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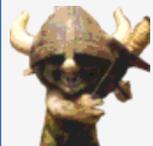


[\[VA\] Short & Sweet Math Challenges #23: "May the 4th Be With You !" Special](#)

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05-17-2018, 05:22 AM

Post: #21



brickviking
Senior Member

Posts: 330
Joined: Dec 2014

RE: [\[VA\] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...](#)

Maximilian Hohmann Wrote: →

(05-15-2018 07:42 PM)

... (The last time I wrote the word "PEEK" before this reply must have been ca. 1983 when I did some machine language programming on my Sinclair ZX81). ...

PEEK and POKE have interesting results on a SHARP PC-1247. I got several somewhat unexpected results by poking instruction codes directly into program memory, as that was within the range of program listings. I don't have that calculator any more, I suspect I lost it in a move along with the dual-trace 1MHz oscilloscope.

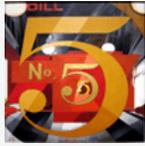
As the 1247 only had 3328 bytes of addressable memory, it wasn't considered "big iron" enough for what I thought I wanted out of a programmable calculator. It certainly wasn't in the same league as the 71B or 75C/D (but was probably considerably cheaper).

(Post 220)

Regards, BrickViking
HP-50g | Casio fx-9750G+ | Casio fx-9750GII (SH4a)

05-17-2018, 11:12 PM

Post: #22



Valentin Albillo 
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...

Hi, **Jeff O**, **Maximilian Hohmann** and **brickviking**:

Jeff O Wrote:

Upon further review, Step the 6th is the kind of number manipulation challenge that I have enjoyed attempting on various models [...] With that said, reading that Egan put 3 hours and one sleepless night into it, and it will continue to haunt him, kind of scares me off a bit.

No need to be afraid, Egan was probably trying to scare would-be solvers, actually it's not that difficult. On hindsight, I probably goofed badly when I put this lovely problem last after a row of essentially 71B-only, tricky ones, so people failed to notice its generality (more or less solvable in every machine) and classic nature. My bad.

Quote:

My usual inclination with such problems is to just go ahead and try for a brute force method, then try to optimize. The DM42 is fast, I would like to see how many digits it could handle in a reasonable time by brute force, so if I get the time I may have a go at it.

Please do. I haven't created a solution for the *DM42* but I guesstimate that with correct programming it can solve the 11-digit version in 5 min. to 1 hour running time.

Quote:

In any case, thanks for your challenges, please don't be put off by a lower than hoped-for response. Next time I'll be sure to read through more carefully!

Thank you very much, you'll be welcome to try. I feel better now. :-D

Maximilian Hohmann Wrote:

Although I [...] would not have been able to solve a single one of these challenges. Especially the ones which require PEEKing the digits of mathematical constants out of the ROM... (The last time I wrote the word "PEEK" before this reply must have been ca. 1983 when I did some machine language programming on my Sinclair ZX81).

He he, same here ! I also had a *Sinclair ZX81* back then and also did *Z80A* machine language programming, most especially video games and graphics routines. I got many books dealing with the matter (which I still keep to this day), most of them truly excellent, and learned a lot. I remember writing my *Bombardier* game utterly by hand, with no compilers or any other tools, painstakingly computing the offsets for the jumps by sheer byte-counting, etc., and being ecstatic when it run fine the first time I tried it, not even a single bug or miscalculation. Those were the days ... !

Quote:

Nonetheless these challenges and the answers are a pleasure to read and think about!

Thank you very much for your kind words, much appreciated. See below for something on *PEEK* ... :-)

brickviking Wrote:

PEEK and POKE have interesting results on a SHARP PC-1247. I got several somewhat unexpected results by poking instruction codes directly into program memory, as that was within the range of program listings.

It's quite similar to the way we HP calc fans initially discovered synthetics in the *HP-41C*. We would enter data in storage registers and thanks to *Bug 2* it would appear in program memory as various synthetic functions, most notably *STO M, N*, and such. My first *HP-41C* was a very early model with all the bugs. Regrettably, I eventually sold it and the next *HP-41C* I got didn't have *Bug 2* anymore.

Quote:

As the 1247 only had 3328 bytes of addressable memory, it wasn't considered "big iron" enough for what I thought I wanted out of a programmable calculator. It certainly wasn't in the same league as the 71B or 75C/D (but was probably considerably cheaper).

Much cheaper. And the *71B* was also much cheaper (and 5 times slower !) than the *75CD* (which I never liked, too bulky, bad keyboard layout, mediocre *BASIC*).

Best regards to all.

V.

.



05-20-2018, 04:50 PM

Post: #23

**J-F Garnier**

Senior Member

>VERS
HP71:2COCC HP11:1B
MATH:1A JPC:FDS...

Posts: 302

Joined: Dec 2013

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...

Valentin Albillo Wrote: →

(05-17-2018 11:12 PM)

... the 71B was also much cheaper (and 5 times slower !) than the 75CD (which I never liked, too bulky, bad keyboard layout, mediocre BASIC).

I do also prefer the HP71, but the HP75 is an interesting machine, too.

Especially the 16kB Math module is very good, much more powerful than the HP80 series Matrix ROM. It has matrix functions, complex number support (although not as nicely integrated than on the HP71), various utility math functions, the PROOT polynomial root finder, the Fourier Transform and more important the FNROOT and INTEGRAL functions.

That is quite the same feature set than the 71.

Or we may better say that the HP71 Math ROM included all the previous HP75 Math ROM features, adding a better integration with the mainframe (e.g. complex number) and improvements such as the re-entrant FNROOT and INTEGRAL functions.

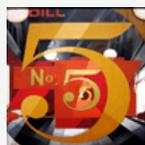
And with emu75 (very similar to emu71/DOS that you know very well), the first two drawbacks mentioned above are no more relevant :-)

J-F



05-21-2018, 01:01 AM (This post was last modified: 05-21-2018 04:17 AM by Valentin Albillo.)

Post: #24

**Valentin Albillo**

Senior Member

Posts: 347

Joined: Feb 2015

Warning Level: 0%

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...

Hi, J-F:

J-F Garnier Wrote: →

(05-20-2018 04:50 PM)

I do also prefer the HP71, but the HP75 is an interesting machine, too. Especially the 16kB Math module is very good, much more powerful than the HP80 series Matrix ROM.

I'd love to have a look at its *Owner's Handbook* to ascertain what it does and what it doesn't do. Just for instance, I think comparing it to the *HP80 series Matrix ROM* is quite unfair. The *Matrix ROM* does just that, matrix handling, so it's no surprise it doesn't delve with complex support, integrals, or root-finding, that's simply out of its scope.

For what it does, matrices, I wonder if the *HP-75 16 Kb ROM* had even a fraction of its functionality. I don't remember that it did, and that's why I'd love to see its manual. The *HP-71B Math ROM* is also quite inferior in that regard, having much less functionality in its matrix capabilities as compared to the *HP80 series ROM*.

Quote:

It has matrix functions, complex number support (**although not as nicely integrated than on the HP71**), [...]

Matter of fact, the complex number support isn't integrated at all. The *HP-75* mainframe has no provision whatsoever for complex number support (unlike the *HP-71B*, which does) and so there's no way to integrate it, nicely or not. I did try those capabilities at the time and found them severely lacking and awkward to use.

Quote:

[...]the PROOT polynomial root finder, the Fourier Transform and more important the FNROOT and INTEGRAL functions. **That is quite the same feature set than the 71.**

I seriously doubt it because the *HP-71B's* is a **32Kb** ROM and the *HP-75C's* is a **16 Kb** one. I don't think that *Capricorn* assembly language is 2 times more space-efficient than *Saturn* assembly language so I don't think that it could fit in 16 Kb what it takes 32 Kb in the *HP-71B*.

Back at the time I had an *HP-87XM* fitted with the *Assembler ROM* (among many others) ad 192 Kb RAM and I did tons of *Capricorn* assembly language *BIN* files, including a very large one implementing all kinds of matrix functionality (even *SORTing*), printing utilities to speed raster graphics, CRT manipulation, the works, and I don't think the instruction set was *200%* more efficient space-wise.

Quote:

Or we may better say that the HP71 Math ROM included all the previous HP75 Math ROM features, adding a better integration with the mainframe (e.g. complex number) and improvements such as the re-entrant FNROOT and INTEGRAL functions.

The *Math ROM* article in the *HP Journal* says as much. It also says that it used the best algorithms from the *80 series Matrix ROM* and enhanced versions of the *HP-15C* algorithms.

Quote:

And with [emu75](#) (very similar to [emu71/DOS](#) **that you know very well**), the first two drawbacks mentioned above are no more relevant :-)

Thanks for your kind words but I'm pretty sure you do know **emu71/DOS** better than me ... ;-D

Best regards.

V.

.

Edit to correct a mistake.



05-21-2018, 02:02 AM

Post: #25

rprosperi

Senior Member

Posts: 3,278

Joined: Dec 2013

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You!" ...**Valentin Albillo Wrote:** →

(05-21-2018 01:01 AM)

I seriously doubt it because the *HP-71B*'s is a **64 Kb** ROM and the *HP-75C*'s is a **16 Kb** one. I don't think that *Capricorn* assembly language is 4 times more space-efficient than *Saturn* assembly language so I don't think that it could fit in 16 Kb what it takes 64 Kb in the *HP-71B*.

The 75C/D has 48KB ROM in all, comprised of:

SYSROM - 24K

BASROM - 8K

ALTROM - 8K

MELROM - 8K

This is 'visible' by using the VER\$ function which reports 'aaaaa', 'bbbbb', or 'ddddd', indicating the version letter for each of the 6 x 8K ROMs.

--Bob Prosper

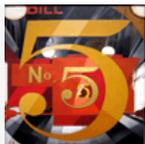


05-21-2018, 04:14 AM

Post: #26

Valentin Albillo

Posts: 347



Senior Member

Joined: Feb 2015
Warning Level: 0%
RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...

.
Hi, **Bob**:

rprosperi Wrote: →

(05-21-2018 02:02 AM)

The 75C/D has 48KB ROM in all, comprised of:[...] This is 'visible' by using the VER\$ function which reports 'aaaaaa', 'bbbbbb', or 'dddddd', indicating the version letter for each of the 6 x 8K ROMs.

My bad. I was referring to the sizes of the respective Math ROMs, not the System ones but I got the wrong 71B Math ROM size, it's 32 Kb, not 64 Kb, which I'll correct immediately in my post.

Thanks a lot. 4:15 a.m. here. Regards.

V.
.



05-21-2018, 04:42 AM

Post: #27

rprosperi 
Senior Member
Posts: 3,278
Joined: Dec 2013
RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...
Valentin Albillo Wrote: →

(05-21-2018 04:14 AM)

.
Hi, **Bob**:

rprosperi Wrote: →

(05-21-2018 02:02 AM)

The 75C/D has 48KB ROM in all, comprised of:[...] This is 'visible' by using the VER\$ function which reports 'aaaaaa', 'bbbbbb', or 'dddddd', indicating the version letter for each of the 6 x 8K ROMs.

My bad. I was referring to the sizes of the respective Math ROMs, not the System ones but I got the wrong 71B Math ROM size, it's 32 Kb,

not 64 Kb, which I'll correct immediately in my post.

Thanks a lot. 4:15 a.m. here. Regards.

V.

.

Happy to chat, and glad if it helped to clarify the discussion.

Though this probably could have waited until 6 or 7 am... 😊

--Bob Prospero



05-21-2018, 10:24 AM (This post was last modified: 05-21-2018 10:37 AM by J-F Garnier.)

Post: #28



J-F Garnier

Senior Member

Posts: 302

Joined: Dec 2013

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...

Valentin Albillo Wrote: →

(05-21-2018 01:01 AM)

I'd love to have a look at its *Owner's Handbook* to ascertain what it does and what it doesn't do.

The handbook and QRG are available on the [HP75 group](#) (access to files for registered users only), together with the HP75 Math ROM **source file!**

Quote:

For what it does, matrices, I wonder if the *HP-75 16 Kb ROM* had even a fraction of its functionality. I don't remember that it did, and that's why I'd love to see its manual. The *HP-71B Math ROM* is also quite inferior in that regard, having much less functionality in its matrix capabilities as compared to the *HP80 series ROM*.

I didn't remember that the Series 80 Matrix ROM had such more functionalities. Maybe it's time for me to re-start my old HP85...

Quote:

Matter of fact, the [HP75] complex number support isn't integrated at all. The *HP-75* mainframe has no provision whatsoever for complex number support (unlike the *HP-71B*, which does) and so there's no way to integrate it, nicely or not. I did try those capabilities at the time and found them severely lacking and awkward to use.

Sure. Complex numbers are managed as 2-element arrays and, for instance, to add two complex numbers you must do something like:

```
MAT Z = CADD(Z1,Z2)
```

But at least it exists, if you need complex numbers, you don't have to write your own routines as you have to in the Series 80.

Quote:

Quote:

[...]the PROOT polynomial root finder, the Fourier Transform and more important the FNROOT and INTEGRAL functions. **That is quite the same feature set than the 71.**

I seriously doubt it because the *HP-71B*'s is a **32Kb** ROM and the *HP-75C*'s is a **16 Kb** one. I don't think that *Capricorn* assembly language is 2 times more space-efficient than *Saturn* assembly language so I don't think that it could fit in 16 Kb what it takes 32 Kb in the *HP-71B*.

This is surprising for me too. Even if the 71 Math LEX is only 27 kB long (the rest of the ROM is filled with 0), it makes a big difference of code size.

I intent to compare the features of the 71 and 75 Math ROM more in details. But it will be the subject of another thread.

Quote:

Back at the time I had an *HP-87XM* fitted with the *Assembler ROM* (among many others) ad 192 Kb RAM and I did tons of *Capricorn* assembly language *BIN* files, including a very large one implementing all kinds of matrix functionality (even *SORTing*), printing utilities to speed raster graphics, CRT manipulation, the works, and I don't think the instruction set was *200%* more efficient space-wise.

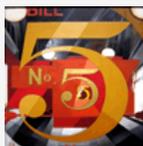
If you still have some material of that time, we at the [HP Series 80 group](#) would love to see it, and preserve it if you permit.

J-F



05-21-2018, 04:48 PM

Post: #29



Valentin Albillo
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You!" ...

J-F Garnier Wrote: →

(05-21-2018 10:24 AM)

(... lotsa lotsa things ...)

J-F

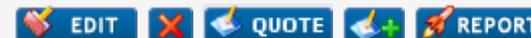
This is deviating too far from my S&SMC#23 so time for another dedicated thread.

I suggest you create it with some adequate Subject (say, "Math ROMs for 71B, 75C and Series 80") and include as its first post what you say in your latest here, then I'll comment on each of your points.

Regards.

V.

.



05-24-2018, 08:14 AM

Post: #30



PeterP 
Member

Posts: 63
Joined: Jul 2015

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...

Dear Valentin, thank you for providing yet another of your most wonderful teaching exercises! While it was more focused on 71B but you - thankfully - left one to be tackled by other calculators as well. I had a long flight (actually two) so I tried by luck with it but alas, upon finishing a working code discovered that I had found the original thread after the deadline had past (I did not read the fine print nor any of the comments lest I spoil my pleasure).

My code takes a few minutes to deliver the first 9 digit 'Selfie' on my i41CX, is of course entirely clumsy and could use a true masters hand, but I wanted to ask for your opinion about posting it or not given that it is indeed past your suggested deadline.

In any case, I am very thankful for spending yet again an incredible amount of time and effort in concocting, creating, testing, and then wrapping in a nice story one of your wonderful S&SMC.

Many more you make, I hope.

Cheers

PeterP

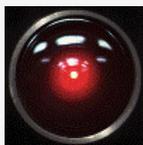
Cheers,

PeterP



05-24-2018, 07:10 PM (This post was last modified: 06-02-2018 08:07 PM by Jeff O..)

Post: #31



Jeff O. 
Member

Posts: 166
Joined: Dec 2013

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You!" ...

Valentin Albillo Wrote: →

(05-17-2018 11:12 PM)

Jeff O Wrote:

My usual inclination with such problems is to just go ahead and try for a brute force method, then try to optimize. The DM42 is fast, I would like to see how many digits it could handle in a reasonable time by brute force, so if I get the time I may have a go at it.

Valentin Albillo Wrote: →

(05-17-2018 11:12 PM)

Please do. I haven't created a solution for the *DM42* but I guesstimate that with correct programming it can solve the 11-digit version in 5 min. to 1 hour running time.

PeterP Wrote: →

(05-24-2018 08:14 AM)

...but I wanted to ask for your opinion about posting it or not given that it is indeed past your suggested deadline.

Peter,

Based on Valentin's "please do" stated above, I'm going on the assumption that it is OK to post. If interested, see below, which details my "clumsy" solution.

As a start, I went ahead and created a brute-force program with which I identified the 30 selfies from 1 to 10 digits:

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

173
351
704
4361
4749
8028
48039
72729
84745
438845
5136299
5271471
7180089
8180124
15087642
77439588
351589219
579533274
638494435
802115641
4777039764

For the sake of completeness, here are the 11-digit selfies, determined using a revised program as described in my post below:

15 694 046 123
52 249 382 004
30 609 287 624
97 653 680 744
60 605 588 394
87 561 939 628
41 919 540 249

I implemented this program on Free42 with the intent to download to my DM42 to see how fast it might go on that machine. The above results were obtained running Free42 on my desktop PC. Output was to the virtual printer. It produces the first 19 (i.e., 6-digit or fewer selfies) nearly instantaneously, then slows down considerably. Takes about maybe 2.5 minutes to get the 7-digit, then maybe 25 minutes for the 8-digit, and *awhile* for the 9-digit. I let the program run most of yesterday and then overnight, and this morning was rewarded with the lone 10-digit selfie. It looks like finding the seven 11-digit selfies would take about 20 days, so I think I'll probably wait until I figure out some optimized method to find those rather than continuing to run my program.

My brute force method does not look directly for selfies, it looks for numbers which have the property that if you sum its N digits raised to

the Nth power you get the original number back (let's call them inverse selfies), then it simply reverses those to create the selfie. I quickly found that not all inverse selfies will be a selfie when reversed. Specifically those that end in zero will not, since when an N digit number ending in zero is reversed, it becomes an N-1 digit number. I thought that perhaps filtering out numbers ending in zero, i.e., not summing their digits to the Nth power to see if they were inverse selfies and so reducing the quantity of numbers to be checked by 10%, might speed things up. Unfortunately, performing that check on every number seemed to take longer, or at least was no quicker, than summing the digits to the Nth power for all numbers and then checking only inverse selfies to see if they end in zero. (I found two such numbers, 370 and 24678050, before I revised the program to eliminate them.) In any case, a 10-fold or more increase in speed is really needed to make this practical.

I can see some ways to determine that some numbers need not be checked, for example, no 10-digit number with three or more nines need be checked since all those will sum to an 11 digit number, no 10 digit number with six as the largest digit can be a selfie since those will not sum to a 10 digit number. I'll keep thinking about the problem to see if I can develop a method that will be much quicker - hopefully it won't keep me awake at night.

Here is the brute force program listing:

```
00 { 90-Byte Prgm }
01 ▶LBL "VA6_6"
02 CLA
03 CF 29
04 FIX 00
05 RCL 02
06 ARCL ST X
07 ALENG
08 STO 00
09 0
10 ▶LBL 04
11 ATOX
12 X=0?
13 GTO 05
14 48
15 -
16 RCL 00
17 Y↑X
18 +
19 GTO 04
20 ▶LBL 05
21 CLX
22 RCL 02
```

23 X≠Y?
24 GTO 08
25 10
26 ÷
27 FP
28 X=0?
29 GTO 08
30 ARCL ST Y
31 0
32 STO 01
33 ▶LBL 06
34 ATOX
35 X=0?
36 GTO 07
37 48
38 -
39 RCL 01
40 10↑X
41 ISG 01
42 DEG
43 ×
44 +
45 GTO 06
46 ▶LBL 07
47 R↓
48 PRX
49 ▶LBL 08
50 ISG 02
51 DEG
52 GTO "VA6_6"
53 END

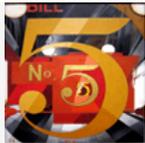
edited to correct typo and add clarity to one item
edit no. 2 - added the 11-digit selfies to the list

Dave - My mind is going - I can feel it.



05-24-2018, 11:13 PM

Post: #32

**Valentin Albillo** 

Senior Member

Posts: 347

Joined: Feb 2015

Warning Level: 0%

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !"
.Hi, **PeterP** and **Jeff 0** :**PeterP Wrote:** →

(05-24-2018 08:14 AM)

Dear Valentin, thank you for providing yet another of your most wonderful teaching exercises!

Long time no see, **PeterP** !! I missed you ! ... Glad to see you taking part in one of my recent *S&SMC*'s as you so frequently did in the past.**Quote:**

While it was more focused on 71B but you - thankfully - left one to be tackled by other calculators as well.

Yes, I was fearing that it was too 71B centric and regrettably the **HP-71B** seems placed in a *no-man's land* being the only calc-sized BASIC model, not RPN, not RPL, so it seems it's got very few fans and thus I provided a *plan B* by including last a challenge that could be solved in most calcs. My fears proved real so I'm glad I did.**Quote:**

upon finishing a working code discovered that I had found the original thread after the deadline had past (I did not read the fine print nor any of the comments lest I spoil my pleasure).

Actually, there are no hard deadlines, most especially for a challenge that no one posted anything about and thus for which I also posted no solution. In such a case anyone is welcome to post anything at any time.

Quote:

My code takes a few minutes to deliver the first 9 digit 'Selfie' on my i41CX, is of course entirely clumsy and could use a true masters hand, but I wanted to ask for your opinion about posting it or not given that it is indeed past your suggested deadline.

See above. I'm eager to see your code so post it here at your earliest convenience, and if possible include timings.

Quote:

In any case, I am very thankful for spending yet again an incredible amount of time and effort in concocting, creating, testing, and then wrapping in a nice story one of your wonderful S&SMC. Many more you make, I hope.

You're welcome, thanks a lot for your everlasting appreciation. I have several *S&SMC* plus assorted *Mini-Challenges* ready to post at a moment's notice.

Jeff O. Wrote:

As a start, I went ahead and created a brute-force program with which I identified the 30 selfies from 1 to 10 digits:

I'm glad that you decided to give it a go, as you say you would. Brute-force or not your results are correct so congratulations, you're the first one (and so far the only one until **PeterP** posts his code) to solve it so my most sincere congratulations.

Quote:

The above results were obtained running Free42 on my desktop PC. It produces the first 19 (i.e., 6-digit or fewer selfies) nearly instantaneously, then slows down considerably. [...] It looks like finding the seven 11-digit selfies would take about 20 days, so I think I'll probably wait until I figure out some optimized method to find those rather than continuing to run my program.

Wise decision. Brute-force usually takes (generic) you so far, then you must think harder in order to beat the exponential curse.

Quote:

In any case, a 10-fold or more increase in speed is really needed to make this practical. [...] I'll keep thinking about the problem to see if I can develop a method that will be much quicker - hopefully it won't keep me awake at night.

Please do. I'll post my original solution at 23:xx (GMT+1) next Sunday so you've got plenty of time to refine and expand your own.

Thanks to both and best regards.

V.

.



05-25-2018, 03:57 AM

Post: #33

PeterP 
Member

Posts: 63
Joined: Jul 2015

**RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...**

Thank you VA for your kind encouragement to post, it was a pleasure to work on for a flight (and a night) so I'm glad I get to share.

Another way to define the selfie is an n-digit number which is identical to the sum of the n-th power of its digits, but does not end in a 0.

To constrain the search space, I used two features:

- (1) One can always rank order the digits of a number in a monotonously falling fashion (each digit is smaller or equal than the prior one)
- (2) As soon as one has a sum of n-th power of digits which is larger than 10^n , one can stop as all combination of digits to the right will yield unqualified results.

The combined application of the above allows to cut of quite substantial swaths of the search tree.

The implementation is based on the specific limitations of the HP41, namely:

- 1) It can only deal with at most 6 subroutine levels. This makes a recursive approach unfortunately not possible on the 41, yet I would not be surprised if this is possible, indeed advisable for the 71b
- 2) The 41 is very very slow in dealing with direct number entries. As such, virtually all numbers are stored in registers for faster processing
- 3) Akin to the JPC rom, my version uses my beloved Sandbox module, for the use of INCX, DECX, and AINT
- 4) Once a number has been found with a sum of the n-th powers of its digits between 10^n and $10^{(n-1)}$, the number is then checked to see if it is a selfie, aka the sum of *its* digts raised to the n-th power, using AINT and ATOX.

The code below takes as an entry the number of digits and then runs until all n-digit selfies are found. Adding a loop over all digits would be trivial but was not done for the purpose of easier exploration of the results of the code, timing, etc.

Code:

```
LBL 'VASSMC'  
CLRG  
STO 00      ''store n-digit  
10^x  
STO 40      ''store upper limit  
10  
/  
STO 42      ''store lower limit  
48  
STO 48      ''store const for fast conversion from ASCII to number
```

Very much looking forward to comments, in particular ways to make it smarter.

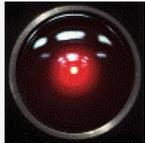
Cheers,

PeterP



06-02-2018, 08:01 PM

Post: #34



Jeff O. 
Member

Posts: 166
Joined: Dec 2013

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...

Valentin Albillo Wrote: →

(05-24-2018 11:13 PM)

Jeff O. Wrote:

In any case, a 10-fold or more increase in speed is really needed to make this practical. [...] I'll keep thinking about the problem to see if I can develop a method that will be much quicker - hopefully it won't keep me awake at night.

Please do. I'll post my original solution at 23:xx (GMT+1) next Sunday so you've got plenty of time to refine and expand your own.

Thanks to both and best regards.
V.

So as to not use anyone else's concepts for the time being, I have not reviewed Peter's work. Should anything I say or present below be a repetition of concepts presented by Peter, I fully acknowledge his priority.

In an effort to reduce execution time, I developed a method which basically checks 10 numbers at a time. I guess a better way to describe it would be to say that it determines if there is a solution between successive numbers that end in zero.

Since it is still basically just brute force, i.e., does not break any ground in attacking the problem in a super-efficient manner, I won't explain the procedure in detail. If anyone wants an explanation, I can provide it.

Since it effectively checks 10 numbers at a time, it seemed like a program based on the procedure should theoretically be up to 10 times faster than the previous program, as it checks all N+1 digit numbers by counting up to N. In practice, it appears that the various

manipulations required to implement it eliminate some of the time saving. The speed-up seems to be more like a factor of 4 to 5. But with that improvement, I went ahead and turned it loose to find the 11-digit selfies. After (only) several days (again, on Free42 running on a couple of PCs), it found the seven 11-digit selfies:

```
15 694 046 123
52 249 382 004
30 609 287 624
97 653 680 744
60 605 588 394
87 561 939 628
41 919 540 249
```

The new program listing is presented below. Unfortunately, this program does not technically meet the original challenge. It cannot determine the single digit selfies from 1 through 9 since if you start counting at 1, it is checking candidates starting at 10. I could add code to just print out 1 through 9 at the start, but that seems unnecessary.

As noted, this is still essentially just brute force, and would be totally impractical on a DM42. Running on a physical machine in minutes or hours would require a massive speed-up factor. I'll keep trying to think of some other method to attack the problem that would be faster, but there's not much time until Sunday. Then I'll have to decide if I want to admit defeat and review Valentin's solution, or let it haunt me the rest of my days...

```
00 { 112-Byte Prgm }
01 ▶LBL "SELF"
02 CLA
03 CF 29
04 FIX 00
05 RCL 02
06 ARCL ST X
07 10
08 ×
09 ALENG
10 1
11 +
12 STO 00
13 R↓
14 ▶LBL 04
15 ATOX
16 X=0?
17 GTO 05
```

18 48
19 -
20 RCL 00
21 $Y \uparrow X$
22 -
23 $X < 0?$
24 GTO 08
25 GTO 04
26 \bullet LBL 05
27 $R \downarrow$
28 RCL ST X
29 RCL 00
30 $1/X$
31 $Y \uparrow X$
32 1
33 +
34 IP
35 STO 11
36 RCL 00
37 $Y \uparrow X$
38 RCL- 11
39 $X \neq Y?$
40 GTO 08
41 10
42 $RCL \times 02$
43 $RCL + 11$
44 ARCL ST X
45 0
46 STO 01
47 \bullet LBL 06
48 ATOX
49 $X = 0?$
50 GTO 07
51 48
52 -
53 RCL 01
54 $10 \uparrow X$
55 ISG 01
56 DEG

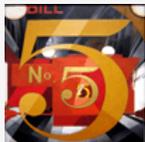
57 ×
 58 +
 59 GTO 06
 60 ▸ LBL 07
 61 R↓
 62 PRX
 63 ▸ LBL 08
 64 ISG 02
 65 DEG
 66 GTO "SELF"
 67 END

Dave - My mind is going - I can feel it.



06-03-2018, 12:37 AM

Post: #35



Valentin Albillo 
 Senior Member

Posts: 347
 Joined: Feb 2015
 Warning Level: 0%

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You!" ...

Hi, **Jeff O.**:

Jeff O. Wrote: →

(06-02-2018 08:01 PM)

In an effort to reduce execution time, I developed a method which basically checks 10 numbers at a time. I guess a better way to describe it would be to say that it determines if there is a solution between successive numbers that end in zero. [...] the speed-up seems to be more like a factor of 4 to 5. [...] After (only) several days (again, on Free42 running on a couple of PCs), it found the seven 11-digit selfies:

Congratulations, it's quite an achievement and I thank you for your efforts on this last part of my *S&SMC#23*. A factor of 400-500% faster over what sheer brute force produces is certainly a remarkable improvement.

Quote:

Unfortunately, this program does not technically meet the original challenge. It cannot determine the single digit selfies from 1 through 9 since if you start counting at 1, it is checking candidates starting at 10. I could add code to just print out 1 through 9 at the start, but

that seems unnecessary.

It certainly is. The meat of the challenge is to produce the many-digit selfies, not the trivial ones. Insisting on that would be nitpicking on my part, which I don't usually indulge in.

Quote:

As noted, this is still essentially just brute force, and would be totally impractical on a DM42. Running on a physical machine in minutes or hours would require a massive speed-up factor

Indeed. As far as I know, there are at least *three* ways to attack this problem. The first and most obvious is sheer brute force (*very* brute), but that stumbles at 10 or 11 digits at most and even then it takes excessively long times.

The second and third ways depend on the same idea but implement it differently and both reduce exponentially the required times, to the point that 11 digits can be reached in *Emu71* in a few minutes, and using somewhat slow multiprecision software running on a decidedly slow old PC they can still find all the solutions with 10, 20, 30 and more digits in a few hours at most.

Quote:

I'll keep trying to think of some other method to attack the problem that would be faster, but there's not much time until Sunday. Then I'll have to decide if I want to admit defeat and review Valentin's solution, or let it haunt me the rest of my days...

Time is not a problem, I'm also no nitpicker with deadlines and such. If you need more time, I'll gladly postpone posting my solutions. Also, if you'd accept a *hint* or two in order to be able to implement the 2nd or 3rd ways, I'll gladly oblige. Perhaps it would spoil somewhat the pleasure of finding the idea by yourself but in the other hand it's also quite pleasurable to create a markedly non-trivial working solution starting from a little hint instead of solely admitting defeat after so much effort and time.

Your choice ... :-D

Again, thanks for your interest and your great efforts, have a nice weekend.

V.

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06-03-2018, 06:52 AM

Post: #36

Warbucks

Junior Member

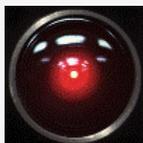
Posts: 15
Joined: Mar 2018

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...

The original problem is a BBP problem using PSLQ as a tool (integer relations finding) is it not?



06-03-2018, 06:34 PM

Post: #37

Jeff O. 
Member

Posts: 166
Joined: Dec 2013

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...**Valentin Albillo Wrote:** →

(06-03-2018 12:37 AM)

Time is not a problem, I'm also no nitpicker with deadlines and such. If you need more time, I'll gladly postpone posting my solutions. Also, if you'd accept a *hint* or two in order to be able to implement the 2nd or 3rd ways, I'll gladly oblige. Perhaps it would spoil somewhat the pleasure of finding the idea by yourself but in the other hand it's also quite pleasurable to create a markedly non-trivial working solution starting from a little hint instead of sorely admitting defeat after so much effort and time.

Your choice ... :-D

Again, thanks for your interest and your great efforts, have a nice weekend.

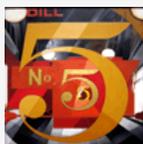
V.

Thanks for your kind words about my efforts. Sure, I'll take a little more time and a hint or two. I'll consider it a learning experience rather than a failing.

Dave - My mind is going - I can feel it.



06-04-2018, 11:19 PM

Post: #38

Valentin Albillo 
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...

Hi, **Jeff O.**:

Jeff O. Wrote: →

(06-03-2018 06:34 PM)

Thanks for your kind words about my efforts. Sure, I'll take a little more time and a hint or two. I'll consider it a learning experience rather than a failing.

In 5 minutes, check your Private Messages. :-)

Regards.

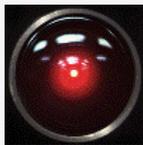
V.

.



06-06-2018, 03:48 AM

Post: #39



Jeff O. 
Member

Posts: 166
Joined: Dec 2013

RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...

Valentin Albillo Wrote: →

(06-04-2018 11:19 PM)

In 5 minutes, check your Private Messages. :-)

Regards.

V.

.

Thank you, message received. I'll see what I can do with the information.

Dave - My mind is going - I can feel it.



06-07-2018, 05:10 AM

Post: #40

Valentin Albillo 
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%



RE: [VA] Short & Sweet Math Challenges #23: "May the 4th Be With You !" ...

Warbucks Wrote: →

(06-03-2018 06:52 AM)

The original problem is a BBP problem using PSLQ as a tool (integer relations finding) is it not?

I don't get you. What "original problem" are you referring to ?

V.

.



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