Display Contest Submittals

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#1a ----- Original Message -----
From: Jim Horn
To: rjnelsoncf@cox.net
Sent: Tuesday, April 28, 2009 3:07 PM
Subject: Interesting calculator display

Hi, Richard –

Well, it takes ***three*** keystrokes, but 81 1/x gives most of the ten digits (0.0123456790123…). Simple and easy. Also uses whatever display resolution is available even on cheap calculators (OK, they may not have 1/x but do have divide; equals; equals).

Otherwise, a display that shows a unique capability of the machine being photographed seems best – multiline numeric, text, and graphics displays can all show their stuff that way. Of course, being calculator dependant such a display can't be keyed in the same on every machine.

Great challenge! I look forward to the other answers.

See you at HHC2009 (for sure – I live and work in the Columbia River gorge as GE laid off their video security team).

Jim Horn
Electrical Engineer
InSitu, Inc.
Phone: 509-493-6313
Cell: 707-327-6253
Jim.Horn@insitu.com
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#2a ----- Original Message -----
From: Gene Wright
To: Richard Nelson
Sent: Tuesday, April 28, 2009 6:28 PM
Subject: My "calculator display number" answer...

is:

81 1/x

Gene
##
#3a ----- Original Message -----
From: martin cohen
To: rjnelsoncf@cox.net
Sent: Tuesday, April 28, 2009 8:33 PM
Subject: Nice number for display

81 1/x (3 ks) = 0.0123456790123....
Satisfies all but 2 ks = needs 3.

Martin Cohen

Another interesting tidbit:

987654321/123456789 = 8.0000000729

Neither the 8 nor the 729 are coincidences.
I found this over 40 years ago, sent it to Martin Gardner, and he published it in his Scientific American math column!
(It's been down hill ever since:)

In general, if the base is B (iirc),
(B-1)(B-2)...(1)/(1)(2)...(B-1) = B-2 + (B-1)^3/B^B + smaller

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#4a ----- Original Message -----
From: Christian Carey
To: Richard J. Nelson
Sent: Tuesday, April 28, 2009 9:12 PM
Subject: Re: What Display Number?

Hello Richard,

I found a reference to your "What Display Number?" contest today, and thought that I'd offer an entry: my suggestion is the natural logarithm of 11211. On my HP 50g, given its flag settings, I enter

```
        11211 LN ->NUM
```

(that is, 11211 right-shift/Y^X right-shift/ENTER) to give the 12-digit result

```
        9.32465071815
```

For a calculator with an eight-digit display, it would show 9.3246507; a ten-digit display would offer 9.324650718; and a 15-digit display would present 9.32465071815359.

This number conforms closely to the four guidelines. It is simple to remember and mathematically interesting, because 11211 = 111 × 101, and thus the number is also the sum of the natural logarithms of 111 and 101; it includes as many of the digits as possible (eight different digits on an eight-digit display, and all ten digits on displays of at least ten digits); it is easily and quickly input on calculators with a natural logarithm function; and it doesn't require extensive knowledge of a machine to generate the number.

My slight violation of the guidelines is that this number is not particularly informative; given that it is a natural logarithm, it simply reveals the area under a graph of f(x) = 1/x from 1 to 11211.

Thanks for running the contest - it was fun trying to come up with an entry for it!

Kind regards,

Chris.
--
Christian Carey <ccarey@capaccess.org>

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#4b----- Original Message -----
From: Christian Carey
To: Richard Nelson

Sent: Wednesday, April 29, 2009 7:55 PM
Subject: Re: What Display Number?

Hello Richard,

thanks for your reply, and for the attachment of the Update #1 document. Given the clarifications that were presented in the update, I thought that I'd submit the second entry to better meet the goals of the contest.

My revised suggestion is the natural logarithm of 0.0832. On my HP 50g, given its flag settings, I enter

```
        .0832 LN
```

(that is, .0832 right-shift/Y^X) to give the 12-digit result

```
        -2.48650793115
```

A calculator with an eight-digit display would show -2.4865079; a ten-digit display would offer -2.486507931; and a 15-digit display would present -2.48650793115497.

This number conforms closely to the four guidelines. It is simple to remember and mathematically interesting, because 0.0832 = 0.64 × 0.13, and thus the number is also the sum of the natural logarithms of 0.64 and 0.13; it includes as many of the digits as possible (eight different digits on an eight-digit display, and all ten digits on displays of at least ten digits); it is easily and quickly input on calculators with a natural logarithm function; and it doesn't require extensive knowledge of a machine to generate the number.

My slight violation of the guidelines is that this number is not particularly informative; given that it is a natural logarithm, it simply reveals the area under a graph of f(x) = 1/x from 1 to 0.0832.

The path of discovery that led me to suggest this number was partially surveyed and partially hacked out. I'd initially decided to give top priority to maximizing the count of distinct digits in the number, with ease of calculation coming in a close second place. I'd figured that minimizing the number of keystrokes would be a helpful side-effect, but that it wouldn't be a necessity if the ease of calculation were maximized.

I began by looking at fractions with a denominator of 81 and numerators that were relatively prime with 81: for example, 10/81 = 0.12345679012345[6]... Since fractions of this variety would only provide nine of the ten digits, I wondered whether there were any fractions with small denominators that would provide all ten digits in the first ten decimal places. I found that 1/38 = 0.02631578947368[4]... and 37/38 = 0.97368421052631[5]... both fit the bill. I rejected 1/38 because the digit zero would appear twice in all displays, thus showing neither eight different digits on an eight-digit display nor ten different digits on a ten-digit display. Using 153/38 = 4.02631578947368[4]... would have solved that problem, but rounding would have changed the appearance of the number on an eight-digit display (as 4.0263158), so I declined to use it on aesthetic grounds. Similarly, 37/38 wouldn't show ten different digits on a ten-digit display, but 227/38 = 5.97368421052631[5]... would; however, its rounding on a ten-digit display (as 5.973684211) would still not show ten different digits, so that number was also set aside.

I then left the realm of rational numbers for the terra incognita of irrational numbers. Not knowing what to expect, I randomly tried manipulating values such as pi, e, and phi, and played with several different functions to get a glimmer of what to expect digit-wise. I thought that natural logarithms seemed to have a better distribution of digits than the other functions did, and so decided to write a little program to see if natural logarithms of smallish numbers might provide the digit variety which I sought after. The program only displayed numbers that had the ten digits represented in each number's first ten significant digits, further filtered by only printing those for which rounding at eight, ten, and twelve digits would always round down, to leave the last displayed digit unmodified. My first entry in this contest, the natural logarithm of 11211, was the easiest number to remember of those that the program revealed.

With the additional information provided by the Update #1 document, I altered my program slightly to see if a negative number with similar qualities could be found. Unlike the positive numbers, for which several candidates were returned, there was only one candidate found that returned a negative number: the natural logarithm of 0.0832. Fortunately, this number is also easy to remember, and at least on my HP 50g (if not in other series) it has the extra benefit of not requiring the ->NUM function to convert its display from symbolic representation to numeric representation.

Thanks again for running the contest!

Kind regards,

Chris.
--
Christian Carey <ccarey@capaccess.org>

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#5a----- Original Message -----
From: Frank Travis
To: Richard Nelson
Cc: frt >> Frank Travis ; FRANK TRAVIS
Sent: Monday, May 04, 2009 8:38 AM
Subject: My HHC 2009 calculator display contest entry

Richard
I am attaching the revised file which I just finished. May 4, 2009

HHC 2009 contest to display maximum different one digit whole numbers (with two or three keystrokes)

I used an HP 48GX and an HP 50G (each with standard precision to display all digits). I got the same results with both calculators:

ln(2)

8 digits: .693 147 18 (missing 2,5,0) [3 numbers missing]

10 digits: .693 147 18 05 (missing number 2) [1 number missing]

11 digits: .693 147 18 05 6 (missing number 2) [1 number missing]

(The displays did not go to 12 digits with this function). Other functions such as sin(6) degrees displayed the full 12 digits.

The early HP calculators from the HP 35 in 1972 to 1979 used LEDs (Light emitting diodes) with segmented numbers.

The HP 41C/CV/CX series first introduced in 1979 was the first family of HP calculators with alphanumeric display and Liquid Crystal Display (LCD). In addition to the vertical and horizontal segments of previous HP LED calculator the HP 41 series had angled segments for letters and characters.

Later HP calculators after the HP 41 series such as the HP 48GX/G/G+/SX/S have LCD dot matrix displays for greater resolution.

Use a tripod or mount so that the camera gets the best possible still photo of the calculator. Getting the full front view of the calculator is the best way to show the display and keys. It is the way most of the calculators are photographed in the following two books:

Codenames of HP Handheld Calculators and PDAs: facts and speculations.
By M. J. P. Staps
1996
ISBN 90-802939-1-1

A Guide to HP Handheld Calculators and Computers
By W. A. C. Mier-Jedrzejowicz, Ph. D.
Fifth Edition (HHC 2007 Printing)
ISBN 978-888840-40-7

\# #

#6 ----- Original Message -----
From: Joseph Horn
To: Richard Nelson
Cc: joehorn@holyjoe.net
Sent: Sunday, May 24, 2009 1:25 AM
Subject: Re: ALL HP and RPN models

Hi, Richard!

> Perhaps a new column could be added for the Logic system - Arithmetic, Algebraic, Reverse Polish Notation, or Command Line Interface.

Great timing! You'll find exactly what ye seek in the attached table, which is part of my now-finished "What Display Number?" contest entry.

Instructions: Print out the "Best Number Table.pdf" file, and have it at hand while reading the "What Display Number jkh.pdf" file. The two files together form my contest entry. The more I delved into it, the more I realized could be said -- and probably OUGHT to be said – but I had to stop somewhere, so there it is. There are many other interesting issues, such as how to best photograph the visibility (or invisibility) of the decimal point in various HP calculators, or the many different ways that HP has chosen to display exponents. Such things will just have to wait for another day. ;-)

Needless to say, if my entry is disqualified due to not being exactly one or two specific "best numbers", I fully understand and don't mind. I hope that my write-up explains the reason that I did not pick just one or two, but instead gave a clear methodology by which anybody can determine which of 5 specific numbers is the best for his or her needs.

Thanks again for a truly captivating contest!

-Joe-

\# #

#7 ----- Original Message -----
From: Roger Hill
To: Richard Nelson
Cc: % Joseph K. Horn ; Frank Travis ; Martin Cohen ; Jim Horn ; % Gene Wright ; Christian Carey
Sent: Wednesday, May 27, 2009 12:34 AM
Subject: Re: HP Calculator Display Contest Results

Hi again,

Okay, I hadn't read (or even seen) the contest rules until after I wrote my last message, which was based on just a cursory look at the attachments, and then went off to dinner.

For future use, however, I still think my number has a lot of good properties, even though it does take more than the optimal number of keystrokes (and I would even add another keystroke to give it a minus sign). It does require setting FIX 9 in advance (if the default is fewer digits), but I gather this doesn't count as extra keystrokes. And was there ever any HP calculator that did NOT have a square-root key? (I guess I'll have to go through my calendar...)

For interest's sake I might add that the number 25.4 is the ONLY integer multiple of 0.1 whose square root is of the form n.nnnnnnnnn... where the first 10 significant digits are all different. This is also true if you say "rounded to 10 significant figures". (I'd like to say that I had an HP-50g chug away on this for a few hours, but I actually did it using an Excel spreadsheet.) This is somewhat remarkable considering that if you choose the 10 digits at random except that the first has to be nonzero, the probability of them being all different is about 1 in 2500. So, sqrt(25.4) is indeed special, besides being the number of millimeters^(1/2) per inch^(1/2) -- whatever that means physically.

Anyway, the purpose of the contest was to have fun, and it indeed served that purpose today, at least for me...

-- Roger

------------ On my previous message: -------------

Well, duh, I'm somewhat confused because I never heard of this contest in the first place, though I think I've been getting all of Richard's E-mailings, and I've looked at Joe's HHC 2009 web site (though I haven't actually registered yet, but I will Real Soon Now...). Or is this a contest *being planned* for HHC 2009?

The only thing of a contest/challenge nature that I have gotten recently from any of you was Joe's "Age Prime" challenge (in what months are there no dates on which you are a prime number of days old?), but I don't know whether he sent it to the whole HHC group, and the answer depends on one's birth date anyhow.

From Richard's attachments, I gather that the contest being discussedis to find a way to generate a display of all 10 digits using the fewest number of keystrokes that works on the widest variety of calculators, and that this was motivated by having something maximally descriptive of the calculator's display for photographing purposes. Actually, I would not expect "fewest number of keystrokes" to be a major concern in practice, as the time it takes to key in 10 digits will probably be small compared to the time it takes to get the lighting just right, the best composition and exposure, etc., etc. But it still makes a good contest.

Anyway, I don't know if anybody else has suggested this, but my best idea at the moment is

sqrt(25.4) = 5.039841267

which has the following advantages:

(1) Most calculators (even non-scientific) have a square root key.
(2) It takes only 5 keystrokes, assuming Sqrt is unshifted.
(3) The number 25.4 is a useful and easy-to-remember one, being the number of millimeters in an inch (exactly).
(4) the next digit would be 3, so the digits shown here won't change if the calculator happens to display more.
(5) A calculator like the HP-50g will give a decimal answer even if in "exact" mode because of the decimal point in the input.
(6) We don't have the ambiguity nf numbers like 0.1234..., where some calculators display the first 0 and some (like the 50g in Standard mode) don't, or numbers like 0.01234... which often default to scientific notation.
(7) If the calculator only displays 9 significant figures, the result will become 5.03984127 which still does not repeat digits.
(8) The number looks like a number that might actually be obtained in an on-the-job calculation (as opposed to obviously "contrived" numbers like 1.23456789, etc.
(n) Maybe some others I haven't though ot...?

7P <> S,

Roger

P.S. Reminds me of some ad somewhere for the HP-41 which had a photo of it displaying MEMORY LOST -- probly not the best feature to show off! Maybe one of you remebers where that was...

P.P.S. I think one of the best displays, at least for numbers, was on HP's very first calculators: the HP-35, 45, 67, etc., where the decimal point took a whole digit space, nicely separating the integer part from the fractional part and making the number very readable. The dot matrix displays on the 48/49/50 (and maybe some others) have gone back to this too.