

Re: The Collatz discrete primes!

Re: The Collatz discrete primes!

Source: <http://sci.tech-archive.net/Archive/sci.math/2007-03/msg05132.html>

- *From:* "mensanator@xxxxxxxxxxxx" <mensanator@xxxxxxx>
 - *Date:* 24 Mar 2007 15:21:06 -0700
-

On Mar 24, 4:58pm, "Danny" <fasttrac...@xxxxxxxxxxxxxx> wrote:

On 24 Mar, 10:57, "mensana...@xxxxxxxxxxxxxx" <mensana...@xxxxxxx> wrote:

On Mar 23, 8:01 am, "Danny" <fasttrac...@xxxxxxxxxxxxxx> wrote:

Just spotted this In OEIS
--- A127781
"The Hailstone pure
numbers"
So my special list
of primes could be called
the Hailstone pure primes!

That's Pure Hailstone primes --- A127928.

I missed that one, I guess I just reinvented
the wheel!

Great minds think alike, eh?

What interests me more about all the pure hailstone
numbers is the difference pattern they leave.

Re: The Collatz discrete primes!

At first I didn't realize you had gone back to `_all_`
pure numbers. Changing my program to show all numbers
(not just primes or odds) I get

```
(0) 405 [0]
      (1) 406 [0]
      (2) 407 [0]
(0) 408 [0]
      (1) 409 [2]
      (2) 410 [0]
(0) 411 [0]
      (1) 412 [0]
      (2) 413 [0]
(0) 414 [0]
      (1) 415 [0]
      (2) 416 [0]
(0) 417 [0]
      (1) 418 [0]
      (2) 419 [2]
(0) 420 [0]
(1) 421 [2]
      (2) 422 [0]
(0) 423 [0]
      (1) 424 [0]
      (2) 425 [0]
(0) 426 [0]
      (1) 427 [0]
      (2) 428 [0]
(0) 429 [0]
      (1) 430 [0]
      (2) 431 [2]
(0) 432 [0]
      (1) 433 [2]
      (2) 434 [0]
(0) 435 [0]
      (1) 436 [0]
      (2) 437 [0]
(0) 438 [0]
```

where for (m) n [p]

- m is modulo 3
- n is the number

Re: The Collatz discrete primes!

– p is prime flag (0=composite,2=prime)

pure on the left, impure to the right.

And when I calculate differences, I get something like (not the same sequence)

1 2 3
1 2 3 3 3
1 2 3
1 2 3 3 3
1 2 3
1 2 3 3 3
1 2 3
1 2 3 3 3
1 2 3
1 2 3 3 3 3 3
1 2 3 3 3 3 3
1 2 3 3 3
1 2 3
1 2 3 3 3
1 2 3
1 2 3 3 3 3 3
1 2 3 3 3
1 2 3
1 2 3 3 3
1 2 3
1 2 3 3 3
1 2

So I think I'm finally on the same page.

I believe we discussed this on an earlier post
but delving into it more I discovered this —

After the initial start these are the only difference
patterns in the hailstone pure numbers.

Re: The Collatz discrete primes!

1,2,3
1,2,3,3,3
1,2,3,3,3,3,3

Which I concur on.

There never is a sequential repeat of the first two patterns (1,2,3) and (1,2,3,3,3) but (1,2,3,3,3,3,3) at times will repeat once.

These repeats occur between hailstone pure @
405 – 438
891 – 924
1863 – 1896
3159 – 3192
3321 – 3354
4779 – 4812
5265 – 5298
6237 – 6270
6705 – 6738
-- etc.

Most of the time the general pattern will be --
[123][12333][123][12333][123][1233333][12333][123]---
and once in awhile the repeat of [1233333][1233333]
but never [123][123] or [12333][12333].
I wonder why that is?

Ah, the \$64 question: why?

There are always rules. Rules have implications. Sometimes the interaction of these implications is hard to see when they are all run together. I may not have crossed every i and dotted every t, but I think it works something like this:

Re: The Collatz discrete primes!

First, every $0 \pmod{3}$ number is pure and since natural numbers are always in modulo 3 sequence, we start out with

$0 \pmod{3}$ pure
 $1 \pmod{3}$?
 $2 \pmod{3}$?
 $0 \pmod{3}$ pure

That means no difference can be greater than 3. If that were the end of the story we would have only [3333333...] as a sequence of differences. There is, of course, more to it than that.

We also know that every $2 \pmod{3}$ is impure (because its sub-branch is only one step above). This applies to both even and odd $2 \pmod{3}$ numbers. So far, we've got

$0 \pmod{3}$ pure
 $1 \pmod{3}$?
 $2 \pmod{3}$ impure
 $0 \pmod{3}$ pure

Which doesn't change our differences. What does change them is whether or not the $1 \pmod{3}$ is pure or impure (and it can be either). That gives us two possibilities

$0 \pmod{3}$ pure
 $1 \pmod{3}$ impure
 $2 \pmod{3}$ impure
 $0 \pmod{3}$ pure

or

$0 \pmod{3}$ pure
 $1 \pmod{3}$ pure

Re: The Collatz discrete primes!

2(mod3) impure
0(mod3) pure

For the first case, we still get a 3, but for the second, we get a 12 instead of a 3 for differences (essentially, a 3 can be replaced by a 12).

So everywhere we see a 12 in the sequence, a 1(mod3) is pure. Wherever you see a 3, the 1(mod3) inside that block is impure.

Next, every even 1(mod3) is impure. Any 1(mod3) is evenly divisible by 3 when you subtract 1, but, by the implication that $3n+1$ always results in an even number, you cannot reverse that operation when the 1(mod3) is odd. You can always reverse it when 1(mod3) is even, thus, every even 1(mod3) has a smaller ancestor and thus, every even 1(mod3) is impure.

What does that imply to our sequence? That you cannot have 2 pure 1(mod3) numbers in a row (because at least one will be even). So a pure 1(mod3) implies

0(mod3) pure
1(mod3) pure
2(mod3) impure
0(mod3) pure
1(mod3) impure
2(mod3) impure
0(mod3) pure

and that means every 12 is followed by a 3, so [123] is the smallest possible unit and the sum of a unit must be a multiple of 6

[123] = 6
[12333] = 12
[1233333] = 18

Re: The Collatz discrete primes!

But wait...there's more.

To have two [123] blocks in a row implies that the next numbers are 12..., in other words

[123][123][12...]

which means we have 3 odd $1 \pmod{3}$ pure numbers in a row but that won't happen since to be pure, the first sub-branch can't be a $2 \pmod{3}$ and out of three consecutive odd $1 \pmod{3}$ numbers, at least one will have a $2 \pmod{3}$ sub-branch. That gives us the major implication

– there cannot be 3 consecutive odd $1 \pmod{3}$ pure numbers

Of course, you can skip one, but if you do, you get two 3's, the one you skipped and the next one because the $1 \pmod{3}$ number would be even. So if you don't get [123], you must get at least [12333].

Likewise, the other major implication is that out of 3 odd $1 \pmod{3}$ numbers, at least one is pure, so we have

– there cannot be 3 consecutive odd $1 \pmod{3}$ impure numbers

which means we can't have a unit larger than [1233333].

Let's see, I haven't covered why you don't see [12333][12333], but my brain is kinda fried right now, I'm sure there's a similar reason.

Re: The Collatz discrete primes!

The answers are always there if you dig deep enough.

Dan– Hide quoted text –

– Show quoted text — Hide quoted text –

– Show quoted text –

Interesting deduction!

Thanks.

So if there was a counter example to the Collatz conjecture it would have to start with an odd pure?

That's an interesting thought. If you're counting upwards from 1, you would never see a pure until you got to it, so if the counter example was impure, you would see one of its ancestors first and that would lead you right into the counter example.

Unless you're not counting upwards from 1. If you had some magic formula that could take you directly to the counter example, I suppose you could find out that counter example is impure but its ancestors, although smaller, are in fact so large they haven't ever been seen either.

That might be worth looking at in other systems like $3n+5$. Although pure might have a slightly different meaning when there are multiple trees involved.

Dan

.

Re: The Collatz discrete primes!