

Teaching Point:	Add and Subtract From a Whole	
Big Idea:	<ul style="list-style-type: none"> We can only add and subtract units that are the same. The same rules/properties for addition, subtraction, and multiplication of whole numbers can be used on fractions! We can rename fractions if we keep the relationship between the numerator and the denominator the same. Fractions are locations on a number line and we can use many strategies to compare their values 	
Standards Addressed:	<ul style="list-style-type: none"> 4.NF.3 d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. 	
Materials Needed:	<ul style="list-style-type: none"> Chart paper/doc cam Student copies of PST, application and exit ticket 	
Lesson Outline:	8 – PST 20 min – discussion and takeaways 15 – application problems 7 min – exit ticket	
Vocabulary	Numerator	The number above the line in a fraction that represents the number of parts we have out of the whole.
	Denominator	The number below the line in a fraction the number equal parts there are in total (the units)
	Unit fraction	A fraction whose numerator is one. It represents 1 shaded part of all the equal parts of the whole. The term “unit” means one.
	Decompose	Taking a number and breaking it into smaller parts (This can be done by both multiplication and addition)
	FGTO (Fraction Greater Than One)	When the numerator is greater than the denominator, you have a fraction that is greater than one whole.
	Mixed Number	A number greater than one whole that is made up of a whole number and a fraction

PST

Carlos is painting the walls in his apartment. The walls are all the same size. After painting two whole walls yellow, he starts on another wall. If he paints $\frac{2}{3}$ of another wall yellow, how many walls has he painted yellow so far?

Carlos started out with 2 whole cans of yellow paint. If he uses $\frac{2}{3}$ of a can of paint, how much yellow paint is remaining?

What we want students to get from this problem: This concept begins to address operations with fractions that are not as simple as just adding and subtracting the numerators and keeping the units the same because it addresses adding and subtracting from whole numbers. Adding to a whole is straightforward and can be done with mental math, but students will need to decompose/regroup when subtracting from a whole. Students should be able to do this with models (bar/tape and number lines) and with number sentences. They should be pushed to solve with more than one strategy throughout these concepts to build their conceptual understanding and fraction number sense. This will continue to build in concept 13 when we add across wholes and then begin to work with operations with mixed number starting in concept 14.

Today's Takeaways:

- When we add a fraction and a whole number, we can solve with mental math and make a mixed number!
- When we subtract a fraction from a whole number, we need to decompose or regroup one of the wholes into the units we are subtracting in order to subtract from it!

Work time on PST (8 min.):

- Routine: PSTs are intended to be focused, independent work unless otherwise noted. Teachers can use the discussion toolkit to plan for the discussion during this time and note misconceptions. Students should engage in the struggle and attempt to work for the whole time - rereading the problem or trying another model or strategy if they finish early. Teachers should only intervene if students have a misconception that needs to be addressed to access the problem (noted in the discussion planner).

Discussion (20 min):

- The following notes are a suggested discussion flow based on what we expect students to do to solve this problem. You may need to adjust or supplement based on the work that students produce during the PST.
- Each discussion is meant to be student focused with students sharing their thinking with the class. The suggested questions can be posed to the student sharing or to the class as the student shares. In order to have as many students engaged in the thinking as possible, pose many questions to the class while the student is sharing. Turn and talks can be very effective to get lots of students involved.

PST:

Part A: Carlos is painting the walls in his apartment. After painting two whole walls yellow, he starts on another wall. If he paints $\frac{2}{3}$ of another wall yellow, how many walls has he painted yellow so far?

Possible strategies:

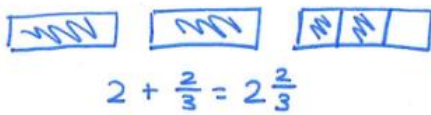
Discussion Setup:

- Today is a great day to have multiples strategies visible so students can draw connections between them! If you are using the doc cam, you can scribe the strategies on a separate chart or have students draw additional strategies on the board.

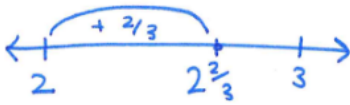
Suggested Flow and Key Questions:

Unpack the PST:

- Students might use a visual model or number line model to combine the wholes and the fraction:



$$2 + \frac{2}{3} = 2\frac{2}{3}$$



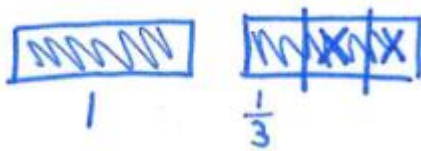
- They may also just solve with mental math because they can combine easily to make a mixed number!

$$2 + \frac{2}{3} = 2\frac{2}{3}$$

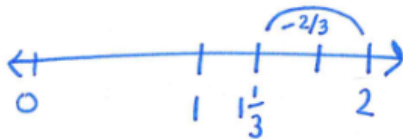
Part B: Carlos started out with 2 whole cans of yellow paint. If he uses $\frac{2}{3}$ of a can of paint, how much yellow paint is remaining?

Possible strategies:

- Look for strategies where the student decomposes/regroups a whole into thirds in order to subtract thirds from it.
 - Visual model:



- Number line model:

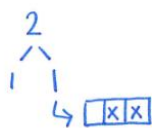


- With numbers:

- **Ask:** Retell part A and part B to your partner and discuss how they are similar/different.
 - In part A, Carlos painted 2 walls and then another $\frac{2}{3}$ of a wall and we're finding the total walls painted. It sounds like addition.
 - In part B, Carlos has 2 cans of paint and used $\frac{2}{3}$ of a can of paint. It sounds like subtraction.
 - Both problems use the same numbers, a whole and a fraction, but A is addition and B is subtraction.
- **Explain:** Today's we're adding and subtraction wholes and fractions! We're going to learn a lot from each other's strategies today.

Discuss part A: (This should only be 5 minutes of the discussion because it is so much easier than the subtraction)

- **Ask:** What number sentence matches part A and why?
 - $2 + \frac{2}{3}$ because we're combining the two walls that Carlos painted with the $\frac{2}{3}$ of a wall he painted.
- **Show student work Bar Model and number line.**
 - Note: If the vast majority of your class used mental math, you can skip ahead to that section!
 - Show both a completed fraction bar model and number line.
 - **Ask:** How did you know to draw 3 wholes? I thought this problem was about 2 wholes.
 - He painted more after her finished two, so we need to draw another whole in order to show the extra $\frac{2}{3}$.
 - **Ask:** How do the endpoints on the number line match the bar model?
 - The student started at two and went to three in order to add the extra $\frac{2}{3}$.
- **Show student work Mental math**
 - If anyone used mental math to solve, have them share.
 - **Say:** I noticed a few scholars didn't actually need a model to solve this. How did you know the sum would be $2\frac{2}{3}$ without a model?



$$2 - \frac{2}{3} = 1\frac{1}{3}$$

- Students might also convert the 2 into an FGTO in order to subtract. This is a great strategy, but can get tricky with large numbers, so make sure that students have an additional strategy if they start using this one for every problem.

$$\frac{6}{3} - \frac{2}{3} = \frac{4}{3}$$

- *I just put them together into a mixed number! 2 AND two more thirds makes $2\frac{2}{3}$.*

○ Name first takeaway:

- **When we add a fraction to a whole number, we can solve with mental math and make a mixed number.**

Discuss B:

- Ask: **What number sentence matches part A and why?**
 - $2 - \frac{2}{3}$ matches this story because he started with 2 whole cans of paint then used $\frac{2}{3}$ of a can of paint. We're finding the remaining amount.
 - Note: If anyone wrote $\frac{2}{3} + ? = 2$, you can discuss this too! We can always write subtraction as missing addend, but the context of this story doesn't suggest it, so you don't need to bring it up unless students do.
- Show student work: **Bar model (and connect with number sentences)**
 - If anyone drew two wholes and decomposed one into thirds to take away $\frac{2}{3}$, show their work first.
 - Note the habits of shading in the amount we have and crossing out the amount we are subtracting so we don't get confused about what's left.
 - Ask: **Why did you decompose this whole into thirds? What made you choose that unit?**
 - *We need to subtract two thirds from 2, so we need break up one of the wholes into that unit!*
 - Notice how you only need to decompose one of the wholes because we're subtracting something that's less than one.
 - **As you are discussing the bar model, discuss the number sentence that would match it (unless you have a student example to show)!**
 - Note how you can decompose the two into 1 and $\frac{3}{3}$ in order to take away the $\frac{2}{3}$. You can connect this to regrouping with the subtraction algorithm! We didn't have any thirds

$$2 - \frac{2}{3} = 1\frac{1}{3}$$

to take away, so we regrouped a whole into thirds so we could subtract. This is like when we take a ten and make it into ten ones in order to subtract in the ones place!

- **Make connections between the model and the number sentences.**
 - **Ask:** Based on this work, how can we answer the question in part B?
 - *Carlos has $1\frac{1}{3}$ cans of yellow paint left.*
- **Show student work: Number Line Model:**
 - **If anyone did a similar strategy with the number line, highlight their work now. Keep the bar model and number sentences visible as well.**
 - **Ask:** How does this number line match what we see with the bar model and the number sentences?
 - *We decomposed the whole between 1 and 2 into thirds to take $\frac{2}{3}$ away, but we didn't have to decompose the whole between 0 and 1.*
 - Note: students can just draw the whole between 2 and 3 to solve this problem. They don't need to start at 0.
- **Show student work: Convert wholes to FGTO**
 - **If anyone converted 2 into $\frac{6}{3}$, share now. If not, ask students:** Is there a way we could think about the number 2 as a fraction greater than one that could help us solve this?
 - *2 wholes = $\frac{6}{3}$.*
 - **Follow up:** Can we subtract $\frac{6}{3} - \frac{2}{3}$?
 - *Yes! That's $\frac{4}{3}$.*
 - Notice how we now have the same units – thirds!
 - **Follow up:** Is that the same as our other answer?
 - *Yes! We got $1\frac{1}{3}$ with the other strategies, which is equivalent to $\frac{4}{3}$.*
 - Note how this can be a helpful strategy with small numbers, but it's tricky if we have big numbers we're using.
- **Summarize:** In each one of these strategies, we had to decompose/regroup a whole in order to subtract! **Ask:**

How did we know what units to regroup/decompose into?

- *We chose thirds because we were subtracting thirds!*

Summarize and Name Takeaways:

- **Say:** Today we added a fraction to a whole and subtracted a fraction from a whole!
- **Explain your takeaways for adding fractions and whole numbers to your partner.**
 - When we add a fraction and a whole number, we can solve with mental math and make a mixed number!
- **Explain your takeaways for subtraction fractions from whole numbers to your partner.**
 - When we subtract a fraction from a whole number, we need to decompose or regroup one of the wholes into the units we are subtracting in order to subtract from it!

Application (15 min):

- Routine: After the discussion, keep all students together to start the application problems. Release students to finish application problems independently when they are demonstrating understanding.

Exit Ticket (7 min)

- Routine to reinforce: Exit tickets should be attempted by all students, even if they have not finished the application work. Exit ticket time should be silent, focused, and independent to collect real data on student understanding of the concept.
- Use the exit tickets to determine which students need a quick conference before the next lesson or to note students with larger misconceptions.

Planner:

Strategy	Looks Like	Student Names
Part A: Students who solve with a visual model or number line		
Part A: Students who solve with mental math	$2 + \frac{2}{3} = 2\frac{2}{3}$	
Part B: Students who model with fraction bars and decompose a whole into thirds		
Part B: Students who model with a number line and decompose a whole into thirds		
Part B: Students who decompose a whole numerically		
Part B: Students who convert 2 into $\frac{6}{3}$ to subtract	$\frac{6}{3} - \frac{2}{3} = \frac{4}{3}$	

Misconceptions to note:

Misconception	Student Names
Students who have difficulty determining the operation of each problem (intervene)	
Students with inaccurate models	
Other	

Small Group Planner: Note any students that will need follow up support based on this lesson.

Student Names	Focus

Name: _____

Problem-Solving Task

Part A: Carlos is painting the walls in his apartment. The walls are all the same size. After painting two whole walls yellow, he starts on another wall. If he paints $\frac{2}{3}$ of another wall yellow, how many walls has he painted yellow so far?

Part B: Carlos started out with 2 whole cans of yellow paint. If he uses $\frac{2}{3}$ of a can of paint so far, how much yellow paint is remaining?

Name _____

1) Solve using mental math:

$4 + \frac{3}{5} =$	$\frac{7}{8} + 4 =$	$\frac{1}{3} + \frac{1}{3} + 5 =$	$10 + \frac{5}{6} =$
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Why are you able to solve the problems above using mental math?

2) Solve each problem below. Show or explain your work for each.

$5 - \frac{6}{10} = ?$
$? = 3 - \frac{2}{6}$

$$8 - \frac{3}{4} = ?$$

3) Lindsey has 6 pages of lifework. She already completed $\frac{5}{6}$ of a page. How many pages of lifework does she have left to do?

4) Two sisters are eating brownies that are the same size. One sister has 5 whole brownies and the other has $\frac{3}{4}$ of a brownie. How many brownies do they have together?

Name _____

Exit Ticket

1. Find the sum using mental math:

$$7 + \frac{4}{5} = ?$$

2. Solve. Show or explain your work.

$$5 - \frac{7}{8} = ?$$

Name _____

Lifework

Today's takeaways:

- When we add a fraction with a whole number, we can solve with mental math and make a mixed number!
- When we subtract a fraction from a whole, we need to decompose or regroup one of the wholes into the units we are subtracting in order to subtract from it!

1) Solve the following problems using mental math:

$2 + \frac{1}{8} =$	$\frac{7}{10} + 3 =$	$\frac{2}{8} + \frac{3}{8} + 7 =$	$10 + \frac{5}{7} =$
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2) Solve each problem. Show or explain your work for each.

$$3 - \frac{1}{8} = ?$$

$$? = 6 - \frac{3}{4}$$