

LOAN/SAVE

Display



(HP-41CX, Hewlett Packard 1983 and DM41X, [SwissMicros](https://www.swissmicros.com) 2020)

Overview¹

Program `L/S` (with subprograms `LOAN` and `SAVE`) calculates monthly payments or savings based on an amount, an interest value and a period. The loan and savings program was written to review different ways of managing the mortgage and savings. Most banks can provide a nice listing but what if the interest changes? Below program may be of help. A feeling of nostalgia will be experienced when calculating a mortgage over a period of 30 years. The calculation loop has to be performed 360 times. The cursor has to move 30 times over the display which is shown by a year-counter.

Calculations

The loan on the basis of annuity is calculated by below algorithm in which **AMT** and **MP** represent the amount respectively monthly payment and **r** is the monthly interest and **m** the number of months:

$$MP = AMT \cdot \frac{r^m}{r^{m-1} + r^{m-2} + \dots + r + 1}$$

$$MP = AMT \cdot \frac{r^m}{r \cdot (r \cdot (r \cdot (\dots) + 1) + 1) + 1}$$

Savings calculation is based on below algorithm in which **SUM** and **MP** represent the lump sum respectively monthly payment:

$$SUM = r \cdot (r \cdot (r \cdot (\dots) + MP) + MP) + MP$$

in which **r** expresses the monthly interest derived from the annual interest **I** (in %) as follows:

$$r = 1 + \frac{I\%}{12 \cdot 100}$$

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Example (1): LOAN

KEYSTROKES	DISPLAY	COMMENTS
		Run L/S (main entry)
[XEQ] [ALPHA] L/S [ALPHA]	L / S ?	Select L for loan
L [R/S]	AMT = ?	Enter the loan AMOUNT
5000 [R/S]	I % = ?	Enter the annual interest
7,5 [R/S]	NRM = ?	Enter the duration in number of months
240 [R/S]	20	Count down in years..
	19	
	.	
	1	
	M.P = 402,80	Monthly payment
[XEQ] [ALPHA] LOAN [ALPHA]	AMT = ?	Run LOAN directly
12000 [R/S]	I % = ?	Enter the annual interest
2 [R/S]	NRM = ?	Enter the duration in number of months
36 [R/S]	3	Count down in years..
	2	
	1	
	M.P = 343,71	Monthly payment
[R/S]	L / S ?	Run again from main entry

Example (2): SAVE

KEYSTROKES	DISPLAY	COMMENTS
		Run L/S (main entry)
[XEQ] [ALPHA] L/S [ALPHA]	L / S ?	Select S for savings
S [R/S]	M.P = ?	Enter the monthly payment
150 [R/S]	I % = ?	Enter the annual interest
3 [R/S]	NRM = ?	Enter the duration in number of months
60 [R/S]	5	Count down in years..
	.	
	1	
	SUM = 9.72 125	Lump sum savings
[CLX]	9.72 124941	Clear display
[XEQ] [ALPHA] SAVE [ALPHA]	M.P = ?	Run SAVE directly
999 [R/S]	I % = ?	Enter the annual interest
1,5 [R/S]	NRM = ?	Enter the duration in number of months
24 [R/S]	2	Count down in years..
	1	
	SUM = 24354,24	Lump sum savings
[R/S]	L / S ?	Run again from main entry

Program Listing

The LOAN program's outcome will be the Monthly Payment for the loan (mortgage) on the basis of annuity and requires the following parameters:

- the Amount to borrow in your own currency
- the effective Annual Interest
- the Number of Months to pay it back

The SAVE program calculates the final Lump Sum you receive after the period of saving and requires the following parameters:

- the Monthly Payment in your own currency
- the effective Annual Interest
- the Number of Months to save your money

The listing below shows an extended command in line 08: ATOX. This is to check whether the input character was an 'L' (value 76). For the C and CV this can be replaced by changing it an ASTO X followed by 'L'. The same applies to line 11 where the compare character is an 'S' (value 83).

The number of bytes can easily be reduced by removing subroutine LBL 06 and its calls XEQ 06 or by deleting lines 01-13.

The listing of program L/S (with subprograms LOAN and SAVE) is given below:

```

01 ▀LBL "L/S"           22 ▀LBL 02             43 CF 29               64 ,
02 ▀LBL 00              23 XEQ 06             44 RTN                 65 ▀LBL 03
03 "L/S?"              24 RCL 01             45 ▀LBL 06            66 XEQ 06
04 AON                  25 +                  46 RCL 03             67 RCL 02
05 PROMPT              26 RCL 02             47 STO 04             68 *
06 AOFF                 27 *                  48 RDN                 69 1
07 76                   28 DSE 03            49 12                  70 +
08 ATOX                 29 GTO 02             50 ST/ 04             71 DSE 03
09 X=Y?                 30 "SUM="            51 X<> 04             72 GTO 03
10 GTO "LOAN"          31 GTO 07             52 FRC                 73 /
11 83                    32 ▀LBL 05            53 X=0?                74 *
12 X#Y?                 33 PROMPT            54 VIEW L              75 "M.P="
13 GTO 00               34 STO 01            55 RDN                 76 ▀LBL 07
14 ▀LBL "SAVE"          35 "I%=?"            56 RTN                 77 FIX 2
15 "M.P=?"             36 PROMPT            57 ▀LBL "LOAN"        78 ARCL X
16 XEQ 05               37 1200              58 "AMT=?"            79 FIX 5
17 *                    38 /                  59 XEQ 05             80 SF 29
18 "NR.M=?"           39 1                   60 "NR.M=?"          81 AVIEW
19 PROMPT              40 +                   61 PROMPT             82 END
20 STO 03              41 STO 02            62 STO 03
21 CLX                  42 FIX 0             63 Y^X

```

(177 bytes)

Registers, Labels and Flags

REGISTERS	COMMENTS	LABELS	COMMENTS
R01	Loan amount or monthly payment	LBL00	Main entry
R02	Annual interest	LBL02	Loop around savings
R03	Duration in number of months	LBL03	Loop around loan
R04	Work register for count down	LBL05	Common stop for interest
		LBL06	Calculate year count down
		LBL07	Reset default, show result

FLAGS	COMMENTS
29	Type of thousands separator

Downloads

The RAW/TXT format of the program is available via the website: [LOAN+SAVE](#) (in zip file).