PBS Lesson Series

Math: Grade 5, Lesson 8, Subtracting with Mixed Numbers

Lesson Focus: Subtracting with mixed numbers
Practice Focus: Students will focus on using equivalent fractions to subtract fractions and mixed numbers with unlike denominators.
Objective: Students will apply their understanding of subtracting fractions to solve problems that require finding the difference between two mixed numbers using models as a strategy to solve.
Key Vocabulary: equivalent fractions, denominator, mixed fractions
TN Standards: 5.NF.A.1
Teacher Materials:

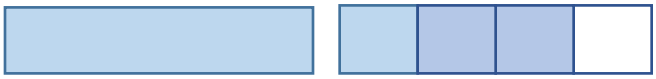
- paper and pencil or white board and markers
- you may also want the introduction problem printed so that you can refer back to it
- student practice packet

Student Materials:

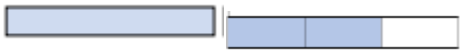
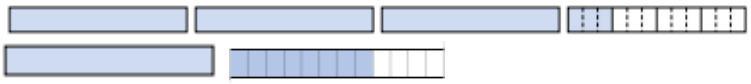
- Paper and a pencil, and a surface to write on

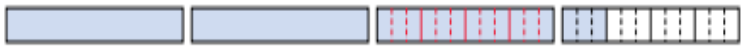
**Note: When writing fractions, remember to write them with a horizontal fraction bar and numerator and denominator lined up one on top of the other. This will help students avoid confusion when working with mixed numbers.*

Teacher Do	Student Do
<u>Opening (1 min)</u> **Hello! Welcome to Tennessee's At Home Learning Series for math! Today's lesson is for all our 5th graders out there, though all children are welcome to tune in. This lesson is the eighth lesson in our series.** **My name is ____ and I'm a 5th grade teacher in Tennessee schools! I'm so excited to be your teacher for this lesson! Welcome to my virtual classroom!** **If you didn't see our previous lesson, you can find it on the TN Department of Education's website at www.tn.gov/education. You can still tune in to today's lesson if you haven't seen any of our others. But it might be more fun if you first go back and watch our other lessons since we'll be talking about things we learned previously.** **Today we will be learning about subtracting with mixed numbers in mathematics! Before we get started, to participate fully in our lesson today, you will need:** ● Paper and a pencil, and a surface to write on **Ok, let's begin!**	Students get materials ready for the lesson.

Intro (4 minutes) **This warm up is going to be important practice for solving our problems with mixed numbers today. Let's start by thinking about mixed numbers! What do you recall about mixed numbers?** [pause] **That's great! You know that mixed numbers are numbers that are composed of a whole number and a proper fraction. Here is an example of a mixed number** [write 1 3/4 = ___] **This is the number one and three fourths. We can make a visual model of this mixed number by drawing fraction bars. Let's do that together now. Do have you paper and pencil ready?** [pause] **Great!** [as you talk through your thinking draw the following model]  **The whole bar represents the whole number 1, and the other bar represents the fraction 3/4; it's divided into four equal pieces and 3 pieces are shaded.** **If I divide the whole fraction bar into fourths and leave all of its sections shaded, it's still equal to one whole, it's just represented differently – as four fourths. How many shaded fourths are there in all?** [divide the whole bar into four fourths and pause]  **I agree, there are 7 fourths. So, one and three fourths are equivalent to 7 fourths.** [write 1 3/4 = 7/4] **Let's try another one. Try modeling an equivalent fraction to the mixed number one and five eighths** [write 1 5/8]. **How many fraction bars will we need to draw?** [pause] **Two? How do you know?** [pause] **I see, because we will need one bar to represent the one whole, and another to represent the five eighths. Good thinking!** [draw the following]  **How many shaded eighths are there?** [pause] **Yes! There are 13. So, one and 5 eighths are equivalent to 13/8.** [write 1 5/8 = 13/8] **Great job warming up!**	This warm up will support students in rewriting mixed numbers as fractions greater than 1 to prepare them for regrouping when subtracting mixed numbers. Students will listen to the teacher think aloud and follow along by writing on their own paper.

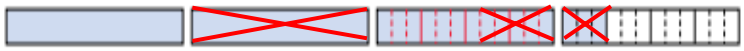
Now, we are ready for our first subtraction problem with mixed numbers.	
Teacher Model: (10 minutes) Objective # 1: Make sense of a contextual problem involving subtraction with mixed numbers. **Now that we are thinking about mixed numbers, let's think through a real world problem.** **On Saturday, Chloe spent 3 and one fourth hours at the park with her family. Then she spent 1 and two thirds hours riding her bike. How much longer did Chloe spend at the park than riding her bike? Give your answer as a number of hours.** **Now what is this problem telling us?** [pause] **Yes, the problem tells us how much time Chloe spent at the park, and how much time she spent riding her bike.** **I notice that the times are given to us as mixed numbers. Recall that mixed numbers are numbers that represent more than one; a whole number and a fractional part. I also notice that the fractions do not have like denominators which will be important when we are ready to do our calculations. For starters, let's visualize the mixed number by drawing these mixed numbers with fraction bars. You can draw them with me using paper and pencil.** [Draw the following models as you think aloud with the script]  **To model the 3 1/4 hours at the park, I know I need to draw 3 whole fraction bars to show the whole number 3 and another fraction bar to show the 1/4. Now, how many equal parts do they each need to be divided into?** [pause] **Okay, I'll divide them into fourths because the denominator tells me how many parts** [shade the model] **Our model shows 3 wholes, and one fourth.** **Now let's model the other mixed number from the problem, one and 2/3. How many whole fraction bars will I need to draw for this mixed number?** [pause] **Two? How do you know?** [pause] **Oh, because one fraction bar represents the one whole, and the other fraction bar represents the 2/3. Great! I'll give you a minute to draw it!** [pause]	Students are using what they know about mixed numbers to make sense of a contextual problem. Students are making sense of the problem. Students are modeling mixed fractions to determine equivalent fractions for subtracting.

Are you ready? Explain to me what you drew. [pause] **Great work! Now, I'll explain to you as I draw mine.** [as you think aloud, draw the model and write the equation] **To model 1 and 2 thirds, I draw one whole and shade it, and I draw another divided into thirds with 2 thirds shaded.** [pause]  **Let's think back to our problem. What is the problem asking us to find?** [pause and show students the problem again] **I heard someone say that the problem asks us to determine how much longer Chloe spends at the park than riding her bike. How can we determine that?** [pause] **I agree! Since the problem asks us to compare the two amounts of time, we can calculate the difference by subtracting.**	Students verbalize their understanding of modeling mixed numbers. Students are making sense of the problem and determining what operation to use for solving.
Objective #2: Teacher will instruct the process of how to use a model to solve a subtraction problem with mixed numbers. **The denominators in the mixed numbers are different. What can we do to help make them easier to subtract?** [pause] **Oh, okay. We can find a common denominator to make some equivalent fractions. Our denominators are 4 and 3. What will be our common denominator?** [pause] **Great! Our common denominator is 12 because 12 is a common multiple of 4 and 3.** **Now let's go back to our models to represent the mixed numbers with common denominators.** [refer back to models and talk through subdividing. The result will be as follows]  **To have enough twelfths to subtract, 3 3/12 will need to be regrouped. Just like we can regroup whole numbers when subtracting, we can also regroup fractions. How can we show this with the fraction bars?** [pause] **Excellent! 3 and 3 twelfths can be regrouped as 2 and 15 twelfths.** [model shown as below]	Students will follow along as the teacher thinks aloud modeling the thought process for solving the problem. Students are using what they know about multiples of 4 and 3 to find a common denominator. Students should recognize that accurate representations show the use of a common denominator for thirds and fourths.



$3\frac{3}{12} = 2\frac{15}{12}$

Using 12 as the common denominator, we subdivide one and two thirds into twelfths as well. [similar as the above, subdivide 2/3 into 8/12]. **We now have enough twelfths to subtract 1 and 8 twelfths. Do you remember how to show subtraction with our model? That's right we can cross off what we are removing from the larger number.**



Now that we have broken apart each mixed number into the whole-number part and the fraction part, we can write an equation to find the difference between the two times. What will the equation be? You can look at the fraction bars to help you. [pause]

Nice work! Our subtraction equation is 2 15/12 – 1 8/12 [write the equation].
2 wholes minus 1 whole equals 1 whole, and 15/12 minus 8/12 equals 7/12. [write the answer to the equation] **We can verify that by looking at our model. Notice on the model we have 1 whole and 7-twelfths left. Thus, Chloe spent one and seven twelfths longer at the park than riding her bike.**

Students create an equation that represents the context of the problem.

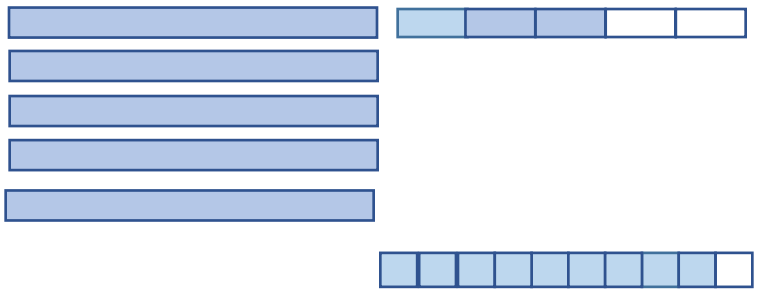
Objective #3: Tying together the Learning
Let's try another problem! [write the equation]

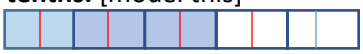
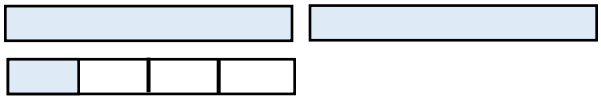
$$4\frac{3}{5} - 9/10$$

Students further solidify the process of using a model to subtract mixed numbers requiring regrouping.

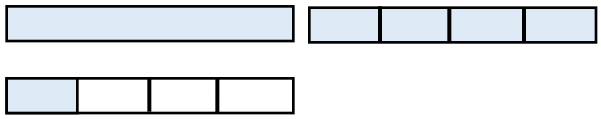
Start by drawing models for the minuend and subtrahend. Remember these are just the terms for the parts of a subtraction equation. Go ahead and try that now. [pause for < 1 min]

Did you draw something that looks like this? [share model]

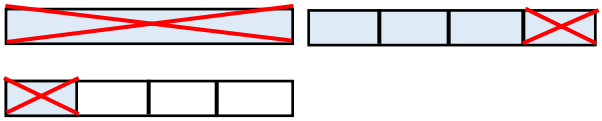


Great! **What will the common denominator be for 3/5 and 9/10?** [pause] **Yes, tenths! Because 10 is a common multiple of 10 and 5. Go ahead and subdivide the 3/5 into tenths.** [pause < 1 min] **How did you subdivide your model of 3/5?** [pause] **Smart thinking! By Just splitting each fifth in half, we get tenths.** [model this]  **There are 4 wholes and 6 tenths. Is that enough tenths for subtracting 9 tenths?** [pause] **You're right, it's not enough. What can we do?** [pause] **Good thinking! We can break apart, or regroup one of the four wholes into 10 tenths; that will give us enough tenths to subtract 9 tenths! Go ahead and regroup one of your 4 wholes.** [pause] [show one of the 4 wholes regrouped as ten tenths].  **So How do we use our model to subtract? That's right! We can mark them off since they are being removed.** [Cross off nine tenths.]**Can you write the equation and the answer?** **Check your work with mine!** [write the equation $6\frac{16}{10} - \frac{9}{10} =$ pause] **Did you get 6 and seven tenths?** [pause] **Great!**	
<u>Guided Practice</u> (10 minutes) (I do) **Let's practice some problems together! Let's try 2 ¼ - 1 ½ .** [Write the problem on your paper]. **Can you draw the model on your paper while I draw mine?** [Pause] **Okay. Let's check your work.** [Draw the model for students to check their work. As you do a think aloud] **Two and one-fourth…I need two…no three wholes and the third one should be divided into fourths.** 	Students are practicing subtracting mixed numbers when regrouping is necessary. They will follow a gradual release model of I do, we do, you do in order to prepare them for independent practice.

Can I remove 1 ½ from my model? No…I need to split my fourths into two pieces. What does that create? Can you say the answer? [Pause] **That's it! It creates eights. Who remember why?** [Pause] **I heard 8. Did you say 8? A common multiple for 2 and 4 is 8. I also heard 4. Is 4 a common multiple for 2 and 4?** [Pause] **It is! We could use either and get a correct answer. For this problem, I'm going to use fourths since we already have one whole split into fourths. Let's do the other one! Can you subdivide yours as I work on mine?** [Pause as you split a whole into fourths]



How did you do? Amazing! Now we can subtract 1 and 2/4. [Pause] **How did I get two-fourths? Great question! Remember we were subtracting 1 ½ which is the same as 1 and 2-fourths. Can you model the subtraction?** [Pause and give students time to work. After about a minute begin marking up your model like the one below]

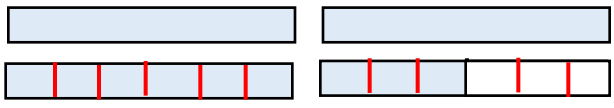


Does your work match mine? I marked out one whole and two fourths. Can you write the equation to represent our work? [Pause]

Did you write $\frac{5}{4} - 1\frac{2}{4} = \frac{3}{4}$? Great work!

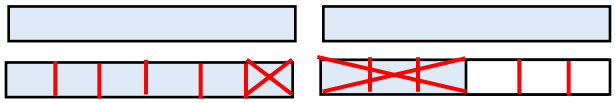
(We do)

Our next problem is $\frac{1}{2} - \frac{2}{3}$. What would we do first? That's right! We need to get our model ready. Can you draw the model and the also find a common multiple and split your model into smaller pieces so we are ready to subtract? Great you do your work while I do mine. [Pause-while the students are working have your model ready to show 3 ½ subdivided into sixths ready to use the model for subtraction]



Did you draw 4 rectangles, represent 3 ½, find a common multiple of 6, and then regroup a rectangle into sixths? You

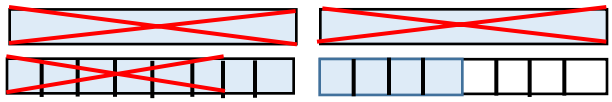
did! That's fantastic! Now model the subtraction. What number are we subtracting? Shout it out! I heard both 4-sixths and 2-thirds? Both are right as they are equal but which one will be easier to use with our model? That's right 4-sixths because it is written with our common denominator! You subtract and then write your expression with your answer. [Pause while student works. Subtract on your model and then write the expression and solution]



Let's check your work. Did you cross out 4-sixths? Then did you write $2\frac{9}{6}-\frac{4}{6}=2\frac{5}{6}$**? Fantastic! Our answer is** $2\frac{5}{6}$**.**

(You do-Cut this problem if you are short on time)

Last one! Can you do this one all by yourself? I think you can! Work the whole problem…draw the model, find the common denominator, subtract using your model, and then find the answer…You've got this! Work the problem $3\frac{1}{8}-2\frac{3}{4}$**.** [Pause and give the students time to work. While they work, write out your answer]



$$2\frac{12}{8}-2\frac{6}{8}=\frac{6}{8}$$

Did you get 6-eighths? Amazing!

Let's think back about what we've learned.
When subtracting the mixed numbers $2\frac{3}{12}-1\frac{1}{12}$ [write expression], **would you need to regroup?** [pause]

You're right, you wouldn't need to regroup because you have enough twelfths to take away 1 twelfth!

What if you were subtracting one and 8 twelfths? [write $2\frac{3}{12}-1\frac{8}{12}$] **Would you need to regroup?** [pause]

Yes! You would need to regroup one of the 2 wholes into 12 twelfths. Additional problem if needed: **Let's try one more. What is the difference between 2 and 5 eighths and 1 and 1 fourth?** [write $2\frac{5}{8} - 1\frac{1}{4} =$] **Possible student work:** $1\frac{1}{4} = 1\frac{2}{8}$ 	
Independent Practice: (1 min) **Great work, everyone! Today, we practiced subtracting with mixed numbers. I hope you're feeling confident about solving problems with subtracting and regrouping mixed numbers! You sure did a great job! I will show you the independent practice problems now, or you can find them in the student practice for this lesson posted on our website, www.tn.gov/education.** [Teacher shows student practice page under document camera or camera zooms in on student practice page.] **Good luck and do your best!**	
Closing: (1 minute) **I enjoyed learning about subtracting mixed numbers with you! Thank you for inviting me into your home. I look forward to seeing you in our next lesson in Tennessee's At Home Learning Series! Bye!**	

Lesson adapted from Curriculum Associates, retrieved from https://capubstore.blob.core.windows.net/mathresources/resources/Grade_05_Concept_3/I-Ready_At-Home_Math_G5_C3_Teacher_Guide.pdf