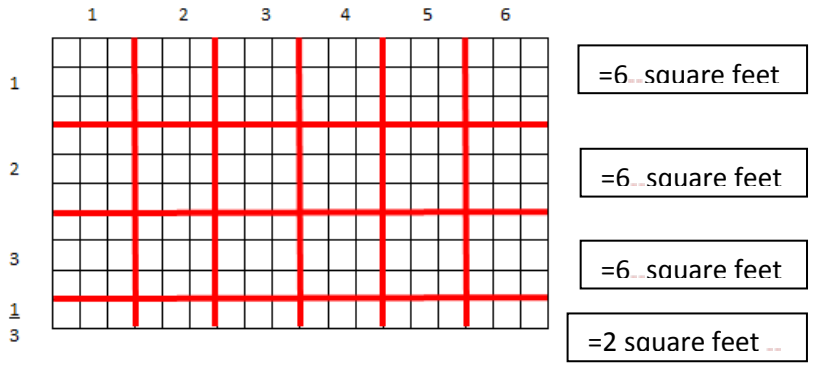


Assessing Questions:

- Can you explain where the 4 x 4 came from?
- Why did you change the measurements into inches?
- Why is there a 4 along the width when all of the other numbers are 12's?
- Can you explain your model?

Advancing Questions:

- Can you work this problem using feet?

Question #2: The student may multiply to find area. $6 \times 3\frac{1}{3} = 6 \times \frac{10}{3} = 20\ ft^2$	Assessing Questions: • Why did you multiply? • Can you explain where the 10/3 came from? • Can you explain the square feet? Advancing Question: • Can you find another way to find the area?
Question #2: The student may realize that each individual tile has an area of $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$ Thus $180 \times \frac{1}{9} = 20\ ft^2$	Assessing Questions: • Can you explain the 1/9? • Why did you multiply by 180? • Can you explain your labeling? Advancing Questions: • Can you find another way to find the area?
Question #2: The student may find the area in inches. $72 \times 40 = 2880\ in^2$	Assessing Questions: • Can you explain where the 72 and 40 came from? • Why did you multiply? • Can you explain your labeling? Advancing Questions: • Can you find the area in feet? • Can you find the area another way?
Question #2: The student may look at this representation:  And count the square feet.	Assessing Questions: • Can you explain your drawing to me? • What do your labels represent? Advancing Questions: • How do you count the square feet with the 1/3? • Can you find the area another way?
Question #2:	Assessing Questions:

The student, working in inches, calculates that each tile has an area of 16 in^2 x 180 tiles =2880 in^2	• Why did you multiply? • Can you explain where 16 and 180 came from? • Can you explain your labeling? Advancing Questions: • Can you find the area in feet? • Can you find the area another way?
Possible Student Misconceptions	
The student may fail to realize that the tiles have fractional dimensions multiplying 6 by 3 1/3 to get the number of tiles.	Assessing Questions: • Can you explain why you multiplied 6 times 3 1/3? • What are the dimensions of 1 tile? Advancing questions: • How many tiles can fit in a square foot? • How much of 1/3 of a foot?
The student may calculate perimeter instead of area.	Assessing Questions: • Can you explain your calculation? • Can you define area? Advancing Question: • What is the difference between area and perimeter?
The student may change part of the dimensions into inches and leave part in feet.	Assessing Question: • Can you explain the units associated with each of the numbers you are working with? Advancing Question: • What does a square inch look like? What does a square foot look like? How are they different?
Entry/Extensions	**Assessing and Advancing Questions**
If students can't get started….	Assessing Questions: • What does the 6 represent? The 3 1/3? • What is the problem asking you to find? Advancing Question: • Can you draw a model to represent the space on the wall?
If students finish early…	If the tiles were 1/5 ft. by 1/5 ft. would 175 still fit? What if they were ½ ft by ½ ft? Would 175 still fit? Why or why not? Do you see any patterns
Discuss/Analyze	
Whole Group Questions	

• What are the different ways we can find the area of this space on the wall?
• What is tiling? How does multiplication relate to tiling?
• Can you explain how to handle the tiles being 1/3 ft by 1/3 ft?
• Is it possible to work this problem without multiplying by a fraction?