7.7 Common fractions: Adding mixed numbers (composing whole numbers)

In this lesson, students use different strategies to add mixed numbers. Each problem involves composing whole numbers from improper fractions.

Step 1 Preparing the lesson

Each student will need:

- Student Journal 7.7

Step 2 Starting the lesson

Write 57 + 36 on the board and have students brainstorm different strategies for adding the two numbers. Then discuss the points below:

Look at the ones digits. What happens when you combine the 7 groups of one with the 6 groups of one?

What is 13 groups of one equal to in groups of tens and groups of ones?

How does this affect the total number of tens?

Highlight that the result of adding 7 and 6 is 13 groups of one, which is equivalent to 1 group of ten and 3 groups of one. Highlight how another group of ten could be made because there were so many groups of one.

Step 3 Teaching the lesson

Write $2\frac{3}{4} + 1\frac{2}{4}$ on the board and have students give a quick estimate of the total. Ask, *Do you think the total is greater than or less than 4? How did you decide?* Encourage students to consider benchmarks of one-half or one whole to justify their estimates (**SMP7**). For example, $\frac{2}{4}$ is equivalent to one-half and $\frac{3}{4}$ is greater than one-half, so if added together their total must be greater than one whole.

Ask, *How could you calculate the exact answer?* Organize students into pairs to consider different ways to add the mixed numbers. Invite students to explain and demonstrate their methods. As each strategy is being shared, encourage students to think about how it is different from or the same as theirs. (**SMP3**) Then work through the strategy, as shown, and highlight that the same-sized groups (ones, fourths) are added together before adding the sub-totals. Encourage a discussion about how this idea relates to what was done in Step 2. Ask, *How can we use the regrouping of the ones digits in the first problem to help us solve the second problem?* (**SMP7**)

Then start with $2\frac{3}{4}$ and add the parts of the other mixed number, writing the steps on the board: $2\frac{3}{4} + 1\frac{2}{4} = 3\frac{3}{4} + \frac{2}{4} = 3\frac{5}{4} = 4\frac{1}{4}$. Relate the method to the count-on strategy used with whole numbers, where you begin with one number intact then progressively add the parts of the other number.

Draw two number lines from 0 to 5 on the board, mark increments showing fourths, and label the whole numbers. Demonstrate the two methods to calculate $2\frac{3}{4} + 1\frac{2}{4}$ on a number line. Ask students to consider the similarities to the methods shown previously (**SMP3**).

Write $2\frac{4}{6} + 1\frac{3}{6}$, $4\frac{3}{5} + 2\frac{2}{5}$, and $5\frac{2}{3} + 1\frac{2}{3}$ on the board. Have the students work individually to solve each problem, then share their solutions in their pairs. Call on

ELL

Encourage the students to discuss the concepts with their partner, as well as repeat the other student's thinking. Encourage the students to explain what they are learning to check that they understand the concept.

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

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

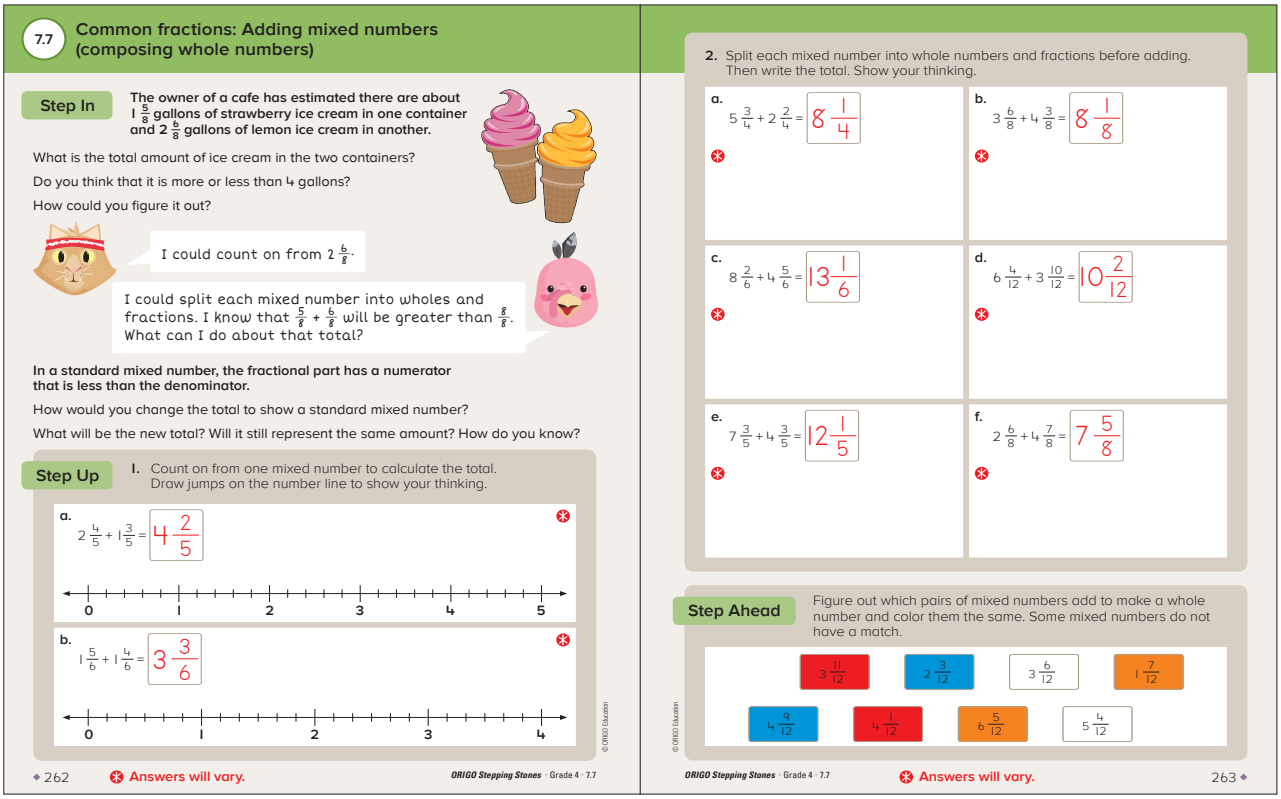
$2 + 1 + \frac{3}{4} + \frac{2}{4}$

$3 + \frac{5}{4}$

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

$4\frac{1}{4}$

Student Journal 7.7, pp. 262–263



7.7 Common fractions: Adding mixed numbers (composing whole numbers)

Step In

The owner of a cafe has estimated there are about $1\frac{5}{8}$ gallons of strawberry ice cream in one container and $2\frac{6}{8}$ gallons of lemon ice cream in another.

What is the total amount of ice cream in the two containers?

Do you think that it is more or less than 4 gallons?

How could you figure it out?

I could count on from $2\frac{6}{8}$.

I could split each mixed number into wholes and fractions. I know that $\frac{5}{8} + \frac{6}{8}$ will be greater than $\frac{8}{8}$. What can I do about that total?

In a standard mixed number, the fractional part has a numerator that is less than the denominator.

How would you change the total to show a standard mixed number?

What will be the new total? Will it still represent the same amount? How do you know?

Step Up

1. Count on from one mixed number to calculate the total. Draw jumps on the number line to show your thinking.

a. $2\frac{4}{5} + 1\frac{3}{5} = 4\frac{2}{5}$

0 1 2 3 4 5

b. $1\frac{5}{6} + 1\frac{4}{6} = 3\frac{3}{6}$

0 1 2 3 4

262 Answers will vary. ORIGO Stepping Stones · Grade 4 · 7.7

2. Split each mixed number into whole numbers and fractions before adding. Then write the total. Show your thinking.

a. $5\frac{3}{4} + 2\frac{2}{4} = 8\frac{1}{4}$

b. $3\frac{6}{8} + 4\frac{3}{8} = 8\frac{1}{8}$

c. $8\frac{2}{6} + 4\frac{5}{6} = 13\frac{1}{6}$

d. $6\frac{4}{12} + 3\frac{10}{12} = 10\frac{2}{12}$

e. $7\frac{3}{5} + 4\frac{3}{5} = 12\frac{1}{5}$

f. $2\frac{6}{8} + 4\frac{7}{8} = 7\frac{5}{8}$

Step Ahead

Figure out which pairs of mixed numbers add to make a whole number and color them the same. Some mixed numbers do not have a match.

$3\frac{11}{12}$ $2\frac{3}{12}$ $3\frac{6}{12}$ $1\frac{7}{12}$

$4\frac{9}{12}$ $4\frac{1}{12}$ $6\frac{5}{12}$ $5\frac{4}{12}$

ORIGO Stepping Stones · Grade 4 · 7.7 Answers will vary. 263

individuals to share their solution and thinking with the class. Prompt discussion by asking questions such as, *How did you know your solution was reasonable? Is there a more efficient strategy you could have used? How does this strategy differ from the strategy you used?* (**SMP3**) Encourage students to use clear and precise language in their responses (**SMP6**).

Work through the Step In discussion (Student Journal 7.7) with the whole class. Read the Step Up and Step Ahead instructions with the students. Make sure they know what to do, then have them work independently to complete the tasks.

Step 4 Reflecting on the work

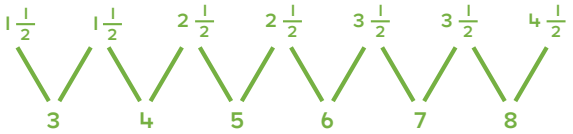
Discuss the students' answers to Student Journal 7.7. Refer to Step Ahead and ask, *How did you decide which mixed numbers should be combined to make whole numbers? Why might it be helpful to combine fractions to make one whole when adding mixed numbers generally?* Guide students to explain that combining fractions can help simplify calculations and make it easier to keep track of numbers in their mind. To demonstrate, challenge students to add all of the mixed numbers in Step Ahead without writing any fractions. However, encourage them to record whole numbers, if needed, and cross off the parts they have added as they go. Then have students share how they found the sum. Emphasize how the whole number part can be separated from the fractional part of the mixed numbers to perform the calculation.

Applications

If time allows, have the students complete this Investigation and/or Problem solving activity.

Investigation: Working with mixed numbers and addition

Write the investigation question, as shown, on the board and read it with the students. Draw the example pattern, as shown, on the board and discuss it with the students. Ask questions such as, *What pattern do you see in the numbers being added? What pattern do you see in the totals?* Organize students into groups of four. They work together to form a response to the investigation question. Afterward, invite groups to present their findings and explain their methods. Discuss any variation between outcomes.



Investigation question

How many addition patterns can you create using mixed numbers that involve one type of denominator, for example, thirds, fourths, or eighths?

Problem solving: Working with common fractions

Each student will need:

- inch ruler (for additional support, if necessary)

Write this word problem on the board and read it with the students:

> *On her bookshelf, Vishaya has a space that is 9 inches wide to put more books. She has bought six books that are each $\frac{7}{8}$ of an inch thick and five books that are each $\frac{5}{8}$ of an inch thick. Will she have enough space to put all the books on the shelf?*

Students work independently or in pairs to determine whether there is enough space for all the books to fit on the shelf. Encourage students to think about what the numerator and the denominator tell them about the thickness of the books. (Some books are 7 one-eighths of an inch thick and others are only 5 one-eighths of an inch thick.) If needed, have students examine an inch ruler to show where $\frac{7}{8}$ and $\frac{5}{8}$ are marked. They then focus on the fact that one-eighth of an inch is repeated seven times from the beginning of the ruler to the $\frac{7}{8}$ mark and only 5 times to the $\frac{5}{8}$ mark. Do not let them use the ruler to solve the problem, however. Invite volunteers to describe how they figured out that there would be enough room on the shelf. Ask, *How much room did she have left over?* ($\frac{5}{8}$ of an inch.)

7.7 Common fractions: Adding mixed numbers (composing whole numbers)

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How could you figure it out?

I could count on from $2\frac{6}{8}$.

I could split each mixed number into wholes and fractions. I know that $\frac{5}{8} + \frac{6}{8}$ will be greater than $\frac{8}{8}$. What can I do about that total?

In a standard mixed number, the fractional part has a numerator that is less than the denominator.

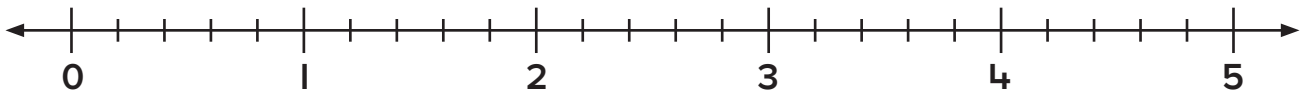
How would you change the total to show a standard mixed number?

What will be the new total? Will it still represent the same amount? How do you know?

Step Up

1. Count on from one mixed number to calculate the total. Draw jumps on the number line to show your thinking.

a. $2\frac{4}{5} + 1\frac{3}{5} =$ ☐



b. $1\frac{5}{6} + 1\frac{4}{6} =$ ☐

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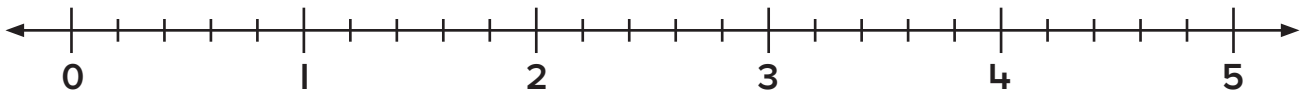


b. $1\frac{5}{6} + 1\frac{4}{6} = 3\frac{3}{6}$

Answers will vary.

2. Split each mixed number into whole numbers and fractions before adding. Then write the total. Show your thinking.

a. $5\frac{3}{4} + 2\frac{2}{4} =$ ☐

b. $3\frac{6}{8} + 4\frac{3}{8} =$ ☐

c. $8\frac{2}{6} + 4\frac{5}{6} =$ ☐

d. $6\frac{4}{12} + 3\frac{10}{12} =$ ☐

e. $7\frac{3}{5} + 4\frac{3}{5} =$ ☐

f. $2\frac{6}{8} + 4\frac{7}{8} =$ ☐

Step Ahead

Figure out which pairs of mixed numbers add to make a whole number and color them the same. Some mixed numbers do not have a match.

$3\frac{11}{12}$ $2\frac{3}{12}$ $3\frac{6}{12}$ $1\frac{7}{12}$

$4\frac{9}{12}$ $4\frac{1}{12}$ $6\frac{5}{12}$ $5\frac{4}{12}$

2. Split each mixed number into whole numbers and fractions before adding. Then write the total. Show your thinking.

a. $5\frac{3}{4} + 2\frac{2}{4} = 8\frac{1}{4}$

✻

b. $3\frac{6}{8} + 4\frac{3}{8} = 8\frac{1}{8}$

✻

c. $8\frac{2}{6} + 4\frac{5}{6} = 13\frac{1}{6}$

✻

d. $6\frac{4}{12} + 3\frac{10}{12} = 10\frac{2}{12}$

✻

e. $7\frac{3}{5} + 4\frac{3}{5} = 12\frac{1}{5}$

✻

f. $2\frac{6}{8} + 4\frac{7}{8} = 7\frac{5}{8}$

✻

Step Ahead

Figure out which pairs of mixed numbers add to make a whole number and color them the same. Some mixed numbers do not have a match.

$3\frac{11}{12}$ $2\frac{3}{12}$ $3\frac{6}{12}$ $1\frac{7}{12}$

$4\frac{9}{12}$ $4\frac{1}{12}$ $6\frac{5}{12}$ $5\frac{4}{12}$

✻ Answers will vary.

Small group differentiation

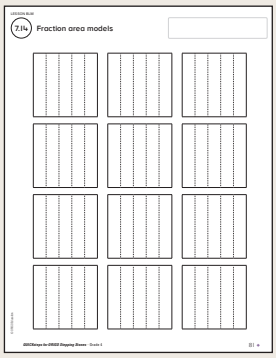
Extra help

Each student will need:

- 1 copy of Blackline Master 7.14
- scissors
- markers or pencils in 2 different colors

Distribute the resources. This activity will help students who have trouble composing a whole from the fractional parts of mixed numbers. Present the students with an expression such as $1\frac{4}{5} + 1\frac{3}{5}$. Have the students use the blackline master to represent each amount by shading each mixed number in a different color. Confirm that each whole is equal to five-fifths. Then have them cut out each whole and each individual fifth of the fractional parts of the mixed numbers. The students can then arrange the one-fifths to create one whole and two extra fifths. With rearrangement, it can be demonstrated that $1\frac{4}{5}$ and $1\frac{3}{5}$ is equivalent to 3 and $\frac{2}{5}$, or $3\frac{2}{5}$. Repeat with other mixed numbers involving fifths.

Blackline Master 7.14



Extra practice

Each group of students will need:

- 1 cube labeled: $\frac{2}{8}$, $\frac{3}{8}$, $\frac{4}{8}$, $\frac{5}{8}$, $\frac{6}{8}$, $\frac{7}{8}$
- 1 standard number cube

Organize students into pairs and distribute the cubes. Students take turns to roll both cubes twice, and join the whole numbers and proper fractions to form two mixed numbers. These mixed numbers are then used to write an addition equation. One point is awarded to the student who records the greatest total. The student with the most points after five rounds wins.

Cross-curricular link

Mixed number artwork

Each student will need:

- collage resources
- scissors and glue
- art paper

Distribute the resources. The students create an original collage to portray mixed numbers in some way. Explain that they can incorporate ideas about themselves or their families in their collage. Allow time for the students to design, then create their collage. Afterward, invite students to present and explain their work. Watch for use of appropriate vocabulary. Afterward, have the students work in groups to compare and contrast their collages.

INTERVIEW

I

Preparation

- Write the following on a sheet of paper:
  $\frac{3}{6} + \frac{7}{6} =$ $\frac{2}{8} + \frac{6}{8} + \frac{7}{8} =$ $\frac{3}{10} + \frac{8}{10} =$ $\frac{1}{12} + \frac{3}{12} =$

Steps

- Show the student the first equation and ask, *Will the total be less than 1, between 1 and 2, or greater than 2? Why do you think that?* Point out that the student does not need to calculate the exact total to help them answer, but it is okay if they do. If they calculate the exact total, ask, *Is it closer to 1 or 2?*
- Repeat the previous step with the next two equations.
- Repeat the first step with $\frac{1}{12} + \frac{3}{12}$. If the student answers that it will be less than 1, ask, *Will it be closest to one-fourth, one-half, or three-fourths? How do you know?*
- Draw a ✔ beside the learning the student has successfully demonstrated.

INTERVIEW

I

$\frac{3}{6} + \frac{7}{6} = \frac{10}{6}$ (between 1 and 2, closer to 2)

☐ Correctly identified the range the total is in.

☐ Correctly identified the closer whole number.

$\frac{3}{10} + \frac{8}{10} = \frac{11}{10}$ (between 1 and 2, closer to 1)

☐ Correctly identified the range the total is in.

☐ Correctly identified the closer whole number.

$\frac{2}{8} + \frac{6}{8} + \frac{7}{8} = \frac{15}{8}$ (between 1 and 2, closer to 2)

☐ Correctly identified the range the total is in.

☐ Correctly identified the closer whole number.

$\frac{1}{12} + \frac{3}{12} = \frac{4}{12}$ (less than 1, closest to $\frac{1}{4}$)

☐ Correctly identified the range the total is in.

☐ Correctly identified the closest proper fraction.

INTERVIEW

I

$\frac{3}{6} + \frac{7}{6} = \frac{10}{6}$ (between 1 and 2, closer to 2)

☐ Correctly identified the range the total is in.

☐ Correctly identified the closer whole number.

$\frac{3}{10} + \frac{8}{10} = \frac{11}{10}$ (between 1 and 2, closer to 1)

☐ Correctly identified the range the total is in.

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$\frac{2}{8} + \frac{6}{8} + \frac{7}{8} = \frac{15}{8}$ (between 1 and 2, closer to 2)

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☐ Correctly identified the range the total is in.

☐ Correctly identified the closest proper fraction.

INTERVIEW

I

$\frac{3}{6} + \frac{7}{6} = \frac{10}{6}$ (between 1 and 2, closer to 2)

- ☐ Correctly identified the range the total is in.
- ☐ Correctly identified the closer whole number.

$\frac{3}{10} + \frac{8}{10} = \frac{11}{10}$ (between 1 and 2, closer to 1)

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- ☐ Correctly identified the range the total is in.
- ☐ Correctly identified the closest proper fraction.

4.NF.B.3 + 4.NF.B.3a

INTERVIEW

I

$\frac{3}{6} + \frac{7}{6} = \frac{10}{6}$ (between 1 and 2, closer to 2)

- ☐ Correctly identified the range the total is in.
- ☐ Correctly identified the closer whole number.

$\frac{3}{10} + \frac{8}{10} = \frac{11}{10}$ (between 1 and 2, closer to 1)

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4.NF.B.3 + 4.NF.B.3a

INTERVIEW

I

$\frac{3}{6} + \frac{7}{6} = \frac{10}{6}$ (between 1 and 2, closer to 2)

- ☐ Correctly identified the range the total is in.
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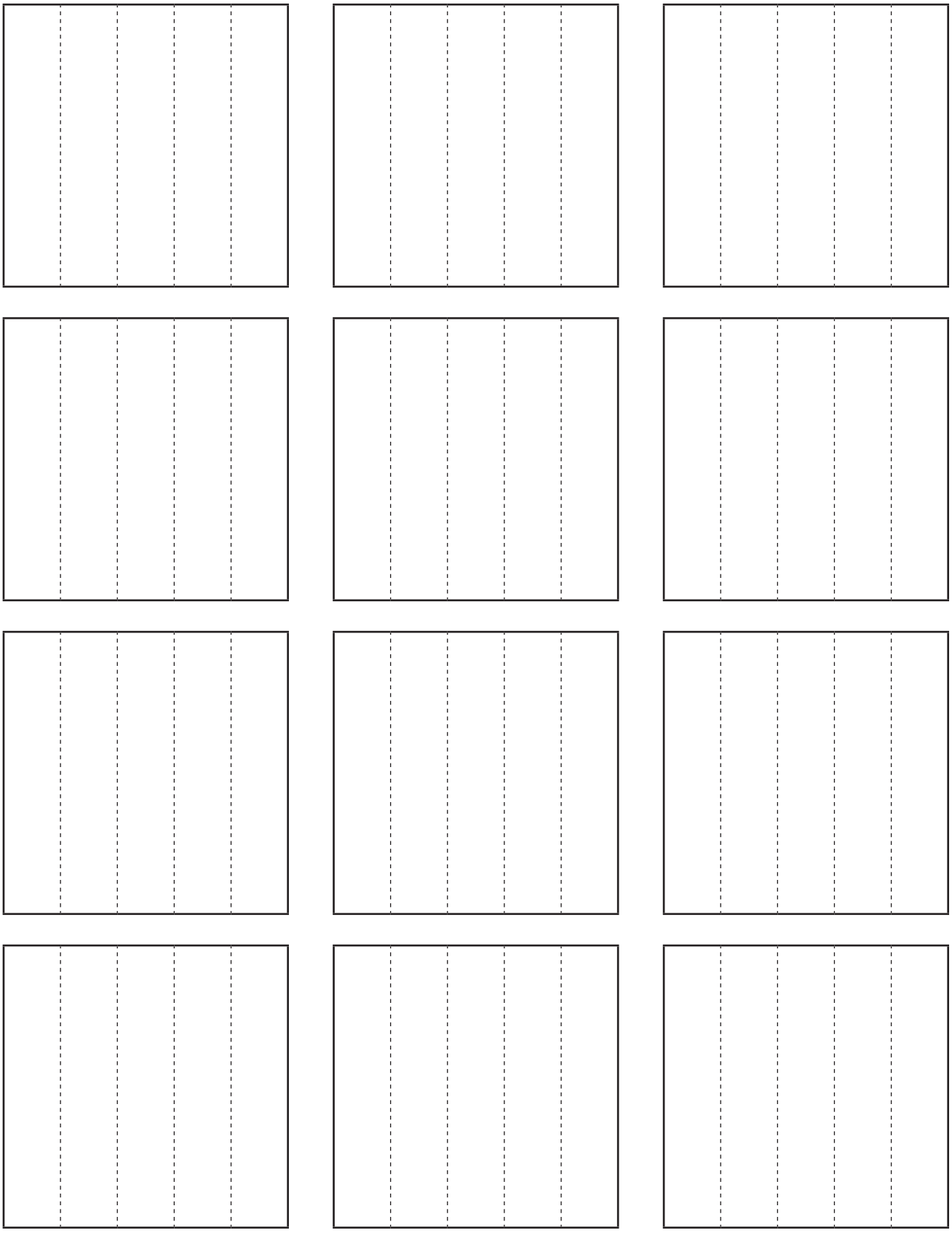
4.NF.B.3 + 4.NF.B.3a

7.14 Fraction area models



7.7 Fracciones comunes: Sumando números mixtos (composición de números enteros)

Conoce

El dueño de una cafetería estimó que había cerca de $1\frac{5}{8}$ galones de helado de fresa en un recipiente y cerca de $2\frac{6}{8}$ galones de helado de limón en otro.

¿Cuál es la cantidad total de helado en los dos recipientes?

¿Crees que es más de o menos de 4 galones?

¿Cómo podrías averiguarlo?

Yo podría contar hacia delante desde $2\frac{6}{8}$.

Yo podría separar cada número mixto en enteros y fracciones. Sé que $\frac{5}{8} + \frac{6}{8}$ será mayor que $\frac{8}{8}$. ¿Qué puedo hacer con ese total?

En un número mixto estándar, la parte fraccionaria tiene un numerador menor que el denominador.

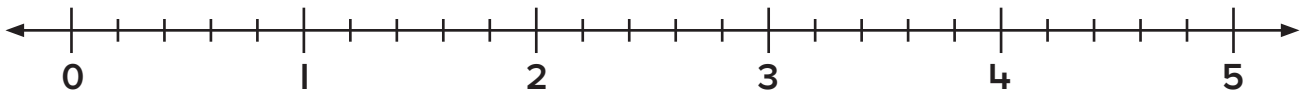
¿Cómo cambiarías el total para representarlo con un número mixto estándar?

¿Cuál será el nuevo total? ¿Representará aún la misma cantidad? ¿Cómo lo sabes?

Intensifica

1. Cuenta hacia delante desde un número mixto para calcular el total. Dibuja saltos en la recta numérica para indicar tu razonamiento.

a. $2\frac{4}{5} + 1\frac{3}{5} =$ ☐



b. $1\frac{5}{6} + 1\frac{4}{6} =$ ☐

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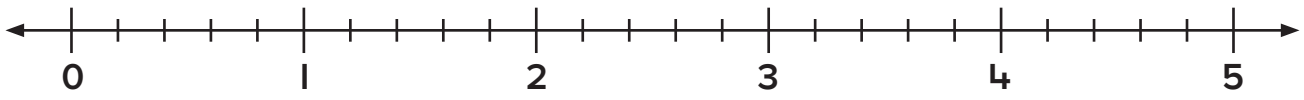

b. $1\frac{5}{6} + 1\frac{4}{6} = 3\frac{3}{6}$ ✻

 ✻ Las respuestas pueden variar.

2. Separa cada número mixto en números enteros y fracciones antes de sumar. Luego escribe el total. Indica tu razonamiento.

a. $5\frac{3}{4} + 2\frac{2}{4} =$ ☐

b. $3\frac{6}{8} + 4\frac{3}{8} =$ ☐

c. $8\frac{2}{6} + 4\frac{5}{6} =$ ☐

d. $6\frac{4}{12} + 3\frac{10}{12} =$ ☐

e. $7\frac{3}{5} + 4\frac{3}{5} =$ ☐

f. $2\frac{6}{8} + 4\frac{7}{8} =$ ☐

Avanza

Calcula cuáles pares de números mixtos forman un número entero al sumarlos y coloréalos del mismo color. Algunos números mixtos no tienen pareja.

$3\frac{11}{12}$ $2\frac{3}{12}$ $3\frac{6}{12}$ $1\frac{7}{12}$

$4\frac{9}{12}$ $4\frac{1}{12}$ $6\frac{5}{12}$ $5\frac{4}{12}$

2. Separa cada número mixto en números enteros y fracciones antes de sumar. Luego escribe el total. Indica tu razonamiento.

a. $5\frac{3}{4} + 2\frac{2}{4} = \boxed{8\frac{1}{4}}$

✻

b. $3\frac{6}{8} + 4\frac{3}{8} = \boxed{8\frac{1}{8}}$

✻

c. $8\frac{2}{6} + 4\frac{5}{6} = \boxed{13\frac{1}{6}}$

✻

d. $6\frac{4}{12} + 3\frac{10}{12} = \boxed{10\frac{2}{12}}$

✻

e. $7\frac{3}{5} + 4\frac{3}{5} = \boxed{12\frac{1}{5}}$

✻

f. $2\frac{6}{8} + 4\frac{7}{8} = \boxed{7\frac{5}{8}}$

✻

Avanza

Calcula cuáles pares de números mixtos forman un número entero al sumarlos y coloréalos del mismo color. Algunos números mixtos no tienen pareja.

$3\frac{11}{12}$ $2\frac{3}{12}$ $3\frac{6}{12}$ $1\frac{7}{12}$

$4\frac{9}{12}$ $4\frac{1}{12}$ $6\frac{5}{12}$ $5\frac{4}{12}$

✻ Las respuestas pueden variar.