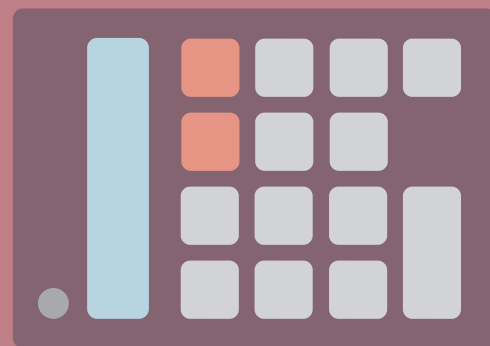




MATH

Student Book



► **5th Grade | Unit 7**

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MATH 507

FRACTION OPERATIONS

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FRACTION OPERATIONS

In this unit, you will begin computing with fractions. You will use models or a pencil and paper in order to solve real-life problems. To solve problems, you will learn how to add and subtract proper fractions and mixed numbers with both like and unlike denominators. You will also learn how to estimate a sum or difference of two fractions or mixed numbers. In addition, you will explore how to multiply with whole numbers, proper fractions, and mixed numbers. You will complete the unit by dividing with unit fractions and whole numbers.

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAK. When you have finished this LIFEPAK, you should be able to:

- Add and subtract fractions and mixed numbers with like denominators.
- Estimate, add, and subtract fractions and mixed numbers with unlike denominators.
- Multiply with fractions and mixed numbers.
- Divide with unit fractions and whole numbers.

1. LIKE DENOMINATORS

Do you remember how to represent a fraction on the number line? Proper fractions come between 0 and 1 on the number line. To plot a proper fraction, evenly divide the length between 0 and 1 into the number of pieces named by the denominator (bottom number). Then, put a point on the tick mark that is named by the numerator (top number). In this lesson, we'll use the number line and fraction models to help us learn how to add and subtract fractions. We'll also solve fraction word problems using addition and subtraction.

Objectives

Read these objectives. When you have completed this section, you should be able to:

- Add fractions that have like denominators.
- Subtract fractions that have like denominators.
- Add mixed numbers with like denominators.
- Subtract mixed numbers with like denominators.
- Estimate sums of fractions and mixed numbers.
- Estimate differences of fractions and mixed numbers.

Vocabulary

Study these new words. Learning the meanings of these words is a good study habit and will improve your understanding of this LIFEPAC.

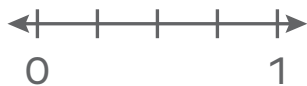
estimate. An approximate value that is close to the actual value.

like denominators. Denominators that are the same number.

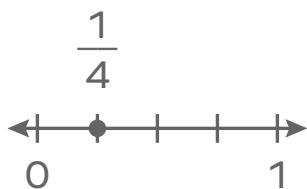
Note: All vocabulary words in this LIFEPAC appear in **boldface** print the first time they are used. If you are unsure of the meaning when you are reading, study the definitions given.

Adding and Subtracting Fractions

Remember, to plot a proper fraction, evenly divide the length between 0 and 1 into the number of pieces named by the denominator, and put a point on the tick mark that is named by the numerator. For example, to represent the fraction $\frac{1}{4}$ on the number line, first divide the length between 0 and 1 into four equal pieces:



Then, draw a point on the first tick mark.

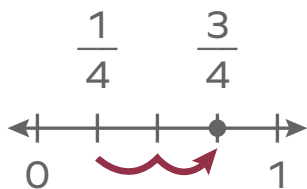


Vocabulary

Remember that in a *proper fraction*, the numerator is less than the denominator.

Adding and Subtracting Fractions That Have Like Denominators

Let's use our number line again to help us add fractions that have like (or the same) denominators. We already plotted $\frac{1}{4}$ on the number line. Let's add $\frac{2}{4}$ to it. Since the number line is already divided into fourths, adding $\frac{2}{4}$ is the same as moving two tick marks to the right.



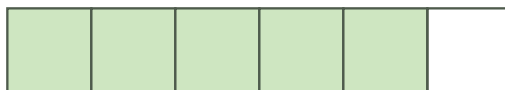
Now, our point is on the third tick mark. So $\frac{1}{4} + \frac{2}{4}$ is equal to $\frac{3}{4}$.

Let's try another one. This time, we'll use a model to help us find the sum of $\frac{2}{6}$ and $\frac{3}{6}$.

Remember that to model a fraction, divide a whole amount evenly into the number of parts named by the denominator. Then, shade in the number of parts named by the numerator. So, to model the fraction $\frac{2}{6}$, divide a rectangle into six equal parts. Then, shade two of them.



Now, let's add $\frac{3}{6}$ to it. Because the model is already divided into sixths, adding $\frac{3}{6}$ is the same as shading in three more pieces.



So, $\frac{2}{6} + \frac{3}{6}$ is equal to $\frac{5}{6}$.

What did you notice in both problems about adding fractions? The numerators were added together, and the denominator stayed the same. Here's another example:

Example:

Kari ate $\frac{3}{12}$ of the pizza, Sam ate $\frac{4}{12}$ of the pizza, and Kristi ate $\frac{1}{12}$ of the pizza. How much did they eat altogether?

Solution:

To find the total amount that they ate, add the fractions together. The fractions have **like denominators**, so add the numerators and keep the denominator the same.

$$\frac{3}{12} + \frac{4}{12} + \frac{1}{12} = \frac{8}{12}$$

Notice that $\frac{8}{12}$ is not written in simplest form. 8 and 12 have a common factor of 4.

$$\frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

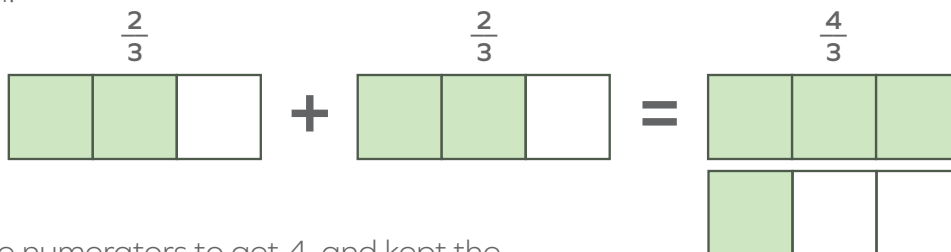
Kari, Sam, and Kristi ate $\frac{2}{3}$ of the pizza altogether.



S-T-R-E-T-C-H...

What fraction of the pizza is left over?

Sometimes, the sum of two or more fractions is greater than 1. For example, let's add $\frac{2}{3}$ and $\frac{2}{3}$, using a model.



We added the numerators to get 4, and kept the denominators the same. Notice that the sum ($\frac{4}{3}$) is an improper fraction. Another way to write an improper fraction is as a mixed number. As you can see from the model, $\frac{4}{3}$ is the same as $1\frac{1}{3}$.

Remember, to add fractions with like denominators, add the numerators together and keep the denominator the same. Then, write the sum as a fraction or mixed number in simplest form.

This might help...

Remember that to convert an improper fraction to a mixed number, divide the numerator by the denominator. The quotient is the whole number part. The remainder is the numerator. And, the denominator stays the same. In this case, $4 \div 3 = 1 \text{ R}1$.

Subtracting Fractions with Like Denominators

Now, let's try subtraction with fractions. Subtracting fractions that have like denominators is similar to adding fractions that have like denominators. Subtract the numerators and keep the denominator the same. Then, represent the difference in simplest form. Like addition, subtraction can be represented on the number line or with a model. On the number line, move left to show subtraction. On a model, remove shading to show subtraction.

Key point...

Always write the final sum in simplest form by dividing the numerator and denominator of the sum by their GCF.

Example:

Find the difference.

$$\frac{7}{8} - \frac{3}{8}$$

Solution:

The fractions have like denominators. So, subtract the numerators, and keep the denominator the same.

$$\frac{7}{8} - \frac{3}{8} = \frac{4}{8}$$

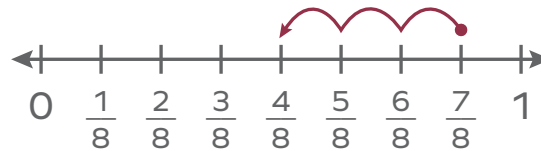
Now, write the difference in simplest form. 4 and 8 have a common factor of 4.

$$\frac{4 \div 4}{8 \div 4} = \frac{1}{2}$$

Keep in mind...

Any time the numerator of a fraction is exactly half of the denominator, the fraction is equivalent to $\frac{1}{2}$.

To represent this subtraction problem on the number line, divide the space between 0 and 1 into eight equal parts. Then, start at $\frac{7}{8}$ and move three tick marks to the left.



To subtract fractions with like denominators, subtract the numerators and keep the denominator the same. Then, write the difference as a fraction in simplest form.

Here's one more example:

Example:

Kari ate $\frac{3}{12}$ of the pizza, Sam ate $\frac{4}{12}$ of the pizza, and Kristi ate $\frac{1}{12}$ of the pizza.

How much more did Sam eat than Kristi?

Solution:

Subtract the amount Kristi ate from the amount Sam ate.

$$\frac{4}{12} - \frac{1}{12} = \frac{3}{12}$$

Write the difference in simplest form. 3 and 12 have a common factor of 3.

$$\frac{3 \div 3}{12 \div 3} = \frac{1}{4}$$

Sam ate $\frac{1}{4}$ more of the pizza than Kristi.

Let's Review!

Before going on to the practice problems, make sure you understand the main points of this lesson.

- ✓ To add or subtract fractions with like denominators, add or subtract the numerators and keep the denominator the same.
- ✓ Write sums and differences in simplest form.
- ✓ Addition or subtraction with fractions can be represented on the number line or with a model.



Circle the correct letter and answer.

- 1.1** A fraction where the numerator is _____ the denominator is called a proper fraction.
- a. larger than b. equal to c. smaller than
- 1.2** Add. Write your answer in simplest form. $\frac{3}{11} + \frac{4}{11}$
- a. $\frac{7}{22}$ b. $\frac{7}{11}$ c. $\frac{1}{11}$ d. $1\frac{1}{11}$

- 1.3** Add. Write your answer in simplest form. $\frac{4}{10} + \frac{2}{10}$
 a. $\frac{3}{5}$ b. $\frac{6}{20}$ c. $\frac{3}{10}$ d. $\frac{6}{10}$
- 1.4** Add. Write your answer in simplest form. $\frac{2}{5} + \frac{2}{5} + \frac{3}{5}$
 a. $\frac{7}{10}$ b. $\frac{1}{5}$ c. $\frac{7}{5}$ d. $1\frac{2}{5}$
- 1.5** Add. Write your answer in simplest form. $\frac{5}{8} + \frac{7}{8}$
 a. $\frac{1}{4}$ b. $\frac{3}{4}$ c. $1\frac{1}{2}$ d. $1\frac{4}{8}$
- 1.6** Mrs. Thomas bought $\frac{2}{4}$ yard of one fabric and $\frac{3}{4}$ yard of a different fabric. How many total yards of fabric did she buy?
 a. $\frac{5}{8}$ yard b. $\frac{1}{4}$ yard c. $1\frac{1}{4}$ yards d. $1\frac{1}{2}$ yards
- 1.7** Subtract. Write your answer in simplest form. $\frac{8}{13} - \frac{2}{13}$
 a. $\frac{6}{0}$ b. $\frac{6}{13}$ c. $\frac{10}{13}$ d. $1\frac{3}{13}$
- 1.8** Subtract. Write your answer in simplest form. $\frac{5}{6} - \frac{3}{6}$
 a. $\frac{2}{6}$ b. $\frac{2}{0}$ c. $\frac{1}{2}$ d. $\frac{1}{3}$
- 1.9** There was $\frac{6}{9}$ of a pie left over from dessert. Then, $\frac{3}{9}$ of it got eaten. How much is left now?
 a. $\frac{3}{0}$ b. $\frac{1}{3}$ c. $\frac{2}{3}$ d. $\frac{12}{18}$



Complete these activities.

- 1.10** Find the sum. Write your answer in simplest form. $\frac{5}{7} + \frac{1}{7}$ _____
- 1.11** Find the difference. Write your answer in simplest form. $\frac{9}{10} - \frac{4}{10}$ _____
- 1.12** Match each addition or subtraction problem with its correct answer in simplest form.
- | | |
|--|-------------------|
| a. _____ $\frac{5}{9} + \frac{3}{9}$ | 1. $\frac{3}{10}$ |
| b. _____ $\frac{1}{6} + \frac{1}{6}$ | 2. $1\frac{3}{7}$ |
| c. _____ $\frac{4}{7} + \frac{6}{7}$ | 3. $\frac{1}{4}$ |
| d. _____ $\frac{9}{10} - \frac{6}{10}$ | 4. $\frac{1}{3}$ |
| e. _____ $\frac{7}{8} - \frac{5}{8}$ | 5. $\frac{8}{9}$ |
| f. _____ $\frac{5}{12} + \frac{9}{12}$ | 6. $1\frac{1}{6}$ |

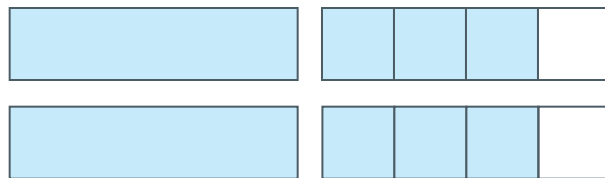
Adding and Subtracting Mixed Numbers

Adding and subtracting fractions with like denominators is a simple process. Add or subtract the numerators and keep the denominator the same. Then, represent the sum or difference as a fraction or mixed number in simplest form. For example, $\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$. Then, $\frac{2}{4}$ reduces to $\frac{1}{2}$.

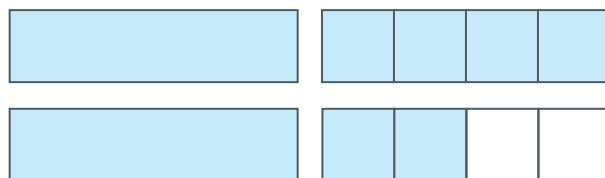
In this lesson, we'll continue to add and subtract fractions with like denominators as we add and subtract mixed numbers. We'll use models to represent the addition and subtraction problems, as well as solve word problems.

Adding Mixed Numbers with Like Denominators

Brianna is making a double batch of muffins today. The recipe says she'll need $1\frac{3}{4}$ cups of flour for each batch. How many total cups of flour will Brianna need? Let's use a model to help us solve this problem. A double batch means that Brianna will be making two batches. And, each batch calls for $1\frac{3}{4}$ cups, so draw two models of $1\frac{3}{4}$.



Notice that there are two whole rectangles shaded in and six-fourths shaded in, which is $2\frac{6}{4}$. The fourths can be combined to completely fill in the third rectangle. This leaves two-fourths shaded in the last rectangle.



So, $1\frac{3}{4} + 1\frac{3}{4}$ is the same as $3\frac{2}{4}$, or $3\frac{1}{2}$.

This might help...

The sum is equal to $3\frac{1}{2}$ because $3\frac{2}{4}$ reduces to $3\frac{1}{2}$. Always write the fraction in simplest form.

We can also use a pencil and paper to add two mixed numbers together. To add mixed numbers, add the whole numbers together. Then, add the fractions together. Finally, write the mixed number in simplest form.

$$1\frac{3}{4} + 1\frac{3}{4}$$

This is the original problem.

$$1 + 1 = 2$$

Add the whole numbers together.

$$\frac{3}{4} + \frac{3}{4} = \frac{6}{4}$$

Add the fractions together.

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

Rewrite the improper fraction as a mixed number.

$$2 + 1\frac{2}{4} = 3\frac{2}{4}$$

Add the whole numbers and the fractions together.

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

Write the fraction in simplest form.

So, Brianna will need $3\frac{1}{2}$ cups of flour to make her muffins.

Example:

Add.

$$2\frac{1}{3} + 1\frac{2}{3}$$

Solution:

Use a model to represent the addition problem.



Next, combine the models.



So, the sum is 4. The sum can also be found using a pencil and paper.

$$2\frac{1}{3} + 1\frac{2}{3}$$

This is the original problem.

$$2 + 1 = 3$$

Add the whole numbers together.

$$\frac{1}{3} + \frac{2}{3} = \frac{3}{3}$$

Add the fractions together.

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

Rewrite the improper fraction $\frac{3}{3}$ as a whole number.

$$3 + 1 = 4$$

Add the whole numbers together.

This might help...

Remember that any fraction in which the numerator and denominator are the same number has a value of 1. So, $\frac{3}{3}$ is equal to 1.

SELF TEST 1: LIKE DENOMINATORS

Each numbered question = 6 points

Answer *true* or *false*.

1.01 _____ Angie and Kim are sharing a large sub sandwich. Angie ate $\frac{1}{3}$ of the sandwich, and Kim ate another $\frac{1}{3}$ of the sandwich. So, together they ate $\frac{2}{6}$ of the sandwich.

1.02 _____ Angie and Kim are sharing a large sub sandwich. Angie ate $\frac{1}{3}$ of the sandwich, and Kim ate another $\frac{1}{3}$ of the sandwich. So, $\frac{1}{3}$ of the sandwich is left over.

Circle the correct letter and answer.

1.03 The sum of $\frac{3}{7}$ and $\frac{4}{7}$ is _____ 1.
a. less than b. greater than c. equal to

1.04 Use a model or paper and pencil to add. Write your answer in simplest form.
 $\frac{9}{12} + \frac{6}{12}$
a. $1\frac{1}{3}$ b. $\frac{4}{5}$ c. $\frac{5}{8}$ d. $1\frac{1}{4}$

1.05 Mason has to mow 6 lawns today. So far, he has mowed $1\frac{1}{2}$ of them. How many does he have left to do?
a. $2\frac{1}{2}$ b. $3\frac{1}{2}$ c. $4\frac{1}{2}$ d. $7\frac{1}{2}$

1.06 Use a model or paper and pencil to subtract. Write your answer in simplest form.
 $4\frac{7}{8} - 2\frac{3}{8}$
a. $2\frac{4}{8}$ b. $2\frac{1}{2}$ c. $1\frac{1}{2}$ d. $1\frac{4}{0}$

1.07 Estimate the sum by rounding each mixed number to the nearest half or whole number. $8\frac{1}{5} + 1\frac{7}{16}$
a. 8 b. $8\frac{1}{2}$ c. 9 d. $9\frac{1}{2}$

1.08 Estimate the difference by rounding each mixed number to the nearest half or whole number. $6\frac{9}{10} - 2\frac{2}{9}$
a. $5\frac{1}{2}$ b. 5 c. $4\frac{1}{2}$ d. 4

Madison made the following table to record the height of each person in her family.
Use the table to answer Questions 1.09 through 1.13.

NAME	HEIGHT (in feet)
Dad	$6\frac{3}{8}$
Mom	$5\frac{5}{8}$
Madison	$5\frac{1}{6}$
Jade	$4\frac{5}{6}$
Ben	$3\frac{1}{2}$

- 1.09** How much taller is her dad than her mom?
 a. $\frac{3}{4}$ foot b. $1\frac{1}{4}$ feet c. $\frac{1}{4}$ foot d. $1\frac{5}{8}$ feet
- 1.010** If Madison and Jade lay end to end, how far will they reach?
 a. $9\frac{1}{2}$ feet b. 9 feet c. 10 feet d. $10\frac{1}{2}$ feet
- 1.011** Round her mom's height to the nearest half or whole.
 a. 5 feet b. $5\frac{1}{2}$ feet c. 6 feet
- 1.012** Round Jade's height to the nearest half or whole.
 a. 4 feet b. $4\frac{1}{2}$ feet c. 5 feet
- 1.013** *About* how much taller is her mom than Jade?
 a. 0 feet b. $\frac{1}{2}$ foot c. 1 foot d. $1\frac{1}{2}$ feet

Complete these activities.

- 1.014** Find the difference. Write your answer in simplest form. $\frac{9}{10} - \frac{5}{10}$ _____
- 1.015** Find the sum. Write your answer in simplest form. $\frac{1}{8} + \frac{4}{8}$ _____

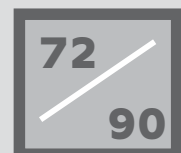


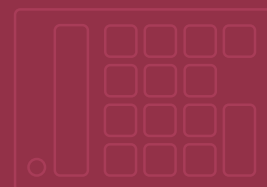
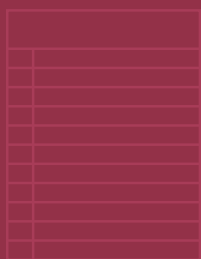
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