

What do you need to know?

Fractions are portions of a whole. They are pieces of a cake, squares of a chocolate bar and orange segments. For this reason, when we multiply fractions by whole numbers, we are just adding the fraction together a certain number of times.



$$\frac{1}{4} \times 3 = \frac{3}{4}$$

To multiply a fraction by a whole number, we can just multiply the **numerator** by the whole number and the **denominator** stays the same.

Numerator $\frac{3}{9} \times 2 = \frac{6}{9}$
 Denominator

Did you know?

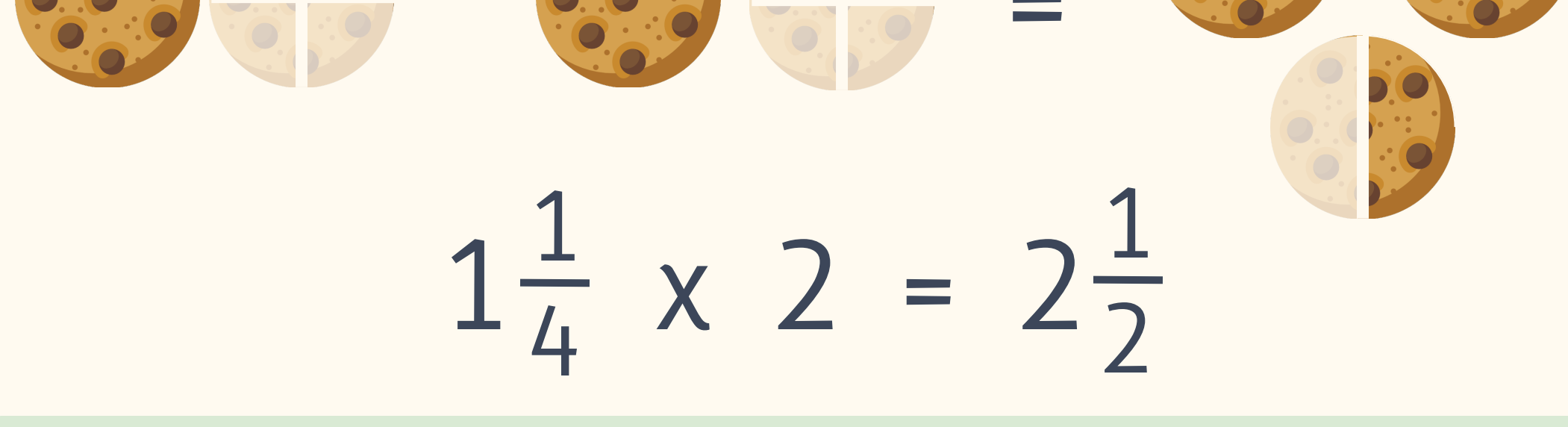
When we multiply a unit fraction such as $\frac{1}{4}$ or $\frac{1}{6}$ by the **same** whole number as its denominator, the answer is always **one whole**:

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

$$\frac{1}{6} \times 6 = \frac{6}{6} = 1$$

When we do this, we say that we can 'cancel out the 4', or 'cancel out the 6'.

A mixed number is a combination of an **integer** (indicating the number of wholes) and a **proper fraction** (portion of a whole). Multiplying mixed numbers by integers is no different to multiplying any other fractions by integers, we are simply repeatedly adding the mixed number to itself.



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

To multiply a **mixed number** by a **whole number**, we first multiply the two whole numbers, and then multiply the remaining fraction.

$$5\frac{3}{8} \times 3 = (5 \times 3) + (5 \times \frac{3}{8})$$

1- First we multiply the two whole numbers together:

$$5 \times 3 = 15$$

2- Next, we multiply the remaining fraction:

$$3 \times \frac{3}{8} = \frac{9}{8}$$

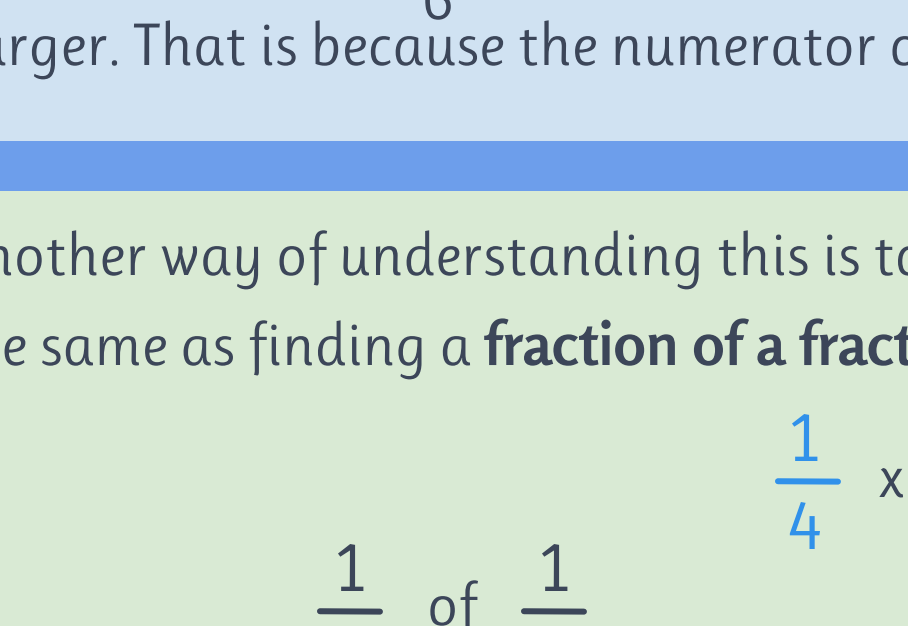
3- Then, we add them together:

$$15 + \frac{9}{8} = 15\frac{9}{8}$$

4- Finally, we convert any improper fractions to mixed numbers, dividing the numerator by the denominator: $\frac{9}{8} = 1\frac{1}{8}$ $15 + 1\frac{1}{8} = 16\frac{1}{8}$

$$5\frac{3}{8} \times 3 = 16\frac{1}{8} \checkmark$$

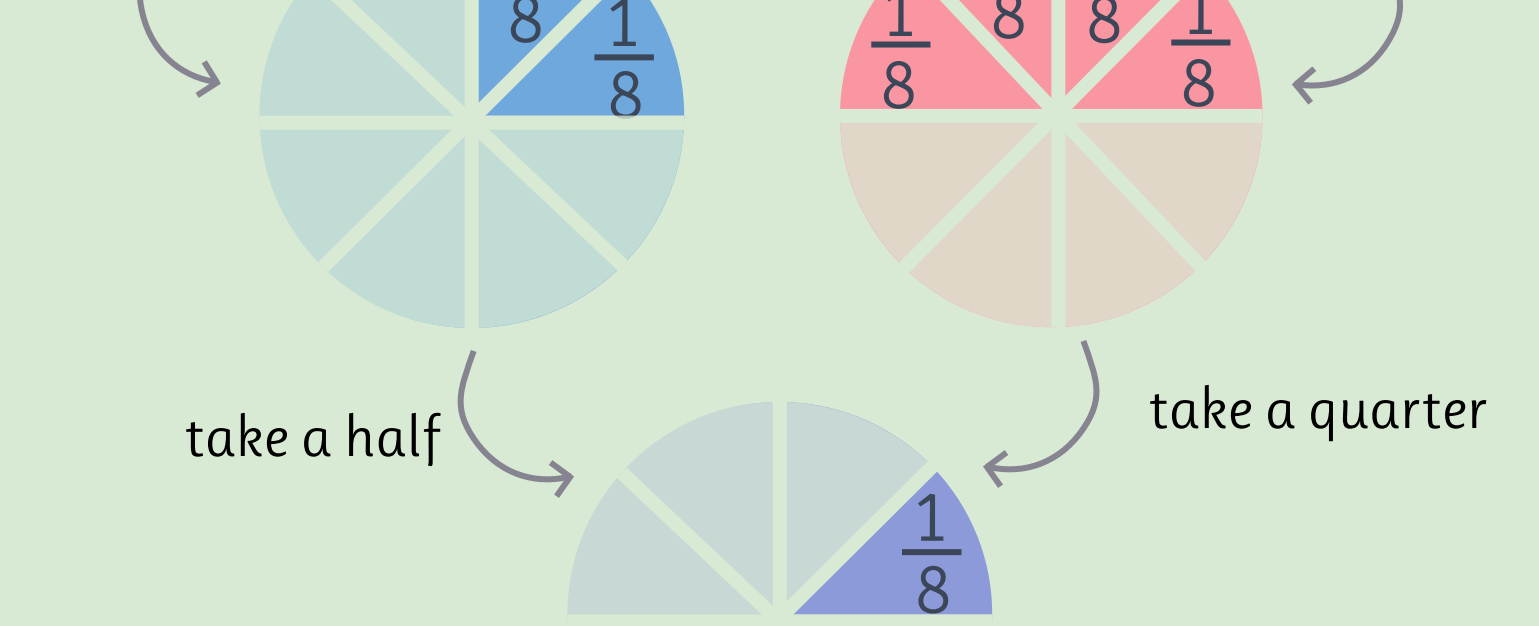
When multiplying **proper fractions by proper fractions** we simply multiply the numerators and then the denominators. To understand what is happening when doing this we can look at an **area model diagram**.



$$\frac{3}{6} \times \frac{2}{3} = \frac{6}{18}$$

The numerator of $\frac{3}{6}$ has doubled in size, and the denominator has become 3 times larger. That is because the numerator of $\frac{2}{3}$ is 2 and the denominator is 3.

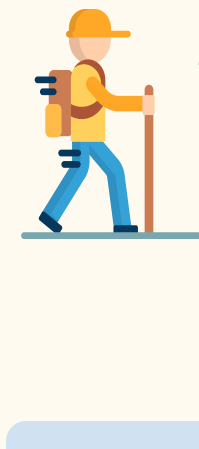
Another way of understanding this is to think that multiplying a fraction by a fraction is the same as finding a **fraction of a fraction**.



$$\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$$

As you can see, it doesn't matter which way you find a fraction of a fraction, you will always get the **same** answer in the end, in this case $\frac{1}{8}$!

Let's take a look at an example:



Three brothers went on a long hike. Their dad prepared a nice lunch box for each one of them, which contained $2\frac{1}{5}$ of an orange for each one of them. How many oranges, as a mixed number, do the three brothers have in total?

We need to work out $2\frac{1}{5} \times 3$

We can use **repeated addition** to figure this out:

$$2\frac{1}{5} + 2\frac{1}{5} + 2\frac{1}{5}$$

Since these are mixed numbers we first add the wholes together:

$$2 + 2 + 2 = 6$$

And then we add the proper fractions:

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

Then we add them together to get our final answer:

$$6 + \frac{3}{5} = 6\frac{3}{5} \checkmark$$

Or we can **multiply** the mixed number by 3:

$$2\frac{1}{5} \times 3$$

First we multiply the whole numbers:

$$2 \times 3 = 6$$

Next we multiply the proper fraction. We multiply the numerator by 3 and the denominator stays the same:

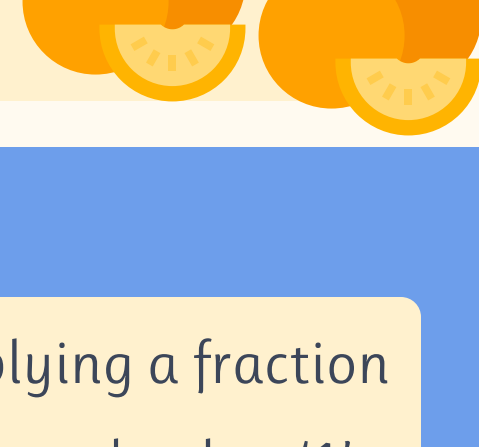
$$3 \times \frac{1}{5} = \frac{3}{5}$$

Then we add them together:

$$6 + \frac{3}{5} = 6\frac{3}{5} \checkmark$$

Both methods give the same answer. For their hike the three brothers will have a total of

$$6\frac{3}{5} \text{ oranges!}$$



Watch out!

Make sure you remember to only multiply the **numerator** when multiplying a fraction by a whole number. The denominator stays the same because a whole number has '1' as its denominator! We are multiplying the amount of cake, not finding an equivalent fraction!

Let's take a look at a different example!



There is $\frac{2}{3}$ of a chocolate pie left in the fridge. Jack's mum splits the two thirds of a pie into fifths to share between the 5 members of the family. As a fraction, how much of the pie will each person get?

We need to find $\frac{1}{5}$ of $\frac{2}{3}$. This is the same as multiplying $\frac{2}{3}$ by $\frac{1}{5}$.

To multiply two fractions, we multiply the numerators first:

$$\frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$$

Then, we multiply the denominators:

$$\frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$$

Therefore:

$$\frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$$

Each of the five people will get $\frac{2}{15}$ of the pie! \checkmark

Tips!

- To multiply a **fraction** by a **whole number**, multiply the numerator by the whole and keep the denominator the same.
- To multiply a **mixed number** by a **whole**, multiply the whole numbers first, and then multiply the fraction.
- To multiply **two fractions**, multiply the two numerators and then the two denominators.
- Remember to **simplify** the answer if required!