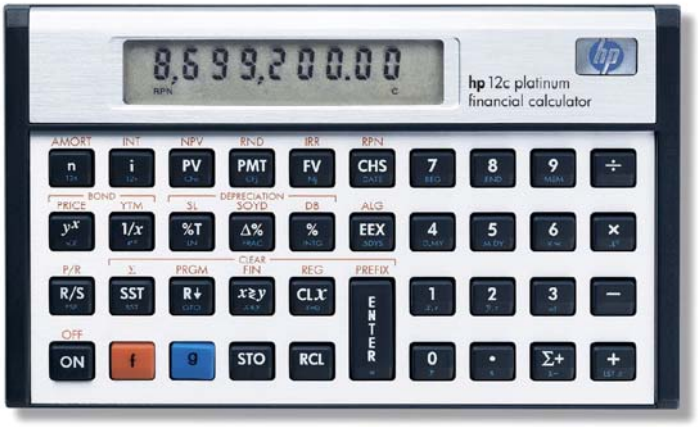
hp calculators



HP 12C Platinum
Writing a small program

Why write programs?

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Why write programs?

The HP12C Platinum resources are complete and powerful enough to solve almost any financial and business related problem. In some situations, a small, predefined sequence of custom-selected functions (called a program) becomes a handy tool to enhance productivity and to reduce the number of errors due to repeated keystroke usage. In general, creating a program is grouping a set of selected functions from the keyboard in a predefined sequence and storing this set in the calculator memory. This sequence can be easily executed later, as many times as needed and whenever needed.

What are keycodes?

Each key in the calculator keyboard is given an internal code. When a key is pressed and its code is identified by the calculator's internal circuits, many operations are performed and the result from these operations is usually returned to the display[1]. As a program is essentially a sequence of keycodes recorded for later execution. When a program is executed, the calculator reacts as if a keystroke sequence is performed. Each keycode is composed of a pair of single digits, where the first one refers to a row and the second one refers to a column on the keyboard. These row and column references define the position of the corresponding key on the keyboard[2]. In most cases, one program line holds more than one keycode.

Figure 1

This is a typical program line. The leftmost code (**002,**) is the program step number and the other number is the keycode. **22** means second row (up to down) and second column (left to right): this is the [1/x] key. This means that line **002,** contains the code for [1/x], and when the program is executed, [1/x] is the operation performed.

Figure 2

This is another program line showing more than one keycode. This is the program step number **003,** and **43** means fourth row (up to down) and third column (left to left): the [g] (blue prefix) key. **22** means second row and second column, or the [1/x] key. This means that line **003,** contains the codes for the keystroke [g][1/x], which is the [e^x] function.

Figure 3

Figure 3 illustrates the reference to a program line numbered **003,** with the keycode **43 2**, which means [g][$\hat{y}$,r].

Converting keystrokes into programs

Each complete keycode in a program composes a program line, and each program line is automatically given a number, or a label. A program will hold as many lines (up to 399 in the HP12C Platinum) as are keyed in to perform the calculation it is meant for. A program must also end with a specific code that stops its execution. In most cases, a known sequence of keystrokes that are used to manually solve a problem is enough to generate a program. Simply put the

[1] Some operations do not return numbers to the display, like setting a particular operation mode, checking for available memory or pressing keys while writing a program.

[2] Except for the [ON] key (no keycode) and the number keys [0] to [9] that have a one-digit code matching the number printed on them.

calculator in program mode by pressing [f] [P/R] and press the keys as if the problem is solved manually. When it is finished, press [f] [P/R] again to return to normal mode. In some cases it is necessary to add a few extra keystrokes to complete the program, like [g] [GTO] [0] [0] [0], [R/S] or [g] [PSE]. Whenever the program is needed, simply enter the necessary data and press [R/S].

Practice writing a small program

Example 1: An industry wants to set the final cost for products given their production costs. In some cases, the product cost is added 15% plus a fixed $1.22. Write a small program that, by hitting only the [R/S] key, calculates the product final cost given the summation of production costs. Then use the program to find the final cost of the products with the following production costs: $33.00, $37.00, $42.50, $48.00 and $51.25. Assume algebraic mode.

Solution: One of the keystroke sequences that can be used to calculate the final cost given the production costs is:

[+] [1] [5] [%] [+] [1] [•] [2] [2] [=]

To clear any program previously written and write the program that performs these calculations, press:

[f] [P/R] [f] [PRGM]

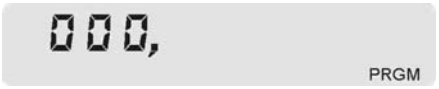

Figure 4

The calculator is now in program mode and program memory is cleared. The display shows the PRGM annunciator to indicate it is in program mode, and line **000,** that cannot contain keycodes. Press the following keys and observe the changes in the display:

[+]

Figure 5

[1]

Figure 6

[5]

Figure 7

[%]

Figure 8

[+]

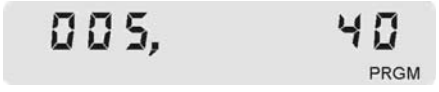

Figure 9

[1]

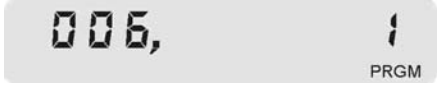

Figure 10

[•]

Figure 11

[2]

Figure 12

[2]

Figure 13

[=]

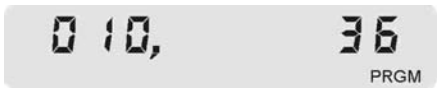

Figure 14

Now put the calculator back in normal mode and set program counter to step 00.

[f] [P/R] [g] [GTO] [0] [0] [0]

The display shows previous contents. Now compute the first final price:

[3] [3] [R/S]

Figure 15

The same keystroke sequence with the next data applies to the others:

[3] [7] [R/S]

Figure 16

To check for the other values:

Keystroke	Display
[4] [2] [•] [5] [0] [R/S]	**50.10**
[4] [8] [•] [0] [0] [R/S]	**56.42**
[5] [1] [•] [2] [5] [R/S]	**60.10**

Figure 17

Answer: One of the programs that performs these calculations is listed below:

Keystroke	Display
f P/R f PRGM	000, PRGM
+	001, 40 PRGM
1	002, 1 PRGM
5	003, 5 PRGM
%	004, 25 PRGM
+	005, 40 PRGM
1	006, 1 PRGM
•	007, 48 PRGM
2	008, 2 PRGM
2	009, 2 PRGM
=	010, 36 PRGM
f P/R g GTO 000	60.10

Figure 18

Example 2: There are many investments to be calculated in your office, and one of the calculations to be done several times is converting continuous nominal rate to effective rate. Write a small program that given a continuous nominal rate returns the effective rate only by hitting R/S key. Then use the program to find the effective rates for these continuous nominal rates: 10.5%, 17.2%, 11.8%, 10.24% and 11.5%. Assume RPN mode.

Solution: The keystroke sequence that calculates effective nominal rate given a continuous nominal rate is:

ENTER 1 x≷y % g e^x Δ%

To write the program that performs the same operations, press:

Keystroke	Display
f P/R f PRGM	000, PRGM
ENTER	001, 36 PRGM
1	002, 1 PRGM
x≷y	003, 34 PRGM
%	004, 25 PRGM
g e^x	005, 43 22 PRGM
Δ%	006, 24 PRGM
f P/R g GTO 000	60.10

Figure 19

The display shows previous results.

Answer: After the program is loaded, simply enter each continuous rate and press [R/S] key to obtain the effective rate.

Keystroke	Display
[1] [0] [•] [5] [R/S]	**11.07**
[1] [7] [•] [2] [R/S]	**18.77**
[1] [1] [•] [8] [R/S]	**12.52**
[1] [0] [•] [2] [4] [R/S]	**10.78**
[1] [1] [•] [5] [R/S]	**12.19**

Figure 20

Going further and additional information

This is a glimpse of what can be done with programs. The HP12C Platinum programming tools allow the user to:

- execute and review programs one step at a time with the use of [SST] and [g] [BST];
- edit programs to correct for errors and add new lines;
- add any available function as program steps in order to create programs with enhanced complexity;
- enhance program efficiency with stack manipulation functions and register storage/retrieval/arithmetic;
- add conditional procedures or jumps ([GTO]) after tests for two conditions: [x=0] and [x≤y].

Any additional information and in-deep examples can be found in the *HP12C Platinum Owner's Handbook and Programming Guide*, parts II and III plus the Appendix A, and in the *HP12C Platinum Solutions Handbook*. Also see the learning module on Programming in Algebraic vs. RPN Modes.