



## Multiplying and Dividing Fractions

### What do I need to be able to do?

By the end of this unit you should be able to:

- Carry out any multiplication or division using fractions and integers
- Solutions can be modelled, described and reasoned

### Keywords

- Numerator**: the number above the line on a fraction. The top number. Represents how many parts are taken.
- Denominator**: the number below the line on a fraction. The number represent the total number of parts.
- Whole**: a positive number including zero without any decimal or fractional parts.
- Commutative**: an operation is commutative if changing the order does not change the result.
- Unit Fraction**: a fraction where the numerator is one and denominator a positive integer.
- Non-unit Fraction**: a fraction where the numerator is larger than one.
- Dividend**: the amount you want to divide up.
- Divisor**: the number that divides another number.
- Quotient**: the answer after we divide one number by another. e.g. dividend ÷ divisor = quotient
- Reciprocal**: a pair of numbers that multiply together to give 1.



### Representing a fraction

**Numerator**  
**Denominator**

Number of parts represented  
Number of parts to make up the whole

$\frac{3}{5}$

ALL PARTS of a fraction are of equal size

### Repeated addition = multiplication by an integer

$4 \times \frac{2}{5} \rightarrow \frac{2}{5} + \frac{2}{5} + \frac{2}{5} + \frac{2}{5}$

Integer (Whole number)  
Each part represents  $\frac{1}{5}$

How many parts are shaded?  
What each part represents

$-\frac{8}{5}$   
 $-\frac{3}{5}$

Each whole is split into the same number of parts as the denominator

**Revisit**  
When adding fractions with the same denominator - add the numerators

### Multiplying unit fractions

$\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$

Parts shaded

Modelled: 3

Total number of parts in the diagram

4

### Multiplying non-unit fractions

Shade in 3 parts

Repeat it on this many rows

$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$

Parts shaded

Modelled: 3

Total number of parts in the diagram

This many columns

This many rows

4

### Quick Multiplying and Cancelling down

$\frac{1}{5} \times \frac{4}{9} = \frac{4}{45}$

The 3 and the 9 have a common factor and can be simplified

Quick Solving

Multiply the numerators  $1 \times 4 = 4$

Multiply the denominators  $5 \times 3 = 15$

### The reciprocal

When you multiply a number by its reciprocal the answer is always 1

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

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

The reciprocal of 3 is  $\frac{1}{3}$  and vice versa

Reciprocals for division

e.g.  $5 \div \frac{1}{4} = 20$

$5 \times 4 = 20$

Multiplying by a reciprocal gives the same outcome

### Dividing an integer by an unit fraction

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

There are 4 quarters in 1 whole.  
Therefore, there are 20 quarters in 5 wholes

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

How many quarters are in 1?

$5 \div \frac{1}{4} = 20$

### Dividing any fractions

Remember to use reciprocals

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

Multiplying by a reciprocal gives the same outcome

Represented

$= \frac{8}{15}$