G5 U3 Lesson 8 - Students will add fractions making like units numerically

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): We've spent several lessons engaging in adding and subtracting fractions and showing our thinking. There are many ways we can show our work when adding and subtracting fractions. What ways have we tried so far? Possible Student Answers, Key Points:

- We've used visual models like tape diagrams or area models to help us think about the units in our fractions.
- We've added and subtracted on a number line.

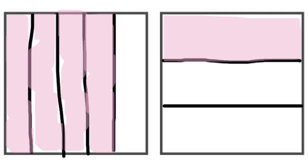
Today, we're going to focus on fraction addition, and we'll consider whether or not we always have to draw a model or a number line to help us find like units. Let's get started!

Let's Talk (Slide 3): Think about the problem ½ + ¼. We could draw an area model to think about our units and find the sum…but do we have to? Is there a way you can think of to find the sum without sketching out models? Possible Student Answers, Key Points:

- I know we can't add them right away, because they're not like units. Maybe I can picture what an area model might look like in my head and write out what I'm picturing using numbers.
- I know ½ is equivalent to 2 fourths. So I can think of 2/4 plus ¼ without needing to draw a model.

I wonder if your ideas will help us today! Let's try the first problem out with an area model and without an area model and see what we notice.

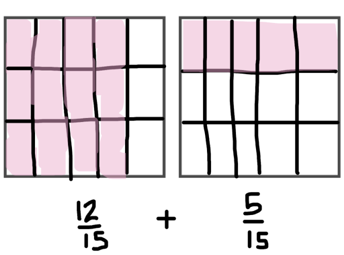
Let's Think (Slide 4): Our first question wants us to find the sum of ⅓ and ⅘. Even though our focus today is working on making like units numerically, or with numbers, let's start by drawing a model for this problem.



Let's show ⅘ vertically and ⅓ horizontally.

We know we can't add fifths and thirds together, because they're unlike units. What can I do in my model to show these two fractions as equivalent fractions with like units? Possible Student Answers, Key Points:

- We can partition them into 15 pieces, since 15 is a multiple of 5 and 3.
- We can cut the first model into 3 horizontal rows and the second model into 5 vertical columns. That will make each area model have 15 pieces.



(partition each area model as you narrate) I can partition each model into 15 pieces since thirds and fifths can both be made into fifteenths. I'll use 2 horizontal cuts to partition the first area model into 15 pieces. I'll use 4 vertical cuts to partition the second area model into 15 pieces. What equivalent fractions do we see now? (12/15 and 5/15)

Sometimes, when we are dealing with a lot of pieces, partitioning area models isn't efficient. Let's think about how we can arrive at these same equivalent fractions numerically, so that we don't always need to rely on a model.

$$\frac{4}{5}=\frac{4}{5}$$

Let’s think about ⅘ first. We started with 4 shaded columns out of 5 columns in all. To partition fifths into fifteenths, we cut our model into 3 rows. This meant that we were essentially tripling our pieces. We had 3 times as many pieces after we cut the model.

$$\frac{4}{5}=\frac{4\times3}{5\times3}=\frac{12}{15}$$

We can show that using multiplication. We had 4 shaded pieces, but we cut to have 3 times as many shaded pieces. We had 5 columns, or 5 total pieces, but we cut to have 3 times as many shaded pieces. Since we tripled the number of shaded pieces and tripled the number of total pieces in the whole, we can show that by multiplying the numerator and denominator by 3. We end up with an equivalent fraction of 12/15. We see the same work we did numerically in our area model.

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

Now let’s think about ⅓. We started with 1 shaded row out of 3 rows in all. To partition thirds into fifteenths, we cut our model into 5 columns. We have 5 times as many pieces after we cut the model.

$$\frac{1}{3}=\frac{1\times5}{3\times5}=\frac{5}{16}$$

We can show that using multiplication. We had 1 shaded piece, but we cut to have 5 times as many shaded pieces. We had 3 rows, or 3 total pieces, but we cut to have 5 times as many shaded pieces. We can show that by multiplying the numerator and denominator by 5. We end up with an equivalent fraction of 5/15. Once again, this is just a numerical way to show the work we did partitioning our area model.

Whether we found like units using the area model or numerically, we’re now ready to add. What is our equation with like units and what is the sum? Possible Student Answers, Key Points:

- Our new equation is 5/15 + 12/15 = ?
- I know 5 units and 12 units is 17 units, so the sum is 17/15. We can also write that as 1 2/15.

$$\frac{5}{15}+\frac{12}{15}=\frac{17}{15} \text{ OR } 1\frac{2}{15}$$

We can add 5 fifteenths plus 12 fifteenths to get 17 fifteenths. We can leave our answer as a fraction greater than 1, like 17/15, or we can write our answer as a mixed number. I know 15/15 is 1 whole, so I can think of 17/15 as 1 whole with 2 extra fifteenths. The mixed number form is 1 2/15.

From this first example, how is finding like units with area models similar to or different from finding like units numerically? Possible Student Answers, Key Points:

- Both strategies help us to find like units. In this case, both ways helped us think about fifteenths.
- The area model involves drawing and partitioning, while the numerical way involves multiplying in place of actually partitioning. The area model way is more visual, but could take longer with some problems.

Let’s try one more example together, and this time we’ll try not to use a model at all. We’ll just try to add by finding equivalent fractions numerically.

Let’s Think (Slide 5): This problem wants us to find the sum of 1 ½ and 3/7. Without using a model, let’s think about our units. What like unit can help us in this problem, and how do you know? Possible Student Answers, Key Points:

- We can use 14 since it is a multiple of 2 and 7.
- I could partition halves into 14 pieces and 7 into 14 pieces, so we can use fourteenths as a unit.

If we were drawing a model, we could partition both models into 14 pieces. We could also maybe use 28 pieces or something bigger, but 14 is arguably the easiest unit to use here.

$$1\frac{1}{2} = 1\frac{1\times}{2\times} = 1\frac{}{14}$$

Let’s think about how we can make equivalent fractions with units of fourteenths numerically. We’ll start with 1 ½. We know we can use multiplication to represent how we might partition our model. If I want to convert 1 ½ into fourteenths, I can think about what I can multiply each part of my fraction by to make 14 pieces.

Let’s look at the fractional part of the mixed number, since I don’t need to worry about the whole number when I write equivalent fractions. What can I multiply ½ by to write it as an equivalent fraction? I know 2 x 7 = 14, so we can multiply the numerator and denominator by 7

$$1\frac{1}{2} = 1\frac{1\times 7}{2\times 7} = 1\frac{7}{14}$$

We can multiply the numerator and denominator each by 7. It’s as though we partitioned our model into 7 rows or columns to make 14 pieces. 1 ½ is equivalent to 1 7/14. No area model required!

$$\frac{3}{7} = \frac{3\times}{7\times} = \frac{}{14}$$

Let’s use the same thinking to write an equivalent fraction for 3/7. We want to think of 3/7 as being cut into 14 pieces. How can I use multiplication to show that I am partitioning 3/7 into 14 pieces? I know 7 x 2 = 14, so we can multiply the numerator and denominator by 2!

$$\frac{3}{7} = \frac{3\times 2}{7\times 2} = \frac{6}{14}$$

It’s like we partitioned the sevenths into 2 columns or 2 rows. And, 3/7 is equivalent to 6/14. We figured this out numerically without the use of an area model.

$$1\frac{7}{14} + \frac{6}{14} = 1\frac{13}{14}$$

Now we can add our fractions with like units. 1 7/14 + 6/14 is 1 13/14, when we add our fractional units.

We’ve written equivalent fractions using area models for several lessons. Today we learned how to add by writing equivalent fractions numerically, without an area model. Which strategy do you prefer at this moment in time and why? Possible Student Answers, Key Points:

- I prefer finding equivalent fractions numerically, because it’s more efficient. I don’t have to draw as much and count up all the pieces.
- I prefer the area model because it’s more visual, and I’m more used to it for now.
- I like both, it just depends on the problem. If there are a ton of pieces, I might prefer to use multiplication instead of an area model.

Let’s Try it (Slides 6 - 7): Now let’s work on adding fractions making like units numerically together. Rather than rely on partitioning a model, we can use multiplication to help us rewrite equivalent fractions with like units numerically. We can always go back to drawing models, but we know that sometimes this can be an inefficient, time-consuming strategy. This is especially true if our fractions will involve many pieces. Let’s use what we’ve been practicing and try a few more problems together.