

Cancelling Down Fractions

This guide aims to help you understand when and how to cancel down a fraction. This guide shows techniques which explain how it is done.

Introduction

When carrying out calculations involving fractions it is very common to have to **cancel down** an equivalent fraction to give its **simplest form**. In fact, one of the best ways you can improve your numeracy is to learn how to cancel down a fraction. For example, cancelling down a fraction is the best way of simplifying long division.

Cancelling down and cancelling out

One of the common misunderstandings in mathematics comes from using the word **cancel**. When you say two pieces of mathematics cancel, you need to distinguish between whether they are **cancelling down** or **cancelling out**.

Cancelling *down* is associated with division. The result of cancelling down is 1, **never 0**. For example $\frac{3}{3} = \frac{2}{2} = \frac{1}{1} = 1$, you can say that $\frac{3}{3}$ has cancelled down to give 1.

Cancelling *out* is associated with subtraction. The result of cancelling out is 0. For example $3 - 3 = 0$, you can say that the threes have cancelled out.

So, when you are cancelling you should state whether you are cancelling *down* or cancelling *out*. The idea of cancelling down is also fundamental in algebra and is discussed in more detail in the study guides: [Simple Factorisation](#) and [Multiplying and Dividing Algebraic Fractions](#).

Strategies for cancelling down fractions

To cancel down a fraction you need to factorise both the numerator and the denominator of your fraction. There are different ways of factorising numbers, you can break each number down into their **prime factors** (see study guide: [Prime Factors](#)), you can find the **highest common factor** of the numerator and denominator (see study guide: [Highest Common Factor](#)) or you can identify any factor which is shared by the numerator and denominator.

Once you have factorised your fraction you can then cancel down any numbers which appear in both the numerator and denominator as **any number divided by itself is 1**. The 1 **does not disappear**; it is still multiplied by the remaining factors but is not shown as **any number multiplied by 1 is itself**. This idea is important in mathematics and its misunderstanding can lead to difficulties when studying algebra. Importantly **you can only cancel down if your numerator and denominator are factorised i.e. they comprise terms which are MULTIPLIED TOGETHER**.

Cancelling down using the highest common factor (HCF)

The most efficient way of cancelling down a fraction involves identifying the highest common factor (HCF) of the numerator and denominator of that fraction. Once you have found the HCF you express the numerator and denominator as multiples of the HCF.

Example: Simplify $\frac{36}{48}$.

The highest common factor of 36 and 48 is $\text{HCF}(36, 48) = 12$. You now express the numerator and denominator as multiples of 12: $36 = 3 \times 12$ and $48 = 4 \times 12$. So:

$$\frac{36}{48} = \frac{3 \times 12}{4 \times 12}$$

As you can see 12 is present in both the numerator and denominator and so they can be cancelled down to give 1:

$$\frac{36}{48} = \frac{3 \times \cancel{12}}{4 \times \cancel{12}} = \frac{3 \times 1}{4 \times 1} = \frac{3}{4}$$

As you have used the HCF you cannot cancel down any further and so the simplest form of $\frac{36}{48}$ is $\frac{3}{4}$.

Other methods of cancelling down

As the highest common factor of the numerator and denominator of a fraction is not always obvious; you can find **ANY** number which is a common factor to cancel down. This method may not always give the simplest form immediately but has the advantage of reducing the size of both the numerator and denominator so that it is easier to identify any further factors. For example if they are both even, they have a common factor of 2. If you are not confident finding the HCF, you should use this method. The study guide: [Rules for Dividing Whole Numbers](#) gives details on how to determine whether smaller numbers are factors of larger numbers.

Another way of cancelling down is by breaking the numerator and denominator down into their prime factor form (see study guide: [Prime Factors](#)). The advantage of this method is that, once you have your numerator and denominator in prime factor form you can cancel down all the common factors at once to give the simplest form.

As with all mathematical skills, factorisation of numbers requires you to practise. The more examples you attempt the better you will get at identifying common factors quickly.

Example: What is the simplest form of the fraction $\frac{66}{96}$?

You can either prime factorise 66 and 96 or look for a factor which is common to both. In prime factor form $66 = 2 \times 3 \times 11$ and $96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$. So, after writing the numerator and denominator in prime factor form and cancelling down you should find:

$$\frac{66}{96} = \frac{\cancel{2} \times \cancel{3} \times 11}{\cancel{2} \times 2 \times 2 \times 2 \times 2 \times \cancel{3}} = \frac{1 \times 1 \times 11}{1 \times 2 \times 2 \times 2 \times 2 \times 1} = \frac{11}{16}$$

Alternatively as the numerator and denominator are even, you have a common factor of 2:

$$\frac{66}{96} = \frac{\cancel{2} \times 33}{\cancel{2} \times 48} = \frac{33}{48}$$

Both 33 and 48 have a factor of 3 as their digits sum to a number which is divisible by 3 giving:

$$\frac{66}{96} = \frac{33}{48} = \frac{\cancel{3} \times 11}{\cancel{3} \times 16} = \frac{11}{16}$$

as before.

Want to know more?

If you have any further questions about this topic you can make an appointment to see a [Learning Enhancement Tutor](#) in the [Student Support Service](#), as well as speaking to your lecturer or adviser.

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