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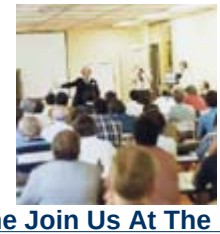
Math and science students will appreciate the logical, accurate, and dependable HP SmartCalc 300s Scientific Calculator now available at Staples in the USA through September (while supplies last) and at several retailers in Europe.

» **RPN Tip #20**

Gene Wright

20 Useful Tips for the 30b Business Professional. This article gives RPN user tips and helps explain differences between an RPL-based machine and a legacy RPN machine.



» **Come Join Us At The HHC 2010 HP Handhelds Conference!**

Jake Schwartz

Jake, official historian of HP Handheld Calculator Conferences, provides his unique perspective and photographs from past conferences.

Issue 20
August 2010

Welcome to the twentieth edition of the HP Solve newsletter. Learn calculation concepts, get advice to help you succeed in the office or the classroom, and be the first to find out about new HP calculating solutions and special offers.

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From the Editor

As HP Solve grows, the current structure will adapt as well. Learn more about current articles and feedback from the latest Solve newsletter.

Learn more »

Customer Corner

» **Meet an HP Calculator user**

Meet Felix Gross, a German patent attorney who visits the US every year to attend the annual HP Handheld Conference.

» **All of HP's Calculators**
A brief summary of every HP Calculator ever made…and even a few that weren't.

» **Fundamentals of Applied Math Series #3**
Richard J. Nelson

This Math Review series looks to explore and explain the math that we use with our calculators in terms of real world application and use. Needing three installments to cover number basics, read the final part of, 'Numbers'.

HP Lesson Plan Sweepstakes for teachers!

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Next generation financial calculator NOW AVAILABLE

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HP30b Business Professional

Next generation financial calculator

At the Consumer Electronics Show in January, HP Calculators announced their most innovative financial calculator to date, the 30b Business Professional Calculator.

Business professionals and students alike will appreciate the versatile, programmable HP 30b Business Professional. With an extensive library of finance, business, real estate, scientific, and statistical functions, it's easy to use and learn. The intuitive layout, very fast processor, and 2-line alphanumeric display gives quick answers. Add custom calculations for course curriculum or line of business with convenient programming capability. Here are a few other features you will find in this new financial calculator:

- Powerful Business Calculator that's easy-to-use:
- Extensive math library of finance, business, real estate, and statistical functions at your fingertips in an intuitive layout
- Dedicated keys for common math functions
- Choose your preferred entry method: Time-saving RPN entry, familiar algebraic, or traditional chain algebraic
- Easily configure your display format and language preferences
- Add custom programs for your course curriculum or line of business:
- Tailor the 30b to your specific needs with a custom key assignment capability to put your most used functions on your choice of keys
- Quickly program custom calculations for time-saving access later
- Elegant and ergonomic:
  HP's durable and stylish Liquid Metal imprint technology
  Beveled keys with HP's accurate rotate-and-click technology
  Tapered sides feel comfortable in your hand
  Thin profile with raised edges to protect the keyboard and screen
  Bright, 2-line alphanumeric LCD display to easily view large numbers (up to 12 digits)
  Scroll through variables, detailed labels, menus and prompts (up to 8 characters)
- HP quality and support:
- HP's legendary heritage of accuracy and reliability
- Award-winning support

Ideal for business professionals and students in finance, business, accounting, insurance, real estate, banking and statistics, the HP 30b Business Professional Calculator is priced at $49.99 and is **available at Staples Europe and Office Depot in the USA** beginning in August (while supplies last).

SmartCalc 300s Scientific Calculator available for a limited time

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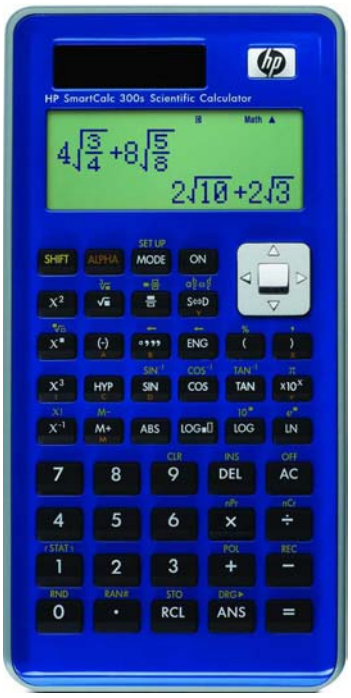
SmartCalc 300

You do the math, we show the expression



Math and science students will appreciate the logical, accurate, and dependable HP SmartCalc 300s Scientific Calculator. Besides showing the result, the impressive Textbook Format Display (TFD) shows the math expression onscreen, just like it would appear on paper. Use the intuitive navigation pad to move around within an expression to change it and watch the result. With 249 built-in functions, students can solve an abundance of math problems from basic to complex.

The SmartCalc 300s is available in the USA at Staples through September (while supplies last) and at the following retailers in Europe:

- Staples
- MediaMarkt
- Office Depot
- Misco
- Expert
- Fust
- Interdiscount

The HP SmartCalc 300s Scientific Calculator shows the expression as you would on paper is:

- great for advanced math,
- has 249+ built-in functions
- uses Textbook Format Display (TFD),
- solar-powered,
- logical and easy-to-use,
- complete with batteries, user guide, and snap-on protective cover,
- and permitted on SAT® Reasoning and SAT® Subject Tests™ in Math 1 & 2, ACT, PSAT/NMSQT, AP Chemistry/Physics, PLAN, EXPLORE†

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RPN Tip #20

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RPN Tip 20

Editor's Note. Our RPN tip for this issue is written by Gene Wright and is actually 20 Tips for the RPN programmer user interested in the HP30b. This article also helps to explain the differences between an RPL based RPN machine and a legacy RPN machine.

20 Hints and Tips for an RPN Programmer Moving to the HP 30b Calculator

Gene Wright

An RPN programmer who desires to write programs on the new HP 30b calculator needs to be aware that there are some differences between the programming paradigm of the HP 30b and other RPN calculators. This document presents some hints and tips for making the transition to the newest model.

1. In program edit mode, new instructions are inserted BEFORE the currently displayed instruction, rather than AFTER.

2. [▬] [Memory] [▲] [▲] shows the number of bytes used in all programs out of the 290 bytes available. However, if [INPUT] [INPUT] is pressed at this point, it will delete all programs. Be careful at this menu location.

3. If speed is important for a program (and the HP 30b is already incredibly fast), the PRGM 0 location in the program catalog will generally execute a program faster than higher-numbered program locations. This is because the HP 30b begins searching for a label location from the top of program memory, which is PRGM 0's location.

4. The [INPUT] command ([=] works just as well) does not copy X to Y if pressed while entering a value, but simply terminates digit entry, similar to the behavior of the HP graphing calculators. On the HP 12c, pressing 4 ENTER x shows a result of 16. To achieve this on the HP 30b, [4] [INPUT] [INPUT] [×] is required.

5. RPN calculators often have conditional tests such as x<y or x>y, which compare the number seen in the display (or X register) with the value previously in the display (and now in the Y register). On the HP 30b however, conditional tests follow the approach used on HP's graphical calculators, where the order of the arguments is reversed from the "normal" RPN approach. For example, if a test of whether the contents of memory 1 are greater than memory 2 is desired, the program in an older RPN calculator might be entered as RCL 2 RCL 1 x>y?. On the HP 30b, however, it would need to be entered RCL 1 RCL 2 ?>, keyed in by pressing [RCL] [1] [RCL] [2] [▬]+[Amort]. (Note: The + between the [▬] and [Amort] means to press and hold [▬] and, while still pressing [▬], press [Amort] which enters the ?> instruction.) . If existing RPN programs are being adapted to run on the 30b, the order of the arguments on the stack must be reversed.

6. No change is needed for conditionals testing ?= or ?≠, (x=y? or x≠y?) however, as the order of the arguments is irrelevant.

7. HP 30b conditional tests (?=, ?=/=, ?<, ?<=, ?>, and ?>=) do not observe the "do if true" rule found on previous HP RPN calculators. Instead, these instructions place either a 0 (if the

condition is false) or a 1 (if the condition is true) on the first level of the stack, pushing off the stack whatever was in the top level. If the contents of that level of the stack are needed, they must be saved before performing a conditional test. The instructions GOTOT (goto if true) and GOTOF (goto if false) remove the 0 or 1 from the stack and branch accordingly. The contents of X and Y before the test are retained. So if the stack contents before the conditional test were T, Z, Y and X, at the point of the conditional test, they will be Z, Y, X, and a 0 or 1. Immediately after the conditional test, whether the branch occurs or not, the contents of the stack would be Z, Z, Y, X.

8. For conditional tests, true means not equal to 0; false means 0. This is similar to the approach taken by the HP graphing calculators.

9. Since GOTOF will branch on a value of 0, sometimes a conditional test itself is unnecessary. Suppose a branch to label 12 is desired if register 4 contained a 0. The following code would do that: RCL 4 [shift]+NPV 1 2, since GOTOF (shift-hold NPV) will branch to label 12 if the X register contained a false (0) value. The GOTOF will pop the 0 off of the stack and branch accordingly.

10. If a program navigates to a menu command, such as [shift] Math [shift]+▲ = for FP or [shift] Math [shift]+▲ [shift]+▲ = for IP, make sure that an INPUT or = is placed after those commands navigate to the appropriate menu item. INPUT or = tells the HP-30b to perform the item selected in the menu and place the result in the stack. Without this, the command in the menu will not be executed. Note: [shift]+▲ inserts an UP command into a program.

11. Running a program does not terminate digit entry. Consider the simple program 2 ×. On the HP 12c, 40 then R/S will display 80, as the 40 will be multiplied by 2. On the 30b, entering 40 and running the same program will display 402 times the contents of the y register, since digit entry was not terminated as the program began executing and the 2 was "appended" to the 40. STO or RCL in a program do terminate digit entry, however. This behavior relates to the basic "macro" or keystroke playback basis for the programming paradigm on the HP-30b.

12. The R/S command is [shift]+(. This requires two fingers during program execution if entering value after a program stops is desired because the program executed R/S. This is necessary because R/S is really a programming function and all programming functions are assigned to shift+hold keys on the overlay.

13. If MSG text string is desired to prompt a user to enter a value, the approach should be: MessageText [shift]+([shift] STO 1. The [shift]+(places the R/S command into the program.

14. To display a value with text above it, follow this approach: MessageText RCL 1 [shift]+(.

15. When entering a message using the MSG command, pressing . inserts a ?, and +/- inserts a space. The digit keys 0 - 9 insert the corresponding numbers. INPUT enters the presently displayed character. Pressing ON/CE terminates character entry. ON/CE will enter the presently displayed character before stopping character entry mode. Pressing [shift]+▲ or [shift]+▼ will move the character position up or down 10 places in the character catalog to allow for faster entry.

16. The HP 30b can indirectly address up to 100 registers using memory register 0. Memory 0 must contain a value from 0 to 99. These 100 registers are the storage locations set aside for cash flow and statistics data. After storing the index value in R0, retrieve indirectly via RCL Data and store indirectly via [shift] STO Data. These registers can be reviewed by pressing [shift] Data.

17. If a program is assigned to a key position but then there is a need to execute that key's original function, press shift+hold and then the key, as long as a program has not been assigned to the shift-hold key position of that key. If a program has been assigned to a key's position and the key's shift-hold position, then one of the two assignments will need to cleared before the original key's function can be executed. To clear a key's assignment, edit the program assigned to that key and press [▲] to view program step 0. Pressing [←] will delete this step and remove the associated key assignment.

18. To use the MOD function found on some HP RPN calculators, the following code will give y mod x in RPN mode: [÷] [▬] [ANS] [)] [▬] [Math] [▬] +[▲] [=] [×], where [)] is the SWAP or X<>Y function in RPN mode and [▬] [Math] [▬] +[▲] [=] accesses the FP function in the Math menu.

19. [▬]+[←] will insert a backspace in program edit mode into a program, if desired.

20. The HP 30b learning module for Programming Examples has example programs as illustrations of the capabilities of the HP 30b, such as

    - a translation of the original HP 25 lunar lander game,
    - a guess the secret number game with MSG prompts,
    - a program that can compute up to the first 693 digits of PI,
    - a prime factor finder program,
    - and a program that can convert a number between bases 2-10.

    These are excellent examples of non-business-oriented applications that can be programmed on this calculator.

    Thanks to Don Shepherd for his help in creating this list.

Come Join Us At The HHC 2010 HP Handhelds Conference!

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Come Join Us At The HHC 2010 HP Handhelds Conference!

Jake Schwartz

Editors Note: Jake is the official historian of the HP Handheld Conferences[1].

HP Conference Beginnings

On September 22, 1979, in the sixth year of its existence, the PPC Club (formerly the HP65 Users' Club, formed in June of 1974) held the first HP Calculator Conference at the Hewlett-Packard facility in Santa Clara, California. It had been conceived and announced by club founder Richard Nelson in the *PPC Journal* (V6 N3) only a few months earlier, providing a coupon to mail back, where members could register potential interest in attending and/or giving a presentation. Richard knew (but couldn't let on) that something "really big" was coming from HP soon, and that this would be a great way not only to get club members together from all parts of the globe, but for HP to promote its next great flagship scientific calculator in front of a live, enthusiastic audience. On July 16th of that year, the HP41C system was born and the excitement of that product not only was the stimulus to increase worldwide PPC membership to many thousands of members, but it provided the driving force for annual HP calculator conferences for decades to come, and continuing to the present day.

Fig. 1 - 1979 HP Calculator Conference, HHC. Professor William Kahan discusses the Integrate function of the HP34C.

Fig. *2 - (1979) Dean Lampman (founder of the Dayton, OH PPC chapter) discusses computer software for automatic flowcharting of HP calculator programs.*

Rapid Growth

As more and more local satellite groups formed around the U.S. and the world to support HP products, additional people took their turns organizing conferences in their own "back yards", with events spreading east and west, including both coasts and Chicago in the Midwest. In the early 1980s, it was not uncommon for multiple conferences to be held in the same year, with meetings held in Las Vegas, Orlando and Providence all in 1983, for instance. The Europeans also got involved with the British Handheld and Portable Computer Club (HPCC) holding formal conferences in their inaugural year of 1982 and every five years since; plus a handful of other groups in the Netherlands, Finland, France, Germany and other countries holding gatherings at various times.

Activities and interest fluctuated and attendance followed suit, with as many as 180 attending the 1981 affair in Corvallis, Oregon (at the then HP Calc R&D "mecca") and only 19 present for the Chicago-area event on 9/15/2001 (only 4 days after "9-11", mainly due to travel restrictions). Attendance has been several dozen in the recent years, with roughly 50 present last year. A list of all U.S. and British HP conferences is shown in Table 1 below.

Table 1 - A list of all U.S. and British formal HP Handheld Conferences, 1979 to 2010.

#	Date	Location	Sponsor	Location/Remarks
1	9/22/79	Santa Clara, Calif.	PPC Orange County	HP Sales Office.
2	6/14/80	Rolling Meadows, IL.	PPC CHIP Chapter	HP Sales Office.
3	3/28/81	Rockville, Maryland	PPC Washington Chapter	Ramada Inn
4	8/22/81	Corvallis, Oregon	PPC Columbia Chapter	Oregon State University
5	4/17-18/82	Philadelphia, PA	PPC Philadelphia Chapter	Best Western Hotel
6	10/9-10/82	London England	HPCC	Great Northern Hotel
7	1/9/83	Las Vegas, Nevada	PPC Las Vegas Chapter	Marina Hotel
8	5/7-8/83	Providence, RI	PPC Rhode Island Chapter	Brown University
9	8/27-28/83	Orlando, Florida	PPC Orlando Chapter	Sheraton Hotel
10	6/2/84	Chicago, Illinois	PPC CHIP Group	University Of Illinois
11	5/4-5/85	Atlanta, Georgia	Atlanta HP Handheld Club	Squire Inn, NW
12	9/27-28/86	Reston, Virginia	CHHU Washington Chapter	Sheraton Hotel
13	9/12/87	London England	HPCC	Imperial College, London
14	8/3-4/88	Corvallis, OR	Corvallis Micro Tech.	Oregon State University, OSU
15	6/3/89	Melrose Park, IL	CHIP Group	Triton College
16	6/2/90	Rolling Meadows, IL	CHIP Group	HP Sales Office
17	8/2-4/91	Corvallis, OR	Richard Nelson	Oregon State University
18	3/28-29/92	Philadelphia, PA	Philadelphia Area HP Club	Drexel University
19	9/19-20/92	London England	HPCC	Imperial College, London
20	10/1-2/94	Zandaam, Netherlands	Prompt Group	Hotel Inntel
21	8/5-6/95	Minneapolis, MN	Graig Finseth	Mall of America
22	8/24-25/96	Anaheim, CA	Shier Systems & Software	Anaheim Marriott Hotel
23	9/21-22/97	London England	HPCC	Imperial College, London
24	8/29-31/98	Vancouver, WA	HP ACO	HP Office
25	8/21-22/99	Vancouver, WA	HP ACO	Phoenix Inn Hotel
26	9/9-10/00	Los Angeles, CA	Richard Nelson	Ramada Plaza Hotel (LAX). CA
27	9/15/01	Chicago, IL	CHIP Group	Four Points Sheraton Hotel
28	9/21-22/02	London, England	HPCC	Imperial College, London
29	9/20-21/03	Newport Beach, CA	Richard Nelson	Radisson Hotel, Newport Beach
30	9/25-26/04	San Jose, CA	Ted Kerber	Radisson Hotel, San Jose
31	9/17-18/05	Franklin Park, IL	CHIP Group	ACE Metal Crafts
32	9/16-17/06	San Jose, CA	Ted Kerber	Radisson Hotel, San Jose
33	9/29-30/07	San Diego, CA	Richard Nelson	HP San Diego
34	10/13-14/07	London, England	HPCC	Imperial College, London
35	9/27-28/08	Corvallis, OR	Richard Nelson	HP Corvallis
36	10/3-4/09	Fort Collins, CO	Richard Nelson	HP Fort Collins
37	9/25-26/10	Fort Collins, CO	Richard Nelson	HP Fort Collins

Favorite Topics

Over the years, in addition to talks by the calculator-development-team members, we have seen presentations from engineers, scientists, teachers, students, mathematicians, surveyors, airline pilots, and much more.

Since a large portion of the machines have been programmable, a great highlight of each event has been presentations of user-developed applications in a myriad of subjects such as curve fitting, games, mathematics, finance and science. Fig.'s 3-8 shows some examples.

Fig. 3 - Brian Walsh discusses HVAC software for the HP48 series at the 1998 conference, Vancouver, WA.

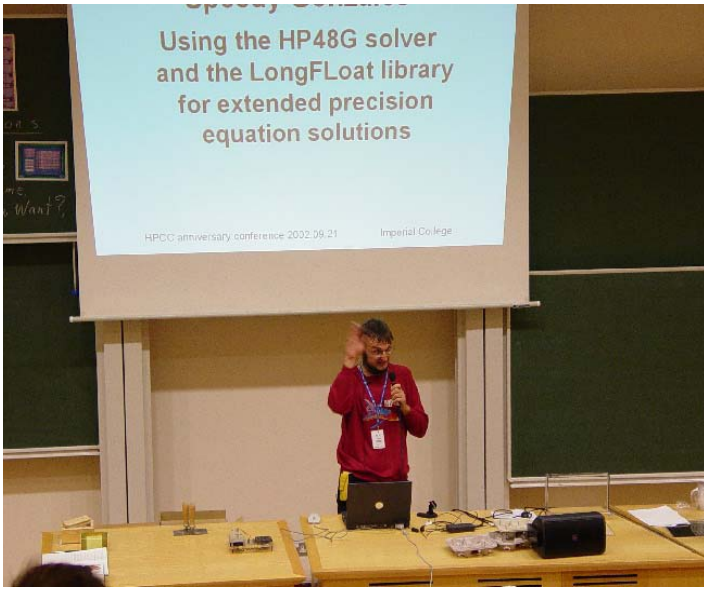

Fig. 4 - Jean Roussel presents the HP48G "LongFloat" software library at the HPCC2002 conference in London.

Fig. 5 - John Cadick and Jeff Bronfeld present HP48 software for Power Engineering at HHC2003 in Newport Beach, CA.

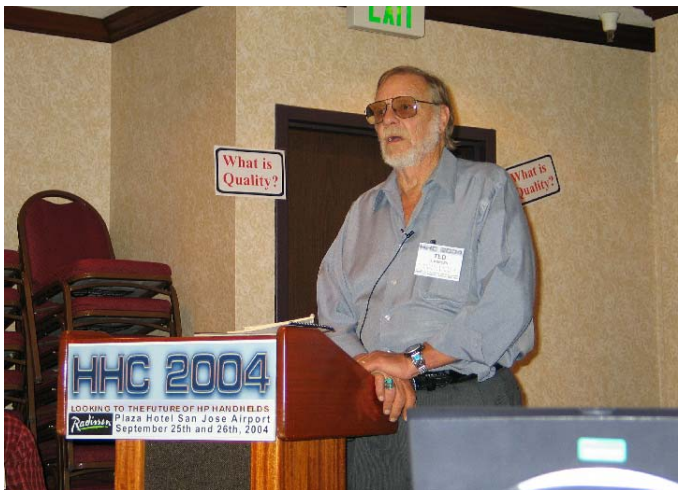

Fig. 6 - Ted Kerber discusses land-surveying software at HHC2004 in San Jose, CA. Wall signs ask a conference thought provoking question.

Hardware modifications and hardware add-ons for HP calculators have garnered much interest at conferences. Some of the most memorable ones include Jim De Arras' external homebrew box which increased the HP41 memory from 63 to 831 registers, many homemade RAM memory cards for the HP48 series, HP41 speedup mods, HP41 external ROM-development systems and more.

Calculator emulators/simulators, either on a computer, PDA, another calculator or more recently, on a smartphone have become a hot topic in the past several years. This has been covered ever since HP41 simulators for the PC were created to run under MS-DOS back in the early 1980s. When Sebastien Carlier wrote his original "emu48" to emulate the HP48 on a PC, it seemed like the floodgates opened with various other pursuits in this area. Some samples are shown in fig.'s 13 - 18.

Another topic of keen interest for the group has been maintenance of older HP machines, since they have become such prized possessions. Two such experts at calculator repair are Tony Duell and Geoff Quickfall, shown in fig.'s 19 and 20.

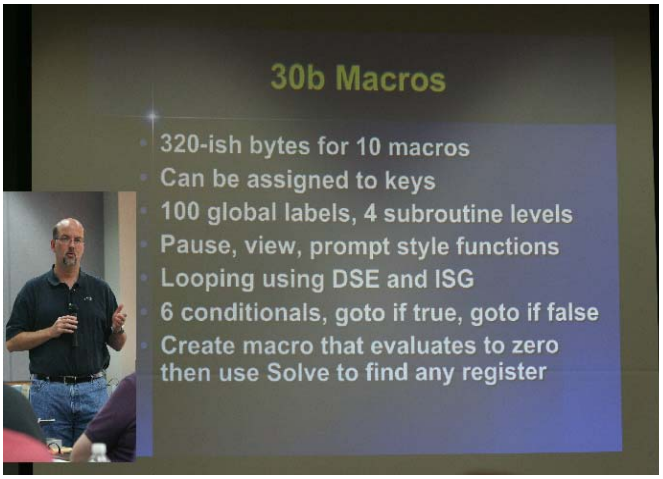

Fig. 7 - Gene Wright presents HP30b macro programming at HHC2009 in Fort Collins, CO.

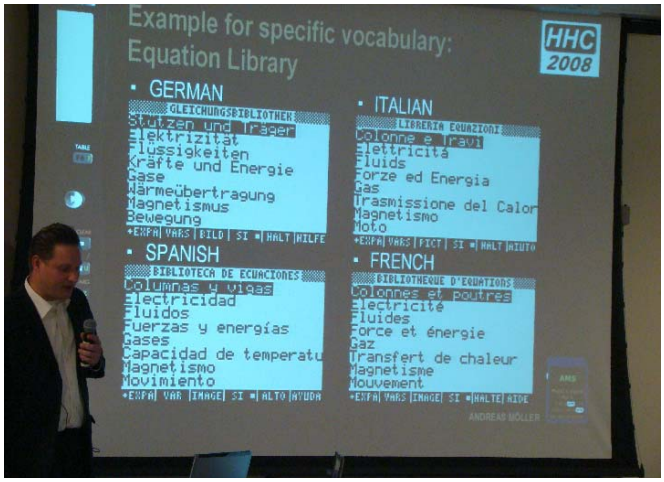

Fig. 8 - Andreas Moller discusses his HP50g Language Localization library at HHC2008 in Corvallis, OR.

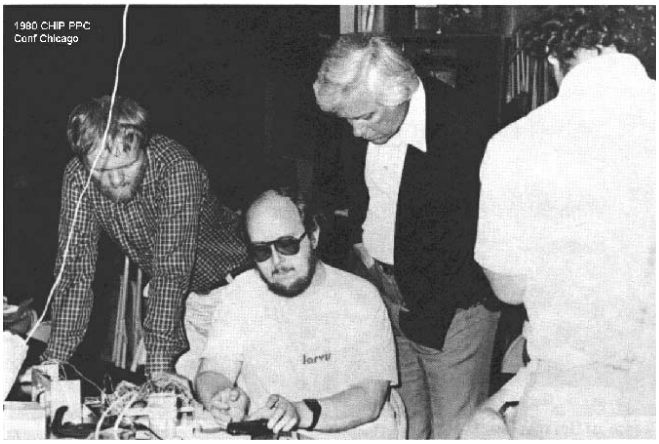

Fig. 9 - Jim De Arras (center) demonstrates his HP41 add-on box to increase memory from 63 to 831 registers at the 1980 conference in Rolling Meadows, IL.

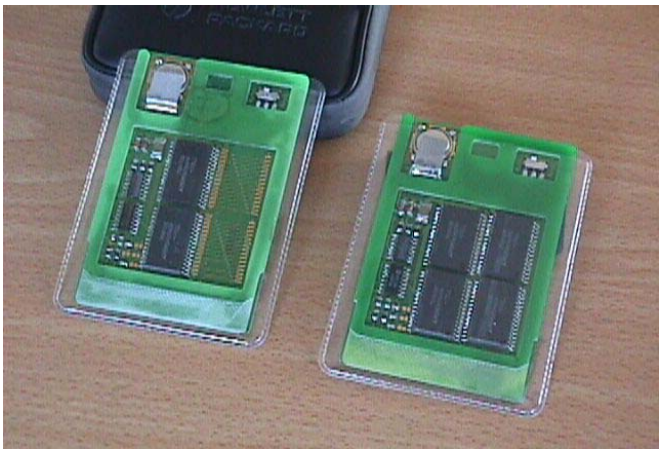

Fig. 10 - Homebrew RAM-memory plug-in cards for the HP48 series calculators at the HPCC1997 conference in London.

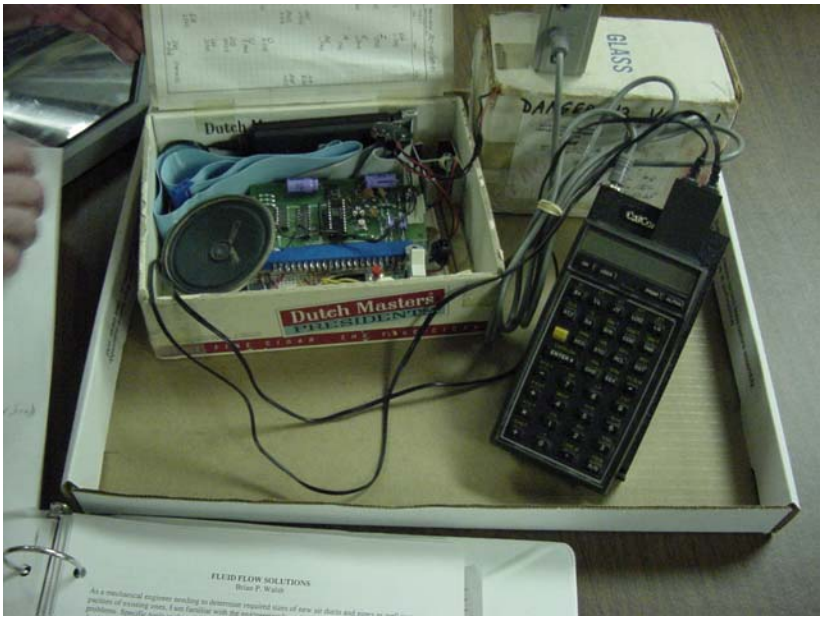

Fig. 11 - Roger Hill's HP41/ HP-IL-based voice synthesizer, first shown at the 1982 conference in Philadelphia, PA. Roger demonstrated his first electronics project again at HHC 2001. The technology unusual.

Fig. 12 - John Evers' & Tim Wessman's surveyor's environmental enclosure for the HP50g at HHC2006 in San Jose, CA.

Fig. 13 – Wing Kin Cheung, newly appointed HP Calculator General manager, attends every hour of presentations at HHC 2007.

Fig. 14 – Eric Smith demonstrating his Nonpareil simulator, running many HP calculators at one time at HHC2004 in San Jose.

Fig. 15 - Michael Oshea's HP97 emulator running on a PC at HHC2008 in Corvallis, OR.

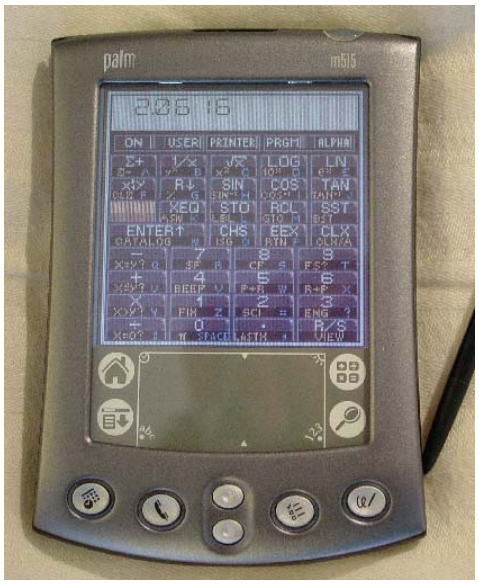

Fig. 16 - An HP41 emulator running on a Palm PDA at HPCC2002.

Fig. 17 – Dirk Dykson, Tim Wessman, and Cyrille de Brebisson answer attendee questions at HHC2009.

Fig. 18 - Two views of the "i41CX+" emulator running on the iPhone at HHC2009. Most known HP41 modules are included.

Fig. 19 - 2007 British HPCC 25th Anniversary Conference from London. Tony Duell (center) discusses disassembly and repair of HP desktop machines.

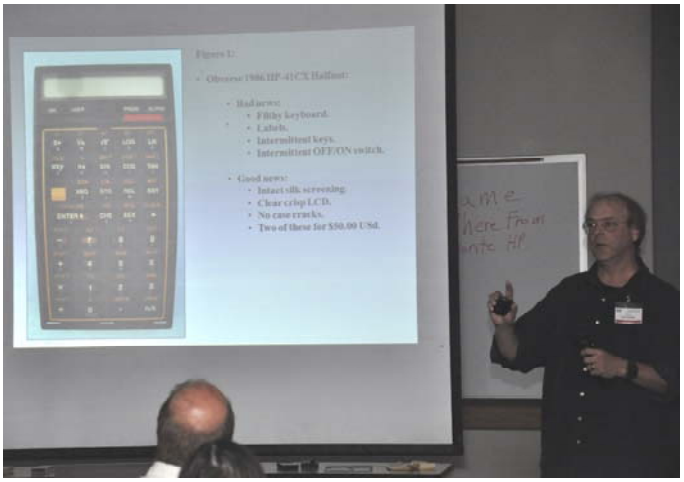

Fig. 20 - HHC2009 Conference in Ft. Collins, CO. Geoff Quickfall reviews repair of the HP41 series calculators. Geoff won the Best speaker Award.

New Calcs, Prototype Calcs, Cancelled Calcs

When the Hewlett-Packard people speak at conferences, they usually have very interesting things to present. Many new calculators were premiered at our conferences, such as the HP41C, 48SX, 49G, 49G+, 33S, 20b, and 30b. In the case of the 1999 conference in Vancouver, they actually distributed new HP49Gs to each attendee. Another special treat has been frequent exposure to calculator prototypes which never made it to full production, providing other snapshots at the inner workings of HP development.

After the HP Xpander graphics calculator and the Jornada X25 PDA projects were cancelled, we were treated (at HPCC2002 in London) not only to extensive stories of their short-lived histories, but had opportunities to purchase some of the prototypes new in their boxes, which were being sold off. At the same conference, an attendee brought an HP38G+ (cancelled 1998 model) prototype and still another person showed off his (cancelled 1977 model) HP95C prototype. Back in 1992 at the Philadelphia conference, Dennis York of HP showed an early wood mockup of what ultimately became the HP48SX. You can't predict what will turn up at these events, but it usually is memorable.

Fig. 21- (L to R) HP Xpander, Jornada X25 PDA, 38G+, 95C and a wood mockup of an "extended HP41" which ultimately morphed into the HP48SX.

HP Panels

One aspect of these conferences which is attempted each year is fielding an HP panel for Q&A with the audience. The number of participants can vary widely, but we usually manage to pull it off. By far, the ultimate panel was at the 1991 Corvallis conference, when eleven calc development team members sat up on stage at Oregon State University to discuss HP48 and HP95 issues.


Fig. 22 - (L to R) HP Q & A panels for 2003 (in Newport Beach), 2006 (in San Jose) and 1991 (in Corvallis).

Don't Miss This Year!

The upcoming HHC2010 conference will be held on September 25-26, 2010 for the second consecutive year in Fort Collins, Colorado at the HP facility there, which is the current administrative "home" for HP calculators. With the calculator R&D team's recent focus on continuing to refresh the line of financial machines along with the start of shipping the HP30b financial calculator; this will probably be one of HP's major topics of discussion. In addition, since the graphing and scientific lines are still held near and dear to our hearts, there will no doubt be presentations from attendees covering those subjects. For more information on registering for the conference and making hotel arrangements, be sure to check out http://holyjoe.net/hhc2010/ on the web. Also, to reference the historical web sites for the past ten years of conferences, consult http://holyjoe.net/hhc/ . See you in September.

(1) One of the primary objectives of a Hewlett-Packard Handheld Conference, HHC, is to document the user's history of HP Calculators. Video DVD's may be obtained from Jake at: http://www.pahhc.org/video.htm You will also find discs of most of the history of the HP User Community including Conference proceedings, Newsletters, HP Journal articles, etc. at: http://www.pahhc.org/ppccdrom.htm

All of HP's Calculators

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All of HP's Calculators 200722

Everyone knows that HP started the scientific (and business) calculator market with the mind boggling HP-35A[(1)] Scientific calculator in January of 1972 some 38 years ago.

It seems that no matter how old you are or what calculator brand or model that you use or collect you have heard about some model of an HP calculator.

HP has manufactured its machines in Brazil, China, Malaysia (Indonesia), Singapore, and the US. HP has made calculators that use RPN, algebraic, chain, or Command line Interface as the "logic" system. HP's pricing range has been from the teens to many hundreds in terms of the US dollar cost. HP has also designed and produced a few calculators that were "pulled back" for various marketing reasons. Even these machines are well known in the HP User Community. The most famous of these are the HP-95C and the Expander.

Even the model "naming" system has changed in the 38 years since "engineers" were the prime customers of HP calculators. After other manufacturers entered the scientific calculator market and the cost came down the market widened and marketing a calculator became more like other widely used products. Every professional and student needs a technical calculator and the historical model numbering system of numbers below 100 evolved into marketing names such as HP12c Prestige, HP OfficeCalc 300 or HP10 QuickCalc. In the first decades the model numbers themselves served as reminders of order or calculating power.

Some model numbers were never used and 13 is an obvious example. Engineers may not be superstitious but many people are and why should you "taunt" your customer? Model number suffix letters have also changed, but three letters have been quite consistent. "S" or "s" for scientific, "B" or "b" for business, and "G" or "g" for graphing.

HP has made many calculators with a common package style and these are part of a series. The first series was the Classic Series followed by Top Cat and others like Sting, Roo, Spike, Spice, and Voyager.

Legacy HP users watch every model that HP announces and some of these users remember them all. Since HP has made more than 100 different "models" (including newer variations of the same model) with suffix distinctions such as I, II, or + it isn't surprising that the same model number is used for different machines. The model 10, for example has been used the most.

Another aspect of HP's calculators is the code name assigned to most of their machines. A code name allows the machine to be talked about before its announcement without any marketing or technical information attached to it.

If you research an HP calculator on the Internet you will find many websites (hundreds) that provide information on the model of interest. A few websites even have lists, but most of them are "dated" and usually only show models of a certain classification such as older models at a "museum site."

Exactly how many calculators has HP made? How many HP calculators have used, shared, the same model number? When was a particular HP calculator announced? Was there ever an HP-17? What kind of calculator was the HP-70? What HP calculator was called Bonnie, and was there a Clyde? Was there a Woodstock series of machines and if so how many machines were in it? Were there any "code names" that were numbers? What model numbers have never been used? How many HP10's are there?

In order to answer these and other questions you would need an accurate up-to-date HP Calculator list. See the list on the next page. There are two versions of the same list. The first is in approximate "time" order and the second list has been sorted by model number. The introduction dates are included and only one machine, HP10s, is "unknown." If you can document this date please contact the editor.

All of HP's Calculators – In "reversed time" Order

Richard J. Nelson, Jake Schwart, & Wlodekz Mier-Jedrezjowicz

The table below is reversed time/series ordered as shown in the HHC 2009 HP Calculator Calendar and the machines announced since HHC 2009 have been added. Four of the five shaded machines were built and then canceled. The 5th is a concept machine. The single non-calculator machine is shaded in orange.

#	Year	Mo	Dy	Model[1]	Code Name	Type[2]	Month	Series/grouping	Date[3]
101	2010	1	6	HP30b	Euro	BUS	—	—	20100106
100	2009	1	7	HP EasyCalc 100	None	OTH	Aux 1	Recent "Named" machines	20090107
99	2009	1	7	HP SmartCalc 300s	None	OTH	Aux 1	Recent "Named" machines	20090107
98	2009	1	7	HP OfficeCalc 300	None	OTH	Aux 1	Recent "Named" machines	20090107
97	2008	6	10	PrintCalc100	None	OTH	Aux 1	Recent "Named" machines	20080610
96	2008	6	10	OfficeCalc200	None	OTH	Aux 1	Recent "Named" machines	20080610
95	2008	6	10	HP10 QuickCalc	None	OTH	Aux 1	Recent "Named" machines	20080610
94	2008	6	10	HP20b	Little Euro	BUS	DEC	Remaining ACO/San Diego	20080610
93	2008	1	7	HP10bII (New case)	None	BUS	DEC	Remaining ACO/San Diego	20080108
92	2007	9	4	HP10s	None	SCI	DEC	Remaining ACO/San Diego	200710??
91	2007	7	12	HP35s	None	SCI	DEC	Remaining ACO/San Diego	20070712
90	2006	1	1	HP8s	None (Asia Pacific only)	SCI	DEC	Remaining ACO/San Diego	20060101
89	2004	4	20	hp33s	Swan	SCI	DEC	Remaining ACO/San Diego	20040420
88	2003	1	23	hp9g	None	GRF	DEC	Remaining ACO/San Diego	20030123
87	2003	1	23	hp9s	None	SCI	DEC	Remaining ACO/San Diego	20030123
86	2001	12	1	HP10BII	R2D2	BUS	DEC	Remaining ACO/San Diego	20011201
85	2000	4	7	HP30S	Astro	SCI	DEC	Remaining ACO/San Diego	20000407
84	1999	4	1	HP6S Solar	Cosmo	SCI	DEC	Remaining ACO/San Diego	19990401
83	1999	4	1	HP6S	Cosmo	SCI	DEC	Remaining ACO/San Diego	19990401
82	2008	6	10	HP StreamSmart 400	Datastreamer	GRF	NOV	Student Machines	20080610
81	2004	1	8	hp40g+ (prototype)	None Cancelled	GRF	NOV	Student Machines	20040108
80	2000	4	13	HP40G	Enterprise (non-US only)	GRF	NOV	Student Machines	20000413
79	2006	11	8	hp40gs	?? (worldwide)	GRF	NOV	Student Machines	20061108
78	2006	8	8	hp39gs	?? (US only)	GRF	NOV	Student Machines	20060808
77	2004	1	8	hp39g+	Little Apple (US only)	GRF	NOV	Student Machines	20040108
76	2000	8	??	Xpander	Cancelled	GRF	NOV		200008??
75	2000	4	13	HP39G	Enterprise (US only)	GRF	NOV	Student Machines	20000413
74	199?	??	??	HP38G+	Cancelled	GRF	NOV	Student Machines	199?????
73	1995	4	6	HP38G	Elsie	GRF	NOV	Student Machines	19950406
72	1993	6	1	HP48G	Alcuin	GRF	OCT	Charlemagne	19930601
71	2006	9	19	HP50g	None	GRF	OCT	Charlemagne	20060119
70	2003	10	28	hp48gII	Mid Apple	GRF	OCT	Charlemagne	20031028
69	2003	10	20	hp49g+	Big Apple	GRF	OCT	Charlemagne	20031020
68	1999	5	21	HP49G	V'ger	GRF	OCT	Charlemagne	19990521
67	1998	3	30	HP48G+	Plus	GRF	OCT	Charlemagne	19980330
66	1993	6	1	HP48GX	Hammer	GRF	OCT	Charlemagne	19930601
65	1991	4	2	HP48S	Shorty	GRF	OCT	Charlemagne	19910402
64	1990	3	6	HP48SX	Charlemagne	GRF	OCT	Charlemagne	19900306
63	2008	1	7	HP17bII+ Silver	None	BUS	SEP	Pioneer	20080108
62	2003	9	23	hp17bII+ Gold	Trader 3	BUS	SEP	Pioneer	20030923
61	1990	1	6	HP17BII	Trader II	BUS	SEP	Pioneer	19900106
60	1989	1	3	HP10B	Ernst	BUS	SEP	Pioneer	19890103
59	1988	10	31	HP14B	Midas	BUS	SEP	Pioneer	19881031
58	1988	1	4	HP17B	Trader	BUS	SEP	Pioneer	19880104
57	1991	3	1	HP32SII	Nardo	SCI	SEP	Pioneer	19910301
56	1989	1	3	HP21S	Monte Carlo	SCI	SEP	Pioneer	19890103
55	1989	1	3	HP20S	Erni	SCI	SEP	Pioneer	19890103
54	1988	10	31	HP42S	DaVinci	SCI	SEP	Pioneer	19881031

#	Year	Mo	Dy	Model[1]	Code Name	Type[2]	Month	Series/grouping	Date[3]
53	1988	6	1	HP32S	Leonardo	SCI	SEP	Pioneer	19880601
52	1988	6	1	HP22S	Plato	SCI	SEP	Pioneer	19880601
51	1988	1	4	HP27S	Mentor	SCI	SEP	Pioneer	19880101
50	1990	1	6	HP19BII	Tycoon II	BUS	AUG	Clamshell	19900106
49	1988	1	4	HP19B	Tycoon	BUS	AUG	Clamshell	19880104
48	1986	6	1	HP18C	Champion	BUS	AUG	Clamshell	19860601
47	2006	??	??	hp19bII+	None, concept only	BUS	AUG	Clamshell	2006????
46	1988	1	4	HP28S	Orlando	SCI	AUG	Clamshell	19880104
45	1987	1	5	HP28C	Paladin	SCI	AUG	Clamshell	19870105
44	2006	6	1	HP12cp 25th anniv.	None	BUS	JUL	Voyager	20060601
43	2003	5	27	HP12c Prestige	None	BUS	JUL	Voyager	20030527
42	2003	5	27	HP12c Platinum	Bondi	BUS	JUL	Voyager	20030527
41	1981	9	16	HP12C	1.0	BUS	JUL	Voyager	19810916
40	1982	9	2	HP10C	0.5	SCI	JUL	Voyager	19820902
39	1982	7	1	HP16C	PR	SCI	JUL	Voyager	19820701
38	1982	7	1	HP15C	1.5	SCI	JUL	Voyager	19820701
37	1981	9	16	HP11C	1.0	SCI	JUL	Voyager	19810916
36	1983	10	1	HP41CX	Honeynut	SCI	JUN	Nut	19831001
35	1981	3	24	HP41C/CV	Blanknut	SCI	JUN	Nut	19810324
34	1980	12	15	HP41CV	Silverbird	SCI	JUN	Nut	19801215
33	1979	7	16	HP41C	Coconut	SCI	JUN	Nut	19790716
32	1978	5	1	HP38C	Chive C	BUS	MAY	Spice/Spike	19780501
31	1978	5	1	HP38E	Chive	BUS	MAY	Spice/Spike	19780501
30	1978	5	1	HP37E	Parsley	BUS	MAY	Spice/Spike	19780501
29	1979	7	1	HP34C	Basil	SCI	MAY	Spice/Spike	19790701
28	1979	7	1	HP33C	Sage C	SCI	MAY	Spice/Spike	19790701
27	1978	5	1	HP33E	Sage	SCI	MAY	Spice/Spike	19780501
26	1978	5	1	HP32E	Thyme	SCI	MAY	Spice/Spike	19780501
25	1978	5	1	HP31E	Ginger	SCI	MAY	Spice/Spike	19780501
24	1984	2	1	HP75D	Merlin	SCI	APR	String/Roo/Cricket	19840201
23	1977	7	1	HP01A	Cricket	OTH	APR	String/Roo/Cricket	19770701
22	1984	2	1	HP71B	Titan	SCI	APR	String/Roo/Cricket	19840201
21	1982	8	23	HP75C	Kangaroo	SCI	APR	String/Roo/Cricket	19820823
20	1977	9	1	HP19C	Clyde	SCI	APR	String/Roo/Cricket	19770901
19	1977	7	1	HP10A	Kiss	OTH	APR	String/Roo/Cricket	19770701
18	1977	7	1	HP92A	Bobcat	BUS	MAR	Top Cat	19770701
17	1976	7	1	HP97A	Kitty Hawk	SCI	MAR	Top Cat	19760701
16	1977	12	1	HP97S	Ricochet	SCI	MAR	Top Cat	19771201
15	1977	1	1	HP95C	Bearcat Cancelled	SCI	MAR	Top Cat	19770101
14	1976	3	1	HP91A	Felix	SCI	MAR	Top Cat	19760301
13	1976	5	1	HP27A	Salad	BUS	FEB	Woodstock	19760501
12	1975	8	1	HP22A	Turnip	BUS	FEB	Woodstock	19750801
11	1977	7	1	HP29C	Bonnie	SCI	FEB	Woodstock	19770701
10	1976	6	14	HP25C	Squish	SCI	FEB	Woodstock	19760614
9	1975	8	1	HP25A	Squash	SCI	FEB	Woodstock	19750801
8	1975	2	1	HP21A	Pumpkin	SCI	FEB	Woodstock	19750201
7	1974	8	1	HP70A	Scrooge	BUS	JAN	Classic	19740801
6	1973	2	1	HP80A	None	BUS	JAN	Classic	19730201
5	1976	7	1	HP67A	Hawkeye	SCI	JAN	Classic	19760701
4	1975	1	1	HP55A	Merlin	SCI	JAN	Classic	19750101
3	1974	1	19	HP65A	Superstar	SCI	JAN	Classic	19740119
2	1973	5	1	HP45A	Wizard	SCI	JAN	Classic	19730501
1	1972	1	4	HP35A	None	SCI	JAN	Classic	19720104
#	Year	Mo	Dy	Model[1]	Code Name	Type[2]	Month	Series/grouping	Date[3]

1. Model numbers prior to the implementation of a suffix letter have had "A" added to avoid confusion with

similar models with suffix letters.

*2 Type: SCI. - A **scientific** calculator has trigonometric, log and other math functions.*
*BUS - A **business** calculator has date, interest, and other business-oriented functions.*
*GRF - A **graphing** calculator has a dot matrix screen for plotting, math, and perhaps business functions.*
*OTH - Any few function, specialty, or low-end calculator is classified as **other**.*

3. Date code is YYYYMMDD for sorting purposes.

4. ?? indicates unknown or uncertain information.

Answers to questions asked above.

Exactly how many calculators has HP made? Excluding 6 cancelled models, etc. **95**

How many HP calculators have used (shared) the same model number? **25**
Model numbers used two times = **16** (6, 9, 20, 21, 22, 25, 27, 28, 30, 32, 33, 35, 40, 49, 75, 97)
Model numbers used three times = **4** (19, 33, 38, 39)
Model numbers used four times = **2** (12, 17)
Model number used five times = **1** (41)
Model number used six times = **1** (48)
Model number used seven times = **1** (10)

Was there ever an HP-17? **NO**

What kind of calculator was the HP-70? **Business calculator in the Classic Series.**

What HP calculator was called Bonnie, **(HP-29C)** and was there a Clyde? **YES, HP-19C**

Was there a Woodstock series of machines and if so how many machines were in it? **YES, 6**

Were there any "code names" that were numbers? **YES, 0.5, 1.0, & 1.5 ?**

What model numbers have never been used? **51** Within model numbers of 1 to 99 more than 51.5% have not been used. **2, 3, 4. 5. 7. 13, 23, 24, 26, 36, 43, 44, 46, 47, 51, 52, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 68, 69, 72, 74, 76, 77, 78, 79, 81, 82, 83, 84, 85, 86, 87, 88, 89, 93, 94, 96, 98, 99.**

How many HP10's are there? **7**

(1) For a historical perspective of the HP-35A check out the link below. Copies of an unpublished internal HP Newsletter describing some of the issues of the early days of the HP-35A are included.

http://holyjoe.net/hhc2007/Remembering%20The%20HP35A.pdf

All of HP's Calculators – In Model Order

Richard J. Nelson, Jake Schwart, & Wlodekz Mier-Jedrezjowicz

The table below is Model number ordered as shown in the HHC 2009 HP Calculator Calendar and the machines announced since HHC 2009 have been added. The leading "HP" had been removed. Named machines are first. Four of the five shaded machines were built and then canceled. The single non-calculator machine is shaded in orange.

#	Year	Mo	Dy	Model[1]	Code Name	Type[2]	Month	Series/grouping	Date[3]
100	2009	1	7	EasyCalc 100	None	OTH	Aux 1	Recent "Named" machines	20090107
96	2008	6	10	OfficeCalc 200	None	OTH	Aux 1	Recent "Named" machines	20080610
98	2009	1	7	OfficeCalc 300	None	OTH	Aux 1	Recent "Named" machines	20090107
97	2008	6	10	PrintCalc100	None	OTH	Aux 1	Recent "Named" machines	20080610
99.	2009	1	7	SmartCalc 300s	None	OTH	Aux 1	Recent "Named" machines	20090107
82	2008	6	10	StreamSmart 400	Datastreamer	GRF	NOV	Student Machines	20080610
76	2000	8	??	Xpander	Cancelled	GRF	NOV		200008??
23	1977	7	1	01A	Cricket	OTH	APR	String/Roo/Cricket	19770701
83	1999	4	1	6S	Cosmo	SCI	DEC	Remaining ACO/San Diego	19990401
84	1999	4	1	6S Solar	Cosmo	SCI	DEC	Remaining ACO/San Diego	19990401
90	2006	1	1	8s	None (Asia Pacific only)	SCI	DEC	Remaining ACO/San Diego	20060101
87	2003	1	23	9s	None	SCI	DEC	Remaining ACO/San Diego	20030123
88	2003	1	23	9g	None	GRF	DEC	Remaining ACO/San Diego	20030123
95	2008	6	10	10 QuickCalc	None	OTH	Aux 1	Recent "Named" machines	20080610
19	1977	7	1	10A	Kiss	OTH	APR	String/Roo/Cricket	19770701
60	1989	1	3	10B	Ernst	BUS	SEP	Pioneer	19890103
86	2001	12	1	10BII	R2D2	BUS	DEC	Remaining ACO/San Diego	20011201
93	2008	1	7	10bII (New case)	None	BUS	DEC	Remaining ACO/San Diego	20080108
40	1982	9	2	10C	0.5	SCI	JUL	Voyager	19820902
92	2007	9	4	10s	None	SCI	DEC	Remaining ACO/San Diego	200710??
37	1981	9	16	11C	1.0	SCI	JUL	Voyager	19810916
41	1981	9	16	12C	1.0	BUS	JUL	Voyager	19810916
42	2003	5	27	12c Platinum	Bondi	BUS	JUL	Voyager	20030527
43	2003	5	27	12c Prestige	None	BUS	JUL	Voyager	20030527
44	2006	6	1	12cp 25th anniv.	None	BUS	JUL	Voyager	20060601
59	1988	10	31	14B	Midas	BUS	SEP	Pioneer	19881031
38	1982	7	1	15C	1.5	SCI	JUL	Voyager	19820701
39	1982	7	1	16C	PR	SCI	JUL	Voyager	19820701
58	1988	1	4	17B	Trader	BUS	SEP	Pioneer	19880104
61	1990	1	6	17BII	Trader II	BUS	SEP	Pioneer	19900106
62	2003	9	23	17bII+ Gold	Trader 3	BUS	SEP	Pioneer	20030923
63	2008	1	7	17bII+ Silver	None	BUS	SEP	Pioneer	20080108
48	1986	6	1	18C	Champion	BUS	AUG	Clamshell	19860601
49	1988	1	4	19B	Tycoon	BUS	AUG	Clamshell	19880104
50	1990	1	6	19BII	Tycoon II	BUS	AUG	Clamshell	19900106
47	2006	??	??	19bII+	None, concept only	BUS	AUG	Clamshell	2006????
20	1977	9	1	19C	Clyde	SCI	APR	String/Roo/Cricket	19770901
94	2008	6	10	20b	Little Euro	BUS	DEC	Remaining ACO/San Diego	20080610
55	1989	1	3	20S	Erni	SCI	SEP	Pioneer	19890103
8	1975	2	1	21A	Pumpkin	SCI	FEB	Woodstock	19750201
56	1989	1	3	21S	Monte Carlo	SCI	SEP	Pioneer	19890103
12	1975	8	1	22A	Turnip	BUS	FEB	Woodstock	19750801
52	1988	6	1	22S	Plato	SCI	SEP	Pioneer	19880601
9	1975	8	1	25A	Squash	SCI	FEB	Woodstock	19750801
10	1976	6	14	25C	Squish	SCI	FEB	Woodstock	19760614
13	1976	5	1	27A	Salad	BUS	FEB	Woodstock	19760501
51	1988	1	4	27S	Mentor	SCI	SEP	Pioneer	19880101
45	1987	1	5	28C	Paladin	SCI	AUG	Clamshell	19870105

#	Year	Mo	Dy	Model[1]	Code Name	Type[2]	Month	Series/grouping	Date[3]
46	1988	1	4	28S	Orlando	SCI	AUG	Clamshell	19880104
11	1977	7	1	29C	Bonnie	SCI	FEB	Woodstock	19770701
101	2010	1	6	30b	Euro	BUS	—	—	20100106
85	2000	4	7	30S	Astro	SCI	DEC	Remaining ACO/San Diego	20000407
25	1978	5	1	31E	Ginger	SCI	MAY	Spice/Spike	19780501
26	1978	5	1	32E	Thyme	SCI	MAY	Spice/Spike	19780501
53	1988	6	1	32S	Leonardo	SCI	SEP	Pioneer	19880601
57	1991	3	1	32SII	Nardo	SCI	SEP	Pioneer	19910301
28	1979	7	1	33C	Sage C	SCI	MAY	Spice/Spike	19790701
27	1978	5	1	33E	Sage	SCI	MAY	Spice/Spike	19780501
89	2004	4	20	33s	Swan	SCI	DEC	Remaining ACO/San Diego	20040420
29	1979	7	1	34C	Basil	SCI	MAY	Spice/Spike	19790701
1	1972	1	4	35A	None	SCI	JAN	Classic	19720104
91	2007	7	12	35s	None	SCI	DEC	Remaining ACO/San Diego	20070712
30	1978	5	1	37E	Parsley	BUS	MAY	Spice/Spike	19780501
32	1978	5	1	38C	Chive C	BUS	MAY	Spice/Spike	19780501
31	1978	5	1	38E	Chive	BUS	MAY	Spice/Spike	19780501
73	1995	4	6	38G	Elsie	GRF	NOV	Student Machines	19950406
74	199?	??	??	38G+	Cancelled	GRF	NOV	Student Machines	199?????
77	2004	1	8	39g+	Little Apple (US only)	GRF	NOV	Student Machines	20040108
75	2000	4	13	39G	Enterprise (US only)	GRF	NOV	Student Machines	20000413
78	2006	8	8	39gs	?? (US only)	GRF	NOV	Student Machines	20060808
80	2000	4	13	40G	Enterprise (non-US only)	GRF	NOV	Student Machines	20000413
79	2006	11	8	40gs	?? (worldwide)	GRF	NOV	Student Machines	20061108
81	2004	1	8	40g+ (prototype)	None Cancelled	GRF	NOV	Student Machines	20040108
33	1979	7	16	41C	Coconut	SCI	JUN	Nut	19790716
34	1980	12	15	41CV	Silverbird	SCI	JUN	Nut	19801215
36	1983	10	1	41CX	Honeynut	SCI	JUN	Nut	19831001
35	1981	3	24	41C/CV	Blanknut	SCI	JUN	Nut	19810324
54	1988	10	31	42S	DaVinci	SCI	SEP	Pioneer	19881031
2	1973	5	1	45A	Wizard	SCI	JAN	Classic	19730501
72	1993	6	1	48G	Alcuin	GRF	OCT	Charlemagne	19930601
67	1998	3	30	48G+	Plus	GRF	OCT	Charlemagne	19980330
70	2003	10	28	48gII	Mid Apple	GRF	OCT	Charlemagne	20031028
66	1993	6	1	48GX	Hammer	GRF	OCT	Charlemagne	19930601
65	1991	4	2	48S	Shorty	GRF	OCT	Charlemagne	19910402
64	1990	3	6	48SX	Charlemagne	GRF	OCT	Charlemagne	19900306
68	1999	5	21	49G	V'ger	GRF	OCT	Charlemagne	19990521
69	2003	10	20	49g+	Big Apple	GRF	OCT	Charlemagne	20031020
71	2006	9	19	50g	None	GRF	OCT	Charlemagne	20060119
4	1975	1	1	55A	Merlin	SCI	JAN	Classic	19750101
3	1974	1	19	65A	Superstar	SCI	JAN	Classic	19740119
5	1976	7	1	67A	Hawkeye	SCI	JAN	Classic	19760701
7	1974	8	1	70A	Scrooge	BUS	JAN	Classic	19740801
22	1984	2	1	71B	Titan	SCI	APR	String/Roo/Cricket	19840201
21	1982	8	23	75C	Kangaroo	SCI	APR	String/Roo/Cricket	19820823
24	1984	2	1	75D	Merlin	SCI	APR	String/Roo/Cricket	19840201
6	1973	2	1	80A	None	BUS	JAN	Classic	19730201
14	1976	3	1	91A	Felix	SCI	MAR	Top Cat	19760301
18	1977	7	1	92A	Bobcat	BUS	MAR	Top Cat	19770701
15	1977	1	1	95C	Bearcat Cancelled	SCI	MAR	Top Cat	19770101
17	1976	7	1	97A	Kitty Hawk	SCI	MAR	Top Cat	19760701
16	1977	12	1	97S	Ricochet	SCI	MAR	Top Cat	19771201

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Numbers - Part III

Richard J. Nelson

Introduction

Numbers – Part I, in ***HP Solve*** Issue 18, outlined the guidelines for this series and set the scene by asking what is the "best" number to put into a calculator display for a photograph[(1)] (see notes at the end). Part II in ***HP Solve*** Issue 19 delved into the basics of numbers arguing that φ = 1.61803 39887 49894 … is the "most interesting" display number for photographing a calculator.

Fig. 1 – HP35s number keyboard is typical[(2)].

Part II also pointed out that you may discover most the interesting facts of most any number by entering "number N" (N = number) as an input to Wikipedia. The Ten aspects of numbers discussed in part II are listed below, and these also included references and links to more advanced aspects of the topics reviewed.

N1. Cardinal and Ordinal Numbers
N2. Counting Numbers
N3. Odd or Even Numbers
N4. Negative or Positive Numbers
N5. Integer or Decimal Numbers
N6. Real Numbers
N7. Being Consistent
N8. Formatting and Expressing Numbers
N9. Precision, Accuracy, and Rounding
N10. Significant digits

Three topics remain for the last part (part III) in this brief review of numbers.

N11. Rational or Irrational Numbers

A rational number is a number that can be expressed as a fraction with an integer numerator and a non-zero natural number denominator. Examples are 3, 1/4, 13.5, etc. In general terms the fraction m/*n* may also be represented as:

$$\frac{m}{n}$$

Two different fractions may correspond to the same rational number; for example, 2/5 and 6/15 are equal; e.g.

$$\frac{2}{5} = \frac{6}{15}$$

If the absolute value of *m* is greater than *n*, then the absolute value of the fraction is greater than 1. Fractions can be greater than, less than, or equal to 1, and they can also be positive, negative, or zero.

The set of all rational numbers includes the integers, since every integer can be written as a fraction with denominator 1. For example −3 can also be written as −3/1.

The real numbers (defined in Part II) include all of the measuring numbers. Unless other wise defined or especially formatted, the numbers you see in your calculator display are real numbers. Real numbers are usually written using decimal numerals, in which a decimal point, radix, is placed to the right of the digit with the place value of one. Each digit to the right of the decimal point has a place value one-tenth of the place value of the digit to its left.

135.246

represents 1 hundred, 3 tens, 5 ones, 2 tenths, 4 hundredths, and 6 thousandths. When you say the number, the decimal is read "point". Say 135.246 as "one three five point two four six ".

As mentioned above the point in a number is called the radix. In Europe and other countries the radix is a comma and most HP scientific calculators have a radix setting as either "." or ",".

To write a fraction as a decimal, divide the numerator by the denominator.

Not every real number is a rational number.

If a real number cannot be written as a fraction of two integers, it is called irrational.	(1)

A decimal that can be written as a fraction either ends (terminates) or forever repeats, because it is the answer to a problem in division. For example the real number 0.25 can be written as 1/4 and the real number 0.333... (forever repeating threes) can be written as 1/3.

Irrational numbers such as the ratio of the circumference of a circle to its diameter do not terminate or repeat. The digits just go on "forever." The ratio is called Pi and 70 digits are shown below.

$\pi \approx 3.14159\ 26535\ 89793\ 23846\ 26433\ 83279\ 50288\ 41971\ 69399\ 37510\ 58209\ 74944\ 59230\ 78164$

Most HP calculators have Pi stored in ROM to a value of 31 decimal places. Wikipedia puts this into perspective.

"For example, the decimal representation of π truncated to 11 decimal places is good enough to estimate the circumference of any circle that fits inside the Earth with an error of less than one millimeter, and the decimal representation of π truncated to 39 decimal places is sufficient to estimate the circumference of any circle that fits in the observable universe with precision comparable to the radius of a hydrogen atom."

These special cases of real numbers that cannot be represented as a decimal that neither ends nor forever repeats, and cannot be written as a fraction, is an example of an irrational number.

Other irrational number examples	$\sqrt{2} \approx 1.41421\ 35672\ 373095\ \ldots$	$\varphi \approx 1.61803\ 39887\ 49894\ \ldots$
	$\sqrt{3} \approx 1.73205\ 08075\ 68877\ \ldots$	$e \approx 2.71828\ 18284\ 59045\ \ldots$

Reader thought question. Are the decimal digits of irrational numbers random?

N12. Ordered (Pair) Numbers

You owe me a movie ticket, pay up. Cut me three yards of cloth. Plot a course North-Northeast.

Each of these situations has a specific numerical representation. The movie ticket may be $10. The value of a ticket is a single number. The cloth, however, cannot be represented without an assumption or standard regarding the width of the cloth. One assumption might be that the cloth is coming from a bolt and that you are to unwind three yards from the bolt and cut it off. Does three yards accurately represent the quantity of cloth? No, it takes two numbers. The length may be three yards, but how wide is it? Bolts in the US have three common widths – 36 inches, 44-45 inches, and 54 inches. You more accurately describe the cloth as 54 x 108 inches – width x length. The course direction actually incorporates two numbers in its value. North is one direction, 0 degrees, and Northeast is another direction, 45 degrees.

Page 3, 3rd line. Omit the "about" since it is redundant with "common".
The cloth and course examples may be numerically represented by a pair of numbers in a specific, predefined order, and there are several different kinds of calculations that use ordered pair numbers. You have probably learned how to calculate with these ordered pairs as coordinate points, polar coordinates, vectors, and polar coordinates. These calculations are described in your Owner's Manual and perhaps they will be explored further – perhaps by a reader – in future articles in this series.

N13. Prime Numbers

Numbers may be broken into various groups. Examples are even numbers and irrational numbers. Another group are those numbers that have two distinct natural number divisors, 1 and the number itself. If you examine the numbers from 1 to 100 you will find 25 of these are prime. You may put any of these primes into Wikipedia by entering "number N" (N = number) to learn some interesting numerical tidbits.

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, and 97

Prime numbers have fascinated people for centuries. Euclid demonstrated that an infinite number of prime numbers exist in approximately 300 BC. The number 1 is by definition not a prime number.

Looking at the small sampling of primes above a few observations and questions jump right out. Except for the first prime number, 2, prime numbers are always odd. How are the primes distributed? Are the prime numbers random? You naturally want to enter them into a list and use your RPL graphing calculator to apply various list functions on the primes. First you want to take the difference. What is the smallest prime number that has substantial difference between it and next prime? Do the differences of sequential prime numbers form a series? Next you may want to take the square root. Are the roots of all prime numbers irrational?

Primality is the name given to the property of a number being prime. Testing a number to determine if it is prime is usually done by trial division. Writing a program to verify the primality of a number is standard practice for any programming class. Because a large number of trial divisions are usually involved these programs are often used to test large numbers known to be prime as a speed test for a calculator. There are more sophisticated algorithms for primality testing other than trial division. These are especially needed for large numbers but there is no known useful formula that yields all of the prime numbers and no composites. Composite numbers are the non-prime numbers, i.e. by definition, every integer greater than one is either a prime number or a composite number.

Have all the possible questions about prime numbers been answered by proofs? No! Goldbach's conjecture asserts that any even natural number bigger than two is the sum of two primes. The twin prime conjecture says that there are infinitely many twin primes (pairs of primes whose difference is two), has been unresolved for more than a century. If you take the difference of the first 25 primes listed above you will find that eight have a difference of two, seven have a difference of four, seven have a difference of six and only one has a difference of eight. This doesn't count the unusual first two primes that have a difference of one. This raises a question. Are there any other consecutive prime numbers that have a difference of one? Hint: Think odd and even numbers.

The most practical use of prime numbers is in cryptography. The most well known example is in public-key cryptography. If the key is a large prime number the key may be broken but the time to verify it requires so much computer time that for all practical purposes it cannot be "broken." A popular type of prime number may be defined as a Mersenne prime named after Marin Mersenne. Every Mersenne prime is a positive integer that is one less than a power of two. Mersenne primes are relatively easy to prove primality using a special algorithm and most known really large prime numbers are Mersenne primes.

The largest known prime number is $2^{43,112,609} - 1$ & is 12,978,189 digits long.

(2)

This was reported on August 23, 2008 by the Great Internet Mersenne Prime Search (GIMPS) group using volunteers and programs that run on their computers. This is the "official" record as of June 2009.

Page 4, top line: change "and" to "as".

Monetary prizes are offered for finding the largest prime number with $100,000 paid for $2^{43,112,609} - 1$. Additional cash prizes are being offered for the first prime number found with at least one hundred million digits and the first with at least one billion digits. If you were to print the current largest prime number with a space every ten digits using the page standard of this article – 12 points, 0.7 inches margins, 80 digits per line, and 50 lines, you would need 1,622.27 sheets of paper printed on both sides.

Conclusion

Calculators, by their very nature deal, with numbers. We must understand numbers if we are going to correctly and accurately use a calculator to do the hard work of number crunching. Three aspects of numbers are discussed in Part III of a three part series.

N11. Rational or Irrational Numbers

N12. Ordered (Pair) Numbers

N13. Prime Numbers

Notes

- -

(1) The photographic calculator display question was actually the basis for a "contest" held on the Internet. The winner was Joseph K. Horn who provided a Meta solution. He wanted very specific restrictions on the number and he decided that he would provide "all solutions" depending on the restrictions you may apply. You may see his "number" answer at: ***http://holyjoe.net/hhc2009/contest1.htm****. All seven contest related documents may also be found at this link.*

(2) Technically the numeric key pad layout hasn't been quite as stable as it might first appear. The non-zero digit order has been consistent, but the bottom row containing the zero and decimal point has moved around on the nearly 100 models of HP calculators. Jake Schwartz has extensively analyzed HP's calculator keyboards and you may find the results in an HP Handheld Conference (HHC), paper titled "HHC 2000 Survey of HP Calculator numeric keypads." http://www.pahhc.org/2010/Articles/HHC2000%20A%20Survey%20of%20HP%20Numeric%20Keypads.pdf *The tables in his paper also include model attributes such as usage (business, scientific, etc.), logic system, programmability, solver, CHS, exponent, and ENTER keys.*

About the Author

Richard J. Nelson has written hundreds of articles on the subject of HP's calculators. His first article was in the first issue of *HP 65 Notes* in June 1974. He became an RPN enthusiast with his first HP Calculator, the HP-35A he received in the mail from HP on July 31, 1972. He remembered the HP-35A in a recent article that included previously unpublished information on this calculator. See http://holyjoe.net/hhc2007/Remembering%20The%20HP35A.pdf He has also had an article published on HP's website on HP Calculator Firsts. See http://h20331.www2.hp.com/Hpsub/cache/392617-0-0-225-121.html.

From the Editor

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Regular Columns

From The Editor – Issue 20

With everyone's busy summer vacation schedules the reader feedback and the issues are getting a little out of synch. I went on vacation and this was a "hard stop" in terms of the schedule. That, along with a virus on my computer, disrupted a few files. As a result the solution to the Math Challenge #2 in issue 19 will have to wait until Issue 21. This reminds me. If you send your files in Word you could save them as a doc file; I prefer the files in Word so I may add the page numbering.

Here is an email regarding a previous issue. Eric's obvious familiarity with HP's calculators helps to fill in some of the "other" models that each ENTER key represented in issue 19. When Jake assembled the ENTER keys it was only intended to be representative of some of the variations of the ENTER key and not to be an extensive coverage. That would be nice to see. Perhaps this could be assembled in a future RPN Tips? The double wide "ENTER" key is a legacy feature for HP RPN calculators.

From: Eric Smith [mailto:eric@brouhaha.com]
Subject: ENTER key challenge in issue 18

The enter key challenge was interesting, and I think I recognize most of them. I wasn't able to pin down some of them to specific models since essentially the same enter key was used in related models, so in those cases I've listed all of the models I think they could be from. I have a hard time distinguishing the leftmost and rightmost photographs in row 3, so those are the keys I'm least confident about.

row 1 - 21/22/25/25C/29C, 11C/12C/15C/16C, 27
row 2 - 35, 34C, 35s
row 3 - 32S/32SII/42S/48S/SX, 41C/CV/CX, 48G/48GX
row 4 - 45/55, 50g, 65
row 5 - 70, 67
row 6 - 91/92/95C/97, 19C

I was disappointed not to see a 28C/28S enter key! And why wasn't there a 33s enter key? I'm not a big fan of the 33s, but it certainly is distinctive!

Best regards,
Eric

Here is an email from a Physics professor commenting on what is a fairly common student's issue of calculator use of keying in large numbers in EEX format.

From: *Roger Hill*
Subject: *EEX*

Hi Richard,

Here's a little thing about the use of calculators that I talk about in basic physics classes. Maybe you have already discussed this before, but here it is:

One time, quite a few years ago, I gave a quiz in which one of the given numbers was something like "10^6 meters". After the quiz I went over it and showed them what my answer was. After the period was

over, a good fraction of the class came up to me and said that they could not get my answer on their calculators; they were all getting an answer 10 times as large. It turned out that instead of entering 10^6 as EEX 6 or 1 EEX 6 (some calculators insist on putting at least one digit before the EEX), they were entering 10 EEX 6, which is of course is 10^7. If I had called it "1 x 10^6 meters" on the quiz they would have gotten it right!

Ever since then, at some point during an elementary class I have them pull out their calculators and give them a little exercise: Key in the number 123456789 and then divide by 18^8. I then take a poll on what answers they got. Most of them get the correct answer 1.23456789, but almost all of the time I catch a few that got 0.123456789 because they entered the 10^8 wrong.

In fact, I did that yesterday in the 2nd-semester calculus-based physics course that I'm teaching this summer, and out of the 13 students there, one of them made the mistake -- so it was worth doing!

-- Roger

Here are the articles in this issue.

S01 Lesson Plan Sweepstakes on Teacher Experience Exchange

Teacher Experience Exchange is a free resource for teachers that offers discussion forums, lesson plans, and professional development tutorials. Visit the site and upload your own lesson plan for a chance to win an HP Mini PC in our weekly drawing.

S02 HP30b Business Professional

Here is a summary description of HP newest financial calculator. The unusual mix of blazing speed and financial functions with scientific and statistical functions.

S03 HP SmartCalc 300

The SmartCalc 300 is terrific machine with its low cost, surprising display, and essential mix of features and functions. Add the solar power benefit and you have a great calculator for student use.

S04 RPN Tip #20 has 20 RPN Tips

Gene Wright is very familiar with HP's calculators and teaching others in the business world how to use them with his books and lectures. HHC, HP Handheld Conference, attendees know Gene well for his work with the HP20b and HP30b.

S05 Come Join Us At The HHC 2010 HP Handhelds Conference!

Jake Schwartz is the official historian for the HP Handheld Conferences and he provides a unique perspective and photographs for a few notable past conferences. This is one of the few events that the average HP customer has to uniquely interface one-on-one with the people responsible for HP calculators.

S06 All of HP's Calculators

A brief discussion of HP's calculators is provided to explain the list of every HP Calculator ever made and a even few that weren't. Two versions of the list are provided with the first one in "time order" and the second one in model number order. You will learn how many of the legacy 99 model numbers "reserved' for HP calculators have actually been used. Take a guess at the percentage, 1 to 99, of the numbers that have NOT been used. You will be surprised and there are many model numbers that still may be used.

S07 Numbers - Part III

This is the third installment in our practical Math Review series. Numbers is a broad enough topic that it took three installments to just cover the basics. More interesting topics will start in Issue 21.

S08 Regular Columns

This collection of repeating columns is new. Here is the Issue 20 list.

- **From the editor.** This column provides feedback and commentary from the editor. A letter from a college professor discusses some of the issues that students experience.
- **RPN Tip 20.** Previous RPN Tips Columns have mentioned that RPL based machines have their own "personality" or quirks in the way certain things are done, especially with stack entry. The new HP30b is a good example and the RPN Tip for this issue is a much longer article that is featured as a stand-alone article. RPN Tip 20 is actually is a list of 20 RPN tips as a "featured article.".
- **One Minute Marvels.** This OMM is really a learning/study HP-48/49/50 exercise "half minute" marvel routine that uniquely calculates the number of binary BITs required for any given decimal number.
- **Community News.** News from the UK on an unusual method for students to learn their math from a "Mathamagician"
- **Did You Know?** This column answers the question, "How can you test your calculator to know if it is Binary based or Binary Coded Decimal based."

S09 Customer Corner – Meet Felix Gross

Periodically ***HP Solve*** Interviews an HP Calculator user under the title of Customer Corner. Felix is a German patent attorney who visits the US at least once a year to attend the annual HP Handheld Conference. His law firm often represents US companies in Germany and his knowledge of American customs and English is very impressive.

That is it for this issue. I hope you enjoy it. If not, tell me!

X < > Y,

Richard
hpsolve@hp.com

One Minute Marvels

HP 48 One Minute Marvel – No. 7 - Binary BITs for decimal N

One Minute Marvels, OMMs, are short, efficient, unusual, and fun HP 48 programs that may be entered into your machine in a minute or less. These programs were developed on the HP 48, but they will usually run on the HP 49 and HP 50 as well. Note the HP48 byte count is for the program only.

All numbers are represented in a specific base. We all use base ten numbers every day and base ten numbers are composed of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. Computers, and many more recent calculators, represent numbers using a binary base or simply base 2. Base 2 numbers only use 0 & 1. The 0's and 1's are called BITs, Binary Digits. Table 1 shows a few base 10 numbers and their base 2 equivalents.

Table 1 – Selected Decimal Numbers and their Binary Equivalents

DEC	BIN	DEC	BIN	DEC	BIN	DEC	BIN
1	0001	6	0110	15	1111	64	100000
2	0010	7	0111	16	10000	127	111111
3	0011	8	1000	31	11111	128	1000000
4	0100	9	1001	32	100000	255	1111111
5	0101	10	1010	63	111111	256	100000000

From table 1 you may notice that base 10 digits from 0 to 15 may be represented by 4 BITs. 16, however requires 5 BITs. Five BITs will represent base 10 numbers up to 31 and 32 rolls over the "counter" to 6 bits. Software engineers often need to know the minimum number of bits to represent a decimal number.

Our One Minute Marvel is really more like a half minute marvel because it is so short. The "Marvel" part is the clever way (looping) that the problem is solved. Thanks to Joseph Horn for this idea.

Problem

How many BITs are required for a decimal N?

'NBIT' << 0 1 ROT FOR **c** 1 + **c** STEP >>

9 commands, 36.5 Bytes, # 17BCh. 1024 ⇒ 11 in 66.8_ms.

How the program works.

Normally a command-by-command description of the program is given. This OMM, however, is presented as a means to inspire you to study the very short program to see how the FOR STEP loop is working. "**c**" is a local variable that is only used while the program is running. You simply key in a decimal number and run **'NBIT'.**

How many BITs are required for 10E100?

How would you solve this problem if you didn't have this program?

ANS: No peeking. root 112896

Community News

This Community News comes from Europe in the form of an email from Karen FitzGerald "announcing" a new book. I am sure we will have a formal review as this most interesting project moves forward.

Karen is working with a UK "Mathamagician" who is writing a book to be released in September called *Cool, Calm, & Calculating*. It is a primary school book aimed at giving teachers and pupils fun exercises to do with HP calculators. Andrew is an HP fan and he has a great deal of experience as a math teacher. He spends his time touring around schools bringing excitement to math lessons.

It will be available in English from www.andrewjeffrey.co.uk priced at GBP 4.99.

Karen reports that calculators in Europe is moving full speed ahead. If any ***HP Solve*** readers are based in Europe and they are interested in working with HP to train the next generation of professionals she would be delighted to hear from them. Contact her at: Karen.fitzgerald@hp.com.

Did You Know?

This ***HP Solve*** column is a general collection of assorted tid bits related to HP Calculators. John Martellaro, Senior Editor, Analysis & Reviews, The Mac Observer asks.

Is it possible to determine, via keyboard operations, whether a calculator is using Binary Coded Decimal, (B.C.D.) math -- as the old HP calculators did or if they're using standard binary arithmetic? For example, some kind of accuracy test that reveals the usage of B.C.D.

I have been told that the HP-15C on the iPhone uses BCD, but I'd like to be able to verify that.

Editor's Note. The HP-15C is a very popular legacy calculator. See the link below for an HP-15C emulator for the iPhone.

http://itunes.apple.com/app/hp-15c-scientific-calculator/id318956846?mt=8

Joseph K. Horn recommends the following.

The method I use is based on the fact that 10/3 in BCD is always a string of d 3's (where d is the number of digits of accuracy in that BCD calculator), but in binary the 3's are always followed by a bunch of other digits (namely, the difference between 1/3 and the closest multiple of 1/2^b where b is the number of bits of accuracy of that binary calculator).

Here's what I do: Calculate 10/3 in SCI mode and then carefully subtract digits until you run out of consecutive 3's. If nothing is left, it's a BCD calculator. If random-looking junk is left, it's a binary calculator. Don't subtract too many digits at a time, though. I use 7 digits at a time out of long-standing habit.

On the HP 50g (HP's current top-of-the-line calculator), in RPN and SCI mode, it looks like this:

10. ENTER 3. / 3.333333 -
--> 3.33330000000E-7
3.333E-7 -
--> 3.00000000000E-11
3E-11 -
--> 0

As you can see, the consecutive 3's got eaten up with no mess remaining, so the HP 50g is BCD.

On the HP 30S in SCI mode:

10/3-3.333333 ENTER
--> 3.333333333E-07
- 3.333333E-7 ENTER
--> 3.333333333E-14
- 3.333333E-14
--> 3.333690075E-21

See the junk digits creeping in? That means that the HP 30S is a binary calculator. There MUST be faster, more efficient ways, but this is the one I use. Long live BCD! :-)

Meet an HP Calculator user

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Customer Corner

Meet Felix Gross

Editor's note. Customer Corner has appeared in past issues of HP Solve where we interview the worldwide users of HP's calculators. Past interviews have been of users who live and work in the US, UK, and Canada. We now go to Germany for our next interview.

HP Solve: What is your background?

Felix: I am a German and European patent attorney working in Berlin, Germany. By training I am a chemical engineer with a diploma degree from RWTH Aachen, Germany (1991) and a PhD from ETH, Zurich, Switzerland (1995).

HP Solve: Do you do much traveling?

Felix: Travelling with my wife is great. We have been travelling, especially in Asia, quite a bit during the last ten years. The good part of business travelling is meeting clients and colleagues; that I enjoy.

HP Solve: When were you first exposed to HP calculators?

Felix: In 1977 an uncle of mine showed me his HP 25. I was amazed by the ease it could handle quadratic equations or simultaneous linear equations, topics I had to deal with at school. But I was really hooked by the Lunar Lander game. Later I learned to play with his HP 67 too.

***HP Solve:* What HP calculators have you used since?**

Felix: In 1978 I got a HP-29C. Since then I have used an HP 41CV, an HP 15C, an HP 48 SX and an HP 50. By the way, my mother uses an HP 20S, my wife an HP 12C Platinum.

***HP Solve:* What have you used your calculators for?**

Felix: The HP 29C was used extensively during high school for calculus, physics and in the chemistry lab. But most of my programming was done for astronomy applications. I became a PPC[(1)] member (No 6512) in 1981 and published two articles about astronomical topics. The fascinating material published in the PPC Journal prompted me to try out new things in programming and showed me that I can use the calculator as a tool to understand things in science. In college the HP-41CV was indispensible for all courses, especially for math, heat transfer, thermo-dynamics and engineering design courses.

***HP Solve:* What was the largest problem you have solved with an HP calculator?**

Felix: As an intern at a refinery I had to perform a Pinch analysis (i.e. a thermodynamic analysis with the aim to improve heat-integration within the plant). The specialized PC program for the Pinch analysis (running on an Intel 286 machine) was very buggy. I needed the results quickly, so I programmed my HP 41 CV for the task. Two days later I had produced two large sheets of paper with the handwritten results. By programming and using the calculator I gained a very good understanding of the method itself, the plant and its thermodynamic potential. My boss was surprised, that something like that could be obtained without the use of "big" computers. When the PC program finally worked, I checked my HP calculator solution and it was entirely correct. Using the calculator not only gave me results but insights.

***HP Solve:* What are you currently using HP calculators for?**

Felix: Naturally as a patent attorney I have to deal less with numerical analysis as I used to. But I have programmed my HP 50 to calculate the cost risks for litigation in Germany for all instances up to the German Supreme Court. Normally this is done using an ungainly table in a book. For clients it is very helpful to know precise risk assessment with one key press. The program has been used in negotiations and in the courtroom. A calculator is much more handy than a laptop in situations like that. For fun I still like to program the HP 50 to solve astronomy problems.

***HP Solve*: What appeals to you about HP calculators?**

Felix: It always was the quality of the hardware and the accuracy of the built-in algorithms and RPN (or later RPL). The improved HP 50 keyboard was most welcomed since I like the functionality of the machine. In the old days I also loved the documentation. In recent years standard of the documentation in the whole industry has deteriorated to some degree.

***HP Solve*: Have you had contact with HHC?**

Felix: In 2003 I learned via the internet that the former PPC people and many new aficionados are regularly meeting in the USA at the HHC[(2)]. In 2005 I had business close to Chicago just at the weekend of the HHC 2005. There I met a lot of people for the first time that I remembered from the PPC days. I had a great time, talking about calculators and any other topic under the sun. I have returned to all HHC conferences ever since.

***HP Solve*: What did you gain from the HHCs?**

Felix: Learning more about the history during the HHCs by talking to others, I experienced the wide range of applications of those machines and the fun you could have with them. I learned a lot by sharing problems and solutions with this extremely dedicated and friendly group of people.

Since I always was interested in the application of HP calculators of all kind of problems, I started assembling a bibliography that currently contains 1042 books. A recent version is published on the HP museum (www.hpmuseum.org) DVD. I started the project when I was stranded for many hours at a very small airport (one of the joys of business travelling...) with just my laptop that fortunately contains a lot material on calculators, like the museum DVD and the all the PPC Journals from a compilation by Jake Schwartz[(3)].

It is amazing to see from those books how people started so solve problems by themselves in the seventies, once they had personal computing power and no readymade, powerful computer software. For example the famous Feigenbaum constant[(4)] was found with computational experiments using an HP 65.

HP Solve*: *What does your family think of your interest in calculators?

Felix: It is somewhat difficult to convey the fun I have in solving problems with calculators, e.g. in astronomy. But my wife understands me, but she will most likely not join me to the next HHC...

***HP Solve*: What kind of HP calculator would you like in the future?**

Felix: For me a portable machine with MATLAB or SCILAB capabilities would be fantastic, since I found programming using the matrix paradigm very efficient.

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(1) *PPC, "Personal Programming Center," was a world wide HP Calculator Club most active for 12 years from the approximate mid 70's to mid 80's. PPC organized HP Handheld Conferences (HHC's), published newsletters,* http://www.pahhc.org/ppccdrom.htm, *sponsored research projects e.g. Synthetic Programming, maintained a calculator telephone news line (this was before the Internet),* http://www.rskey.org/chhubulletins.html, *made quantity hardware and bookware purchases for members (from HP and other vendors), reviewed all of HP's calculators, and maintained offices and meeting facilities in Santa Ana, CA. It was customary for PPC Members to put their member number in parenthesis in all written correspondence. PPC is most famous for the HP Community designed, developed, and publishing of the PPC ROM.*

http://www.hp41.org/LibView.cfm?Command=Image&FileID=23033

(2) *HHC is the HP Handheld Conference held approximately annually since 1979. See* http://hhuc.us *for details. HHC 2010 will be held in Ft. Collins on the last weekend of September.*

(3) **http://www.pahhc.org/ppccdrom.htm**

(4) http://mathworld.wolfram.com/FeigenbaumConstant.html *See also: Gleick, Chaos: The Making of a New Science, 1987.*