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Adding Fractions

There are 3 Simple Steps to add fractions:

- Step 1: Make sure the bottom numbers (the denominators) are the same
- Step 2: Add the top numbers (the numerators). Put the answer over the same denominator.
- Step 3: Simplify the fraction (if needed).

Example 1:

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

Step 1. The bottom numbers are already the same. Go straight to step 2.

Step 2. Add the top numbers and put the answer over the same denominator:

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

Step 3. Simplify the fraction:

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

(If you are unsure of the last step see Equivalent Fractions.)

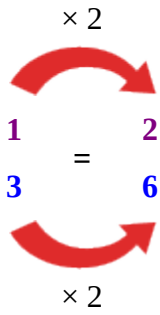
Example 2:

$$\frac{1}{3} + \frac{1}{6}$$

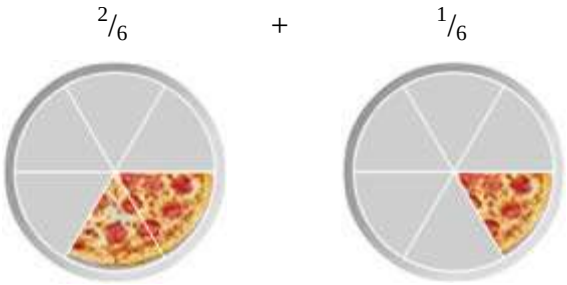
Step 1: The bottom numbers are different. See how the slices are different sizes? We need to make them the same before we can continue, because we **can't** add them like this:

$$^1/_3 \quad + \quad ^1/_6 \quad = \quad ?$$

The number "6" is twice as big as "3", so to make the bottom numbers the same I can multiply the top and bottom of the first fraction by **2**, like this:



Now the first fraction has the same bottom number ("6"), and our question looks like this:

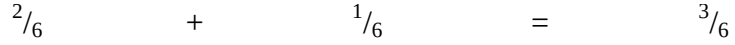


The bottom numbers (the denominators) are the same, so we can go to step 2.

Step 2: Add the top numbers and put them over the same denominator:

$$\frac{2}{6} + \frac{1}{6} = \frac{2+1}{6} = \frac{3}{6}$$

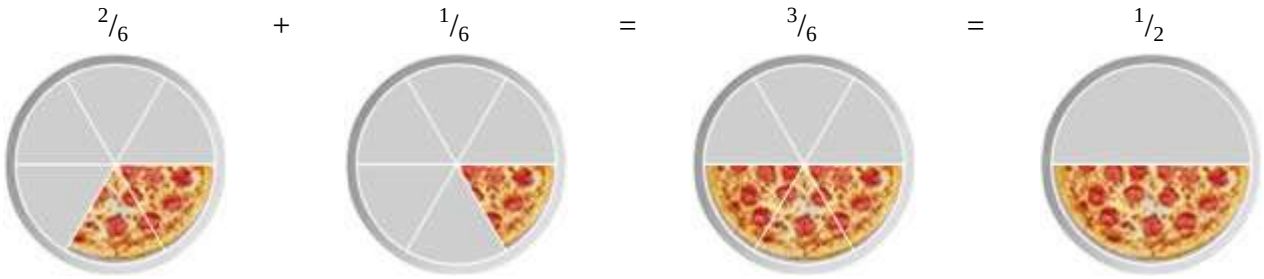
In picture form it looks like this:



Step 3: Simplify the fraction:

$$\frac{3}{6} = \frac{1}{2}$$

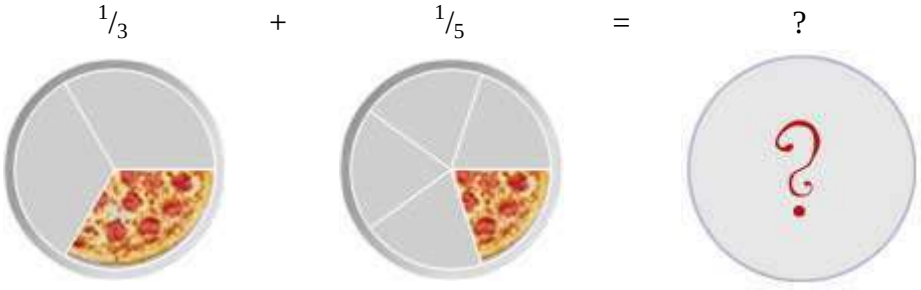
In picture form the whole answer looks like this:



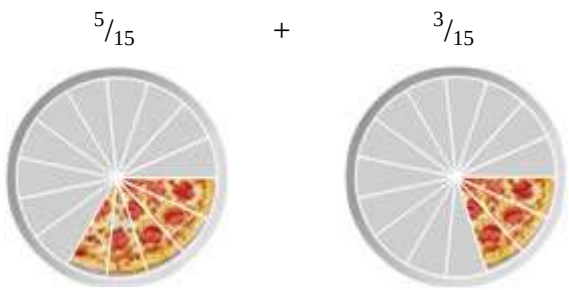
Example 3:

$$\frac{\mathbf{1}}{\mathbf{3}} + \frac{\mathbf{1}}{\mathbf{5}}$$

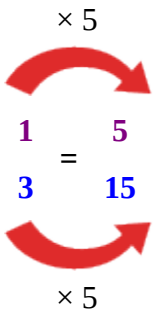
Again, the bottom numbers are different (the slices are different sizes)!



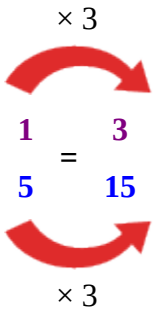
But let us try dividing them into smaller sizes that **will each be the same**:



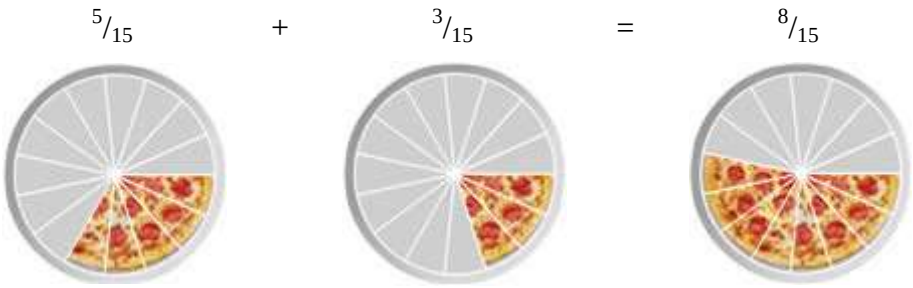
By multiplying the top and bottom of the first fraction by 5 we ended up with $^{5}/_{15}$:



And by multiplying the top and bottom of the second fraction by 3 we ended up with $^{3}/_{15}$:



The bottom numbers are now the same, so we can go ahead and add the top numbers:



Making the Denominators the Same

In the previous example how did I know to cut them into $^{1}/_{15}$ths to make the denominators the same? You can read how to do this using either one of these methods:

- Common Denominator Method, or the
- Least Common Denominator Method

They both work, use whichever you prefer!

Adding and Subtracting Mixed Fractions

$1\ ^{3}/_{4}$

(one and three-quarters)

Quick Definition: A Mixed Fraction is a whole number and a fraction combined, such as $1\ ^{3}/_{4}$.

To make it easy to add and subtract them, just convert to Improper Fractions first:

$^{7}/_{4}$

(seven-fourths or seven-quarters)

Quick Definition: An Improper fraction has a top number larger than or equal to the bottom number,

such as $^{7}/_{4}$ or $^{4}/_{3}$

*(It is "**top-heavy**")*

ADDING /SUBTRACTING MIXED NUMBERS

The steps are the same whether you're adding or subtracting mixed numbers:

1. Find the Least Common Denominator (LCD)
2. Find the equivalent fractions.
3. Add or subtract the fractions and add or subtract the whole numbers.
4. Write your answer in lowest terms.

In Depth:

As you may recall, a mixed number consists of an integer and a proper fraction. Any mixed number can also be written as an improper fraction, in which the numerator is larger than the denominator, as shown in the following example:

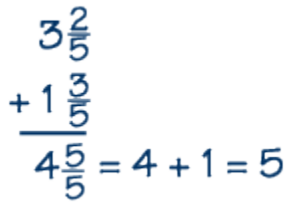
Example 1

$$3\frac{1}{8} = \frac{25}{8}$$

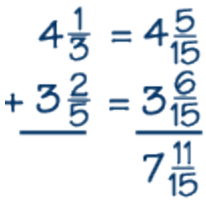
To add mixed numbers, we first add the whole numbers together, and then the fractions.

If the sum of the fractions is an improper fraction, then we change it to a mixed number. Here's an example. The whole numbers, 3 and 1, sum to 4. The fractions, 2/5 and 3/5, add up to 5/5, or 1. Add the 1 to 4 to get the answer, which is 5.

Example 2



If the denominators of the fractions are different, then first find equivalent fractions with a common denominator before adding. For example, let's add 4 1/3 to 3 2/5. Using the techniques we've learned, you can find the least common denominator of 15. The answer is 7 11/15.



Subtracting mixed numbers is very similar to adding them. But what happens when the fractional part of the number you are subtracting is larger than the fractional part of the number you are subtracting from?

Here's an example: let's subtract 3 3/5 from 4 1/3. First you find the LCD; here it's 15.

4 1/3 - 3 3/5	Write both fractions as equivalent fractions with a denominator of 15.
4 5/15 - 3 9/15	
3 + 1 5/15 - 3 9/15	Since you're trying to subtract a larger fraction from a smaller one, you need to "borrow" a one from the integer 4, change it to 15/15, and add it to the fraction.
3 + 20/15 - 3 9/15	
3 20/15 - 3 9/15	Now the problem becomes 3 20/15 minus 3 9/15 and the answer is 11/15.
11/15	