Re: question about the 'loves' algorithm

Source: http://sci.tech−archive.net/Archive/sci.math/2006−10/msg00137.html

- *From*: "The Qurqirish Dragon" <qurqirishd@xxxxxxx>
- *Date*: 29 Sep 2006 07:20:50 −0700

Robert Israel wrote:

> In article <451bd827$1@cs1>, Jeroen <no_mail@xxxxxxxxx> wrote:
>
>> The Qurqirish Dragon wrote:
>>
>>> Jeroen wrote:
>>>
>>>> Hi all,
>>>>
>>>> I have a somewhat practical and maybe silly question about the 'loves' algorithm. Let me explain first what the algorithm is. Suppose your name is John, and you like a girl named Jane. You can calculate the chance that a relationship would work (but don't take the outcome too seriously). For each character in the word 'loves', count the total number of occurences in both names 'John' and 'Jane' (you can also take full names...). Then start adding subsequent digits until a 2 digit number is obtained, which is the outcome. So we have:
>>>>
>>>> John L O V E S Jane
>>>>
>>>> start 0 1 0 1 0 (only 1 'o' and 1 'e' in both names)
>>>> step 1 1 1 1 1
>>>> step 2 2 2 2
>>>> step 3 4 4 −> 44 % success rate for a relationship

For some combinations of names, the
number of digits seems to grow
infinitely. My own name with that of a girl I
happen to like grows to
more than 1e6 digits in 66 iterations.

The question is: is there some way of
determing that the number of
digits will grow infinitely, based on the
starting digits? Or will every
combination of names eventually break
down to a 2 digit number? I have
no idea :−)

Jeroen

Some clarification is needed:
Let's assume the two people are "Lovey" and "Dovey":

start: 1 2 2 2 0
step 1: 3 4 4 2
step 2: 7 8 6

is step 3:
1 5 1 4
15 14
1 6 4 (carry the 1 from the 14 into the 15)

or something else?
The way sums larger than 9 are handled will definitely have
an impact
on the result (if it ever terminates!)

Each step only handles single digits of the previous result (each
sum−results must be written down as separate digits if > 9), so it is
from step 2:

7 8 6
1 5 1 4
6 6 5
1 2 1 1
3 3 2
6 5

Jeroen

> OK, suppose at some step your result consists of n 9's with
> n > 3.
> Next step is 2n−2 digits, consisting of n−1 repetitions of 1 8.
> Next step is 2n−3 9's. Since 2n−3 > n, it grows indefinitely.

Continuing in a similar thought:
what if there is a set of n 8's (minimum n to be determined)?
next step is 2n−2 digits, being n−1 pairs of 1 6
next is 2n−3 7's.
next is 4n−8 digits, being 2n−4 pairs of 1 4
next is 4n−9 5's
next is 8n−20 digits, being 4n−10 pairs of 1 0
next is 8n−21 1's
next is 8n−22 2's
next is 8n−23 4's
next is 8n−24 8's
if 8n−24>n, then the growth continues forever, so n must be greater than 3.

For a string of 7's, looking at the progression of 8 8 8 8, we see five 7's at the second step, so we only need to explicitly test 7 7 7 7, and 7 7 7. After seven iterations, this becomes 8 8 8 8, and so it grows indefinitely.
For 7 7 7 we have:
7 7 7
1 4 1 4
5 5 5
1 0 1 0
1 1 1
2 2
and it terminates.

For n 6's (n to be determined), we have:
first step: 2n−2 digits, being n−1 pairs of 1 2
next step is 2n−3 3's
next step is 2n−4 6's

if n=4, then this is cyclic:
6 6 6 6
1 2 1 2 1 2
3 3 3 3 3
6 6 6 6

if n>4, it grows indefinitely.

for 5's, after five iterations, n 5's becomes 2n−6 8's. If 2n−6>=4 (which means n>=5) this grows indefinitely by the 8's case.

for 4's, after one iteration we have n−1 8's, so n>=5 causes the growth by the 8's case.

for 3's, after one iteration we have n−1 6's, so n=5 is cyclic and n>5 causes growth by the 6's case.

for 2's, after two iterations we have n−2 8's, so n>=6 causes growth by the 8's case.

Finally, for 1's, after 3 iterations, we have n−3 8's, so n>=7 causes growth by the 8's case.

Other situations I leave to others who have even more time than me on their hands.

.