Lesson 17  Add and Subtract Mixed Numbers

Use What You Know

In Lesson 16, you learned about adding and subtracting fractions. In this lesson, you will learn about adding and subtracting whole numbers and fractions.

Raquel measured milk with a $\frac{1}{2}$-cup measuring cup. She filled the cup 5 times and poured each $\frac{1}{2}$-cup of milk in a bowl. How much milk did Raquel pour into the bowl?

a. What fraction do you need to add? __________

b. How many times will you add the fraction? ___________________

c. Write an equation to represent this problem.
   __________________________

d. What is the total amount of milk in the bowl? ________________
Suppose Raquel adds another 2 cups of milk to the bowl. How much milk is there now?

These cups show the $\frac{5}{2}$ cups already in the bowl. There are 2 half-cups in each whole cup.

These cups show the amount Raquel adds. There are 4 halves in 2, so 2 is equal to $\frac{4}{2}$.

There are 9 half-cups of milk.

$$\frac{5}{2} + \frac{4}{2} = \frac{9}{2}$$

Altogether, 4 whole cups and $\frac{1}{2}$ of another cup are filled: $\frac{9}{2} = 4 + \frac{1}{2}$. You can write $\frac{9}{2}$ as a mixed number. **Mixed numbers** have a whole number part and a fraction part. Just write $4 + \frac{1}{2}$ without the +. $\frac{9}{2} = 4\frac{1}{2}$

Here is another way to add $\frac{5}{2} + 2$. You can see from the model above that $\frac{5}{2} = 2 + \frac{1}{2}$.

So, $\frac{5}{2} + 2 = 2 + \frac{1}{2} + 2$, or $2 + 2 + \frac{1}{2}$.

$2 + 2 + \frac{1}{2} = 4 + \frac{1}{2}$ or $4\frac{1}{2}$

**Reflect**

1. Explain how you could figure out how many halves are in $3\frac{1}{2}$.
Read the problem below. Then explore different ways to add mixed numbers.

Markers come in boxes of 8. For an art project, one group of students used 1 \( \frac{5}{8} \) boxes of markers and another group used 1 \( \frac{6}{8} \) boxes. How many boxes of markers did the two groups use altogether?

**Picture It** You can use models to help add mixed numbers.

The picture shows the boxes of markers. Each marker is \( \frac{1}{8} \) of the whole box.

**Model It** You can also use a number line to help add mixed numbers.

Remember that 1 whole box is 8 markers, or \( \frac{8}{8} \) of a box.
Connect It  Now you will solve the problem from the previous page using fractions.

2 What is the sum of just the whole number parts of $1\frac{5}{8}$ and $1\frac{6}{8}$? ________________

3 What is the sum of just the fraction parts of $1\frac{5}{8}$ and $1\frac{6}{8}$? ________________

4 Think about how many wholes are in $\frac{11}{8}$ and how many extra eighths there are.
   Complete the equations below.
   \[
   \frac{11}{8} = \frac{8}{8} + \square \frac{8}{8} = \square \quad \text{So, } \frac{11}{8} = 1 + \square \frac{8}{8}.
   \]

5 Now add the sum of the whole numbers to the sum of the fractions.
   \[2 + 1 + \frac{3}{8} = \square\]

6 Explain how you add mixed numbers. ________________________________________
   ________________________________________
   ________________________________________
   ________________________________________
   ________________________________________
   ________________________________________

Try It  Use what you just learned about adding mixed numbers to solve these problems. Show your work on a separate sheet of paper.

7 Mrs. Suarez sold pies for a fundraiser. She sold $3\frac{5}{6}$ pies the first day and $1\frac{3}{6}$ pies the second day. How many pies did she sell in all? ______________________

8 Beth went on vacation for $4\frac{1}{2}$ days in June and $8\frac{1}{2}$ days in July. How many days was Beth on vacation altogether? ______________________
Read the problem below. Then explore different ways to subtract mixed numbers.

Ursula picked carrots and radishes from her garden. She picked 4 \(\frac{1}{4}\) pounds of carrots and 1 \(\frac{3}{4}\) pounds of radishes. How many more pounds of carrots did she pick than radishes?

**Picture It** You can use a model to help subtract mixed numbers.

This model shows 4 \(\frac{1}{4}\) pounds of carrots.

This model shows 4 \(\frac{1}{4}\) pounds of carrots minus 1 \(\frac{3}{4}\) pounds of radishes. The fourths still shaded red show the difference in weight between the carrots and radishes.

\[
4 \frac{1}{4} - 1 \frac{3}{4} = 2 \frac{1}{4}
\]

**Model It** You can also use a number line to help subtract mixed numbers.

To subtract using a number line, start at the number you are subtracting from and move left the amount you are subtracting.
Connect It  Now you will solve the problem from the previous page using equations.

\[4 \frac{1}{4} - 1 \frac{3}{4}\]

9 Complete the equations to write \(4 \frac{1}{4}\) as a fraction greater than 1.

\[4 \frac{1}{4} = \frac{16}{4} + \frac{1}{4}\]

So, \(4 \frac{1}{4} = \frac{17}{4}\).

10 Complete the equations to write \(1 \frac{3}{4}\) as a fraction greater than 1.

\[1 \frac{3}{4} = \frac{4}{4} + \frac{3}{4}\]

So, \(1 \frac{3}{4} = \frac{7}{4}\).

11 Subtract the fractions. Write an equation that shows the difference.

12 How many more pounds of carrots did Ursula pick than radishes? ________________

13 Explain how you can use fractions greater than 1 to subtract mixed numbers.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Try It  Use what you just learned about subtracting mixed numbers to solve these problems. Show your work on a separate sheet of paper.

14 Monica rode her bike \(3 \frac{1}{4}\) miles on Monday. She rode \(2 \frac{2}{4}\) miles on Tuesday.

How much farther did Monica ride on Monday than on Tuesday? ________________

15 Look at problem 14. Monica wants to ride \(8 \frac{2}{4}\) miles total. How many more miles does she need to ride? ________________
Guided Practice

Practice

Add and Subtract Mixed Numbers

Lesson 17

Study the example below. Then solve problems 16–18.

Example

One soccer team drank $5 \frac{2}{3}$ liters of water during a game. Their opponents drank $4 \frac{2}{3}$ liters of water. How much water did both teams drink?

Look at how you could show your work using models.

The student added the whole numbers and then combined the fractions!

Solution

The teams drank $10 \frac{1}{3}$ liters of water combined.

Pair/Share

How could you use a number line to help you solve this problem?

16 Kelly bought $4 \frac{7}{8}$ pounds of apples and $2 \frac{3}{8}$ pounds of oranges. How many pounds of fruit did she buy altogether?

Show your work.

What operation do you need to use?

Solution

Is there one way that works the best to solve this problem?
Karina read a total of 20\(\frac{2}{4}\) pages in her science and social studies books combined. She read 12\(\frac{3}{4}\) pages in her science book. How many pages did she read in her social studies book?

**Show your work.**

**Solution**

Which of the following shows a correct way to subtract 15\(\frac{4}{5}\) \(-\) 9\(\frac{3}{5}\)? Circle the letter of the correct answer.

A  Subtract the whole numbers, then subtract the fractions. Subtract the differences.

B  Add the whole numbers, then add the fractions. Subtract the sums.

C  Subtract the whole numbers, then subtract the fractions. Add the differences.

D  Write the mixed numbers as fractions greater than one. Then add the fractions.

Marella chose A as the correct answer. Did she do each step correctly? Explain why or why not.
Solve the problems.

1. On Saturday, Shawn worked in his yard for $3 \frac{5}{6}$ hours. On Sunday, he worked another $4 \frac{1}{6}$ hours in his yard. How long did he work in the yard in all?
   - A $\frac{2}{6}$ hour
   - B 7 hours
   - C $7 \frac{5}{6}$ hours
   - D 8 hours

2. Ella ordered 16 pizzas for a party. After the party, there were $3 \frac{5}{8}$ pizzas left. How many pizzas were eaten?
   - A $12 \frac{3}{8}$
   - B $13 \frac{3}{8}$
   - C $13 \frac{5}{8}$
   - D $19 \frac{5}{8}$

3. Luis is writing recipes for soup that require cans of broth. Each can has $1 \frac{3}{4}$ cups of broth. He needs each batch of soup to have an amount of broth within the range given below.
   - Draw cans in each pot so that the amount of broth is within the given range.
   - Leave the pot empty if the given range is not possible using an exact number of cans.

   Small batch
   3 to 4 cups of broth

   Medium batch
   6 to 7 cups of broth

   Large batch
   9 to 10 cups of broth
4 Four friends shared 3 orders of chicken wings.
   • Alex ate $\frac{5}{8}$ of an order.
   • Chase ate $\frac{7}{8}$ of an order.
   • Ella ate $\frac{6}{8}$ of an order.
   How much chicken is left for the fourth friend? ________________

5 Marnel used $4\frac{2}{3}$ cups of cereal and $3\frac{1}{3}$ cups of marshmallows to make cereal bars.
   How many more cups of cereal did Marnel use than marshmallows?
   **Show your work.**

   **Solution**

6 Kieran ran the first part of a relay in $4\frac{4}{6}$ minutes.
   David ran the next part in $3\frac{5}{6}$ minutes.
   How long did they take to run both parts of the relay?
   **Show your work.**

   **Solution**

**Self Check** Go back and see what you can check off on the Self Check on page 143.