Lesson - Adding and subtracting fractions

Year: Year 4

Hello, I am Otto! Fractions help us share things fairly and describe parts of a whole. In this chapter you learn to find equivalent fractions, to add and subtract fractions with the same denominator, to write answers bigger than one as mixed numbers, and to find fractions of amounts.

Starter activity

A pizza is cut into 8 equal slices. Maya eats 3 slices and Omar eats 2 slices. What fraction of the pizza have they eaten together? Each slice is one eighth. Maya ate three eighths and Omar ate two eighths. Together they ate 5 slices out of 8, which is five eighths. You added fractions without even noticing!

Numerator and denominator

Definition: fraction

A **fraction** shows equal parts of a whole. The bottom number is the **denominator**. It tells you how many equal parts the whole is cut into. The top number is the **numerator**. It tells you how many of those parts you have. In the fraction $\frac{3}{8}$, the whole is cut into 8 equal parts and we have 3 of them.



The circle is cut into 8 equal parts and 3 are shaded, so $\frac{3}{8}$ of the circle is shaded.

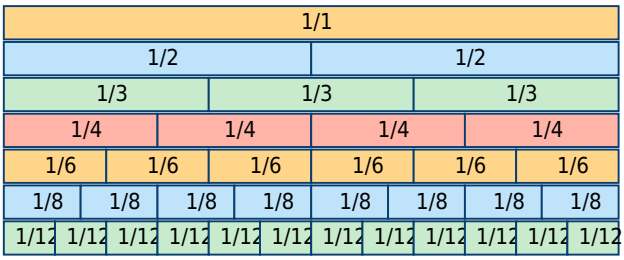
Key fact: unit fractions and non-unit fractions

- A **unit fraction** has a numerator of 1, such as $\frac{1}{2}$, $\frac{1}{5}$ or $\frac{1}{10}$.
- A **non-unit fraction** has a numerator bigger than 1, such as $\frac{3}{4}$.
- The bigger the denominator, the smaller each part is: $\frac{1}{8}$ is smaller than $\frac{1}{4}$.

Equivalent fractions

Definition: equivalent fractions

Equivalent fractions are fractions that have the same value but look different. For example $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$. Half of a pizza is the same amount whether it is 1 slice out of 2 or 4 slices out of 8.



Look at the fraction wall. The bar for one half is exactly as long as two quarters, three sixths, four eighths or six twelfths. Fractions in the same position on the wall are equivalent.

Rule: making equivalent fractions

Multiply the numerator and the denominator by the same number and you get an equivalent fraction. For example $\frac{2}{3} = \frac{4}{6} = \frac{6}{9}$ (we multiply the top and bottom by 2 and by 3). You can also divide the top and bottom by the same number to make a simpler fraction: $\frac{6}{8} = \frac{3}{4}$.

Example 1

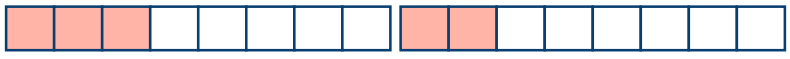
Find the missing number: $\frac{3}{5} = \frac{?}{10}$.

The denominator goes from 5 to 10, so we multiply by 2. Multiply the numerator by 2 too: $3 \times 2 = 6$. So $\frac{3}{5} = \frac{6}{10}$.

Adding and subtracting fractions with the same denominator

Rule: same denominators

When the denominators are the same, add or subtract **only the numerators**. The denominator stays the same because the size of the parts does not change. So $\frac{2}{7} + \frac{3}{7} = \frac{5}{7}$, not $\frac{5}{14}$.



3 eighths plus 2 eighths is 5 eighths.

Method: adding and subtracting fractions

1. Check that the denominators are the same.
2. Add or subtract the numerators.
3. Write the answer over the same denominator.
4. If the numerator equals the denominator the answer is 1 whole. If it is larger, write the answer as a mixed number.

Example 2

Work out $\frac{3}{8} + \frac{2}{8}$ and $\frac{7}{10} - \frac{4}{10}$.

Add the numerators and keep the denominator: 3 + 2 = 5, so $\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$. Subtract the numerators and keep the denominator: 7 − 4 = 3, so $\frac{7}{10} - \frac{4}{10} = \frac{3}{10}$.

Watch out

Never add the denominators! If you eat $\frac{1}{4}$ of a cake and then another $\frac{1}{4}$, you have eaten $\frac{2}{4}$ (which is the same as $\frac{1}{2}$), not $\frac{2}{8}$. The pieces are quarters before and after you add, so the denominator stays 4.

Mixed numbers

Definition: mixed number

A **mixed number** has a whole number part and a fraction part, such as $1\frac{3}{4}$. An **improper fraction** has a numerator bigger than the denominator, such as $\frac{7}{4}$. Both mean the same amount: $\frac{7}{4}$ is 1 whole and $\frac{3}{4}$.

Example 3

Work out $\frac{5}{6} + \frac{4}{6}$.

Add the numerators and keep the denominator: 5 + 4 = 9, so $\frac{5}{6} + \frac{4}{6} = \frac{9}{6}$, which is $1\frac{3}{6}$ as a mixed number. We can see this because 9 sixths is 6 sixths (1 whole) and 3 sixths more, so $1\frac{3}{6}$. This is the same as $1\frac{1}{2}$, since $\frac{3}{6} = \frac{1}{2}$.

Fractions of amounts

Method: finding a fraction of an amount

1. Divide the amount by the denominator to find one part (the unit fraction).
2. Multiply by the numerator to find the required number of parts.
3. Write the answer with the correct unit.

Example 4

Find $\frac{3}{4}$ of 20, and $\frac{2}{5}$ of £30.

$\frac{1}{4}$ of 20: 20 ÷ 4 = 5. So $\frac{3}{4}$ of 20 is 3 × 5 = **15**. $\frac{1}{5}$ of £30: 30 ÷ 5 = 6. So $\frac{2}{5}$ of £30 is 2 × 6 = **£12**.

Example 5

A class has 28 children. $\frac{3}{7}$ of them walk to school. How many children walk?

How many do not?

$\frac{1}{7}$ of 28 is 28 ÷ 7 = 4. So $\frac{3}{7}$ of 28 is 3 × 4 = **12 children walk**. The rest do not walk: 28 − 12 = **16 children**. Check: $\frac{4}{7}$ of 28 = 4 × 4 = 16.

Did you know?

The ancient Egyptians wrote almost all their fractions as unit fractions, such as $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$. They wrote $\frac{3}{4}$ as $\frac{1}{2}$ + $\frac{1}{4}$. The word fraction comes from a Latin word that means "broken", because a fraction is a broken piece of a whole.

Otto's tip

If you are not sure about a fraction question, draw a bar and split it into equal parts. Shade the parts you need. The picture often shows the answer before you calculate! Also remember: the bottom number names the parts, so it never changes when you add or subtract.