Lesson: Addition of Fractions
Math Academy – Day 07
Student Notes

Goals:

- Define addition of fractions as joining parts referring to the same whole
- Use equivalent fractions with addition of fraction problems involving unlike denominators
- Demonstrate addition of fractions with models, drawings, and equations

Prerequisite Knowledge:

- Understand when two fractions are said to be equivalent.
- Be able to find equivalent fractions.

Activities: Working with a partner:

1. Name two nice numbers that $\frac{5}{4}$ is between. Is $\frac{5}{4}$ closer to one of the two numbers you listed?

2. Name two nice numbers that $\frac{5}{2}$ is between. Is $\frac{5}{2}$ closer to one of the two numbers you listed?

3. Whole Class Discussion: What is an *improper fraction*? In English, 'improper' means to not be proper or to be incorrect or inaccurate. Does it mean the same in mathematics when talking about improper fractions?

4. Given the set of numbers: $\left\{\frac{7}{3}, \frac{9}{4}, \frac{2}{3}, \frac{33}{3}, \frac{8}{5}, \frac{5}{6}, \frac{6}{5}, \frac{18}{8}, \frac{3}{2}\right\}$. Sort the numbers into their appropriate column below.

Between 0 and 1	Between 1 and 2	Between 2 and 3	Bigger than 3

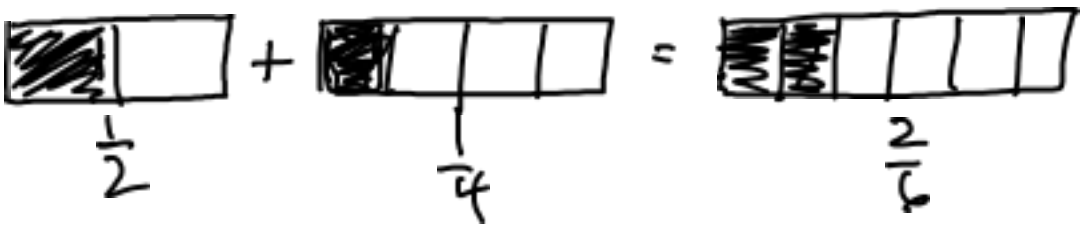
5. In the previous problem, did you use any operation(s) to complete the activity? If so, which operation(s) did you use? Be prepared to share your thoughts with the class.

6. Whole Class Discussion: Back on day 2, we discussed the physical action associated with addition. What does this look like?

7. Consider the following scenario: *Sally is making homemade banana bread. She uses a* $\frac{1}{2}$ *cup of granulated sugar and a* $\frac{1}{4}$ *cup of light brown sugar. How much sugar did Sally use altogether?*
    a. Draw a picture of this scenario. Be sure to show and label both portions of sugar.

    b. Discuss with your partner the result. Report the result as a fraction (either proper or improper).

    c. Mark drew and arrived at the following. Discuss with your partner whether you agree or not. If you do not agree with Mark's conclusion, where did he go wrong and why?

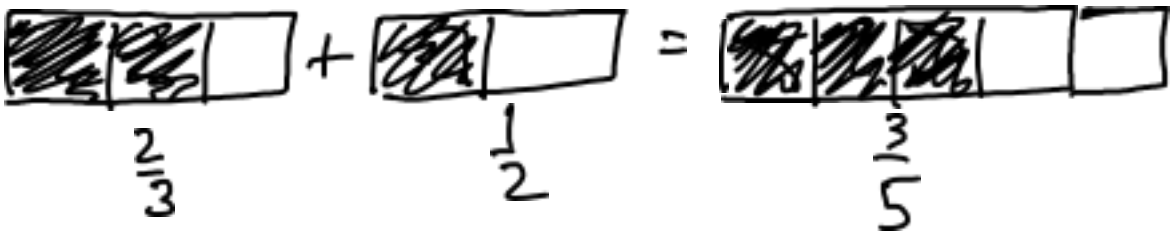


    d. Whole Class Discussion: How do we solve this problem? Is Mark correct?

8. Consider the following scenario: *Sally would like to put chocolate chips and walnuts in her banana bread. She adds* $\frac{2}{3}$ *cup of chocolate chips and* $\frac{1}{2}$ *cup of walnuts to the original recipe. How much extra ingredients did Sally add to her original recipe?*
    a. Draw a picture of this scenario. Be sure to show and label each portion.

    b. Discuss with your partner the result. Report the result as a fraction (either proper or improper).

    c. Beva drew and arrived at the following. Discuss with your partner whether you agree or not. If you do not agree with Beva's conclusion, where did she go wrong and why?



    d. Whole Class Discussion: How do we solve this problem?

Lesson: Addition of Fractions
Math Academy – Day 07
Instructor Notes

Goals:

- Define addition of fractions as joining parts referring to the same whole
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Prerequisite Knowledge:

- Understand when two fractions are said to be equivalent.
- Be able to find equivalent fractions.

Lesson Materials:

- Student Notes for Day 07
- Extra Fraction Strips if students want to use them for thinking through problems

Lesson Breakdown:

Activity	Size of Group	Time in Activity Total Time: 55 minutes
Name two numbers that $\frac{5}{4}$ is between	Groups of 2	3 minutes
Name two numbers that $\frac{5}{2}$ is between	Groups of 2	3 minutes
Discussion on the meaning of improper fractions	Whole Class	4 minutes
Sorting numbers	Groups of 2	10 minutes
Operations helpful when sorting discussion	Whole Class	3 minutes
Physical action of addition	Whole Class	2 minutes
Sally Problem #1	Partners, part (d) as whole class	15 minutes
Sally Problem #2	Partners, part (d) as whole class	15 minutes

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Activities: Working with a partner:

1. Name two nice numbers that $\frac{5}{4}$ is between. Is $\frac{5}{4}$ closer to one of the two numbers you listed?

This problem introduces students to improper fractions. We would like to see the student figure out the 5/4's is more than 1. Two nice numbers that 5/4 is in-between is 1 and 2. However, there are a lot of answers here. 5/4 is also between 1 and 1½ and this is a perfectly fine response.

2. Name two nice numbers that $\frac{5}{2}$ is between. Is $\frac{5}{2}$ closer to one of the two numbers you listed?

   This problem is another improper fraction, but one that is greater than 2. An example of two nice numbers that 5/2 is in-between is 2 and 3. However, if students lists this than 5/2 is not closer to one of them because it is directly in the middle of the two numbers. Another example of two numbers that 5/2 is in-between is 2 and 4 and here 5/2 is closer to 2.

3. Whole Class Discussion: What is an *improper fraction*? In English, 'improper' means to not be proper or to be incorrect or inaccurate. Does it mean the same in mathematics when talking about improper fractions?

   NO!!! Improper does not imply that something is wrong. "Improper" is foul math language. A fraction being improper is OK, it just means that the fraction is 1 or larger. In upper level math courses, especially algebra and above, students are required to read numbers in improper form and to report answers as improper fractions (not mixed numbers). So, becoming fluent with improper fractions is important.

4. Given the set of numbers: $\left\{\frac{7}{3}, \frac{9}{4}, \frac{2}{3}, \frac{33}{3}, \frac{8}{5}, \frac{5}{6}, \frac{6}{5}, \frac{18}{8}, \frac{3}{2}\right\}$. Sort the numbers into their appropriate column below.

Between 0 and 1	Between 1 and 2	Between 2 and 3	Bigger than 3
2/3 5/6	8/5 6/5 3/2	7/3 9/4 18/8	33/3

Suggest asking (one at a time): "Are all of these fractions improper? If not, which was are proper fractions? How can we identify proper fractions by just looking at them? What does it mean to be a proper fraction?"

5. In the previous problem, did you use any operation(s) to complete the activity? If so, which operation(s) did you use? Be prepared to share your thoughts with the class.

   Operation used: division. If the student divides the numerator by the denominator, they get the answer.

6. Whole Class Discussion: Back on day 2, we discussed the physical action associated with addition. What does this look like?

   Pushing blocks together, sorting by shape or type, then counting each "type" is addition.

7. Consider the following scenario: *Sally is making homemade banana bread. She uses a* $\frac{1}{2}$ *cup of granulated sugar and a* $\frac{1}{4}$ *cup of light brown sugar. How much sugar did Sally use altogether?*
   a. Draw a picture of this scenario. Be sure to show and label both portions of sugar.

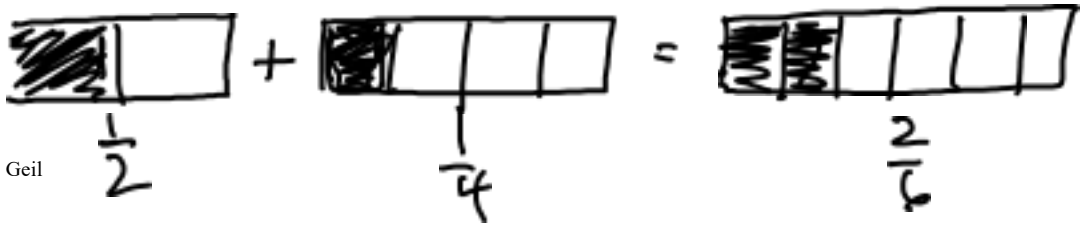
      Here, we are looking for students to draw each amount of sugar, and then add. It is OK if the addition is incorrect or the picture looks similar to Mark's drawing in part c. If a pair of students has an incorrect picture (like in part c), probe at their thinking. Ask them something like, "does your thinking hold true for all scenarios or for just this scenario?" If they respond 'just for this scenario' then ask, "why would that be?". If they respond 'for all scenarios', then ask, "OK. So let me ask you, does this holds true for money?" Wait for a response (no matter how long it takes – allow a student time to think). And continue to probe until they arrive at the realization that 50 cents and 25 cents does not make 33 cents.

   b. Discuss with your partner the result. Report the result as a fraction (either proper or improper).

      Result is: ¾ cup of sugar. In order to arrive at the result, students may refer to getting to ½ as using two quarter measuring cups (1/4 cup). Then altogether, Sally would have ¾ cup of sugar.

      At this point in time, it is OK for students to have drawn their pictures incorrectly. So, if students have 2/6 written here, it is OK.

   c. Mark drew and arrived at the following. Discuss with your partner whether you agree or not. If you do not agree with Mark's conclusion, where did he go wrong and why?



d. Whole Class Discussion: How do we solve this problem? Is Mark correct?

Allow students to lead you through this. Do not tell students that they have to have similar sized regions in order to count the total number of regions when they are put together.

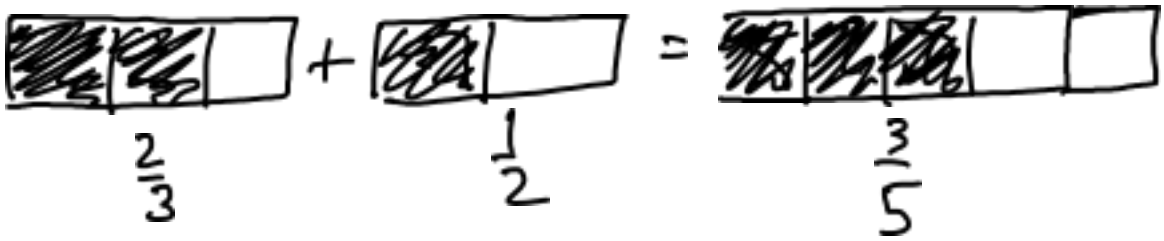
8. Consider the following scenario: *Sally would like to put chocolate chips and walnuts in her banana bread. She adds* $\frac{2}{3}$ *cup of chocolate chips and* $\frac{1}{2}$ *cup of walnuts to the original recipe. How much extra ingredients did Sally add to her original recipe?*
   a. Draw a picture of this scenario. Be sure to show and label each portion.

   Here we want students to again add two fractions, but this time where they would need to convert both denominators, not just one. Again, students should be looking through reasoning with addition and counting the same number of "types" as in the base-ten blocks. They, hopefully after going through problem 7, have an idea that they need to have similar size regions (or "types") in order to count the total amount.

   b. Discuss with your partner the result. Report the result as a fraction (either proper or improper).

   Result: 7/6

   c. Beva drew and arrived at the following. Discuss with your partner whether you agree or not. If you do not agree with Beva's conclusion, where did she go wrong and why?



   d. Whole Class Discussion: How do we solve this problem?

   Again, the reasoning is the same as problem 7. In order to add these two amounts together and be able to report the total, the regions need to be similar size. Since thirds and halves don't have similar marks on our fraction strips, we must use sixths. (It may be helpful to some students that they remember that when making the fraction strip for sixths – they had to do two folds, first into thirds, and then fold each third in half). Allow students to discuss this.

   Also, if time permits, ask students: "So, if I state any two fractions, how do we add them together?"