

## Re: reducing large fractions

**Source:** <http://sci.tech-archive.net/Archive/sci.math/2004-07/3648.html>

---

**From:** Thomas Mautsch ([mautsch\\_at\\_math.ethz.ch](mailto:mautsch_at_math.ethz.ch))

**Date:** 07/14/04

Date: 14 Jul 2004 18:02:02 +0100

In news:<20040714012859.06753.00001460@mb-m13.aol.com> schrieb Mensanator:

>>*Subject: reducing large fractions*

>>*From: "slag" rob@robfindlay.org*

>>*Date: 7/13/04 11:59 PM Central Daylight Time*

>>*Message-id: <cd2eip\$5ks@odbk17.prod.google.com>*

>>

>>*Is there any shortcuts for reducing LARGE fractions.*

>>

>>*For instance: 6809/10800 ?*

>

> *Factor the numerator and denominator and cancel common factors.*

^^^^^^^^

For large denominator and numerator, factoring will be overkill:

> *Nevertheless, it can still be factored: 6809 = 11 \* 619*

>

>>*so it wont reduce?*

>

> *You'll need to check the factors of 10800: 2^4 \* 3^3 \* 5^2*

> *Note that the numerator and denominator have no common*

> *factors, so you cannot reduce the fraction.*

The better alternative would be to use Euclid's algorithm

for the greatest common divisor of 10800 and 6809:

$$10800 : 6809 = 1 \text{ R. } 3991$$

$$6801 : 3991 = 1 \text{ R. } 2818$$

$$3991 : 2818 = 1 \text{ R. } 1173$$

$$2818 : 1173 = 2 \text{ R. } 472$$

$$1173 : 472 = 2 \text{ R. } 229$$

$$472 : 229 = 2 \text{ R. } 14$$

$$229 : 14 = 16 \text{ R. } 5$$

$$14 : 5 = 2 \text{ R. } 4$$

$$5 : 4 = 1 \text{ R. } 1$$

$$4 : 1 = 4 \text{ R. } 0$$

So the g.c.d. is 1, and the fraction can not be reduced.

sci.math: Re: reducing large fractions

This was not as effortless as expected,  
so what one might rather do is  
to split off as many prime factors from numerator and denominator  
as one is able to find,  
and then find the g.c.d. of the remaining terms.

(As an application of the rule:  $\gcd(a,b*c) = \gcd(a,c)$  when  $\gcd(a,b)=1$ .)

For the example 6809/10800,  
finding the complete factorisation of 10800 is very easy,  
and 6809 is not divisible by either of the prime factors 2, 3, and 5  
of 10800,

but if, for example, one only knew that

$$10800 \text{ is } 100 * 108 = 2^2 * 5^2 * 108,$$

and that the prime factors 2 and 5 are no divisor of 6809,  
then one would calculate the g.c.d. of 6809 and 108:

$$6809 : 108 = 63 \text{ R. } 5$$

$$108 : 5 = 21 \text{ R. } 3,$$

hence:

$$\gcd(10800,6809) = \gcd(6809,108) = \gcd(5,3) = 1.$$