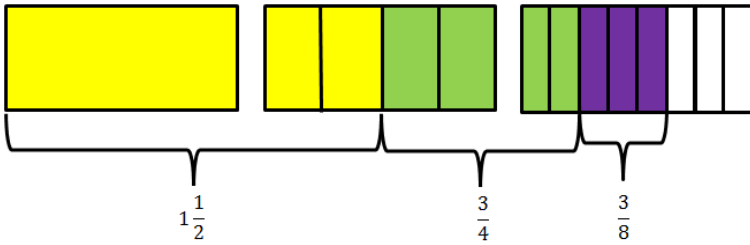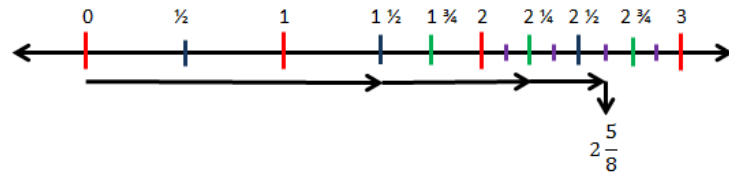| Task: Apple Orchard Task	5th Grade

1. Andrea, Anthony, and Amy were in the orchard picking apples. Andrea picked $\frac{3}{4}$ of a bushel, Anthony picked $\frac{3}{8}$ of a bushel, and Amy picked $1\frac{1}{2}$ bushels. How many bushels of apples did they pick? Draw a model to represent your thinking.

2. Their Grandma needs $3\frac{1}{4}$ bushels to make apple jelly. Did they pick enough apples? If so, how much extra do they have? If not, how much more is needed? Draw a model to represent your thinking.

Teacher Comments:

The intent of this task is to be an introduction into adding fractions with unlike denominators. Students are to explore their ideas from what they know about adding fractions BEFORE they are taught how to work with unlike denominators.

Common Core State Standards for Mathematical Content	Common Core State Standards for Mathematical Practice
5.NF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)* 5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < ½.*	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct a viable argument 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

- The interpretations of the operations on rational numbers are essentially the same as those on whole numbers, but some interpretations require adaptations and the algorithms are different.
- Estimation and mental math are more complex with rational numbers than with whole numbers.

Explore Phase

Possible Solution Paths	Assessing and Advancing Questions
1. Students may change the denominators to be "like" and add the fractions together: $\frac{3}{4} + \frac{3}{8} + 1\frac{1}{2} = \frac{6}{8} + \frac{3}{8} + \frac{12}{8} = \frac{21}{8} = 2\frac{5}{8}$ bushels of apples	Assessing Questions: • Can you explain your equation? • How did you get $\frac{12}{8}$? • Why did you add? Advancing Questions: • (If not labeled) What does the $2\frac{5}{8}$ represent? • Can you draw a picture to demonstrate your thinking?

1. Students may add pictorially: $1\frac{1}{2}$ $\frac{3}{4}$ $\frac{3}{8}$ $= 2\frac{5}{8}$ bushels of apples	Assessing Questions: • Can you explain your picture? • I don't see $2\frac{5}{8}$ on your picture. Can you explain how that is your answer? • Why are your rectangles unevenly divided? Advancing Questions: • Can you write an equation to represent your picture? How? • (If not labeled) What does the $2\frac{5}{8}$ represent? • How many eights are in a half? In one and a half? • Can you show me how to draw the picture using only eighths?
1. Students may add on a number line Thus, they picked $2\frac{5}{8}$ bushels of apples.	Assessing Questions: • Can you explain what the arrows represent? • Can you explain the number line? • Can you explain the marks on your number line? Advancing Questions: • Can you write an equation to represent your picture? How? • (If not labeled) What does the $2\frac{5}{8}$ represent? • Can you show me how to fill in all of the one eights on your number line? • How many eights are in one half? In one and a half?
2. They did not pick enough apples. Students may subtract to justify: $$3\frac{1}{4} - 2\frac{5}{8} = 3\frac{2}{8} - 2\frac{5}{8} = 2\frac{10}{8} - 2\frac{5}{8} = \frac{5}{8}$$ Thus, they need $\frac{5}{8}$ of a bushel more apples in order to have enough.	Assessing Questions: • Why did you subtract? • Why did you find common denominators? • Can you explain how you got $2\frac{10}{8}$? Advancing Questions: • (If not labeled) What does the $\frac{5}{8}$ represent? • Can you draw a picture to demonstrate your thinking? • Can you subtract without common denominators? Why or why not? • Is your answer reasonable?
2. **(see misconception below) They did not pick enough apples. Students may subtract "chunks" instead of the entire amount to justify their thinking.	Assessing Questions: • Why did you subtract? • Can you explain why you subtracted three times?

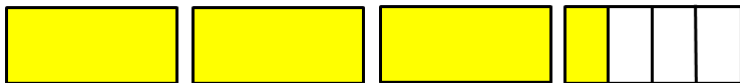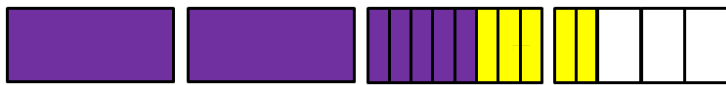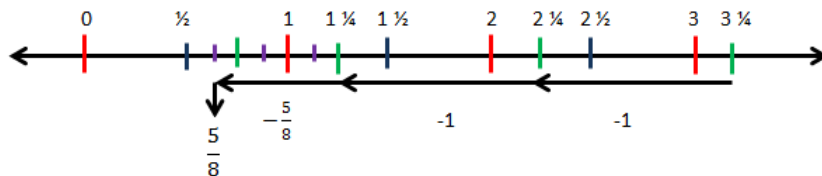|	
$$3\frac{1}{4} - \frac{3}{4} = 2\frac{1}{2}$$ $$2\frac{1}{2} - 1\frac{1}{2} = 1$$ $$1 - \frac{3}{8} = \frac{5}{8}$$ Thus, they need $\frac{5}{8}$ of a bushel more apples in order to have enough.	• Why did you choose to subtract in this order? Advancing Questions: • Would your answer have changed if you subtracted the $\frac{3}{8}$ before the $\frac{3}{4}$? • (If not labeled) What does the $\frac{5}{8}$ represent? • It is possible to solve the problem with only 1 equation. How? • Can you draw a picture to demonstrate your thinking? • Is your answer reasonable?
2. They did not pick enough apples. Students may use a pictorial representation to justify their thinking. Start with 3 ¼ : Take away $2\frac{5}{8}$ (purple): That leaves $\frac{5}{8}$ unaccounted for (yellow). Thus, they need to pick $\frac{5}{8}$ of a bushel more to have enough apples.	Assessing Questions: • Can you explain your picture? • Why did you take away $2\frac{5}{8}$? • Can you explain the "white" boxes? Advancing Questions: • Can you write an equation to represent your picture? How? • (If not labeled) What does the $\frac{5}{8}$ represent? • Where are the apples that Amy picked represented in your picture? Andrea? Anthony? • Is your answer reasonable?
2. Students may subtract on a number line: Thus, they need to pick $\frac{5}{8}$ of a bushel more to have enough apples.	Assessing Questions: • Can you explain your number line? • Why did you start on the right hand side of the number line? • Can you explain the "tick marks" on your number line? Advancing Questions: • Can you write an equation to represent your number line? How? • (If not labeled) What does the $\frac{5}{8}$ represent? • Where are the apples that Amy picked represented in your picture? Andrea? Anthony? • Is your answer reasonable?
2. Students may use addition to find the amount needed to get from $2\frac{5}{8}$ to $3\frac{1}{4}$: The may calculate this pictorially, on a number line, or with an	Assessing Questions: • Can you explain your number line (equation)? • Why did you use addition? • Can you explain what each arrow represents (on the number line)?

equation.	Advancing Questions:

equation.

For example, looking at this number line, how much more would I need to get to 3 ¼ ?
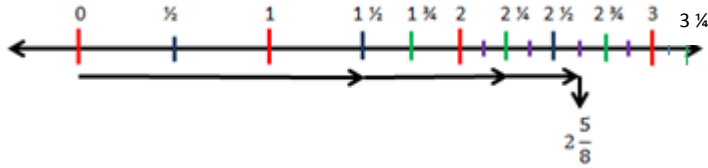
I would need $\frac{5}{8}$ more. Thus, they need to pick $\frac{5}{8}$ of a bushel more to have enough apples.

OR as an equation: $2\frac{5}{8} +$ _____ $= 3\frac{1}{4}$

Advancing Questions:
- Can this problem be worked another way?
- Can you write an equation to represent the number line?
- Can you draw a picture to represent your equation?
- (If not labeled) What does the $\frac{5}{8}$ represent?
- Is your answer reasonable?

Possible Student Misconceptions

Students may add both numerator and denominator. This is especially typical when working with the equation.	Assessing Questions: - Can you explain your work? - Why did you add both the numerators and denominators? Advancing Questions: - What happens to fractions as you change their denominator? - How does your answer compare to each of the numbers of bushels picked by Andrea, Amy, and Anthony? - Is your answer reasonable?
Students may lack precision in their number lines or in partitioning the rectangles leading to incorrect answers.	Assessing Questions: - Can you explain the markings on your drawing? - Can you show me ¼ on your drawing? $\frac{1}{8}$? Advancing Questions: - Are your intervals (partitions) precise? Why or Why not?
**Students may string these together as one long connected equation. This does not preserve the property of equality and is a VERY common mistake when students work with an operation repeatedly. $$3\frac{1}{4} - \frac{3}{4} = 2\frac{1}{2} - 1\frac{1}{2} = 1 - \frac{3}{8} = \frac{5}{8}$$	Assessing Questions: - Can you explain your work? - Does $3\frac{1}{4} - \frac{3}{4} = \frac{5}{8}$? Advancing Questions: - Can you find a more accurate way to show your work? Show me.

Entry/Extensions	Assessing and Advancing Questions
If students can't get started…	Assessing Questions: • What do the numbers in the problem represent? • What is the problem asking you to find? Advancing Questions: • Can you draw a model to represent the apples?
If students finish early…	A bushel of apples weighs approximately 50 pounds. How many pounds of apples has Andrea picked? Anthony? Amy? How many mores pounds need to be picked so that Grandma has enough apples to make apple jelly?

Discuss/Analyze

Whole Group Questions

- How are the pictorial representations connected to the equations?
- Why when working with the equation was it so important to have common denominators?
- Are the common denominators shown in the other representations?
- How are addition and subtraction of fractions related?
- Can we estimate to check the reasonableness our answers? How? Is this important to check? Why or why not?