



MISSISSIPPI
EXEMPLAR
Units & Lessons
MATHEMATICS

Grade 5

Grant funded by:



Lesson 7: Adding and Subtracting Mixed Numbers

Focus Standard(s): 5.NF.1, 5.NF.2

Standards for Mathematical Practice: SMP.3

Estimated Time: 120 minutes

Resources and Materials:

- Markers
- Glue
- Chart paper
- Handout 7.1: Number Lines
- Handout 7.2: Word Problem Cards – Addition
- Handout 7.3: Word Problem Cards - Subtraction

Lesson Target(s):

- Students will add and subtract mixed numbers with unlike denominators using the associative property.
- Students will add and subtract mixed numbers with unlike denominators on a number line.
- Students will solve word problems by adding and subtracting mixed numbers with unlike denominators.

Guiding Question(s):

- How is adding and subtracting mixed numbers with unlike denominators like adding and subtracting fractions with unlike denominators?
- When would you add and subtract mixed numbers with unlike fractions in real world situations?

Vocabulary

Academic Vocabulary:

- add
- addends
- benchmark fractions
- denominator
- fraction
- mixed number
- model
- numerator
- sum

Instructional Strategies for Academic Vocabulary:

- Introduce words with student-friendly definition and pictures
- Model how to use the words in discussion
- Students write/discuss using the words.
- Read and discuss the meaning of word in a mathematical context

Symbol

Type of Text and Interpretation of Symbol



Instructional support and/or extension suggestions for students who are EL, have disabilities, or perform well below grade level and/or for students who perform well above grade level

✓

Assessment (Pre-assessment, Formative, Self, or Summative)

Instructional Plan

Understanding Lesson Purpose and Student Outcomes:

Students will solve word problems containing mixed numbers with unlike denominators. They will use number lines, decomposing fractions and finding equivalent fractions.

Anticipatory Set/Introduction to the Lesson: “My Favorite No”

- ✓ Distribute large index cards or half sheets of paper. Display the following for students:

Mike and Carlos were gathering apples in their garden. Mike collected $2\frac{1}{8}$ baskets of apples and Carlos collect $3\frac{3}{8}$ baskets of apples. How many baskets of apples did they collect together? How many more apples did Carlos collect than Mike?

Pair students and give them 10 minutes to discuss the problem and complete their work. Allow more time if necessary. Remind students to read the problem carefully and look for connections to previous lessons. Each pair will submit one card. At the end of the time collect the

students' work being careful not to reveal the students' names. Go through the cards identifying those that have the work done correctly as "Yes" and those that have errors as "No". Look for misconceptions (these will be called "My favorite no"). Smile when you find cards with common misconceptions and say encouraging statements such as, "Oh, I'm so glad someone did this so we can learn from it!" or "So many people make this mistake, but we can learn how to do it correctly!" Copy the incorrect work for the first problem on the board without changing it. Facilitate an open discussion about why the work is not correct. If a student says the work or answer you displayed is incorrect have them offer a reason why it is incorrect and tell how they would correct it (SMP.3).

Note: Refer to Lesson 1 for details on how to use "My Favorite No" for instruction.

For students who are EL, have disabilities, or perform well below the grade-level:

- Give students fraction tiles or fraction circles to use.

Extensions for students with high interest or working above grade level:

- Have students write a paragraph to justify their answers.

Activity 1: Adding Mixed Numbers with Unlike Fractions

Tell students that today they will use what they know about adding fractions with unlike denominators to add mixed numbers with unlike denominators.

While teaching the lesson, create an anchor chart with students. Display the following expressions:

$$2\frac{2}{5} + 4\frac{1}{6} \qquad 3\frac{1}{7} - 1\frac{2}{3}$$

Explain that to add mixed numbers, we can use the associative property to make an easier expression.

$$\text{Write } 2\frac{2}{5} + 4\frac{1}{6} = 2 + 4 + \frac{2}{5} + \frac{1}{6} = 6 + \frac{2}{5} + \frac{1}{6}$$

Ask students what we can do to add the fractions? (Find the LCD, convert them to equivalent fractions and add the fractions.)

Demonstrate how to use a chart to find the common denominator for 5 and 6 and finding equivalent fractions.

$$\frac{2}{5} + \frac{1}{6}$$

$$\frac{2}{5} \times \frac{6}{6} = \frac{12}{30}$$

$$\frac{1}{6} \times \frac{5}{5} = \frac{5}{30}$$

$$\frac{12}{30} + \frac{5}{30} = \frac{17}{30}$$

1x	5	6
2x	10	12
3x	15	18
4x	20	24
5x	25	30
6x	30	36

Explain that they will add their fraction and the whole number to get $\frac{17}{30} + 6 = 6\frac{17}{30}$.

Display the following expression: $3\frac{1}{7} - 1\frac{2}{3}$

Explain that when you subtract mixed numbers, one method is to convert both mixed numbers into improper fractions. Demonstrate how to decompose the whole number into fractions to create improper fractions. Ask, "In the whole number 3, how many $\frac{1}{7}$'s are there?" (3)

Write $1 + 1 + 1$. Ask, "How many $\frac{1}{7}$'s are in 1?" (7) Write $3 = \underbrace{1}_{\frac{7}{7}} + \underbrace{1}_{\frac{7}{7}} + \underbrace{1}_{\frac{7}{7}}$ and if we add $\frac{1}{7}$ to that we get $\frac{22}{7}$ so $3\frac{1}{7} = \frac{22}{7}$

Tell students to decompose $1\frac{2}{3}$ into unit fractions on their white boards and then into an improper fraction. ($1 = \frac{3}{3}$ and $\frac{2}{3} + \frac{3}{3} = \frac{5}{3}$) Tell students to turn to an elbow buddy and compare their work (SMP.3). Tell students to add the 2 improper fractions, $\frac{22}{7}$ and $\frac{5}{3}$ showing their work on their personal white board. Instruct them to turn to their elbow buddy and share their work discussing any differences (SMP.3). Call on one pair to show their work on the board. Invite other class members to comment and ask questions about the work.

✓ While students are working, walk around the room listening to conversations and checking for accuracy or misconceptions.

Note: The least common multiple for 3 and 7 is 21 so students should convert each fraction to have like denominators then add: $\frac{22}{7} \times \frac{3}{3} = \frac{66}{21}$ and $\frac{5}{3} \times \frac{7}{7} = \frac{35}{21}$ so $\frac{66}{21} + \frac{35}{21} = \frac{101}{21}$.

Ask students what kind of fraction $\frac{31}{21}$ is? (improper) Ask them why it's called improper? (The numerator is greater than the denominator.)

Lead a class discussion to recall how to convert an improper fraction to a mixed number and create an anchor chart with students to display the procedure. See the following:

To rewrite a mixed number as an equivalent improper fraction, divide the denominator by the numerator and express the remainder as a fraction. For the improper fraction $\frac{31}{21}$, $31 \div 21 = 1$ with a remainder of 10 expressed as $1\frac{10}{21}$.

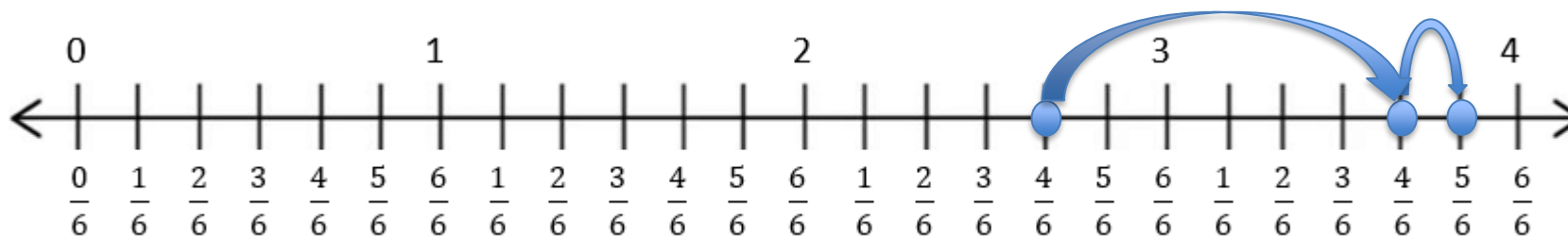
Note: Encourage the understanding that improper fractions are not "bad" or "wrong" fractions, but equivalent fractions written in a different way. The standards do not specify that fractions must be written in their simplest form.

Activity 2: Adding Mixed Numbers with Unlike Fractions on a Number Line

Ask students if they think it's possible to add and subtract mixed numbers on a number line. Let students share their thoughts reflecting how they used a number line to add fractions with unlike denominators. Display the following: $2\frac{2}{3} + 1\frac{1}{6}$. Explain to students that the fraction part of a mixed number must have the same denominator. Ask students what the least common denominator for 3 and 6 is. (6) Tell students to find equivalent fractions with a denominator of 6 and show their work on their personal white board. ($\frac{2}{3} = \frac{4}{6}$ and $\frac{1}{6}$ does not change)

Draw a number line and show the first addend on the number line. Move on the number line to the right the value of the whole number 1.

Place a mark at $3\frac{4}{6}$. Move on the number line the value of the fraction



Note: It does not matter if students add the whole number or the fraction first, so long as they are moving the correct distance on the number line to the right. It may be easier to understand add the whole number then the fraction.

Use the same mixed numbers but change the operation to subtraction showing the numbers moving to the left on the number line.

$$2\frac{2}{3} - 1\frac{1}{6} = 2\frac{4}{6} - 1\frac{1}{6} = 1\frac{3}{6} = 1\frac{1}{2}$$

Allow time for questions and discussion clarifying any misconceptions. Tell students use their personal white boards to add $4\frac{3}{5}$ and $2\frac{3}{10}$. As students work, look for errors and make note of students who need one-on-one help. Ask for a volunteer to work the problem on the board. After the students have completed this task, tell them to use the same two mixed numbers but this time subtract the mixed numbers.

Activity 3: Partner Work

Distribute **Handout 7.1: Number Lines**. Display/write these expression on the board: $7\frac{3}{4} + 3\frac{1}{12}$ $3\frac{2}{3} + 1\frac{1}{8}$ $7\frac{3}{4} + 3\frac{1}{12}$ $3\frac{2}{3} - 1\frac{3}{8}$

Tell students they will work with their partner to find the value of all the expressions. Instruct them to find the value of both addition expressions, trade papers, check each other's work, and discuss any differences (SMP.3). Tell students to repeat the same steps doing the subtraction on the back side of the paper. While students are working with partners, call students who demonstrated a need for additional support to the teacher table to work the problems with you.

For students who are EL, have disabilities, or perform well below the grade-level:

- Students work with the teacher scaffolding instruction to show moving on the number line with whole numbers, then fractions, then mixed numbers with denominators of 2 and 4.
- Students can use fraction circles to show equivalent fractions and adding mixed numbers.

Extensions for students with high interest or working above grade level:

- Give students these mixed numbers to add and observe what they do with an answer that has a whole number and a fraction greater than one: $6\frac{5}{6} + 2\frac{2}{3}$. (Equals $8\frac{9}{6} = 9\frac{3}{6} = 9\frac{1}{2}$)

✓ Monitor students' work looking for misconceptions or missing steps.

Prompting questions:

- Is there a part of the process you skipped?
- Is your answer reasonable?

Lead a discussion to check solutions, answering questions, and clarifying misconceptions.

Activity 4: Adding and Subtracting Mixed Numbers in the Real World

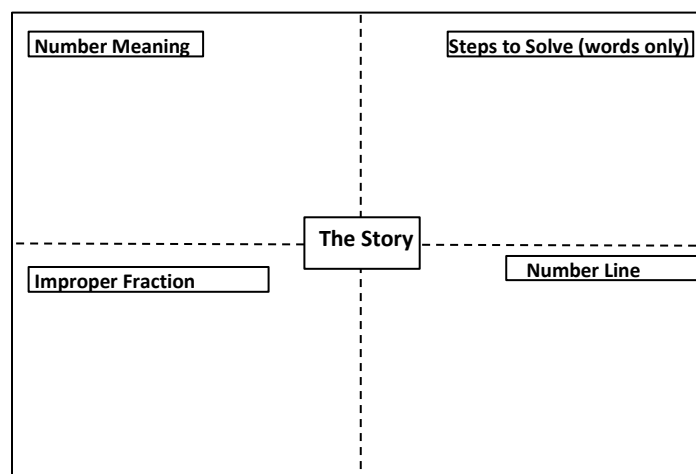
Ask students when they might have to add and subtract mixed numbers with unlike fractions in the real world? Record student answers on chart paper. Tell students they will look at the problem from the anticipatory set but the denominators will be different. Display the following:

✓ Distribute large index cards or half sheets of paper. Display the following for students:

Mike and Carlos were gathering apples in their garden. Mike collected $2\frac{1}{8}$ baskets of apples and Carlos collect $3\frac{5}{16}$ baskets of apples. How many baskets of apples did they collect together? How many more apples did Carlos collect than Mike?

Tell students to find the answer to the first question on their white board using any strategy they have learned in this unit. Have them check the work of an elbow buddy, discuss any differences, and explaining corrections (SMP.3). Choose a student to show the work on the board. Tell students to do the same thing to answer the second question. Lead a discussion to answer any questions and clarify any misconceptions.

Distribute **Handout 7.2: Word Problem Cards – Addition**, **Handout 7.3 - Subtraction**, markers, and chart paper. Assign students to groups of 4. Explain to students that they will each get 2 word problems. They will solve the problems using the adapted Frayer model to show their work. Display the adapted Frayer model they will use.



Tell students for both problems, they will glue their story to the center of the chart paper, list all the numbers in the story, describe in words only the steps to solve, solve with a number line, and with improper fractions. Tell students they should all do the work and check each other before creating the posters. Tell groups to exchange one poster with another group and their second poster with a different group so they have 2 posters from two different groups. Tell them to critique the work on the posters by 2 notes that will contain glows (something done well) and 2 notes will contain grows (things that could improve). Tell them that each poster will get a total of 4 sticky notes. After they have completed their critiques, tell them to return the posters to the authors. Instruct students to read the notes and determine if they agree with the observations. Lead a class discussion to share the comments and allow time for discussion. Clarify any misconceptions.

Reflection and Closing

✓Review the lesson by discussing skills and asking questions.

Prompting questions:

- How do we determine what denominator we need to use to add or subtract fractions?
- When do we change both denominators, and when do we just change one denominator?

Homework

No Homework

Handout 7.1: Number Lines (Page 1)

Name: _____



Handout 7.1: Number Lines (Page 2)

Handout 7.2:

Word Problem Cards - Addition



<p>A) Sabrina uses $5\frac{1}{2}$ yards of fabric to make curtains and $3\frac{1}{4}$ yards of fabric to make pillows. How much fabric did Sabrina use?</p>	<p>B) Jack is packing gifts for his father who is in Iraq. One item weighs $6\frac{1}{4}$ kg and the other item weighs $3\frac{3}{8}$ kg. What is the combined weight of the items in the package?</p>
<p>C) Last weekend I spent $5\frac{3}{5}$ hours on history homework and $1\frac{1}{4}$ hours on math homework. How much time did I spend on homework?</p>	<p>D) Ava buys fruit., If she buys $2\frac{1}{3}$ pounds of apples, and $1\frac{1}{5}$ pounds of pears, how many pounds of fruit did she buy?</p>
<p>E) Zach is making cookies. The recipe calls for him to use $2\frac{2}{3}$ cups of white sugar and $1\frac{1}{2}$ cups of brown sugar. How much sugar will he use for the cookies?</p>	<p>F) Madan plays soccer. On Monday, he practiced for $1\frac{3}{4}$ hours and on Tuesday, he practiced for $1\frac{1}{3}$ hours. How much time did he practice on these two days?</p>
<p>G) Christina must write two essays for her English class. One essay is $2\frac{1}{8}$ pages long and the second essay is $4\frac{1}{6}$ pages long. How many pages will she write?</p>	<p>H) Mario walked $5\frac{3}{7}$ km one week and the next week he walked $6\frac{1}{2}$ km. How far did he walk in both weeks?</p>

<p>I) While cooking a stew, Brett used $2\frac{3}{4}$ teaspoons of salt and $1\frac{1}{2}$ teaspoons of pepper. How much more salt than pepper did Brett use?</p>	<p>J) A meteorologist recorded the rainfall in Arcadia in two consecutive months. He recorded $2\frac{5}{8}$ inches in the first month and $1\frac{5}{12}$ inches in the second month. How much more rain was recorded in the first month than the second month?</p>
<p>K) Ron read $5\frac{3}{5}$ chapters of his book on Friday and $3\frac{1}{3}$ chapters on Saturday. How many more chapters did he read on Friday than on Saturday?</p>	<p>L) A marine biologist measured two fish. The first fish was $8\frac{5}{7}$ meters long and the second fish was $5\frac{1}{3}$ meters long. How much longer was the first fish than the second fish?</p>
<p>M) A builder has two ladders. The first ladder is $12\frac{3}{10}$ feet tall. The second ladder is $16\frac{1}{2}$ feet tall. How much taller is the second ladder than the first ladder?</p>	<p>N) Marla made batches of cupcakes for her office. She used $3\frac{1}{6}$ cups of flour for the first batch and $4\frac{2}{3}$ cups of flour for the second batch. How much more flour was in the second batch?</p>
<p>O) Kristi wrote two lessons for her math class. The first lesson is $3\frac{2}{5}$ pages long and the second lesson is $2\frac{1}{4}$ pages long. How many more pages is the first lesson than the second lesson?</p>	<p>P) Devin has $7\frac{1}{2}$ hours to edit a math unit. He has worked for $5\frac{2}{5}$ hours. How much more time does Devin have left to edit his unit?</p>

Handout 7.2: Word Problem Cards – Addition Key

A) $8\frac{3}{4}$

B) $9\frac{5}{8}$

C) $6\frac{17}{20}$

D) $9\frac{8}{15}$

E) $4\frac{1}{6}$

F) $3\frac{1}{2}$

G) $6\frac{7}{24}$

H) $11\frac{13}{14}$

Handout 7.3: Word Problem Cards – Subtraction Key

I) $1\frac{1}{4}$

J) $1\frac{5}{24}$

K) $2\frac{4}{15}$

L) $3\frac{8}{21}$

M) $4\frac{2}{10}$

N) $1\frac{3}{6}$

O) $1\frac{3}{20}$

P) $2\frac{1}{10}$

For training or questions regarding this unit,
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