

Adding and Subtracting Fractions with Unlike Denominators

When adding and subtracting fractions with like denominators, add or subtract the numerators, while keeping the denominator the same. The process is different when adding and subtracting fractions with unlike denominators because the fractions represent parts of different wholes. Problem solvers can take different approaches to add and subtract fractions with unlike denominators.

EXAMPLE

In Brianna's refrigerator are two partially full water bottles. One is $\frac{1}{3}$ full, and the other is $\frac{3}{4}$ full. Can Brianna combine the partially full water bottles into one?

Summarize the Context.

If Brianna pours a $\frac{1}{3}$ -full bottle of water into a $\frac{3}{4}$ -full bottle of water, will the water fit without overflowing?

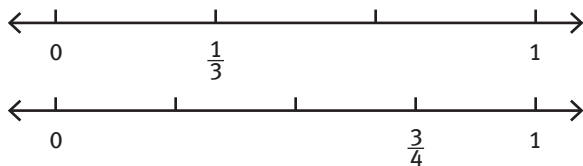
Explain the Math.

Brianna should add $\frac{1}{3}$ and $\frac{3}{4}$. If the sum is greater than 1 whole, she cannot combine them without overflow.

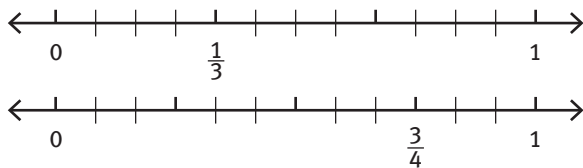
Solve the Problem.

Approach 1: Use number lines.

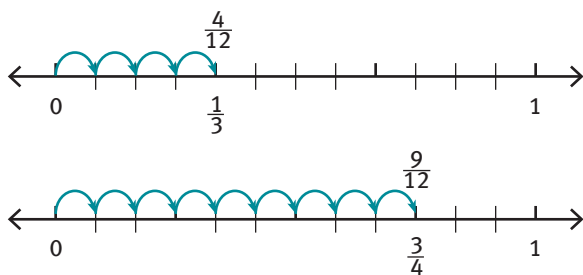
First, represent the fractions on separate number lines.



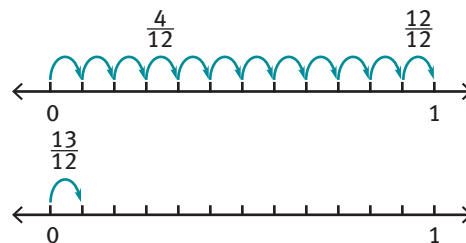
Next, use the number line to find a common denominator. Further cut each number line into equal parts that are the same on both.



Then, represent equivalent fractions on the number lines.



Finally, use the number line to add the numerators of the fractions with like denominators.



$$\frac{4}{12} + \frac{9}{12} = \frac{13}{12} = 1\frac{1}{12}$$

Approach 2: Use the addition algorithm.

First, represent the problem.

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

Next, find a common denominator by using the Least Common Multiple. Then, write equivalent fractions using the Identity Property of One.

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

$$\frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$$

Finally, add the numerators of the fractions with like denominators.

$$\frac{4}{12} + \frac{9}{12} = \frac{13}{12} = 1\frac{1}{12}$$

Solution: Brianna cannot combine the two partially full water bottles into one because $1\frac{1}{12} > 1$.

Adding and Subtracting Fractions with Unlike Denominators (continued)

GUIDED PRACTICE

Andrew's cake recipe calls for $1\frac{1}{3}$ cups of sugar. It specifies to separate $\frac{1}{2}$ cup out for the frosting, and to use the rest for the cake mix. How much sugar is used for the cake mix itself?

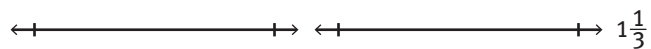
Summarize the Context.

Explain the Math.

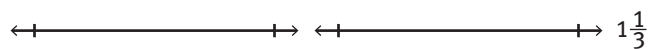
Solve the Problem.

Approach 1: Use number lines.

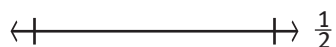
First, represent the fractions on separate number lines.



Next, use the number line to find a common denominator. Further cut the number lines into equal parts that are the same for both fractions.



Then, represent equivalent fractions on the number lines.



PRACTICE

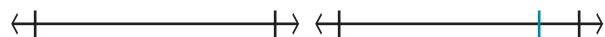
Determine the sum or difference using the approach you prefer. Show your work.

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

2. $\frac{11}{12} - \frac{2}{5} =$

3. $4\frac{6}{7} - 1\frac{3}{4} =$

Finally, use the number lines to subtract the numerators of the fractions with like denominators.



Approach 2: Use the subtraction algorithm.

First, represent the problem.

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

Next, find a common denominator by using the Least Common Multiple. Then, write equivalent fractions using the Identity Property of One.

Finally, perform the operation with like denominators.

Solution: