

# EduCALC TECHNICAL NOTES

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## HP-41CX OR HP-28C? Is the Latest Model the Best for Me?

Calculator shoppers will often end their evaluations of potential calculator purchases with the choice narrowed down to two machines equal in cost: the older HP-41CX or the newer HP-28C. The HP-71 is a third 'choice', but is often not directly compared because it is over twice the cost. The following descriptions will put the HP-41CX and the HP-28C in perspective.

The HP-41CX is a general purpose, alphanumeric, programmable scientific calculator that has four input/output ports. A large number of Hewlett-Packard and third party hardware and software suppliers offer nearly 200 products supporting the HP-41. The HP-41 was introduced in July, 1979.

The HP-28C is a specialized, symbolic math, alphanumeric, programmable mathematics calculator that has one infrared output to drive a special printer. Less than a dozen HP and third party products have been announced for the HP-28C. The HP-28C was introduced in January, 1987.

While HP designed memory expansion into the HP-41, the HP-28 was intentionally designed *not* to be memory expanded—no ports. The HP-28 infrared printer is the lowest cost printer for any HP handheld. In November, 1987, HP introduced an infrared module that plugs into the HP-41 to allow the same printer to be used with the HP-41. The HP-41 IR module makes the fourth printer option<sup>1</sup> for the HP-41; the HP-28 has one. The HP-28 uses the Titan processor, the same one used for the HP-71. Small computers—these calculators are really computers programmed for numeric calculations—have three major characteristics: speed, memory, and user functions/convenience. The HP-28 is much faster than the HP-41 and has a larger number of functions, while the HP-41 has a greater memory. Table 1 lists HP-41CX and HP-28C comparisons.

From the user's viewpoint, which machine has been more popular with students, engineers, businessmen, or mathematicians? If the student is taking engineering or general science courses, the HP-41 is recommended. If the student is a math major, the HP-28 is the machine of choice. For the engineer, it is still the HP-41; for the mathematician, it is the HP-28. If the businessman is not satisfied with the HP-12C or HP-18C, the HP-41 is recommended. There are exceptions, but the machines sold thus far reflect these choices.

Table 1 comparisons are generalizations. The informed user will try to be very specific, and place a relative value on important features or functions. If, for example, matrices are often used, this function may be the deciding factor for a particular model. The HP-28 is attractive because it is the latest model. Features such as a curve plotting, 4 line, 23 character display; algebraic expression handling; soft key menus, and new packaging are attention getting. Just looking at the long list of functions is impressive enough to sell the machine. The reason the HP-41, after eight years, is still so popular—well over 1 million sold—is its versatility. Because of the tremendous third party support and upward compatibility from previous models, the HP-41 has the greatest software support of any handheld in history. The greatest complaint of HP-28 users is lack of memory. The EduCALC/SOS memory addition helps solve this problem.

The HP-28 has one function that is especially worth mentioning. It is SYSEVAL. With this function it is possible to give the machine a ROM address and have it start executing at that address. It is quite possible that, with SYSEVAL, a 250 function machine can have its functions multiplied by a factor of two to four times if all the useful entry points were known. At the present time HP has not released very many entry points—less than a dozen. The most useful one is 123E (hex), which returns the number of ticks of the system clock. This is useful for writing a short program to display the time of day or to act as a stopwatch.

<sup>1</sup>Refer to TN #3 for more information on HP-41 printer options.

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Table 1: HP-41CX and HP-28C Comparisons

Characteristic	HP-41CX	HP-28C	Remarks
Execution speed	8.4 sec.	6.22 sec.	10 loops of sin 30
Memory as purchased	3,126 Bytes	1,672 Bytes	Effective program
Number of functions	186	250	Per HP's literature
Maximum memory	134K	34K	Commercially available
Mainframe ROM	24K	128K	HP-28 largest of any calculator
Printer options	4	1	2 strip, ThinkJet, IR
HP-IL available	YES	NO	Instrumentation, modem
Off-line storage (disc)	YES	NO	
NiCads for heavy use	YES	NO	Not recommended by HP
User's program library	YES	NO	
Multiline plotting display	NO	YES	
Soft key menus	NO*	YES	* can be programmed
Any function on any key	YES	NO	Custom Keyboards
Time and date capability	YES	NO	SYSEVAL time on HP-28

Conclusion: The HP-28C is the newest model. It is a specialized symbolic math machine that has an excellent programming language but limited memory. Its four line, curve plotting display and 128K ROM with 250 functions is very impressive. The HP-28 does not have input/output ports, nor does it have a capability of loading programs from off-line storage. The HP-28C is popular with math students, teachers, and engineers who need the matrix or other specific functions.

The HP-41CX is a more general machine that has been available for over eight years. Because of its input/output ports, there is tremendous third party support with programs, plug-in modules, interfaces, and peripherals. The HP-41 has a greater memory capacity, and because of its versatility, a greater application for data acquisition, control, and friendly use with a redefinable keyboard.

HP-28S Note: On January 4, 1988 Hewlett-Packard announced the HP-28S as a replacement for the HP-28C. This machine is 56% faster, has 32K of memory built in, adds permutations, combinations, and a function to convert the pixels of the LCD into a string and vice versa; plus 11 menu and memory management functions. This machine is in answer to the many customers who demanded more memory and it sells for the same price as the HP-28C.

In order to make the HP-28S improvements, HP had to leave out the configuration code that allowed the addition of memory to the HP-28C. The HP-28S does not allow adding memory. As noted in Catalog 39, EduCALC offers a 64K memory addition for HP-28C owners. It is important to keep in mind, however, that large memories without the ability to back them up are very inconvenient when they fail. No handheld has reliable enough memory to depend on without the ability to back up memory contents with some means of off-line storage. This is one of the advantages of the HP-41CX. The 'clock' SYSEVAL address for the HP-28S is 11CA hex.

The added memory of the HP-28S overcomes one of the major advantages of the HP-41CX but progress continues with the HP-41. There is a good possibility that a 256K card reader RAM box will be available by the end of the year. The features of key assignments, I/O ports, and simple non-cryptic programming still make the HP-41CX a popular choice for engineers, engineering students, and surveyors. If, however, you were slightly leaning toward the HP-28C and are wondering if the HP-28S is a major improvement over the HP-28C, the answer is an unqualified YES! The choice, however, is still a difficult one.

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