Task: Sally's Garden	5th Grade

Sally wants to plant a vegetable garden in her back yard. Her mom agrees that she can use a space 5/6 of the length of the yard and ¼ the width of the yard.

1. What fraction of the total area of the backyard is Sally's garden? Draw a model to justify your reasoning or explain your reasoning in words.
2. Sally wants ½ of her garden planted with corn, 3/10 with beans, and 1/5 in tomatoes. What fraction of the total area of the yard will be planted in each? Draw at least 1 model to justify your reasoning.
3. Sally's backyard measures 75 ft by 60 ft. What is the area of Sally's garden? How much area will be allotted for corn? Beans? Tomatoes? Justify your reasoning with words, models, or equations.

Common Core State Standards for Mathematical Content	Common Core State Standards for Mathematical Practice
CCSS.Math.Content.5.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. CCSS.Math.Content.5.NF.B.4a Interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a × q ÷ b$. *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.)* CCSS.Math.Content.5.NF.B.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem	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.

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.
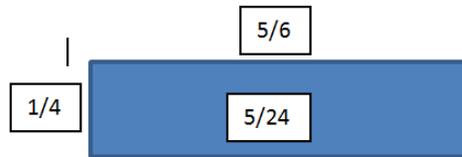
| **Explore Phase**	
Possible Solution Paths	**Assessing and Advancing Questions**
1. The student may multiply to get the fraction of the yard: 5/6 x 1/4= 5/24 Model: 	Assessing Question: • Can you explain your model? • Can you explain why you multiplied? • Where did 24 come from? Advancing Question: • How does 5/24 compare in size to 1/4 and 5/6? Can you explain why this happens?
1. The student may use an area model to realize that the garden is 5/24 of the yard. 	Assessing Question: • Can you explain your model? • Why are there 24 pieces? • Can you explain the shading on your model? • Can you show me where 5/24 is in your diagram? Advancing Question: • Is there another way to get 5/24? • How does 5/24 compare in size to 1/4 and 5/6? Can you explain why this happens?
2. The student may multiply to get the fractional part: Corn: 5/24 x 1/2= 5/48 Beans: 5/24 x 3/10= 1/16 Tomatoes: 5/24 x 1/5= 1/24	Assessing Questions: • Can you explain why you multiplied? • Can you show me how you multiplied? • Can explain where 1/8 came from on the diagram? • Can you explain where 1/6 came form on the diagram? • Why does each box represent 1/48? Advancing Questions:
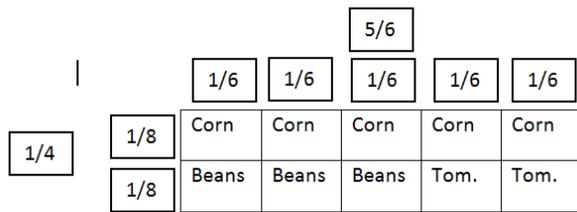
  In the model, each box represents 1/48 of the yard. Thus, each vegetable takes up the amount of the yard listed above.	• What happens when I add up 5/48, 1/16, and 1/24? Why does this happen? • What would the rest of Sally's yard look like?

2.
 	
In this model, the student cuts each row in half again to create 10 spaces in the garden since 10 is the LCD for 2, 5, and 10. Thus, the new model has 48 spaces giving each vegetable the following fraction of the original yard:
      Corn: 5/48
      Beans: 1/16
      Tomatoes: 1/24
	Assessing Questions:
	• Can you explain how you divided the picture into boxes?
	• Where did the original 24 boxes go?
	• Why did you split all of the boxes in half?
	• Can you explain how the answer for corn is 5/48?
	Advancing Question:
	• What happens when I add up 5/48, 1/16, and 1/24? Why does this happen?
	• Is there another way to get these answers?

3. The student finds the total area of the yard: 75 x 60= 4500 ft^2 The student then multiplies the fraction of the garden by the total area to get how much area the garden has. 5/24 x 4500 = 937.5 ft^2 The student continues multiplying to get the area for each	Assessing Questions: • Can you explain how you got 937.5 ft^2? • Can you explain why you multiplied? • How did you get 4500 ft^2? Advancing Questions: • Is there another way to get the answers? (trying to get them to see the "OR" way listed below) • Can you draw a picture to show your reasoning?

vegetable:

Corn: 937.5 x 1/2= 468.75 ft^2 OR 4500 x 5/48 = 468.75 ft^2
Beans: 937.5 x 3/10= 281.25 ft^2 OR 4500 x 1/16 = 281.25 ft^2
Tom.: 937.5 x 1/5 = 187.5 ft^2 OR 4500 x 1/24= 187.5 ft^2

3.

Corn	Corn	Corn	Corn	Corn	
Beans	Beans	Beans	Tomatoes	Tomatoes	

On the above diagram, the student realizes that each box is 1/48 of the yard and thus represents 1/48 of the area.

1/48 of 4500 yd^2 is 93.75 yd^2. The student then extrapolates to get the area of each vegetable and the entire garden.

Assessing Question:
- Can you explain why each box is 1/48 of the area of the yard?
- How did you get 93.75 ft^2?
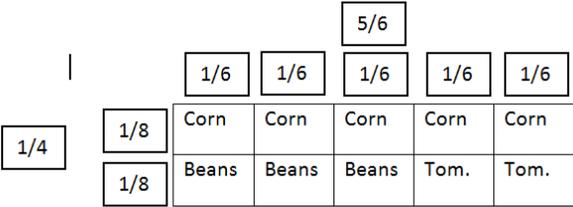- What happens to the 4500?

Advancing Questions:
- Can you find another way to get the same answer?

3.

The student may go back to this model where each box represents 1/24 of the area of the yard. Then each box has an area of 187.5 ft^2.

Then the student must work with the 1/2, 3/10, and 1/5 to find the areas for each vegetable.

Assessing Question:
- Can you explain why each box is 1/24of the area of the yard?
- How did you get 187.5 ft^2?
- What happens to the 4500?

Advancing Questions:
- Can you find another way to get the same answer?

Possible Student Misconceptions	
Question 1: The student may find perimeter instead of area.	Assessing Question: • What does area mean? • Why did you add? Advancing question: • Can you draw a representation of area that doesn't involve fractions?
Question #2: The student may not split all of the boxes in the model in half thus having 30 pieces instead of 48 pieces.	Assessing Question: • Can you explain how you divided up the boxes? Advancing Questions: • Why are the top boxes smaller than the bottom boxes? Does this matter?
Question #2: In this model: 5/6 1/6 1/6 1/6 1/6 1/6 Corn Corn Corn Corn Corn 1/8 1/4 1/8 Beans Beans Beans Tom. Tom. The student may fail to split the ¼ in half and try to say in this picture each box is 1/24.	Assessing Question: • Why did you multiply by ¼? • Can you explain your model? • Can you explain where the 1/6 came from? Advancing Question: • What happens when you split ¼ into two equal pieces?
Question #3: The student takes 1/2, 1/5, and 3/10 of the WHOLE area of the yard (4500 ft^2) instead of working with the area of just the garden	Assessing Question: • What is the area of Sally's whole yard? • Will the area of Sally's garden be smaller or larger than the entire yard? Advancing Questions: • Can you draw a model to represent how you calculated 4500?
Entry/Extensions	**Assessing and Advancing Questions**
If students can't get started….	Assessing Questions: • What is the problem asking you to find? • Can you draw Sally's yard? Advancing Questions: • Can you draw where Sally's garden would be in the yard?

	• How do we model area?
	• Can you draw a representation of 1/4? 5/6?
If students finish early…	If a tomato plant needs 12 ft^2 of space to grow, how many tomato plants can Sally plant in her new garden? Justify your reasoning with words, models, or equations.

Discuss/Analyze

Whole Group Questions

- How do we model area?
- Can you explain why multiplying by ½ is the same as dividing a shape into 2 equal pieces?
- Why on question #2 did we end up with 48th's?
- Can you explain how to multiply a fraction by a fraction?
- Can you explain how to multiply a fraction by a whole number?
- Can you model multiplying a fraction by a fraction?