Lesson - Fractions: unit and non-unit

Year: Year 3

Hello, I am Otto! When we share a pizza, split a bar of chocolate or measure a part of a journey, we use fractions. In this chapter you will learn about unit and non-unit fractions, how to count in tenths, how to find a fraction of an amount and how to add and subtract fractions with the same denominator.

Starter activity

Take 12 counters. Share them equally between 4 cups. How many counters are in each cup? Now put 3 cups together. How many counters is that? You found one quarter of 12, which is 3, and then three quarters of 12, which is 9. The whole chapter is about this idea: split into equal groups, then count how many groups you need.

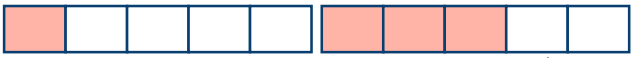
Unit and non-unit fractions

Definition: unit fraction

A **unit fraction** is a fraction with 1 as its numerator, such as $\frac{1}{2}$, $\frac{1}{4}$ or $\frac{1}{10}$. It shows one equal part of a whole.

Definition: non-unit fraction

A **non-unit fraction** has a numerator bigger than 1, such as $\frac{2}{5}$, $\frac{3}{4}$ or $\frac{7}{10}$. It shows several equal parts of a whole. A non-unit fraction is made up of unit fractions: $\frac{3}{4}$ is three of $\frac{1}{4}$.



The first bar shows the unit fraction $\frac{1}{5}$. The second bar shows the non-unit fraction $\frac{3}{5}$, which is 3 of the unit fractions $\frac{1}{5}$.

Example 1

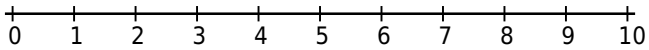
Which of these are unit fractions: $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{9}$, $\frac{4}{5}$?

A unit fraction has numerator 1. So $\frac{1}{3}$ and $\frac{1}{9}$ are unit fractions. $\frac{2}{3}$ and $\frac{4}{5}$ are non-unit fractions.

Counting in tenths

Definition: tenths

When a whole is split into **10 equal parts**, each part is one tenth, written $\frac{1}{10}$. We can count in tenths: $\frac{1}{10}$, $\frac{2}{10}$, $\frac{3}{10}$ and so on up to $\frac{10}{10}$, which is one whole.



A line from 0 to 1 split into tenths: each mark is one tenth. The mark at 5 is five tenths, which is the same as one half.

Example 2

Count on in tenths: $\frac{7}{10}$, $\frac{8}{10}$, ... What are the next two fractions? What is $\frac{10}{10}$?

The next fractions are $\frac{9}{10}$ and $\frac{10}{10}$. Ten tenths make **1 whole**.

Fractions of a shape or a set

A fraction can describe part of a shape or part of a group of objects. To find a fraction of a group, look at the denominator. It tells you how many equal groups to make. Then the numerator tells you how many groups to count. If 12 cakes are shared into 3 equal groups, each group is one third of the cakes. So one third of 12 is 4.

Example 3

A bag has 8 sweets. 3 of them are red. What fraction are red?

There are 8 sweets in all, so the denominator is 8. There are 3 red sweets, so the numerator is 3. The fraction is $\frac{3}{8}$.

Finding a unit fraction of an amount

Method: unit fraction of an amount

1. Look at the denominator. It tells you how many equal parts to make.
2. Divide the amount by the denominator.
3. The answer to the division is one equal part, which is the unit fraction of the amount.
4. Check by multiplying your answer by the denominator.

Example 4

Find $\frac{1}{5}$ of 30.

Divide 30 by 5: 30 ÷ 5 = 6. So $\frac{1}{5}$ of 30 is **6**. Check: 6 × 5 = 30.

Rule: unit fractions of an amount

Finding $\frac{1}{2}$ means dividing by 2. Finding $\frac{1}{3}$ means dividing by 3. Finding $\frac{1}{10}$ means dividing by 10. The bigger the denominator, the smaller the part you get.

Finding a non-unit fraction of an amount

Method: non-unit fraction of an amount

1. Divide the amount by the denominator to find one unit fraction.
2. Multiply the answer by the numerator.
3. Write the answer with its unit, for example 15 cm or £9.

Example 5

Find $\frac{3}{4}$ of 20.

Step 1: find one quarter. 20 ÷ 4 = 5. Step 2: three quarters is 3 lots of 5. 3 × 5 = 15. So $\frac{3}{4}$ of 20 is **15**.

Example 6

A bar of chocolate costs £12. Hassan pays $\frac{2}{3}$ of the price with his saving. How much does he pay?

One third of £12 is £12 ÷ 3 = £4. Two thirds is 2 × £4 = **£8**.

Watch out

Do not forget the second step! To find $\frac{3}{4}$ of 20, many children stop at 5, which is only one quarter. Also remember to divide by the denominator, not the numerator. For $\frac{2}{5}$ of 30 you divide by 5, not by 2.

Adding and subtracting fractions with the same denominator

Rule: same denominator

When fractions have the same denominator, add or subtract the numerators only. The denominator tells you the size of the pieces, and the size of the pieces does not change. $\frac{2}{8} + \frac{3}{8} = \frac{5}{8}$. $\frac{7}{10} - \frac{4}{10} = \frac{3}{10}$.

Example 7

Anna drinks $\frac{2}{5}$ of a bottle of juice in the morning and $\frac{1}{5}$ in the afternoon. What fraction does she drink? What fraction is left?

Drunk: $\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$. The whole bottle is $\frac{5}{5}$, so left: $\frac{5}{5} - \frac{3}{5} = \frac{2}{5}$.

Making one whole

A fraction with the same numerator and denominator is equal to one whole. $\frac{4}{4} = 1$ and $\frac{10}{10} = 1$. To find what fraction you need to make a whole, subtract from the denominator. For $\frac{3}{8}$, you need $\frac{5}{8}$ more, because 3 + 5 = 8. Together they make $\frac{8}{8}$, one whole.

Equal parts matter

Key fact: the parts must be equal

A fraction only makes sense when the whole is split into **equal** parts. If a rectangle is cut into two pieces of different sizes, neither piece is a half. When you check a drawing, ask: are all the parts the same size? If they are, count the parts shaded and write the fraction. If they are not, you cannot name the fraction.

Example 8

A ribbon is 40 cm long. Ali cuts off $\frac{1}{5}$ of it for a gift and $\frac{2}{5}$ for a card. How much ribbon is left?

One fifth of 40 cm is 40 ÷ 5 = 8 cm. So the gift ribbon is **8 cm** and the card ribbon is 2 × 8 = **16 cm**. Together Ali uses 8 + 16 = 24 cm. The ribbon left is 40 − 24 = **16 cm**. We can check with fractions: $\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$, so $\frac{2}{5}$ is left, and $\frac{2}{5}$ of 40 is 16 cm. Both ways agree!

Method: checking a fraction answer

1. Ask if the answer is sensible. A unit fraction of an amount must be smaller than the amount.
2. Multiply your unit fraction answer by the denominator. You should get the whole amount back.
3. For a non-unit fraction, check that the answer is a multiple of your unit fraction answer.

Did you know?

The word "fraction" comes from a Latin word meaning "broken". People in Ancient Egypt, India and Babylon all used fractions to share food, measure land and trade. Today we use fractions in recipes, in music (a quarter note is a quarter of a whole note) and in sport, for example half time in football.

Otto's tip

For a fraction of an amount, remember the two words "share, then count". First share the amount into equal groups (divide by the denominator). Then count the groups you need (multiply by the numerator).