

# Fractions

Fractions are equal parts of a whole.

The **numerator** of a fraction represents how many parts we have out of a whole.

The **denominator** of a fraction represents how many equal parts there are.

Numerator

→ 3

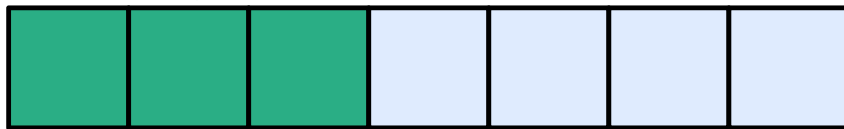
$\frac{3}{7} = 3$  parts out of 7  
(or  $3 \div 7$ )

Denominator

→ 7



We want 3 out of 7 equal parts.



The whole amount is split into 7 equal parts.

A fraction also visually displays a **division**.

The numerator represents the **dividend** - the quantity you are dividing.

The denominator represents the **divisor** - what you're dividing by.

# Simplifying Fractions

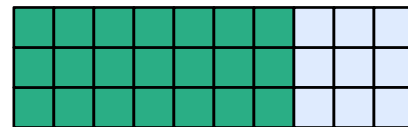
To **simplify** a fraction, we look for common factors in the numerator and denominator to cancel the fraction down to its simplest form. Remember that the numerator and denominator are always whole numbers.

 **Example**

Simplify  $\frac{21}{30}$

3 is a common factor of 21 and 30,  
so divide the numerator and  
denominator by 3

$$\frac{21}{30} \div 3 = \frac{7}{10}$$



=



 **Example**

Simplify  $\frac{12}{20}$

Look for the **highest common factor**.  
Here, 2 is a factor but 4 is the HCF,  
so we divide by 4. This ensures our  
answer is fully simplified.

$$\frac{12}{20} \div 4 = \frac{3}{5}$$

# Fractions of Amounts

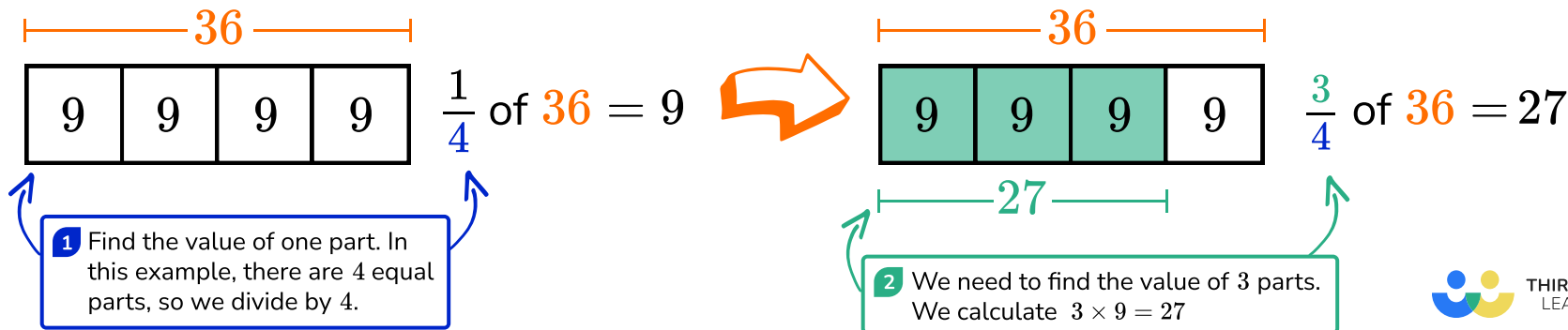
The **numerator** of a fraction represents how many parts we have out of a whole. The **denominator** of a fraction represents how many equal parts there are. We can use this idea to **find a fraction of an amount**. A bar model is often useful.

 **Example**

Calculate  $\frac{3}{4}$  of 36

We want 3 parts of the whole amount.

There are 4 equal parts.



# Adding Fractions

To add fractions, we must ensure that the fractions in the calculation have **common denominators**.

 **Example** Work out  $\frac{3}{5} + \frac{1}{10}$

$\frac{3}{5} + \frac{1}{10}$

**1** Find the **LCM (lowest common multiple)** of the denominators.  
The LCM of 5 and 10 is 10

**2** Use equivalent fractions to change the fractions so that they have like denominators.

**3** Add the numerators.

$= \frac{6}{10} + \frac{1}{10}$

$= \frac{7}{10}$

 **Example** Work out  $\frac{2}{3} + \frac{4}{7}$

$\frac{2}{3} + \frac{4}{7}$

**1** Find the **LCM (lowest common multiple)** of the denominators.  
The LCM of 3 and 7 is 21

**2** Use equivalent fractions to change the fractions so that they have like denominators.

**3** Add the numerators.

**4** Simplify the answer if possible.

$= \frac{14}{21} + \frac{12}{21}$

$= \frac{26}{21}$

$= 1\frac{5}{21}$

# Subtracting Fractions

To subtract fractions, we must ensure that the fractions in the calculation have **common denominators**.

 **Example**

Work out  $\frac{5}{6} - \frac{7}{12}$

$$\frac{5}{6} - \frac{7}{12}$$

**1** Find the **LCM (lowest common multiple)** of the denominators.  
The LCM of 6 and 12 is 12

$$= \frac{10}{12} - \frac{7}{12}$$

**2** Use equivalent fractions to change the fractions so that they have like denominators.

$$= \frac{3}{12}$$

**3** Add the numerators.

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

**4** Simplify the answer if possible.

 **Example**

Work out  $\frac{3}{4} - \frac{1}{6}$

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

**1** Find the **LCM (lowest common multiple)** of the denominators.  
The LCM of 4 and 6 is 12

$$= \frac{9}{12} - \frac{2}{12}$$

**2** Use equivalent fractions to change the fractions so that they have like denominators.


$$= \frac{7}{12}$$


**3** Add the numerators.

# Multiplying Fractions

## Multiplying an integer by a fraction

To **multiply** an **integer** (whole number) by a **fraction**, we think about multiplication as “(lots) of” and **find a fraction of an amount**.

 **Example** Work out  $\frac{3}{4} \times 24$  This means  $\frac{3}{4}$  of 24

$24 \div 4 = 6$   **1** Find  $\frac{1}{4}$  (divide by denominator)

$6 \times 3 = 18$   **2** Find 3 lots of  $\frac{1}{4}$  (multiply by numerator)

$$\frac{3}{4} \times 24 = 18$$

## Multiplying a fraction by a fraction

To **multiply two (or more) fractions**, we multiply the **numerators** together and multiply the **denominators** together.

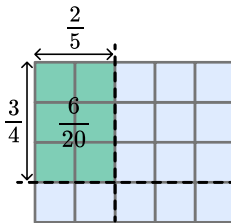
 **Example** Work out  $\frac{2}{5} \times \frac{3}{4}$

$\frac{2}{5} \times \frac{3}{4} = \frac{2 \times 3}{5 \times 4} = \frac{6}{20} \stackrel{\div 2}{=} \frac{3}{10}$

Multiply the numerators together.

Multiply the denominators together.

Simplify if possible.



Visually:  
 $\frac{2}{5}$  of  $\frac{3}{4} = \frac{6}{20}$

# Dividing Fractions

To **divide fractions**, we use **reciprocals** to convert the calculation to an equivalent multiplication.

**Reciprocal** means **multiplicative inverse**.

 **Example** The reciprocal of 4 is  $\frac{1}{4}$  because  $4 \times \frac{1}{4} = 1$

Then we multiply the numerators and multiply the denominators.

 **Example**

Work out  $\frac{9}{10} \div 5$

$$\frac{9}{10} \div 5 = \frac{9}{10} \times \frac{1}{5} = \frac{9 \times 1}{10 \times 5} = \frac{9}{50}$$

**2** Multiply numerators.

**3** Multiply denominators.

**1** The reciprocal of 5 is  $\frac{1}{5}$ . We “flip” the second fraction.

 **Example**

Work out  $\frac{2}{5} \div \frac{3}{4}$

$$\frac{2}{5} \div \frac{3}{4} = \frac{2}{5} \times \frac{4}{3} = \frac{2 \times 4}{5 \times 3} = \frac{8}{15}$$

**2** Multiply numerators.


**3** Multiply denominators.

**1** The reciprocal of  $\frac{3}{4}$  is  $\frac{4}{3}$ . We “flip” the second fraction.

# Mixed Numbers and Improper Fractions

An **improper fraction** is a fraction where the numerator is larger than the denominator. A **mixed number** has a whole number part and a fractional part.

## Improper to Mixed

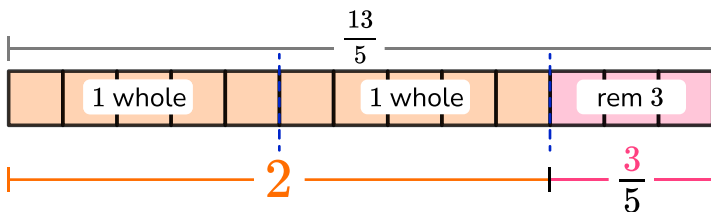
 **Example** Write  $\frac{13}{5}$  as a mixed number.

Work out how many times 5 goes into 13


There are 5 equal parts in 1 whole.

$$\frac{13}{5} = 2\frac{3}{5}$$

13 goes into 5 **twice (2)**, with **remainder 3**



## Mixed to Improper

 **Example** Write  $2\frac{3}{4}$  as an improper fraction.

There are **2 wholes** and each one has **4 equal parts**  
 $2 \times 4 = 8$

We have **3 parts** in the numerator.

$$2\frac{3}{4} = \frac{11}{4}$$

$$8 + 3 = 11$$

