

Mixed Numbers and Improper Fractions



What do you need to know?

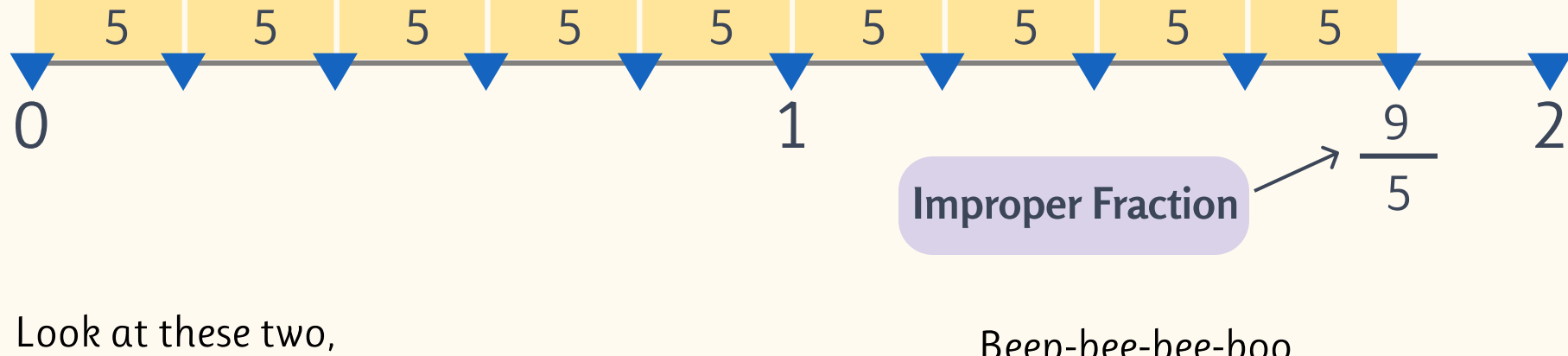
A fraction is a portion of a whole. The **denominator** shows how many equal pieces a whole is split into. The **numerator** shows how many of those pieces we have.

An **improper fraction** is a fraction whose **numerator** is **greater** than the **denominator**.

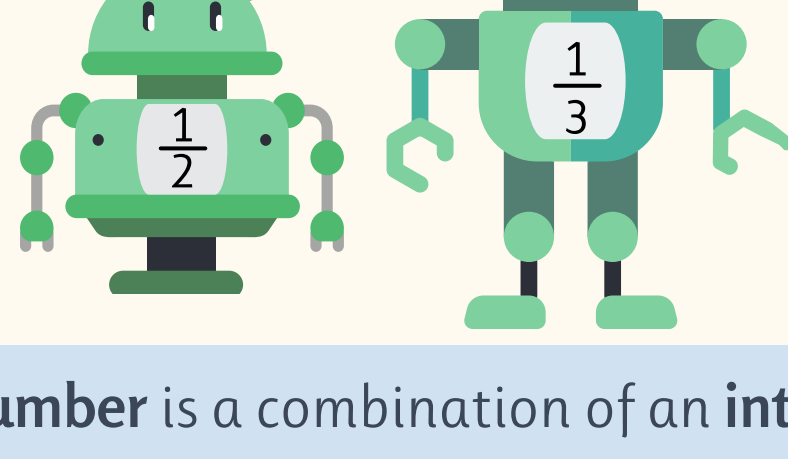
$$\frac{9}{5}$$

Numerator: 9
Denominator: 5

It is very easy to see when a fraction is improper in a **number line**! If the number represented in the number line passes the 1 mark we are looking at an improper fraction!



Look at these two, they are so improper...



Beep-bee-bee-boo pbee-doo-weep



A **mixed number** is a combination of an **integer** (indicating the number of wholes) and a **proper fraction** (indicating the remaining portions).

$$3 \frac{2}{5} = 3 + \frac{2}{5}$$

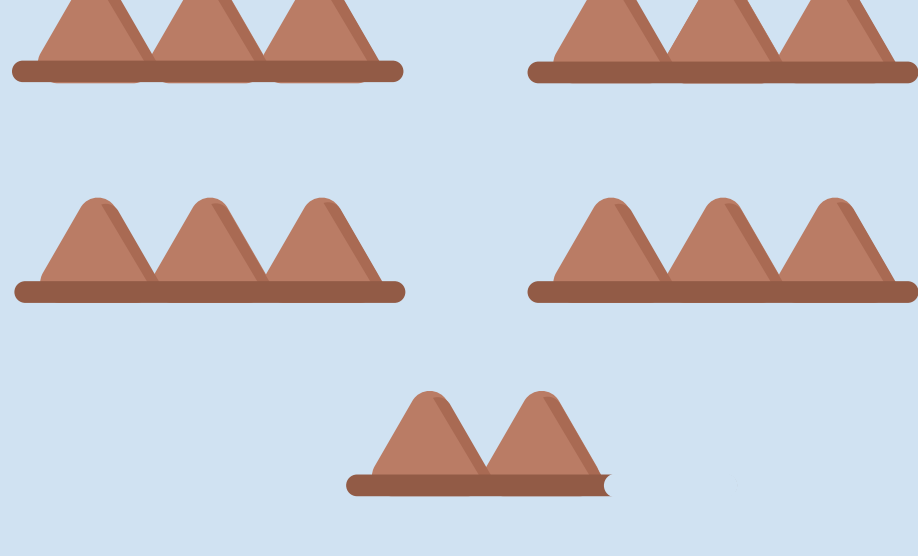
Integer: 3
Proper fraction: 2/5

It is very easy to see when we are working with mixed numbers. If we have **one or more than one whole figure** (like a whole cake, a pizza, or a whole circle), we know we are looking at a **mixed fraction**!

We can express improper fractions as mixed numbers and vice versa:

To convert an improper fraction to a mixed number, we **divide** the **numerator** of the fraction by the **denominator**.

How many times can I fit 3 into 14?



$$14 \div 3 = 4 \text{ remainder } 2$$

We then put the remainder over the original denominator:

$$\frac{14}{3} = 4 \frac{2}{3}$$

x 4
+ 2/3

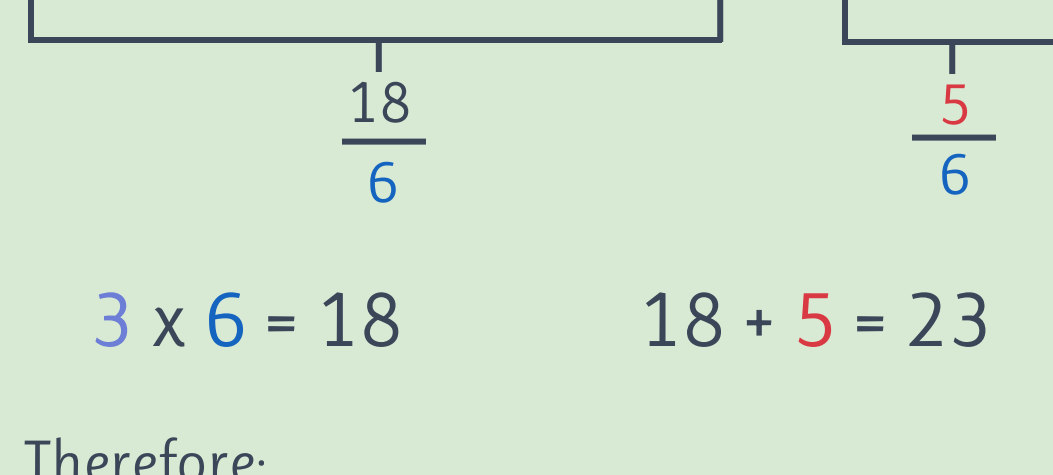
To convert a mixed number to an improper fraction, we:

1- **Multiply** the **integer** by the **denominator** of the original fraction. This helps us to see how the integer would look as a fraction.

2- **Add** this number to the **numerator of the fraction** in our mixed number.

2- Put this answer over the original denominator.

How can we write $3 \frac{5}{6}$ as an improper fraction?



$$3 \times 6 = 18$$

$$18 + 5 = 23$$

Therefore:

$$3 \frac{5}{6} = \frac{23}{6}$$

Sometimes, we may need to **simplify** an improper fraction after converting it from a mixed number.

To simplify a fraction, we divide the numerator and the denominator by their **highest common factor** (the highest number that we can divide both numbers by).

For example, to simplify $\frac{42}{12}$:

We find the common factors of 42 and 12. These are:

$$2 \quad 3 \quad 6$$

The highest of these is 6, so we can divide both the numerator and the denominator by 6!

$$\frac{42}{12} \div 6 = \frac{7}{2}$$

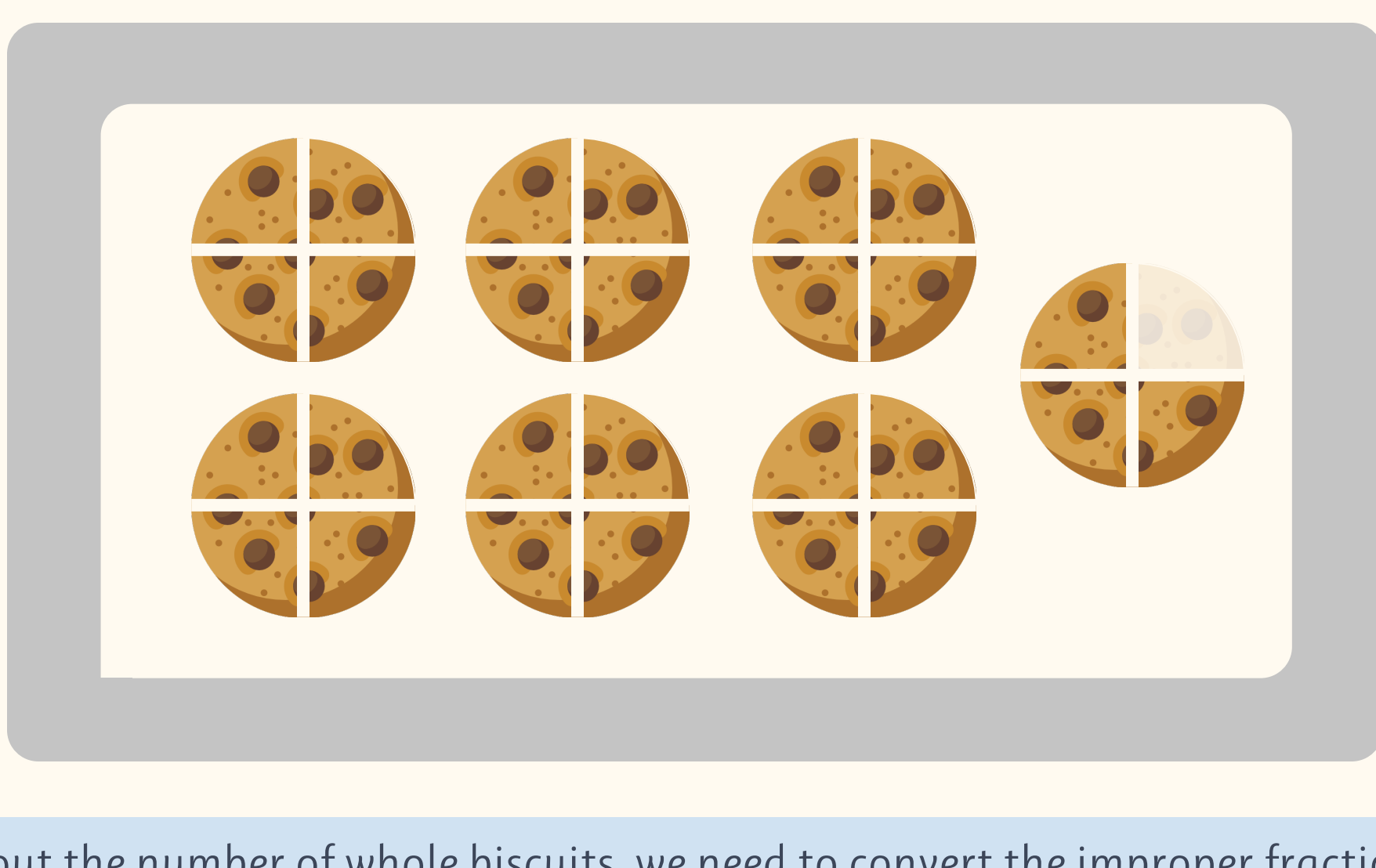
Therefore $\frac{42}{12}$ can be simplified to $\frac{7}{2}$

Let's take a look at an example:



Maya works in a biscuit factory. She has a tray of biscuits that have broken into **quarters**. There are $\frac{27}{4}$ and Maya wonders how many whole biscuits this would make.

What is $\frac{27}{4}$ as a mixed number?



To work out the number of whole biscuits, we need to convert the improper fraction to a **mixed number**. We can convert $\frac{27}{4}$ by dividing the numerator by the denominator and writing any remainder as a fraction using the original denominator.

$$27 \div 4 = 6 \text{ remainder } 3$$

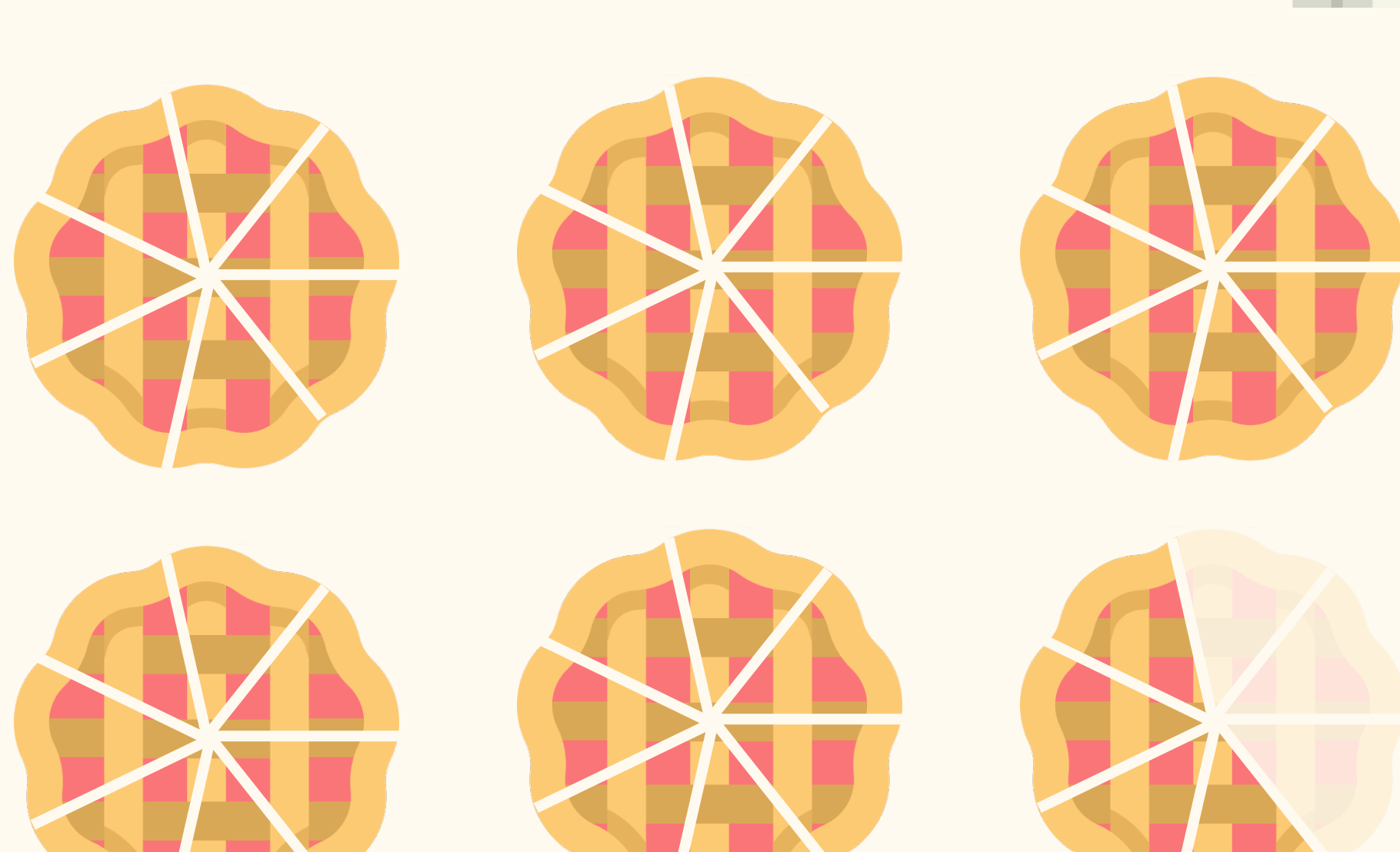
This means that 27 quarters will make 6 whole biscuits with 3 quarters remaining.

We can write this mixed number as: $6 \frac{3}{4}$

Maya's tray of broken biscuits would therefore make 6 whole biscuits. Just enough for her friends to have with a cup of tea!

Let's take a look at a different example!

Billy has been baking. He has 5 whole pies and $\frac{4}{7}$ of a pie left. He needs to cut all of the pies into sevenths to sell at his cafe. How many sevenths are there in $5 \frac{4}{7}$?



To work out how many sevenths are in $5 \frac{4}{7}$, we need to convert the **mixed number** to an **improper fraction**.

If we follow our steps to convert a mixed number into an improper fraction we:

1- Multiply the integer by the denominator of our fraction. Our integer (or number of wholes) is 5 and the denominator is 7 so:

$$5 \times 7 = 35$$

2- We then add this number to the numerator of the other fraction:

$$35 + 4 = 39$$

3- Finally, the denominator in the mixed number is '7', so we write the total as a fraction using the denominator '7'.

$$5 \frac{4}{7} = \frac{39}{7}$$

Billy can cut his pies into 39 sevenths!

! Watch out!

Make sure you remember to add the remaining fraction to the total formed by multiplying the integer and the denominator!

Tips!

★ Convert a **mixed number** to an **improper fraction** by multiplying the integer by the denominator and then adding.

★ Convert an **improper fraction** to a **mixed number** by dividing the numerator by the denominator.

★ **Simplify** improper fractions by dividing the numerator denominator by the **highest common factor** between these.