



How to Add and Subtract Unlike Fractions and Mixed Numbers

Simple fraction arithmetic gets a little more complicated when our denominators don't match. In this lesson, we'll learn how to add and subtract unlike fractions. Then, we'll do the same with mixed numbers.

Handling Fractions

Some fractions are easy to add. Let's consider the fractions of burgers. What if you eat a $\frac{1}{4}$ pound burger, then another $\frac{1}{4}$ pound burger? How much burger did you eat? $\frac{1}{4} + \frac{1}{4}$ is $\frac{2}{4}$, so you ate $\frac{1}{2}$ a pound of burger. We just added the numerators, or the numbers on the top. That's simple, tasty math.

Adding Unlike Fractions

But, what if you ate a $\frac{1}{4}$ pound burger and then a $\frac{1}{2}$ pound burger? That's a lot of meat. To add unlike fractions, you need to find the least common denominator. The denominator is the number on the bottom. The **least common denominator** is the smallest shared multiple of the denominators. With 2 and 4, it's 4! So, we multiply $\frac{1}{2}$ by $\frac{2}{2}$ to get $\frac{2}{4}$. Then, we have $\frac{1}{4} + \frac{2}{4}$, which is $\frac{3}{4}$. So, you ate $\frac{3}{4}$ of a pound of beef.

Here's another example: After all that meat, you start watching what you eat. You're making your own salad dressing for your new, healthier lunch. The recipe calls for $\frac{3}{8}$ of a teaspoon of salt and $\frac{1}{3}$ of a teaspoon of sugar. $\frac{1}{3}$ of a teaspoon? Where did you get this cookbook? Anyway, how much salt and sugar is that? $\frac{3}{8} + \frac{1}{3}$ - those are different denominators. What's the least common denominator? Sometimes, it's easiest to just multiply them together. $8 * 3$ is 24. That actually is the least common multiple.

We multiply $\frac{3}{8}$ by $\frac{3}{3}$ to get $\frac{9}{24}$. We multiply $\frac{1}{3}$ by $\frac{8}{8}$ to get $\frac{8}{24}$. $\frac{9}{24} + \frac{8}{24}$ is $\frac{17}{24}$. So, $\frac{17}{24}$ of a teaspoon - that's your total of salt and sugar.

Subtracting Unlike Fractions

To subtract unlike fractions, we do the same thing - find the least common denominator. Here's an example: Eating salads was ok, but you think exercise is a better way to get healthy. You decide to take up rock climbing. You're on a practice wall, and you get $\frac{4}{5}$ of the way to the top. The next day, you're very sore, and you only get $\frac{1}{4}$ of the way. How much less far did you climb? This is $\frac{4}{5} - \frac{1}{4}$. The least common denominator is 20. So, $\frac{4}{5}$ becomes $\frac{16}{20}$, and $\frac{1}{4}$ becomes $\frac{5}{20}$. $\frac{16}{20} - \frac{5}{20}$ is $\frac{11}{20}$. So, the difference between day one and day two is $\frac{11}{20}$ of the wall.

Here's another example: After rock climbing makes you hurt all over, you try running. You run a loop around a local park, and it takes $\frac{3}{4}$ of an hour. The next time, it only takes $\frac{2}{3}$ of an hour. How much time did you cut? That's $\frac{3}{4} - \frac{2}{3}$. The smallest multiple? It's 12. $\frac{3}{4}$ becomes $\frac{9}{12}$. $\frac{2}{3}$ becomes $\frac{8}{12}$. $\frac{9}{12} - \frac{8}{12}$ is $\frac{1}{12}$. So, you cut $\frac{1}{12}$ of an hour. That's five whole minutes. Nice work!

Adding Unlike Mixed Numbers

Let's move on to adding unlike mixed numbers. This just requires the additional step of adding the whole numbers. With like mixed numbers, this is pretty straightforward. $2\frac{1}{4} + 1\frac{1}{4}$ is just $2 + 1$, or 3, and $\frac{1}{4} + \frac{1}{4}$, or $\frac{2}{4}$. So, it's $3\frac{2}{4}$. Let's try an unlike one in context.

You decide to add swimming to your exercise options. The first day, you swim $7\frac{1}{2}$ laps. The next day, you swim $9\frac{1}{4}$ laps. How many total laps did you swim? First, let's find common multiples. It's 4, so $9\frac{1}{4}$ stays the same. $7\frac{1}{2}$ becomes $7\frac{2}{4}$. $9 + 7$ is 16, and $\frac{1}{4} + \frac{2}{4}$ is $\frac{3}{4}$. So, you swam $16\frac{3}{4}$ laps. That's pretty good!

You're a long way from those multiple burger meals by this point. In fact, your ever-expanding athletic repertoire now includes cycling. You go out for a ride and cover $7\frac{1}{10}$ miles. You stop for a quick snack. Then, you ride another $11\frac{2}{5}$ miles. How far did you go? Our smallest common multiple is 10, so $7\frac{1}{10}$ is good. $11\frac{2}{5}$ becomes $11\frac{4}{10}$. $7 + 11$ is 18. Then, $\frac{1}{10} + \frac{4}{10}$ is $\frac{5}{10}$, or $\frac{1}{2}$. So, you went $18\frac{1}{2}$ miles. I think you're ready for a triathlon.

Subtracting Unlike Mixed Numbers

Let's try subtracting unlike mixed numbers. Think of these like two separate subtraction problems, where you subtract the whole numbers, then the fractions. Let's try it in context.

Let's say you're deep into triathlon training, and you're all about the protein smoothies. You've been drinking a $3\frac{5}{8}$ cup smoothie, but you decide to cut that back to $2\frac{1}{4}$. How much less is that? This is $3\frac{5}{8} - 2\frac{1}{4}$. Let's get those least common denominators. With 8 and 4, it's just 8. So, we make $2\frac{1}{4}$ into $2\frac{2}{8}$. Now let's consider the whole numbers and fractions separately. $3 - 2$ is 1, and $\frac{5}{8} - \frac{2}{8}$ is $\frac{3}{8}$. So, you've cut $1\frac{3}{8}$ cups of smoothie.

Let's do one more. Let's jump forward in time. We saw you go from burger mania to triathlon ready. Let's say you're now a world class Ironman triathlon competitor. You complete one triathlon in $14 \frac{5}{6}$ hours. That's pretty good. But, you train and train, then do another in $9 \frac{1}{3}$ hours. That seems like a huge improvement, but how much is it? It's $14 \frac{5}{6} - 9 \frac{1}{3}$. Let's make $9 \frac{1}{3}$ into $9 \frac{2}{6}$, then consider the parts separately. $14 - 9$ is 5. And, $\frac{5}{6} - \frac{2}{6}$ is $\frac{3}{6}$, or $\frac{1}{2}$. So, you cut $5 \frac{1}{2}$ hours off your time. That's amazing!

Lesson Summary

In summary, did you know you were an amazing Ironman triathlete? Wait, you're not? Well, okay. But, you do know how to add and subtract unlike fractions and mixed numbers! When you add or subtract unlike fractions, you first need to find the **least common denominator**. This is the smallest common multiple. Then, you just add or subtract the numerators. With mixed numbers, you still need the least common denominator. But then, you handle the whole numbers and fractions separately.

Learning Outcome

You should be able to add and subtract unlike fractions and mixed numbers after watching this video lesson.