

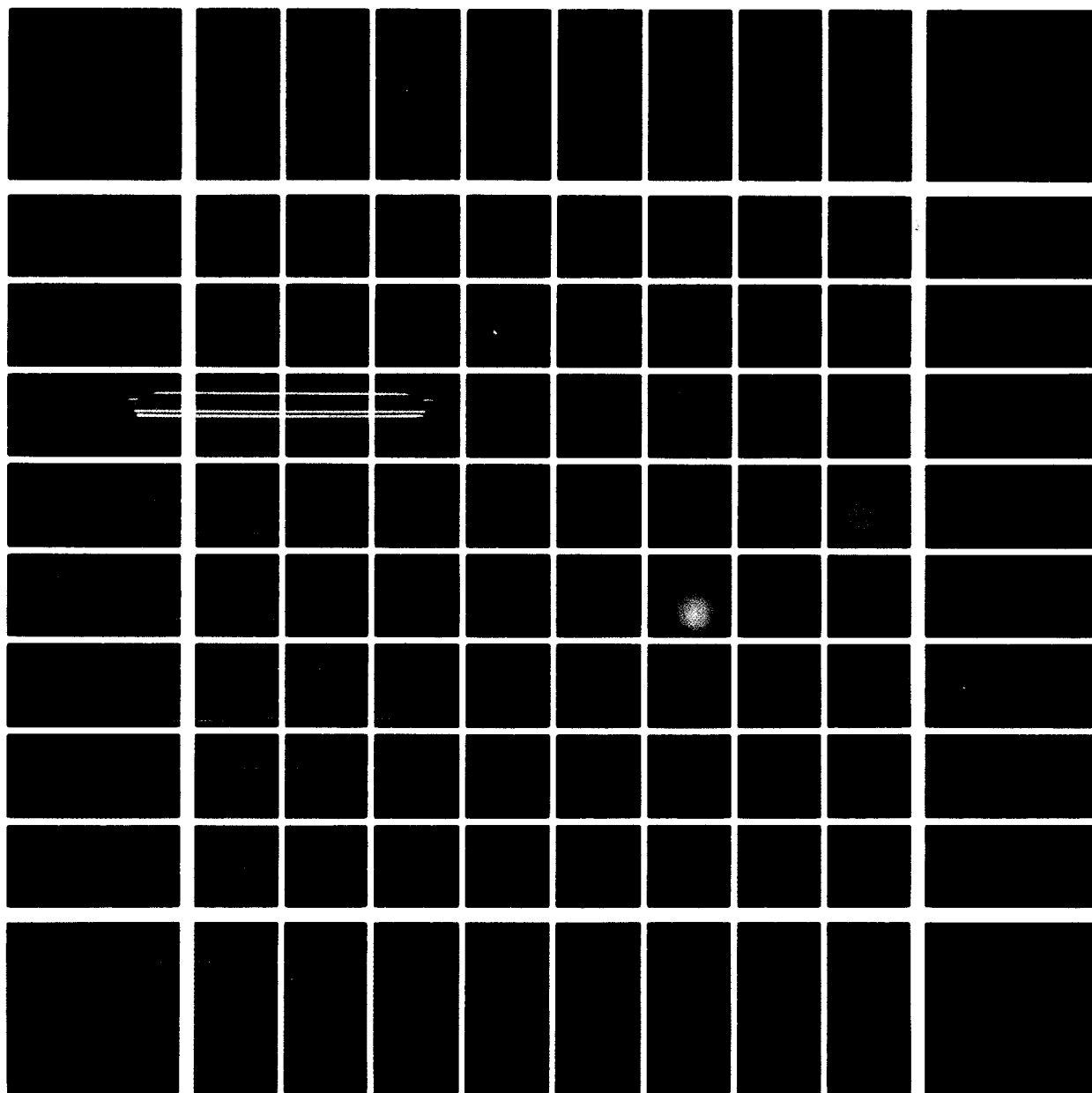
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HEWLETT-PACKARD

HP-41

USERS' LIBRARY SOLUTIONS

Lend/Lease/Savings



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INTRODUCTION

This HP-41C Solutions book was written to help you get the most from your calculator. The programs were chosen to provide useful calculations for many of the common problems encountered.

They will provide you with immediate capabilities in your everyday calculations and you will find them useful as guides to programming techniques for writing your own customized software. The comments on each program listing describe the approach used to reach the solution and help you follow the programmer's logic as you become and expert on your HP calculator.

KEYING A PROGRAM INTO THE HP-41C

There are several things that you should keep in mind while you are keying in programs from the program listings provided in this book. The output from the HP 82143A printer provides a convenient way of listing and an easily understood method of keying in programs without showing every keystroke. This type of output is what appears in this handbook. Once you understand the procedure for keying programs in from the printed listings, you will find this method simple and fast. Here is the procedure:

- At the end of each program listing is a listing of status information required to properly execute that program. Included is the SIZE allocation required. Before you begin keying in the program, press **XEQ** **ALPHA** **SIZE** **ALPHA** and specify the allocation (three digits; e.g., 10 should be specified as 010).

Also included in the status information is the display format and status of flags important to the program. To ensure proper execution, check to see that the display status of the HP-41C is set as specified and check to see that all applicable flags are set or clear as specified.
- Set the HP-41C to PRGM mode (press the **PRGM** key) and press **■** **GTO** **♦** **♦** to prepare the calculator for the new program.
- Begin keying in the program. Following is a list of hints that will help you when you key in your programs from the program listings in this handbook.
 - When you see " (quote marks) around a character or group of characters in the program listing, those characters are ALPHA. To key them in, simply press **ALPHA**, key in the characters, then press **ALPHA** again. So "SAMPLE" would be keyed in as **ALPHA** "SAMPLE" **ALPHA**.
 - The diamond in front of each LBL instruction is only a visual aid to help you locate labels in the program listings. When you key in a program, ignore the diamond.
 - The printer indication of divide sign is /. When you see / in the program listing, press **÷**.
 - The printer indication of the multiply sign is \times . When you see \times in the program listing, press **×**.
 - The \dagger character in the program listing is an indication of the **APPEND** function. When you see \dagger , press **■** **APPEND** in ALPHA mode (press **■** and the K key).
 - All operations requiring register addresses accept those addresses in these forms:

nn (a two-digit number)

IND nn (INDIRECT: **■**, followed by a two-digit number)

X, Y, Z, T, or L (a STACK address: **♦** followed by X, Y, Z, T, or L)

IND X, Y, Z, T or L (INDIRECT stack: **■** **♦** followed by X, Y, Z, T, or L)

Indirect addresses are specified by pressing **■** and then the indirect address. Stack addresses are specified by pressing **♦** followed by X, Y, Z, T, or L. Indirect stack addresses are specified by pressing **■** **♦** and X, Y, Z, T, or L.

Printer Listing

Keystrokes

Display

```

01 ♦ LBL "SAM
PLE"
02 "THIS IS
A "
03 "†SAMPLE
"
04 AVIEW
05 6
06 ENTER†
07 -2
08 /
09 ABS
10 STO IND
L
11 "R3="
12 ARCL 03
13 AVIEW
14 RTN

```

```

■ LBL ALPHA SAMPLE ALPHA
ALPHA THIS IS A ALPHA
ALPHA ■ APPEND SAMPLE
■ AVIEW ALPHA
6
ENTER+
2 CHS
÷
XEQ ALPHA ABS ALPHA
STO ■ ♦ L
ALPHA R3= ■ ARCL 03
■ AVIEW
ALPHA
■ RTN

```

```

01 LBLT SAMPLE
02T THIS IS A
03T † SAMPLE
04 AVIEW
05 6
06 ENTER /
07 -2
08 /
09 ABS
10 STO IND L
11T R3=
12 ARCL 03
13 AVIEW
14 RTN

```


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3.	AMORTIZATION SCHEDULE	13
	This program calculates and prints or displays an amortization schedule.	
4.	ADD-ON TO APR WITH ODD DAYS	21
	This program calculates the monthly payment amount, total finance charge, and the Annual Percentage Rate (APR) for an add-on rate loan.	
*5.	SAVINGS PLAN	28
	This program determines interest earned on a savings account using as input the date and amount of each transaction.	
6.	INTEREST CONVERSIONS	37
	This program does simple interest calculations and converts between nominal and effective rates.	
7.	LEASE WITH ADDITIONAL PAYMENTS IN ADVANCE	47
	Solves for the payment and APR of a lease when more than one payment is made at the time of closing.	
8.	SKIPPED PAYMENTS	54
	Finds payment amount for a loan or lease with a specific set of monthly payments skipped each year.	
9.	COMPOUNDING PERIODS DIFFERENT FROM PAYMENT PERIODS	60
	Calculates number of payments, payment amount or future value.	
*10.	COMPOUND INTEREST SOLUTIONS	68
	Duplicates the top row keys of HP financial calculators. Also allows for payments at the beginning or the end of the month.	

*Requires one memory module.

CONSTANT PAYMENT TO PRINCIPAL LOAN

This type of loan is structured such that the principal is repaid in equal installments with the interest added to each payment. Therefore, each periodic payment is different; it has a constant amount applied to the principal and a decreasing amount to the interest.

The first part of the program displays the payment number and calculates the payment to interest, total payment, remaining balance, and total interest. The constant payment to principal required as input data (CPMT) can be found by dividing the loan amount by the total number of payment periods. The schedule may be started at any desired payment period; that is, the value entered for K need not be 1.

The second part of the program calculates the accumulated interest between any two payments J and K. The necessary inputs are the periodic interest rate, constant payment, initial loan amount, and the numbers of the starting and ending payments in the time frame.

Equations:

$$BAL_K = PV - (K \times CPMT)$$

$$Kth \text{ payment to interest} = (i) (BAL_{K-1}) = (PMT_i)_K$$

$$Kth \text{ total payment} = CPMT + (PMT_i)_K$$

$$\text{Total interest to payment } K =$$

$$\left[\frac{\frac{(2 - K) CPMT}{PV} + 2}{2} \right] [(K - 1) (I/100) (PV)]$$

Example:

A twenty year 8% loan for \$100,000.00 is being amortized by annual payments to principal of \$5000.00 plus interest on the remaining balance. Generate a two year amortization schedule on this loan. How much interest is accumulated during years 5 to 10 inclusive?

Solution: (Keystrokes reflect a printer in the system)

Keystrokes:

[USER]
 [XEQ] [ALPHA] SIZE [ALPHA] 008
 [XEQ] [ALPHA] CPMT [ALPHA]
 [A]
 1 [R/S]
 8 [R/S]
 5000 [R/S]
 100000 [R/S]

[R/S] [B]
 8 [R/S]
 5000 [R/S]
 100000 [R/S]
 5 [R/S]
 10 [R/S]

Display:

(Set USER mode)

K?
 INT?
 CPMT?
 PV?
 K=1.00
 PMT. I.=8,000.00
 T. PMT.=13,000.00
 BAL.=95,000.00
 T. INT.=8,000.00
 K=2.00
 PMT. I.=7,600.00
 T. PMT.=12,600.00
 BAL.=90,000.00
 T. INT.=15,600.00
 INT?
 CPMT?
 PV?
 B. PER. NO.?
 E. PER. NO.?
 ACC. INT.=32,400.00

User Instructions

				SIZE: 008
STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Key in the program and set USER mode		USER	
2.	Initialize		[XEQ] CPMT	
3.	To generate an amortization schedule, press		[A]	K ?
4.	Input: first period of sched. (need not			
	be 1)	K	[R/S]	INT ?
	periodic interest rate (%)	INT	[R/S]	CPMT ?
	constant payment to principal	CPMT	[R/S]	PV ?
	initial loan amount	VP	[R/S]	K = 1
5.	Find: payment to interest		[R/S]*	PMT. I. = ()
	total payment		[R/S]*	T. PMT. = ()
	remaining balance		[R/S]*	BAL. = ()
	total interest		[R/S]*	T. INT. = ()
6.	For the next period, press [R/S]		[R/S]*	K = (K+1)
	and go to step 5.			
7.	To find the accumulated interest between			
	any two points, press		[B]	INT ?
8.	Input: periodic interest rate (%)	INT	[R/S]	CPMT ?
	constant payment to principal	CPMT	[R/S]	PV ?
	initial loan amount	PV	[R/S]	B. PER. NO. ?
	beginning period number	J	[R/S]	E. PER. NO. ?
	ending period number	K	[R/S]	ACC. INT. = ()
*	These steps need not be performed when			
	there is a printer in the system.			

Program Listings

97 RCL 06	Display routine	51	
98 STO 00			
99 XEQ 00			
100 RCL 05			
101 X<>Y			
102 -			
103 "ACC. IN			
T."			
104*LBL 09			
105 "I="		60	
106 ARCL X			
107 AVIEW			
108 RTN			
109 .END.			
20		70	
30		80	
40		90	
50		00	

CONSTANT PAYMENT TO
PRINCIPAL LOAN
PROGRAM REGISTERS NEEDED: 34

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LENDING SAVING & LEASING

ROW 1 (1 - 4)



ROW 2 (5 - 10)



ROW 3 (10 - 15)



ROW 4 (15 - 21)



ROW 5 (22 - 30)



ROW 6 (31 - 41)



ROW 7 (41 - 45)



ROW 8 (45 - 48)



ROW 9 (48 - 57)



ROW 10 (58 - 70)



ROW 11 (70 - 73)



ROW 12 (74 - 83)



ROW 13 (83 - 87)



ROW 14 (87 - 90)



ROW 15 (90 - 90)



ROW 16 (91 - 99)



ROW 17 (100 - 103)



ROW 18 (104 - 109)



RULE OF 78's

This program calculates the unearned interest (rebate) as well as the remaining principal due for a prepaid consumer loan using the rule of 78's.

Equations:

$$REB_K = (N - K) \frac{FC (N - K + 1)}{N (N + 1)}$$

$$BAL_K = (N - K) PMT - REBATE_K$$

Example:

A \$1,000 loan, with a total finance charge of \$180.00 is being paid at \$39.33 per month for 30 months. What is the unearned interest (rebate) and remaining balance after the 25th regular payment?

Solution:

Keystrokes:

[XEQ] [ALPHA] SIZE [ALPHA] 005

[XEQ] [ALPHA] RULE [ALPHA]

30 [R/S]

25 [R/S]

39.33 [R/S]

180 [R/S]

[R/S]

Display:

N ?

K ?

PMT ?

FC ?

REB=\$5.81

BAL=\$190.84

User Instructions

[illegible]

Program Listings

01♦LBL "RUL		51	
E"			
02 "N ?"	Prompt and		
03 PROMPT	store data		
04 STO 00			
05 "K ?"			
06 PROMPT			
07 STO 01			
08 "PMT ?"			
09 PROMPT			
10 STO 02		60	
11 "FC ?"			
12 PROMPT			
13 STO 03			
14 RCL 00			
15 RCL 01			
16 -			
17 1			
18 +			
19 RCL 03	Calculate		
20 *	rebate	70	
21 RCL 00			
22 X↑2			
23 LASTX			
24 +			
25 /			
26 RCL 00			
27 RCL 01			
28 -			
29 *			
30 STO 04		80	
31 "REB"			
32 XEQ 09			
33 RCL 02	Calculate		
34 RCL 00	remaining		
35 RCL 01	balance		
36 -			
37 *			
38 RCL 04			
39 -			
40 "BAL"		90	
41♦LBL 09			
42 "F=\$"			
43 ARCL X	Display routine		
44 PROMPT			
45 RTN			
46 .END.			
50		00	

DATA REGISTERS				STATUS							
00	N	50		SIZE	005	TOT. REG.	17	USER MODE			
	K			ENG		FIX	2	SCI	ON	OFF	X
	PMT			DEG		RAD		GRAD			
	FC										
	REB										
05		55		FLAGS							
				#	INIT S/C	SET INDICATES		CLEAR INDICATES			
0		60									
5		65									
0		70									
5		75									
0		80									
5		85									
				ASSIGNMENTS							
				FUNCTION		KEY		FUNCTION		KEY	
0		90									
5		95									

RULE OF 78'S

PROGRAM REGISTERS NEEDED: 12

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LENDING SAVING & LEASING

ROW 1 (1 - 3)



ROW 2 (4 - 8)



ROW 3 (9 - 17)



ROW 4 (18 - 30)



ROW 5 (31 - 38)



ROW 6 (39 - 44)



ROW 7 (45 - 46)



AMORTIZATION SCHEDULE

This program finds both the total interest paid over a specified number of payment periods and the remaining balance at the end of the last specified period, given the periodic interest rate, periodic payment amount, loan amount, and the beginning and ending payment numbers for the time span being considered. The payments associated with both the beginning (J) and the ending (K) payment periods are included in the calculation.

The program can be used for loans with a balloon payment as well as loans arranged to be fully amortized provided two cautions are observed. First, the balloon payment of the loan must be at the same time as, and in addition to, the last payment. Second, care should be taken not to enter a value for K that is after the last payment since the program has no way of knowing the term of the loan.

An option is available to output the amortization schedule between payments J and K.

Equations:

$$BAL_K = \frac{1}{(1+i)^{-K}} \left[PMT \frac{(1+i)^{-K} - 1}{i} + PV \right]$$

$$INT_{J-K} = BAL_K - BAL_{J-1} + (K - J + 1) \cdot PMT$$

where:

$$\text{Kth payment to principal} = BAL_{K-1} - BAL_K$$

$$\text{Kth payment to interest} = PMT - (BAL_{K-1} - BAL_K)$$

$$\text{Total payment to interest} = (K) \times (PMT) - (PV - BAL_K)$$

Notes:

For loans scheduled to be fully amortized, the remaining balance after the last payment period may be slightly more or less than zero. This is because the program assumes that all payments are equal to the value entered for PMT. In fact for most loans, the last payment is slightly more or less than the rest.

The calculator performs all internal calculations to ten digits. If the user wishes to round the schedule to dollars and cents, the following sequence may be used:

1. Press [///] [GTO] . 120
2. [PRGM]
3. [XEQ] [ALPHA] RND [ALPHA]
4. [PRGM]

Example 1:

A mortgage is arranged such that the first payment is made at the end of October, 1978 (i.e., October is payment period 1). It is a \$20,000 loan at 9%, with monthly payments of \$167.84. What is the accumulated interest for 1978 (periods 1-3) and 1979 (periods 4-15) and what would the remaining balance be at the end of each year?

Keystrokes:

Display:

[USER]	(Set USER mode)
[XEQ] [ALPHA] SIZE [ALPHA] 009	
[XEQ] [ALPHA] AMORT [ALPHA]	INT ?
9 [ENTER ↑] 12 [÷] [R/S]	PMT ?
167.84 [R/S]	PV ?
20000 [R/S]	J ?
1 [R/S]	K ?
3 [R/S] [A]	INT=449.60
	BAL=19,946.08
[C]	J ?
4 [R/S]	K ?
15 [R/S] [A]	INT=1,785.89
	BAL=19,717.88

Example 2:

Generate an amortization schedule for the first two payments of a \$30,000, 7% mortgage having monthly payments of \$200. Then jump ahead and generate the data for the 36th payment.

Solution: (Keystrokes reflect a printer in the system)

[XEQ] [ALPHA] AMORT [ALPHA]	INT ?
7 [ENTER ↑] 12 [÷] [R/S]	PMT ?
200 [R/S]	PV ?
30000 [R/S]	J ?
1 [R/S]	K ?
2 [R/S] [B]	PMT NO.=1.00
	INT=175.00
	PRIN=25.00
	BAL=29,975.00
	ΣINT=175.00
	PMT NO.=2.00

[C]

36 [R/S]

36 [R/S] [B]

INT=174.85

PRIN=25.15

BAL=29,949.85

Σ INT=349.85

J ?

K ?

PMT NO.=36.00

INT=169.36

PRIN=30.64

BAL=29,001.75

Σ INT=6,201.75

User Instructions

				SIZE: 009
STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Key in the program and set USER mode		[USER]	
2.	Initialize the program		[XEQ] AMORT	INT ?
3.	Input: periodic interest rate (%)	INT	[R/S]	PMT ?
	periodic payment amount	PMT	[R/S]	PV ?
	initial loan amount	PV	[R/S]	J ?
	starting period no.	J	[R/S]	K ?
	ending period no.	K	[R/S]	
4.	Find the total interest paid between			
	periods J and K inclusive and the balance		[A]	INT= ()
	at the end of period K - OR -		[R/S]*	BAL=()
5.	Generate the amortization schedule (J to K)		[B]	PMT NO.=()
6.			[R/S]*	INT=()
			[R/S]*	PRIN=()
			[R/S]*	BAL=()
			[R/S]*	Σ INT=()
7.	Press		[R/S]*	PMT NO.=()
	and go to step 6.			
8.	To change J and K, press		[C]	J ?
	and input: J	J	[R/S]	K ?
	and K	K	[R/S]	
9.	Go to step 4 or 5			
*	These keystrokes need not be performed			
	when there is a printer in the system.			

Program Listings

01♦LBL "AMO RT"	Initialize	51 +	
02 SF 21		52 RCL 02	
03 "INT ?"		53 *	
04 PROMPT	Prompt and store data	54 +	
05 1 E2		55 "INT"	
06 /		56 XEQ 09	
07 STO 01		57 RCL 04	
08 "PMT ?"		58 "BAL"	
09 PROMPT		59 XEQ 09	
10 STO 02		60 STOP	
11 "PV ?"		61♦LBL B	Generate Amortization
12 PROMPT		62 RCL 07	
13 STO 03		63 ADV	
14♦LBL C		64 "PMT NO."	
15 "J ?"		"	
16 PROMPT		65 XEQ 09	
17 STO 07		66 1	
18 "K ?"		67 RCL 01	
19 PROMPT		68 +	
20 STO 00		69 STO 08	
21 STOP		70 RCL 07	
22♦LBL A		71 XEQ 01	
23 RCL 00		72 STO 04	
24 RCL 07		73 RCL 08	
25 X<=Y?	Calculate total interest between two periods and balance at end	74 RCL 07	
26 GTO 00		75 1	
27 STO 00		76 -	
28 RDN		77 XEQ 01	
29 STO 07		78 RCL 04	
30♦LBL 00		79 -	
31 1		80 STO 06	
32 RCL 01		81 RCL 02	
33 +		82 X<>Y	
34 STO 08		83 -	
35 RCL 00		84 "INT"	
36 XEQ 01		85 XEQ 09	schedule
37 STO 04		86 RCL 06	
38 RCL 08		87 "PRIN"	
39 RCL 07		88 XEQ 09	
40 1		89 RCL 04	
41 -		90 "BAL"	
42 XEQ 01		91 XEQ 09	
43 CHS		92 RCL 07	
44 RCL 04		93 RCL 02	J ≤ K
45 +		94 *	
46 STO 06		95 RCL 03	
47 RCL 00		96 RCL 04	
48 RCL 07		97 -	
49 -		98 -	
50 1		99 "Σ INT"	
		100 XEQ 09	

Program Listings

101 1		51	
102 ST+ 07			
103 RCL 00			
104 RCL 07			
105 X<=Y?			
106 GTO B			
107♦LBL 01			
108 CHS			
109 Y↑X			
110 STO 05		60	
111 1			
112 -			
113 RCL 01			
114 /			
115 RCL 02			
116 *			
117 RCL 03			
118 +			
119 RCL 05			
120 /		70	
121 RTN			
122♦LBL 09	Display routine		
123 "I="			
124 ARCL X			
125 AVIEW			
126 RTN			
127 END			
30		80	
40		90	
50		00	

DATA REGISTERS				STATUS							
0	K	50		SIZE	009	TOT. REG.	40	USER MODE			
	i/100			ENG		FIX	2	SCI	ON	X	OFF
	PMT			DEG		RAD		GRAD			
	PV			FLAGS							
	used										
5	used	55		#	INIT	SET INDICATES		CLEAR INDICATES			
	used			21	S	refer to owner's manual					
	J										
	1 + 1/100										
0		60									
5		65									
0		70									
5		75									
0		80									
5		85									
0		90									
5		95									

AMORTIZATION SCHEDULE

PROGRAM REGISTERS NEEDED: 32

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LENDING SAVING & LEASING

ROW 1 (1 - 3)



ROW 2 (3 - 8)



ROW 3 (8 - 14)



ROW 4 (14 - 20)



ROW 5 (21 - 31)



ROW 6 (32 - 42)



ROW 7 (42 - 53)



ROW 8 (54 - 58)



ROW 9 (59 - 64)



ROW 10 (64 - 71)



ROW 11 (71 - 81)



ROW 12 (82 - 87)



ROW 13 (87 - 91)



ROW 14 (92 - 99)



ROW 15 (100 - 107)



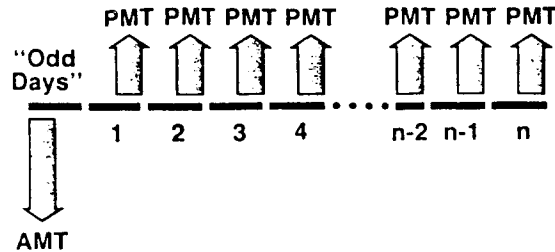
ROW 16 (108 - 120)



ROW 17 (121 - 127)



ADD-ON TO APR WITH ODD DAYS



This program calculates the monthly payment amount, total finance charge, and the Annual Percentage Rate (APR) for an add-on rate loan.

When a loan is initiated in the middle of a month, the first payment is generally not required until the end of the first full month. The number of days from the beginning of the loan to the beginning of the first month (see above diagram) are called "odd days" and decrease the APR to be quoted with the loan. The calculation of the APR considers these odd days.

Equations:

$$FC = AMT \cdot \left(\frac{N + h}{12} \right) \cdot AIR$$

$$PMT = \frac{AMT + FC}{N} = AMT (1+i)^h \left[\frac{i}{1 - (1+i)^{-N}} \right]$$

$$APR = 12i$$

where:

$$h = ODD \cdot 12/365$$

Example:

A 36 month car loan for \$3,500 with a 6% add-on rate is initiated such that there are 18 "odd days". Calculate the monthly payment required to amortize this loan, the total finance charge, and the annual percentage rate.

Solution:

Keystrokes:

Display:

[XEQ] [ALPHA] SIZE [ALPHA] 008

[XEQ] [ALPHA] ADD [ALPHA]

ODD ?

18 [R/S]

N ?

36 [R/S]

AIR ?

6 [R/S]

PV ?

3500 [R/S]

PMT=115.01

[R/S]

FC=640.36

[R/S]

APR=10.89

User Instructions

SIZE: 008

[illegible]

Program Listings

01*LBL "ADD		51 +	
02 "ODD ?"		52 STO 06	
03 PROMPT	Prompt and store	53 RCL 02	
04 STO 00	data	54 CHS	
05 12		55 Y↑X	
06 *		56 STO 07	
07 365		57 -	
08 /		58 RCL 00	
09 STO 01		59 /	
10 "N ?"		60 RCL 05	
11 PROMPT		61 *	
12 STO 02		62 RCL 06	Calculate f'(i)
13 "AIR ?"		63 RCL 01	
14 PROMPT		64 Y↑X	
15 STO 03		65 RCL 04	
16 "PV ?"		66 *	
17 PROMPT		67 -	
18 STO 04		68 RCL 07	
19 RCL 02		69 RCL 06	
20 RCL 01		70 /	
21 +		71 RCL 02	
22 12		72 1	
23 /		73 +	
24 RCL 03	Calculate payment	74 *	
25 *	and finance	75 RCL 00	
26 E2	charge	76 *	
27 /		77 1	
28 RCL 04		78 RCL 07	
29 *		79 -	
30 STO 00		80 RCL 00	
31 RCL 04		81 +	
32 +		82 -	
33 RCL 02		83 RCL 00	
34 /		84 X↑2	
35 STO 05		85 /	
36 "PMT"		86 RCL 05	
37 XEQ 09		87 *	
38 RCL 00		88 RCL 06	
39 "FC"		89 RCL 01	
40 XEQ 09		90 Y↑X	
41 RCL 03		91 RCL 06	
42 12 E2		92 /	
43 /		93 RCL 01	
44 X=0?		94 X<>Y	
45 GTO 08		95 *	
46 STO 00		96 LASTX	
47*LBL 01		97 -	
48 1		98 RCL 04	
49 RCL 00		99 *	
50 1	Calculate f(i)	100 -	

	101 /			51	
	102 RCL 00				
	103 X<>Y				
	104 -				
	105 STO 00				
	106 LASTX				
	107 ABS				
	108 E6-				
	109 X<=Y?				
	110 GTO 01			60	
	111 RCL 00				
	112 1200				
	113 *				
	114+LBL 08				
	115 "APR"				
	116+LBL 09				
	117 "I="				
	118 ARCL X				
	119 PROMPT				
	120 RTN			70	
	121 .END.				
30				80	
40				90	
50				00	

DATA REGISTERS				STATUS			
00	ODD	50		SIZE	008	TOT. REG.	34
	h			ENG		FIX	
	N			DEG		RAD	
	AIR			SCI		GRAD	
	PV						
05	PMT	55		FLAGS			
	$1 + I/100$			#	INIT S/C	SET INDICATES	CLEAR INDICATES
	$(1+I/100)^N$						
10		60					
15		65					
20		70					
25		75					
30		80					
35		85					
				ASSIGNMENTS			
				FUNCTION	KEY	FUNCTION	KEY
40		90					
45		95					

ADD-ON TO APR WITH ODD DAYS

PROGRAM REGISTERS NEEDED: 26

HEWLETT PACKARD
SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 1 (1 - 2)



ROW 2 (3 - 10)



ROW 3 (10 - 16)



ROW 4 (16 - 25)



ROW 5 (26 - 36)



ROW 6 (36 - 41)



ROW 7 (42 - 50)



ROW 8 (51 - 63)



ROW 9 (64 - 76)



ROW 10 (77 - 89)



ROW 11 (90 - 102)



ROW 12 (103 - 112)



ROW 13 (112 - 117)



ROW 14 (118 - 121)



SAVINGS PLAN

This program determines interest earned on a savings account using as input the date and amount of each transaction in the period. Accommodates:
 a) Periodic or continuous compounding; b) 360 or 365 day convention; c) interest earned or forfeited on withdrawal date; and d) adjusts for leap years. One memory module will be required.

Equations:

<p>For continuous compounding:</p> $r = e^{iy/z} - 1$ <p>For periodic compounding:</p> $r = (1+i/n)^{ny/z} - 1$ <p>Interest = $[(1+r)^{d/y} - 1] A$</p>	<p>r = effective annual interest rate e = constant = 2.718281828 (decimal) i = nominal annual interest rate (decimal) y = # days in full year z = 360 or 365 (interest convention) n = # of compounding periods per year</p> <p>d = days of interest A = Amount of transaction</p>
--	--

NOTE:

If the effective annual interest rate is known, rather than the nominal rate, it should be used at step 3.

References: HP-65 USERS' LIBRARY program #02063A by Keith Rumbel
 HP-67/HP-97 USERS' LIBRARY program #00288D by Howard Kutner

Example:

Nominal Interest Rate - 5½%
 Continuously compounded
 Leap year
 Interest on withdrawal date
 360 Day basis

<u>Transaction</u>	<u>Date</u>	<u>Amt.</u>
Opening balance	1/1	4377.53
Withdrawal	1/15	700.00
Deposit	3/5	425.00

Solution:

Keystrokes:

[USER]
 [XEQ] [ALPHA] SIZE [ALPHA] 012
 [XEQ] [ALPHA] SAVE [ALPHA]
 5.25 [R/S]
 [ALPHA] CONT [ALPHA] [R/S]
 [ALPHA] LEAP [ALPHA] [R/S]
 [ALPHA] Y [ALPHA] [R/S]
 360 [R/S]
 1 [R/S] [A]
 1.01 [R/S]
 4377.53 [R/S]
 [B]
 1.15 [R/S]
 700 [R/S]
 [A]
 3.05 [R/S]
 425 [R/S] [D]
 [R/S]
 [R/S]

Display:

(Set USER mode)

INT ?
 CONT/PER ?
 LEAP/NORM ?
 INT ON W/D DATE ? (Y/N)
 INT BASIS ? (360/365)
 QUARTER NO. ?
 DATE (MM.DD) ?
 DEP. AMT ?
 NEXT TRANS. ?
 DATE (MM.DD) ?
 W/D AMT ?
 NEXT TRANS. ?
 DATE (MM.DD) ?
 DEP. AMT ?
 ACC. INT=\$52.36
 BAL=\$4,102.53
 T. BAL=\$4,154.89

User Instructions

				SIZE: 012
STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Key in the program and set USER mode		[USER]	
2.	Initialize the program		[XEQ] SAVE	INT ?
3.	Input: nominal interest rate (%)	INT	[R/S]	CONT/PER ?
	continuous or periodic compounding	"CONT" or "PER"	[R/S]	LEAP/NORM ?
	leap year or normal year	"LEAP" or "NORM"	[R/S]	INT ON W/D DATE ? (Y/N)
	interest earned on withdrawal date	"Y" or "N"	[R/S]	INT BASIS ? (360/365)
	interest basis	360 or 365	[R/S]	QUARTER NO. ?
	and quarter number of year	1,2,3 or 4	[R/S]	
	TRANSACTIONS:			
4.	For a deposit , press		[A]	DATE(MM.DD)
	input date	MM.DD	[R/S]	DEP. AMT ?
	and amount of deposit	\$	[R/S]	NEXT TRANS.?
5.	For a withdrawal, press		[B]	DATE(MM.DD)
	input date	MM.DD	[R/S]	W/D AMT ?
	and amount of withdrawal	\$	[R/S]	NEXT TRANS.?
	AT ANY TIME			
6.	Display: accumulated interest		[D]	ACC. INT=\$ ()
	balance (without interest)		[R/S]	BAL=\$ ()
	and total balance		[R/S]	T. BAL=\$ ()
7.	For a new case:			
	a) same parameters	0	[STO] 06	
	(clear accumulating registers)		[STO] 07	
	and go to step 4			
	b) entirely new case, go to step 2			

Program Listings

<pre> 01*LBL "SAV E" 02 "INT ?" 03 PROMPT 04 E2 05 / 06 STO 00 07 0 08 STO 08 09 + 10 CF 00 11 CF 01 12 CF 03 13 CF 02 14 "CONT/PE R ?" 15 PROMPT 16 ASTO Y 17 "CONT" 18 ASTO X 19 X=Y? 20 GTO 09 21 "NO. PER IODS ?" 22 PROMPT 23 STO 08 24 SF 02 25*LBL 09 26 365 27 STO 09 28 CF 00 29 "LEAP/NO RM ?" 30 PROMPT 31 ASTO Y 32 "NORM" 33 ASTO X 34 X=Y? 35 GTO 10 36 SF 00 37 366 38 STO 09 39*LBL 10 40 CF 01 41 " INT 0 N W/D DA" 42 "FTE ? < Y/N>" 43 PROMPT 44 ASTO Y 45 "Y" </pre>	<p>Prompt and store data</p>	<pre> 46 ASTO X 47 X=Y? 48 SF 01 49 " INT BASIS ? " 50 "F<360/3 65>" 51 PROMPT 52 STO 10 53 "QUARTER NO. ?" 54 PROMPT 55 31 56 STO 01 57 STO 02 58 STO 03 59 CLX 60 STO 06 61 STO 07 62 + 63 STO 11 64 3 65 * 66 STO 04 67 1 68 DSE 11 69 GTO 02 70 RCL 02 71 3 72 - 73 FS? 00 74 1 75 FS? 00 76 + 77 STO 02 78 GTO 07 79*LBL 02 80 DSE 11 81 GTO 03 82 ST- 01 83 ST- 03 84 GTO 07 85*LBL 03 86 DSE 11 87 GTO 04 88 ST- 03 89 GTO 07 90*LBL 04 91 ST- 02 92*LBL 07 93 RCL 09 </pre>	<p>Store No. of days in each month of the quarter</p>
--	------------------------------	---	---

Program Listings

<pre> 94 RCL 10 95 / 96 FS?C 02 97 GTO 08 98 RCL 00 99 * 100 1 101 E↑X 102 X<>Y 103 Y↑X 104 STO 05 105 RTN 106♦LBL 08 107 RCL 08 108 * 109 RCL 00 110 LASTX 111 / 112 1 113 + 114 X<>Y 115 Y↑X 116 STO 05 117 RTN 118♦LBL B 119 XEQ 13 120 "W/D AMT ?" 121 PROMPT 122 CHS 123 FS? 01 124 SF 02 125 SF 03 126♦LBL A 127 FC? 03 128 XEQ 13 129 "DEP. AM T?" 130 FC?C 03 131 PROMPT 132 ST+ 07 133 X<>Y 134 FS?C 02 135 GTO 03 136 1 137 + 138♦LBL 03 139 RCL 09 140 / 141 RCL 05 142 X<>Y </pre>	<p>Continuous com- pounding effective rate</p> <p>Periodic com- pounding effective rate</p> <p>Withdrawal routine</p> <p>Deposit routine</p> <p>Interest calculation</p>	<pre> 143 Y↑X 144 1 145 - 146 * 147 RND 148 ST+ 06 149 "NEXT TR ANS.?" 150 PROMPT 151♦LBL 13 152 "DATE <M M.DD>?" 153 PROMPT 154 FRC 155 RCL 04 156 1 157 LASTX 158 INT 159 - 160 + 161 STO 11 162 RCL 03 163 R↑ 164 E2 165 * 166 - 167 DSE 11 168 GTO 01 169 RTN 170♦LBL 01 171 RCL 02 172 + 173 DSE 11 174 GTO 02 175 RTN 176♦LBL 02 177 RCL 01 178 + 179 RTN 180♦LBL D 181 RCL 06 182 "ACC. IN T" 183 XEQ 12 184 RCL 07 185 "BAL" 186 XEQ 12 187 + 188 "T. BAL" 189♦LBL 12 190 "T=\$" </pre>	<p>Determine no. of days</p> <p>Display results</p>
--	--	---	---

Program Listings

191 ARCL X		51	
192 PROMPT			
193 RTN			
194 .END.			
10		60	
20		70	
30		80	
40		90	
50		00	

[illegible]

SAVINGS PLAN

PROGRAM REGISTERS NEEDED: 64

HEWLETT PACKARD
SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 1 (1 - 2)



ROW 2 (2 - 11)



ROW 3 (12 - 14)



ROW 4 (14 - 19)



ROW 5 (20 - 21)



ROW 6 (21 - 28)



ROW 7 (28 - 29)



ROW 8 (30 - 35)



ROW 9 (36 - 41)



ROW 10 (41 - 42)



ROW 11 (42 - 44)



ROW 12 (44 - 49)



ROW 13 (49 - 50)



ROW 14 (50 - 53)



ROW 15 (53 - 54)



ROW 16 (55 - 66)



ROW 17 (67 - 75)



ROW 18 (76 - 83)



SAVINGS PLAN

HEWLETT PACKARD
SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 19 (84 - 91)



ROW 20 (91 - 101)



ROW 21 (102 - 114)



ROW 22 (115 - 120)



ROW 23 (120 - 125)



ROW 24 (126 - 129)



ROW 25 (129 - 134)



ROW 26 (135 - 146)



ROW 27 (147 - 149)



ROW 28 (149 - 152)



ROW 29 (152 - 158)



ROW 30 (159 - 168)



ROW 31 (169 - 179)



ROW 32 (180 - 183)



ROW 33 (183 - 188)



ROW 34 (188 - 192)



ROW 35 (193 - 194)



INTEREST CONVERSIONS

The first part of the program permits the user to solve for any variable of an accrued simple interest calculation. Given three of the four variables (number of days, annual interest rate, beginning amount, and accrued interest) the fourth is calculated. Accrued interest can be based on a 360 or 365 day year. In addition, the user may choose to add the calculated accrued interest to the initial principal to determine the final amount.

The second part deals with nominal to effective interest rate conversions, and vice-versa. By definition, an annual effective interest rate demonstrates the effect of compounding for a full year of compounding periods at a particular periodic interest rate. The periodic interest rate to be used is determined by dividing the number of compounding periods in a year into the stated annual nominal interest rate. The effect is such that if the nominal rate is held constant, as the number of compounding periods per year is increased, the annual effective interest rate will increase. The ultimate, or upper limit, in this process is to have an infinite number of compounding periods in a year, commonly called continuous compounding.

Given the number of compounding periods in a year, and one of the rates (nominal or effective), the other rate can be calculated. If for example, you require the periodic interest rate for a calculation, given the effective rate, use this program to determine the annual nominal rate first. Dividing the annual nominal rate by the number of compounding periods in a year will give the required periodic interest rate.

The third part is for continuous compounding. Given either rate, the other is calculated.

The most common and straightforward definition of effective interest rate has been implemented. Occasionally other definitions will be used and the results will not compare exactly with those calculated by these programs. For example, since the maximum annual nominal rate that savings institutions can offer is regulated by law, they may modify the process (also regulated) so that the effective rate is even higher (e.g., for daily compounding, the periodic rate may be divided by 360 and then compounding accomplished for 365 periods). It is important then, when attempting to match results, to understand the process employed.

Equations:

$$\text{INT } 360 = \frac{\text{DAYS}}{360} \cdot \text{BEG AMT} \cdot \text{RATE}$$

$$\text{INT } 365 = \frac{\text{DAYS}}{365} \cdot \text{BEG AMT} \cdot \text{RATE}$$

finite coumpounding

$$EFF = \left(1 + \frac{NOM}{C}\right)^C - 1$$

continuous compounding

$$EFF = (e^{NOM} - 1)$$

Example 1:

Calculate the accrued interest and final amount (both 360 and 365 day basis) for a \$30,000, 8%, 90 day interest at maturity note.

Keystrokes:

Display:

[USER]

(Set USER mode)

[XEQ] [ALPHA] SIZE [ALPHA] 007

[XEQ] [ALPHA] CONV [ALPHA]

[A]

INT BASIS (360/365) ?

365 [R/S]

NO. DAYS ?

90 [R/S]

INT RATE ?

8 [R/S]

BEG. AMT ?

30000 [R/S]

ACC. INT ?

[R/S]

INT=591.78

[+]

30,591.78 (Final Amount)

Example 2:

What is the nominal rate if the effective annual rate is 13% compounded quarterly?

Keystrokes:

Display:

[B]

NO. PER. ?

4 [R/S]

NOM ?

[R/S]

EFF ?

13 [R/S]

NOM=12.41

Example 3:

A bank offers a savings plan with a 5% annual nominal interest rate. What is the annual effective rate if compounding is continuous?

Keystrokes:	Display:
[C]	NOM ?
5 [R/S]	EFF ?
[R/S]	C.EFF=5.13

Example 4:

In the above example, what is the annual effective rate if compounding is continuous on a 365/360 basis?

Keystrokes:	Display:
[D]	NOM ?
5 [R/S]	C.EFF=5.20

User Instructions

				SIZE: 007
STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Key in the program and set USER mode		[USER]	
2.	Initialize		[XEQ] CONV	
3.	SIMPLE INTEREST, press		[A]	INT BASIS (360/365) ?
4.	Input interest basis	360 or 365	[R/S]	NO. DAYS ?
5.	Input 3 of the following:			
	number of days	# days	[R/S]	INT RATE ?
	annual interest rate	INT	[R/S]	BEG. AMT ?
	beginning amount	BEG. AMT	[R/S]	ACC. INT ?
	accrued interest	ACC. INT	[R/S]	
6.	When prompted for the unknown variable,			DAYS=()
	press [R/S] (make no input). The unknown			or RATE=()
	is automatically calculated when all the			or AMT=()
	data is input.			or INT=()
7.	(Optional) After solving for accrued			
	interest, press		[+]	XXX.XX
	to find the final amount.			
8.	Interest conversions (finite), press		[B]	NO. PER. ?
9.	Input the number of compounding periods/ year	NO. PER	[R/S]	NOM ?
10.	Input either one: nominal rate	NOM	[R/S]	EFF ?
	effective rate	EFF	[R/S]	NOM=()
11.	(See step 6)			or EFF=()
12.	Interest conversions (continuous), press		[C]	NOM ?
	Input either one: nominal rate	NOM	[R/S]	EFF ?
	effective rate	EFF	[R/S]	C. NOM=()
13.	(See step 6)			or C. EFF=()
14.	Calculate the continuous effective rate			

C. EFF = ()

Program Listings

<pre> 01♦LBL "CON V" 02 STOP 03♦LBL A 04 1.1 05 STO 00 06 "INT BAS IS <360/" 07 "F365> ? " 08 PROMPT 09 STO 05 10 CF 22 11 "NO. DAY S ?" 12 XEQ 12 13 "INT RAT E ?" 14 XEQ 12 15 "BEG. AM T ?" 16 XEQ 12 17 "ACC. IN T ?" 18 XEQ 12 19 1 E2 20 ST/ 02 21 GTO IND 06 22♦LBL 01 23 RCL 04 24 RCL 05 25 * 26 RCL 03 27 / 28 RCL 02 29 / 30 "DAYS" 31 XEQ 13 32♦LBL 02 33 RCL 05 34 RCL 04 35 * 36 RCL 01 37 / 38 RCL 03 39 / 40 1 E2 41 * 42 "RATE" 43 XEQ 13 </pre>	<p>Simple interest</p> <p>Prompt and store data</p> <p>Calculate no. of days</p> <p>Calculate Int. rate.</p>	<pre> 44♦LBL 03 45 RCL 04 46 RCL 05 47 * 48 RCL 01 49 / 50 RCL 02 51 / 52 "AMT" 53 XEQ 13 54♦LBL 04 55 RCL 03 56 RCL 01 57 RCL 05 58 / 59 RCL 03 60 * 61 RCL 02 62 * 63 "INT" 64 XEQ 13 65♦LBL B 66 1.1 67 STO 00 68 "NO. PER ?" 69 PROMPT 70 STO 05 71♦LBL 14 72 CF 22 73 "NOM ?" 74 XEQ 12 75 "EFF ?" 76 XEQ 12 77 GTO IND 06 78♦LBL 01 79 RCL 02 80 1 E2 81 / 82 1 83 + 84 RCL 05 85 1/X 86 Y↑X 87 1 88 - 89 RCL 05 90 * 91 1 E2 92 * </pre>	<p>Calculate beginning amount</p> <p>Calculate accumulated interest</p> <p>Nom. (-) eff.</p> <p>Prompt and store data</p> <p>Calculate nominal rate</p>
---	--	---	---

Program Listings

93 "NOM"		144 STO IND	
94 XEQ 13		00	
95♦LBL 02	Calculate	145 RCL 00	input made?
96 RCL 01	effective rate	146 FC?C 22	no, calc. this
97 RCL 05		147 STO 06	quantity
98 1 E2		148 ISG 00	
99 *		149 RTN	
100 /		150♦LBL D	
101 1		151 "NOM ?"	
102 +		152 PROMPT	Continuous
103 RCL 05		153 365	365/360 basis
104 Y↑X		154 *	
105 1		155 360	
106 -		156 /	
107 1 E2		157 GTO 07	
108 *		158 .END.	
109 "EFF"			
110 XEQ 13			
111♦LBL C	Continuous		
112 3.1	compounding	70	
113 STO 00			
114 GTO 14			
115♦LBL 03	Calculate		
116 RCL 04	nominal rate		
117 1 E2			
118 /			
119 1			
120 +			
121 LN			
122 1 E2		80	
123 *			
124 "C.NOM"			
125 XEQ 13			
126♦LBL 04			
127 RCL 03			
128♦LBL 07	Calculate		
129 1 E2	effective rate		
130 /			
131 E↑X			
132 1		90	
133 -			
134 1 E2			
135 *			
136 "C.EFF"			
137♦LBL 13	Display routine		
138 "I="			
139 ARCL X			
140 PROMPT			
141 RTN			
142♦LBL 12	Input routine		
143 PROMPT		00	

[illegible]

INTEREST CONVERSIONS

PROGRAM REGISTERS NEEDED: 51

HEWLETT PACKARD
SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 1 (1 - 4)



ROW 2 (4 - 6)



ROW 3 (6 - 7)



ROW 4 (8 - 11)



ROW 5 (11 - 13)



ROW 6 (13 - 15)



ROW 7 (15 - 17)



ROW 8 (17 - 20)



ROW 9 (21 - 30)



ROW 10 (30 - 39)



ROW 11 (40 - 44)



ROW 12 (45 - 53)



ROW 13 (53 - 63)



ROW 14 (63 - 68)



ROW 15 (68 - 72)



ROW 16 (73 - 75)



ROW 17 (75 - 81)



ROW 18 (82 - 92)



INTEREST CONVERSIONS

HEWLETT PACKARD
SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 19 (93 - 98)



ROW 20 (99 - 109)



ROW 21 (109 - 114)



ROW 22 (114 - 122)



ROW 23 (123 - 128)



ROW 24 (129 - 136)



ROW 25 (136 - 142)



ROW 26 (143 - 151)



ROW 27 (151 - 155)



ROW 28 (156 - 158)



LEASE WITH ADDITIONAL PAYMENTS IN ADVANCE

Payments on loans are typically made at the end of the period (in arrears). However, there are situations where payments are made in advance (leasing is a good example). Sometimes these agreements call for extra payments to be made when the transaction is closed, before the payments would normally be due. Or, the transaction has advance payments and a residual value at the end of the normal term.

This program solves for the periodic payment amount necessary to achieve a desired yield when a number of payments are made in advance. And, given the periodic payment, the program finds the yield. Either amount may be calculated when a residual value exists.

The necessary inputs are the total number of periods in the loan (n), the number of payments made in advance (A), the loan amount (PV), and either the periodic payment amount (PMT) or the periodic yield (i). The residual value at the end of the n th period ($RESID$) is optional.

Equations:

$$PMT = \frac{PV - RESID (1 + i)^{-n}}{\left[\frac{1 - (1 + i)^{-(n-A)}}{i} + A \right]}$$

Notes:

The value of A must be less than the value of n . $A = 0$ implies an ordinary annuity calculation, while $A = 1$ means an annuity due calculation.

Example:

A lease has been written to run for 60 months. The leased equipment has a value of \$25,000 with a \$600 monthly payment. The lessee has agreed to make 3 payments at the time of closing. What is the annual yield? (There is no residual value at the end of 60 months.)

Keystrokes:

[XEQ] [ALPHA] SIZE [ALPHA] 008
[XEQ] [ALPHA] ADV [ALPHA]
3 [R/S]
60 [R/S]
25000 [R/S]
0 [R/S]
600 [R/S]
12 [x]

Display:

NO. ADV. PMTS?
NO. PER. ?
PV ?
RESID. ?
PMT ?
INT=1.44
17.33 (annual)

User Instructions

[illegible]

Program Listings

01♦LBL "ADV		48 +	
02 "NO. ADV		49 /	
03 PMTS?"	Prompt and store data	50 "PMT"	
04 PROMPT		51 XEQ 12	
05 STO 01		52♦LBL 01	
06 "NO. PER		53 STO 03	
07 ?"		54 E-3	
08 PROMPT		55 STO 02	
09 X<=Y?	error	56♦LBL 00	
10 GTO 02		57 1	
11 CHS		58 RCL 02	
12 STO 00		59 +	
13 "PV ?"		60 STO 07	
14 PROMPT		61 RCL 00	
15 STO 04		62 RCL 01	
16 "RESID.		63 +	
17 ?"		64 Y↑X	
18 PROMPT		65 1	
19 STO 05		66 X<>Y	
20 CF 22		67 -	
21 "PMT ?"		68 RCL 02	
22 PROMPT		69 /	
23 FS?C 22		70 RCL 01	
24 GTO 01		71 +	
25 "INT ?"		72 RCL 03	
26 PROMPT		73 *	
27 E2		74 RCL 07	
28 /		75 RCL 00	
29 STO 02		76 Y↑X	
30 1	Calculate payment	77 RCL 05	
31 +		78 *	
32 STO 07		79 +	
33 RCL 00		80 RCL 04	
34 Y↑X		81 -	
35 RCL 05		82 STO 06	
36 *		83 RCL 07	
37 RCL 04		84 RCL 00	
38 X<>Y		85 RCL 01	
39 -		86 +	
40 RCL 07		87 1	
41 RCL 00		88 -	
42 RCL 01		89 Y↑X	
43 +		90 RCL 00	
44 Y↑X		91 CHS	
45 1		92 RCL 01	
46 X<>Y		93 -	
47 -		94 *	
48 RCL 02		95 RCL 02	
49 /		96 *	
50 RCL 01		97 RCL 07	
		98 RCL 00	
		99 RCL 01	

Calculate interest using Newton method

Program Listings

100 +		51	
101 Y↑X			
102 1			
103 X<>Y			
104 -			
105 -			
106 RCL 02			
107 X↑2			
108 /			
109 RCL 03		60	
110 *			
111 RCL 07			
112 RCL 00			
113 1			
114 -			
115 Y↑X			
116 RCL 05			
117 *			
118 RCL 00			
119 *		70	
120 +			
121 RCL 06			
122 X<>Y			
123 /			
124 ST- 02			
125 ABS			
126 E-6			
127 X<=Y?			
128 GTO 00			
129 RCL 02		80	
130 1 E2			
131 *			
132 "INT"			
133♦LBL 12	Display routine		
134 "I="			
135 ARCL X			
136 PROMPT			
137 RTN			
138♦LBL 02	"DATA ERROR"		
139 0		90	
140 /			
141 END			
50		00	

[illegible]

LEASE WITH ADDITIONAL PAYMENTS
IN ADVANCE
PROGRAM REGISTERS NEEDED: 32

HEWLETT PACKARD
SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 1 (1 - 2)



ROW 2 (2 - 5)



ROW 3 (5 - 8)



ROW 4 (9 - 14)



ROW 5 (14 - 18)



ROW 6 (18 - 22)



ROW 7 (23 - 34)



ROW 8 (35 - 47)



ROW 9 (48 - 54)



ROW 10 (54 - 66)



ROW 11 (67 - 79)



ROW 12 (80 - 92)



ROW 13 (93 - 105)



ROW 14 (106 - 118)



ROW 15 (119 - 128)



ROW 16 (128 - 134)



ROW 17 (134 - 141)



SKIPPED PAYMENTS

Sometimes a loan (or lease) may be negotiated in which a specific set of monthly payments are going to be skipped each year. Seasonality is usually the reason for such an agreement. For example, because of heavy rainfall, a bulldozer cannot be operated in Oregon during December, January, and February, and the lessee wishes to make payments only when his machinery is being used. He will make nine payments per year, but the interest will continue to accumulate over the months in which a payment is not made.

Equations:

$$D_{END} = \frac{E}{\left[1 - \left(1 + \frac{C}{A} \right)^{-AB} \right]} \times \frac{\left[\left(1 + \frac{C}{A} \right)^A - 1 \right] \frac{C}{A}}{\left[\left(1 + \frac{C}{A} \right)^A - \left(1 + \frac{C}{A} \right)^{A-K} + \left(1 + \frac{C}{A} \right)^{A-L-K} - 1 \right]}$$

$$D_{BEGIN} = \frac{D_{END}}{1 + \frac{C}{A}}$$

where: A = number of payment periods per year
 B = number of years
 C = annual percentage rate (as decimal)
 D = periodic payment amount
 E = loan amount
 K = number of last payment before payments close the first time
 L = number of skipped payments

Example:

A bulldozer worth \$100,000 is being purchased in September. The first payment is due one month later, and payments will continue over a period of 5 years. Due to the weather, the machinery will not be used during the winter months, and the purchaser does not wish to make payments during January, February, and March (months 4 thru 6). If the current interest rate is 8 3/4%, what is the monthly payment necessary to amortize the loan?

Solution:**Keystrokes:**

[XEQ] [ALPHA] SIZE [ALPHA] 008

[XEQ] [ALPHA] SKIP [ALPHA]

12 [R/S]

5 [R/S]

8.75 [R/S]

100000 [R/S]

3 [R/S]

3 [R/S]

Display:

NO. PER./YR. ?

NO. YRS. ?

INT ?

PV ?

LAST PMT NO. ?

NO. PMTS SKIPPED ?

E. PMT=2,761.44

[illegible]

Program Listings

[illegible]

[illegible]

SKIPPED PAYMENTS

PROGRAM REGISTERS NEEDED: 25

HEWLETT PACKARD
SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 1 (1 - 2)



ROW 2 (2 - 5)



ROW 3 (5 - 8)



ROW 4 (8 - 13)



ROW 5 (13 - 16)



ROW 6 (16 - 19)



ROW 7 (19 - 20)



ROW 8 (20 - 27)



ROW 9 (28 - 40)



ROW 10 (41 - 53)



ROW 11 (54 - 65)



ROW 12 (66 - 70)



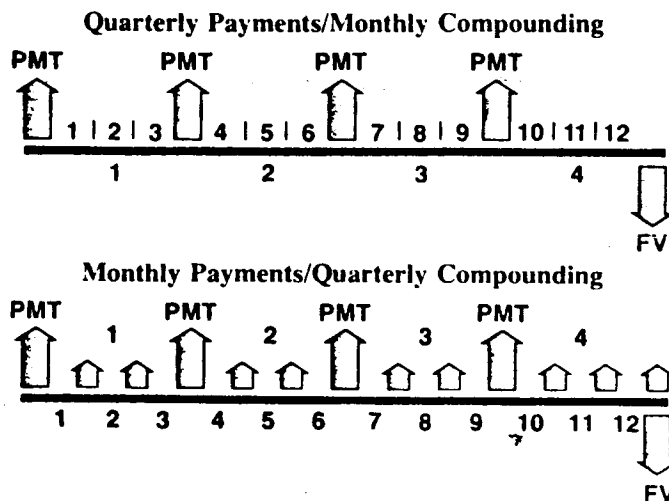
ROW 13 (71 - 74)



ROW 14 (75 - 77)



COMPOUNDING PERIODS DIFFERENT FROM PAYMENT PERIODS



Payments into a savings plan may not occur with the same frequency as the compounding frequency offered. This program solves for the number of payments, the periodic payment amount, or future value.

The diagrams above depict two of the many combinations that may be encountered. Note that payments are assumed to occur at the beginning of the payment period (annuity due).

Another assumption of this program is that payments deposited for a partial compounding period will accrue simple interest for the remainder of the compounding period. Thus, a deposit at the beginning of the 2nd month of a quarter into a savings plan that compounds quarterly is assumed to accrue two months simple interest. This is often the case, but is not true for all institutions.

Equations:

$$PMT = \frac{FV}{Z} \left[\frac{Q}{(1 + Q)^n - 1} \right]$$

when $P/C \leq 1$

$$Q = (1 + i)^{C/P} - 1$$

$$n = \#PAY$$

$$Z = (1 + Q)$$

when $P/C > 1$

$$Q = i$$

$$n = (\#PAY) \times (C/P)$$

$$Z = (P/C + 1) \times \left(\frac{Q}{2}\right) + (P/C)$$

Example 1:

Quarterly deposits of \$95 are to be made into a savings account paying 5% compounded monthly. What amount will be in that account after 7 years (28 total payments)?

Keystrokes:

[XEQ] [ALPHA] SIZE [ALPHA] 008
 [XEQ] [ALPHA] CPDPP [ALPHA]
 4 [R/S]
 12 [R/S]
 5 [ENTER ↑] 12 [÷] [R/S]
 7 [ENTER ↑] 4 [x] [R/S]
 95 [R/S]
 [R/S]

Display:

NO. PMT/YR ?
 NO. PER./YR ?
 INT ?
 NO. PMTS ?
 PMT ?
 FV ?
 FV=3,203.59

Example 2:

In 2 years, you will need \$4000. If a savings account will pay $5\frac{1}{4}\%$ compounded quarterly, what amount must you deposit each month to accumulate the desired amount:

Keystrokes:

[XEQ] [ALPHA] CPDPP [ALPHA]
 12 [R/S]
 4 [R/S]
 5.25 [ENTER ↑] 4 [÷] [R/S]
 24 [R/S]
 [R/S]
 4000 [R/S]

Display:

NO. PMT/YR ?
 NO. PER./YR ?
 INT ?
 NO. PMTS ?
 PMT ?
 FV ?
 PMT=157.78

[illegible]

Program Listings

```

01♦LBL "CPE
PP"
02 1
03 "NO. PMT
/YR ?"
04 PROMPT
05 "NO. PER
./YR ?"
06 PROMPT
07 /
08 STO 04
09 X>Y?
10 SF 00
11 "INT ?"
12 PROMPT
13 100
14 /
15 STO 03
16 LASTX
17 *
18 RCL 03
19 1
20 +
21 RCL 04
22 1/X
23 Y↑X
24 STO 05
25 .1
26 STO 06
27 CF 22
28 "NO. PMT
S ?"
29 XEQ 09
30 "PMT ?"
31 XEQ 09
32 "FV ?"
33 XEQ 09
34 GTO IND
07
35♦LBL 00
36 FS?C 00
37 GTO 10
38 RCL 05
39 1
40 -
41 RCL 02
42 *
43 RCL 05
44 RCL 01
45 *
46 /

```

Prompt and
store data

P/C > 1

Calculate N
P/C ≤ 1

```

47 1
48 +
49 LN
50 RCL 05
51 LN
52 /
53 "N"
54 XEQ 13
55♦LBL 10
56 RCL 02
57 RCL 03
58 *
59 RCL 04
60 1
61 +
62 RCL 03
63 2
64 /
65 *
66 RCL 04
67 +
68 RCL 01
69 *
70 /
71 1
72 +
73 LN
74 RCL 03
75 1
76 +
77 LN
78 /
79 RCL 04
80 *
81 "N"
82 XEQ 13
83♦LBL 01
84 FS?C 00
85 GTO 11
86 RCL 05
87 1
88 -
89 RCL 05
90 RCL 00
91 Y↑X
92 1
93 -
94 /
95 RCL 02
96 *
97 RCL 05

```

Calculate N
P/C > 1

Calculate PMT
P/C ≤ 1

Program Listings

<pre> 98 / 99 "PMT" 100 XEQ 13 101♦LBL 11 102 RCL 04 103 1/X 104 RCL 00 105 * 106 RCL 03 107 1 108 + 109 X<>Y 110 Y↑X 111 1 112 - 113 RCL 03 114 X<>Y 115 / 116 RCL 04 117 1 118 + 119 RCL 03 120 2 121 / 122 * 123 RCL 04 124 + 125 / 126 RCL 02 127 * 128 "PMT" 129 XEQ 13 130♦LBL 02 131 FS?C 00 132 GTO 12 133 RCL 05 134 RCL 00 135 Y↑X 136 1 137 - 138 RCL 05 139 * 140 RCL 01 141 * 142 RCL 05 143 1 144 - 145 / 146 "FV" 147 XEQ 13 148♦LBL 12 </pre>	<p>Calculate PMT P/C > 1</p>	<pre> 149 RCL 04 150 1 151 + 152 RCL 03 153 2 154 / 155 * 156 RCL 04 157 + 158 RCL 03 159 1 160 + 161 RCL 00 162 RCL 04 163 1/X 164 * 165 Y↑X 166 1 167 - 168 * 169 RCL 01 170 * 171 RCL 03 172 / 173 "FV" 174♦LBL 13 175 "F=" 176 ARCL X 177 PROMPT 178 RTN 179♦LBL 09 180 PROMPT 181 STO IND 06 182 RCL 06 183 FC?C 22 184 STO 07 185 ISG 06 186 RTN 187 .END. </pre>	<p>Calculate FV P/C > 1</p>
		<p>Display routine</p>	
		<p>Input routine</p>	
		<p>00</p>	

[illegible]

COMPOUNDING PERIODS DIFFERENT
FROM PAYMENT PERIODS
PROGRAM REGISTERS NEEDED: 42

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SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 1 (1 - 3)



ROW 2 (3 - 5)



ROW 3 (5 - 6)



ROW 4 (7 - 13)



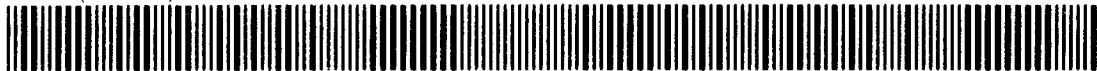
ROW 5 (13 - 24)



ROW 6 (25 - 28)



ROW 7 (28 - 31)



ROW 8 (31 - 35)



ROW 9 (36 - 46)



ROW 10 (47 - 56)



ROW 11 (57 - 69)



ROW 12 (70 - 81)



ROW 13 (82 - 90)



ROW 14 (91 - 100)



ROW 15 (100 - 111)



ROW 16 (112 - 124)



ROW 17 (125 - 131)



ROW 18 (132 - 143)



COMPOUNDING PERIODS DIFFERENT
FROM PAYMENT PERIODS

HEWLETT PACKARD
SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 19 (144 - 152)



ROW 20 (153 - 165)



ROW 21 (166 - 175)



ROW 22 (175 - 184)



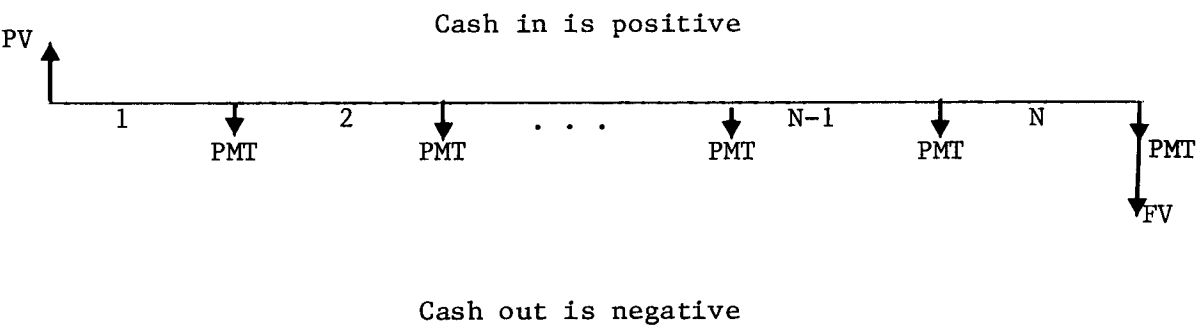
ROW 23 (185 - 187)



COMPOUND INTEREST SOLUTIONS

Commonly described as annuities and compound amounts, this program converts your HP-41C into a financial calculator, giving you the ability to solve complex problems involving savings, mortgages, annuities, and other financial calculations in a simple and straightforward manner. It duplicates the convenient and powerful built-in functions of the "top row keys" found on HP financial calculators. One Memory Module is needed to execute the program.

The five variables which have become standard for formatting and describing most compound interest problems can best be explained by referring to a pictorial representation called the cash flow diagram.



The diagram begins with a horizontal line called the time line. It represents the duration of a financial problem and is divided into N compounding periods of equal duration (length).

Exchange of cash is represented with vertical arrows. Money received is represented by an arrow pointing up (positive) from the time line where the transaction occurred and money paid out is represented by an arrow pointing down (negative).

Payments (PMT) represent a series of cash exchanges of the same direction and amount. In the standard cash flow diagram the payments occur coincidental with the compounding periods and are equal to the number of periods. The first payment can either occur at the beginning of the first period (BEGIN) or at the end of the first period (END).

It is always necessary when working compound interest problems involving payments, (PMT) to specify which of the two possible payment streams is applicable, (BEGIN) or (END). In the parlance of various industries BEGIN payments are often referred to as annuity due, or first payment in advance. END payments are referred to as ordinary annuity, payment in arrears, or immediate annuity.

A single cash flow at the start of the time line is called the present value (PV). A similar single cash flow at the end of the time line is called the future value (FV).

The fifth variable is I, the compound interest rate per period.

This program solves for any of the five standard compound interest variables:

N = the number of payments or compounding periods
 I = the interest rate per period (as a percent)
 PV = the initial transaction (present value)
 PMT = the periodic payment coinciding with the compounding period
 FV = the final transaction (future value)

When using the cash flow diagram and the cash flow sign convention to format compound interest problems the following rules always apply.

- N and I must correspond to the same period of time
- Both N and I must be present in a problem. Either both values are known, or one is known and the other is to be solved for.
- A valid financial transaction must always include at least one positive cash flow and one negative cash flow.

The cash flow diagram can be used to describe many variations of compound interest problems. Although the terminology used to describe a particular cash transaction may vary from industry to industry the cash flow diagram remains consistent. In providing a means of describing financial problems without using terminology specific to a particular segment, the cash flow diagram becomes, in a sense, a universal language.

Equations:

$$0 = PV + (1+\delta i) PMT \left[\frac{1 - (1+i)^{-N}}{i} \right] + FV (1+i)^{-N}$$

where $i = I/100$

$$\delta = \begin{cases} 0 & \text{in END} \\ 1 & \text{in BEGIN} \end{cases}$$

Example 1:

What monthly payment will amortize a mortgage loan of \$50,000 over 30 years at 10½% interest? The first payment is made 1 month after the exchange of the initial loan amount (END).

Keystrokes:

Display:

[USER]		(Set USER mode)
[XEQ] [ALPHA] SIZE [ALPHA] 010		
[XEQ] [ALPHA] MONEY [ALPHA]	0.00	
30 [///] [A]	N=360.00	
50000 [C]	PV=50,000.00	
10.5 [///] [B]	I=0.88	
[D]	PMT=-457.37	(Monthly payment)

Example 2:

In the previous example, what amount would be necessary to prepay the mortgage (remaining balance) at the end of the 6th year?

Keystrokes:

Display:

6 [///] [A]	N=72.00	
[E]	FV=-48,018.77	(Remaining balance)

Example 3:

How much money must be set aside in a savings account each month in order to accumulate \$4,000 in three years if the account compounds monthly at 6% per year? The deposits "begin" immediately.

Keystrokes:

Display:

[///] [E]	0.00	(Clears financial data registers)
[///] [C]	BEGIN	(Set BEGIN mode)
4000 [E]	FV=4,000.00	
3 [///] [A]	N=36.00	
6 [///] [B]	I=0.50	
[D]	PMT=-101.18	(Monthly deposit)

Example 4:

What interest rate did the bank pay (in the previous example) if the actual amount at the end of the 3 years was \$4,025.50?

Keystrokes:

Display:

4025.50 [E]	FV=4,025.50	
[B]	I=0.53	
12 [X]	6.40	(Annual interest rate)

User Instructions

				SIZE: 010
STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Key in the program and set USER mode.		[USER]	
2.	Initialize		[XEQ] MONEY	0.00
3.	The following steps may be performed in any order:			
	• Multiplies the displayed number by 12 and stores in N	n	[///] [A]	$N = n \times 12$
	• Divides the displayed number by 12 and stores in I	i	[///] [B]	$I = i/12$
	• Toggles between BEGIN and END modes. Flag 0 displayed (set) is BEGIN mode.		[///] [C]	BEGIN or END
	• List values*		[///] [D]	
	• Clear financial data		[///] [E]	0.00
4.	The following steps may be performed in any order:			
	• Compute or store number of periods ⁺		[A]	N =
	• Compute or store compound interest rate ⁺		[B]	I =
	• Compute or store present value ⁺		[C]	PV =
	• Compute or store payment ⁺		[D]	PMT =
	• Compute or store future value ⁺		[E]	FV =
5.	Review stored values		[RCL] [A]-[E]	
*	Press [R/S] to list successive values if a printer is not being used.			
+	If an [A]-[E] key is pressed immediately after keying in a value, the value will be stored. If the key is pressed after previously pressing another [A]-[E] key and during which time no digit entry has been made, computation will occur.			

Program Listings

01*LBL "MON EY"	Initialize	51 GTO 14	
02*LBL e		52 XEQ "PMT"	
03 SF 21			
04 SF 27		53 GTO 14	
05 CF 00		54*LBL E	Store FV
06 FIX 2		55 "FV"	
07 0		56 STO 05	
08 STO 00		57 FS?C 22	
09 STO 01		58 GTO 14	
10 STO 02		59 XEQ "FV"	
11 STO 03		60 GTO 14	
12 STO 04		61*LBL c	Begin/End
13 STO 05		62 "END"	
14 RTN		63 0	
15*LBL 14	Output routine	64 STO 00	
16 "F="		65 FS?C 00	
17 ARCL X		66 PROMPT	
18 AVIEW		67 1	
19 RTN		68 STO 00	
20*LBL a		69 SF 00	
21 12	12	70 "BEGIN"	
22 *		71 PROMPT	
23*LBL A		72*LBL d	List variables
24 "N"	Store N	73 ADV	
25 STO 01		74 FS? 00	
26 FS?C 22		75 GTO 00	
27 GTO 14		76 "END"	
28 XEQ "N"		77 AVIEW	
29 GTO 14		78 GTO 01	
30*LBL b		79*LBL 00	
31 12	12÷	80 "BEGIN"	
32 /		81 AVIEW	
33*LBL B		82*LBL 01	
34 "I"	Store I	83 "N"	
35 STO 02		84 RCL 01	
36 FS?C 22		85 XEQ 14	
37 GTO 14		86 "I"	
38 XEQ "*I"		87 RCL 02	
39 GTO 14		88 XEQ 14	
40*LBL C		89 "PV"	
41 "PV"	Store PV	90 RCL 03	
42 STO 03		91 XEQ 14	
43 FS?C 22		92 "PMT"	
44 GTO 14		93 RCL 04	
45 XEQ "PV"		94 XEQ 14	
46 GTO 14		95 "FV"	
47*LBL D		96 RCL 05	
48 "PMT"	Store PMT	97 GTO 14	
49 STO 04		98*LBL "N"	
50 FS?C 22		99 RCL 02	
		100 X=0?	Calculate N

Program Listings

101 GTO 03		152 STO 03	
102 1 E2		153 +	
103 /		154 RCL 06	
104 STO 06		155 CHS	
105 RCL 03		156 STO 06	
106 *		157 ABS	
107 RCL 04		158 RCL 00	
108 +		159 *	
109 X=0?		160 1	
110 GTO 04		161 +	
111 XEQ 08		162 RCL 04	
112 RCL 09		163 *	
113 SIGN		164 RCL 06	
114 X>0?		165 RCL 03	
115 GTO 02		166 *	
116 RCL 08		167 +	
117 SIGN		168 /	
118 X>0?		169 RCL 06	
119 GTO 01		170 *	
120 LBL 04	Data error message	171 CHS	
121 "\$ERROR"		172 STO 09	
122 AVIEW		173 RTN	
123 RTN		174 LBL 08	
124 LBL 03		175 XEQ 09	
125 RCL 03	Calculate N if I=0	176 STO 08	
126 RCL 05		177 XEQ 09	
127 +		178 RTN	
128 RCL 04		179 LBL "PV"	Calculate PV
129 /		180 RCL 02	
130 CHS		181 X=0?	
131 STO 01		182 GTO 00	
132 RTN		183 XEQ 07	
133 LBL 01		184 RCL 07	
134 RCL 08		185 RCL 05	
135 XEQ 10		186 *	
136 CHS		187 RCL 04	
137 STO 01		188 RCL 06	
138 RTN		189 *	
139 LBL 02		190 +	
140 RCL 09		191 GTO 01	
141 LBL 10		192 LBL 00	
142 LN1+X		193 RCL 04	Calculate PV if I=0
143 RCL 06		194 RCL 01	
144 LN1+X		195 *	
145 /		196 RCL 05	
146 STO 01		197 +	
147 RTN		198 LBL 01	
148 LBL 09		199 CHS	
149 RCL 03		200 STO 03	
150 ENTER↑		201 RTN	
151 X<> 05		202 LBL "PMT"	Calculate PMT

Program Listings

<p>"</p> <p>203 RCL 02</p> <p>204 X=0?</p> <p>205 GTO 00</p> <p>206 XEQ 07</p> <p>207 RCL 07</p> <p>208 RCL 05</p> <p>209 *</p> <p>210 RCL 03</p> <p>211 +</p> <p>212 RCL 06</p> <p>213 /</p> <p>214 GTO 01</p> <p>215♦LBL 00</p> <p>216 RCL 03</p> <p>217 RCL 05</p> <p>218 +</p> <p>219 RCL 01</p> <p>220 /</p> <p>221♦LBL 01</p> <p>222 CHS</p> <p>223 STO 04</p> <p>224 RTN</p> <p>225♦LBL "FV"</p> <p>226 RCL 02</p> <p>227 X=0?</p> <p>228 GTO 00</p> <p>229 XEQ 07</p> <p>230 RCL 06</p> <p>231 RCL 04</p> <p>232 *</p> <p>233 RCL 03</p> <p>234 +</p> <p>235 RCL 07</p> <p>236 /</p> <p>237 GTO 01</p> <p>238♦LBL 00</p> <p>239 RCL 04</p> <p>240 RCL 01</p> <p>241 *</p> <p>242 RCL 03</p> <p>243 +</p> <p>244♦LBL 01</p> <p>245 CHS</p> <p>246 STO 05</p> <p>247 RTN</p> <p>248♦LBL 07</p> <p>249 RCL 02</p> <p>250 1 E2</p> <p>251 /</p> <p>252 LN1+X</p>	<p>Calculate PMT if I=0</p> <p>Calculate FV</p> <p>Calculate FV if I=0</p>	<p>253 RCL 01</p> <p>254 *</p> <p>255 CHS</p> <p>256 E↑X</p> <p>257 STO 07</p> <p>258 LASTX</p> <p>259 E↑X-1</p> <p>260 CHS</p> <p>261 RCL 02</p> <p>262 1 E2</p> <p>263 /</p> <p>264 /</p> <p>265 LASTX</p> <p>266 RCL 00</p> <p>267 *</p> <p>268 1</p> <p>269 +</p> <p>270 *</p> <p>271 STO 06</p> <p>272 RTN</p> <p>273♦LBL "*I"</p> <p>274 RCL 01</p> <p>275 RCL 04</p> <p>276 *</p> <p>277 RCL 03</p> <p>278 +</p> <p>279 RCL 05</p> <p>280 +</p> <p>281 X=0?</p> <p>282 GTO 02</p> <p>283 CF 05</p> <p>284 RCL 03</p> <p>285 RCL 04</p> <p>286 RCL 00</p> <p>287 *</p> <p>288 +</p> <p>289 STO 06</p> <p>290 LASTX</p> <p>291 RCL 04</p> <p>292 -</p> <p>293 CHS</p> <p>294 RCL 05</p> <p>295 +</p> <p>296 STO 07</p> <p>297 RCL 01</p> <p>298 1</p> <p>299 X=Y?</p> <p>300 GTO 00</p> <p>301 RCL 04</p> <p>302 X≠0?</p> <p>303 GTO 01</p>	<p>Calculate I</p> <p>I=0</p>
--	--	--	-------------------------------

Program Listings

```

304♦LBL 00
305 RCL 06
306 RCL 07
307 *
308 X=0?
309 GTO 04
310 RCL 07
311 RCL 06
312 /
313 CHS
314 RCL 01
315 1/X
316 Y↑X
317 1
318 -
319 GTO 02
320♦LBL 01
321 RCL 07
322 RCL 06
323 *
324 X>0?
325 GTO 04
326 RCL 01
327 1/X
328 1
329 +
330 STO 02
331 RCL 06
332 RCL 04
333 *
334 X<0?
335 XEQ 05
336♦LBL 12
337 RCL 02
338 LN
339 RCL 01
340 *
341 E↑X-1
342 RCL 02
343 1
344 -
345 X=0?
346 GTO 00
347 /
348 GTO 01
349♦LBL 00
350 RCL 01
351♦LBL 01
352 STO 08
353 1
354 -

```

Calculate I by
simple formula

Begin loop

```

355 RCL 04
356 *
357 RCL 02
358 RCL 01
359 Y↑X
360 RCL 06
361 *
362 +
363 STO 09
364 RCL 01
365 RCL 08
366 -
367 RCL 02
368 1
369 -
370 X=0?
371 GTO 00
372 /
373 RCL 02
374 *
375 RCL 04
376 *
377 GTO 01
378♦LBL 00
379 RCL 01
380 1
381 RCL 01
382 -
383 *
384 2
385 /
386♦LBL 01
387 RCL 09
388 RCL 01
389 *
390 +
391 RCL 09
392 X<>Y
393 /
394 RCL 07
395 CHS
396 RCL 09
397 /
398 X<>Y
399 Y↑X
400 RCL 02
401 *
402 LASTX
403 X<>Y
404 STO 02
405 X<>Y

```

Program Listings

406 %CH		51	
407 ABS			
408 1 E-6			
409 X<=Y?	If I not small, repeat loop		
410 GTO 12			
411 FS? 05			
412 XEQ 05			
413 CF 05			
414 RCL 02			
415 1		60	
416 -			
417 STO 02			
418 LBL 02			
419 1 E2			
420 *			
421 STO 02			
422 RTN			
423 LBL 05			
424 SF 05			
425 RCL 02			
426 1/X		70	
427 STO 02			
428 RCL 07			
429 X<> 06			
430 STO 07			
431 .END.			
30		80	
40		90	
50		00	

COMPOUND INTEREST SOLUTIONS
PROGRAM REGISTERS NEEDED: 90

HEWLETT PACKARD
SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 1 (1 - 3)	
ROW 2 (4 - 13)	
ROW 3 (14 - 21)	
ROW 4 (22 - 28)	
ROW 5 (29 - 36)	
ROW 6 (36 - 41)	
ROW 7 (41 - 47)	
ROW 8 (47 - 52)	
ROW 9 (52 - 58)	
ROW 10 (58 - 62)	
ROW 11 (63 - 70)	
ROW 12 (70 - 76)	
ROW 13 (76 - 82)	
ROW 14 (83 - 89)	
ROW 15 (89 - 94)	
ROW 16 (94 - 99)	
ROW 17 (100 - 109)	
ROW 18 (110 - 118)	

COMPOUND INTEREST SOLUTIONS

HEWLETT PACKARD
SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 19 (119 - 124)

ROW 20 (125 - 135)

ROW 21 (136 - 148)

ROW 22 (149 - 160)

ROW 23 (161 - 173)

ROW 24 (174 - 179)

ROW 25 (179 - 187)

ROW 26 (188 - 199)

ROW 27 (200 - 205)

ROW 28 (206 - 215)

ROW 29 (216 - 225)

ROW 30 (225 - 233)

ROW 31 (234 - 245)

ROW 32 (246 - 256)

ROW 33 (257 - 267)

ROW 34 (268 - 275)

ROW 35 (276 - 286)

ROW 36 (287 - 299)

COMPOUND INTEREST SOLUTIONS

HEWLETT PACKARD
SOLUTION BOOK:
LENDING SAVING & LEASING

ROW 37 (300 - 309)



ROW 38 (310 - 321)



ROW 39 (322 - 333)



ROW 40 (334 - 344)



ROW 41 (345 - 355)



ROW 42 (356 - 368)



ROW 43 (369 - 379)



ROW 44 (380 - 392)



ROW 45 (393 - 405)



ROW 46 (406 - 412)



ROW 47 (412 - 421)



ROW 48 (422 - 431)



ROW 49 (431 - 431)



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Hewlett-Packard Software

In terms of power and flexibility, the problem-solving potential of the HP-41 programmable calculator is nearly limitless. And in order to see the practical side of this potential, HP has different types of software to help save you time and programming effort. Every one of our software solutions has been carefully selected to effectively increase your problem-solving potential. Chances are, we already have the solutions you're looking for.

Application Pacs

To increase the versatility of your HP-41, HP has an extensive library of "Application Pacs". These programs transform your HP-41 into a specialized calculator in seconds. Included in these pacs are detailed manuals with examples, miniature plug-in Application Modules, and keyboard overlays. Every Application Pac has been designed to extend the capabilities of the HP-41.

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Users' Library

The Users' Library provides the best programs from contributors and makes them available to you. By subscribing to the HP-41 Users' Library you'll have at your fingertips literally hundreds of different programs from many different application areas.

***Users' Library Solutions Books**

Hewlett-Packard offers a wide selection of Solutions Books complete with user instructions, examples, and listings. These solution books will complement our other software offerings and provide you with a valuable tool for program solutions.

You can choose from:

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*Some books require additional memory modules to accommodate all programs.

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