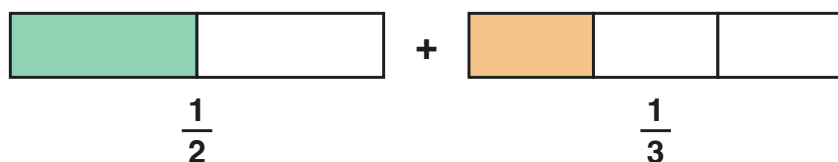


Adding and Subtracting Fractions: Unlike Denominators

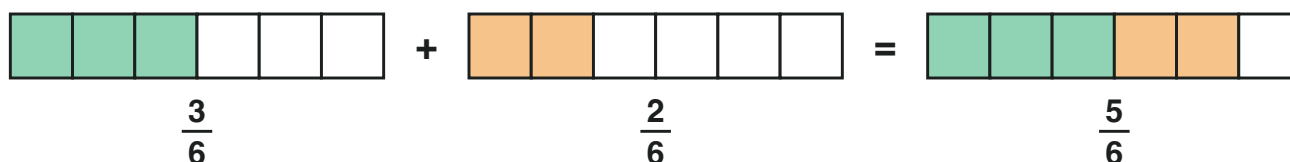
Fractions can be added or subtracted only when their bottom numbers match.

1. The pieces have to be the same size



Halves and thirds are different sizes, so they cannot be counted together yet.

Cut both bars into sixths.



Now every piece is a sixth, so the pieces can be counted: 3 sixths + 2 sixths = 5 sixths. A bottom number that both fractions can use is called a **common denominator**.

2. The steps

Example: adding

$$\frac{3}{4} + \frac{1}{6}$$

Step 1. Find a bottom number both can use. Count by 4s: 4, 8, **12**. Count by 6s: 6, **12**.

Step 2. Rename both as twelfths. $\frac{3}{4} = \frac{9}{12}$ and $\frac{1}{6} = \frac{2}{12}$

Step 3. Add the tops. $9 + 2 = 11$. The bottom stays 12.

So $\frac{3}{4} + \frac{1}{6} = \frac{11}{12}$

Example: subtracting

$$\frac{5}{6} - \frac{1}{2}$$

Step 1. 2 goes into 6, so use sixths. Only $\frac{1}{2}$ has to change.

Step 2. Rename. $\frac{1}{2} = \frac{3}{6}$

Step 3. Subtract the tops. $5 - 3 = 2$. That is $\frac{2}{6}$

Step 4. Simplify. $\frac{2}{6} = \frac{1}{3}$

So $\frac{5}{6} - \frac{1}{2} = \frac{1}{3}$

How to find a common denominator

Does the smaller bottom go into the bigger one? Use the bigger one. For halves and eighths, use 8.

If not, count by the bigger bottom until the smaller one goes in. For fourths and sixths: 6, 12. Use 12.

Multiplying the two bottoms always works, but the numbers may be bigger than you need.

Watch out

Do **not** add the tops and add the bottoms. $\frac{1}{2} + \frac{1}{3}$ is not $\frac{2}{5}$. The bars show why: $\frac{2}{5}$ is less than $\frac{1}{2}$, so it cannot be one half plus something more.

