

Re: Length of sequence of consecutive primes starting at 2

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From: Robert Silverman (*anonymous_at_mathforum.org*)

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On 20 Jul 2004, Joseph Weinberg wrote:

>*rsilverman@draper.com (Bob Silverman) wrote in message news:<200407191526.i6JFQck07076@proapp.mathforum.org>...<snip>*

>*"known" consecutive primes. What I mean by consecutive primes is the >following. The sequence 2,3,5,7,11,13 is made up of consecutive >primes while the sequence 2,3,5,11,13 is not (it's missing the prime >number 7). Understand what I mean? And yes, I mean the largest list >that has ACTUALLY been published.*

Such a list is going to be fairly small. The largest PUBLISHED list I know is VERY old and was published by D.N. Lehmer. It goes up to 10 million. Modern researchers might have somewhat larger tables stored on disk somewhere but I can't image the need to store such a table beyond (say) 10^9 or so. Computational number theorists, if they need primes to (say) 10^{12} would generate them as needed.

>
>> *(3) If you mean that you are looking for a list of ALL primes below >> a certain bound and you want the list with the largest bound that has >> actually been calculated, I can tell you that such a list does not >> exist per se. Or rather, that such a list changes constantly, so you >> are asking for a moving target. It is also one thing to calculate >> such a list, it is another to store and publish it.*

>
>*OK. Can I find the largest upper bound published somewhere? It's OK >if the bound is slightly outdated.*

May I ask why you need ALL the primes? As I stated, at one time or another all primes up to about 10^{12} have been generated. I doubt if ANYONE knows what the largest upper bound truly is. It is at least 10^{12} .

>
>> *(4) If you want a list of primes up to some bound B, it would be >> faster to generate it via a sieve than to read it over the internet.*

>> *And storage for any reasonable B would be problematic. You are
>> talking terabytes.*
>
> *Nope, I'm not interested in this.*

Huh? This contradicts what you specifically asked for!!

You asked for the largest published table. All primes to 10^{12} have been generated. It would take "about" 10^{12} bytes to store the complete table. There are roughly $10^{12}/\log(10^{12})$ such primes, and all primes $> \sim 4 \times 10^9$ will take more than 4 bytes apiece to store. There are compact bit maps that can be constructed, but these do not store the primes themselves. And even they are large.

>
>> *(5) The answer to your last question is trivial. If B is the bound
>> on your list, then $M_{41} - B$ is the number you are looking for.*
>
> *See (3) (I am looking for actual numbers, not theoretical results)*

How is $M_{41} - 10^{12}$ a "theoretical result"??

>
>> *(6) At one time or another, lists of all primes up to at least 10^{12}
>> have been generated. But I can't imagine anyone putting such a list
>> into permanent or even semi-permanent storage. It would be pointless.
>> Further, if at anytime someone did store such a list, extending it
>> a little bit would be trivial.*
>
> *Really? How would you that (I mean extend the list)? Doesn't this
> suggest that it would be trivial to find the prime following M_{41} ?*

I'm not sure I understand you. You seem to be confused. The largest table of the type you ask for has maybe 12 digits in the largest prime. M_{41} has over 6 million. How do you jump to the conclusion that because I say it is easy extending the complete table from (say) 10^{12} to (say) 2×10^{12} , that it is thereby easy to find the next prime after M_{41} ? In the first case you are dealing with 12 digit primes, and in the latter with 6 million digit primes.

>
>> *(7) If you tell me what you REALLY want, I can and will help. But
>> your questions are too imprecise for me to discern your real desire.
>> Please. If you are going to discuss mathematics, then you need to
>> learn how to pose your questions more precisely.*
>
> *What I am REALLY wondering about is the following. The largest known
> primes are Mersenne primes. The largest non-Mersenne prime is much
> smaller than the largest Mersenne prime [1]. It seems to me that
> there should be many primes between these two.*

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May I suggest that you look up the "Prime Number Theorem"?

There will indeed be many, many primes between the two.

I am wondering whether

*>there exist any efficient methods of constructing primes that would
>fall into this range.*

Random primes? No.

Primes of special form? Yes.

Efficient methods exist to find primes of the form (say) $k^{2^n} + 1$.

The special form allows use of FFT based multiples and fast modular reduction also makes the primality testing algorithm rather simple.

May I suggest that you get a book on this subject?

Hans Riesel, "Prime Numbers and Computer Methods for Factorization" is a good book for those with just a modest math background.