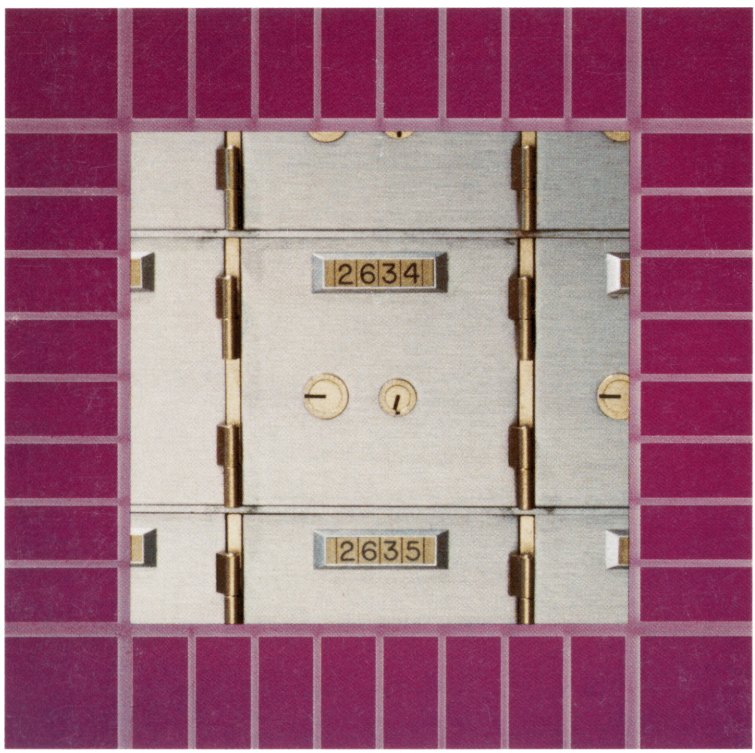
HEWLETT-PACKARD

HP-37E & HP-38E/38C

LENDING, SAVINGS, AND LEASING

Applications



For Continuous Memory Models

Although this book refers specifically to the HP-37E or HP-38E, the programs and calculations contained herein apply equally well to the HP-38C. The user should note, however, that the display format and data register contents are retained by the calculator even though it has been turned off. It may be desirable to reset or clear these conditions before running programs or making calculations.

HP-37E & HP-38E/38C

Lending, Savings, & Leasing Applications

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Introduction

This applications book has been designed to supplement the HP-37E and HP-38E *Owners' Handbooks* by providing a collection of applications specifically designed for lending, savings, and leasing institutions. Step by step keystroke procedures, examples, and programs for 19 problem types are explained. Hopefully, this book will provide a reference guide to the majority of your problems, and show you how to redesign our examples to fit your specific needs.

It is sometimes necessary in these keystroke solutions to include operations which involve prefix keys, namely, [f] on the HP-37E and [f] and [9] on the HP-38E. For example, the operation [12×] is performed on the HP-37E as [f] [12×] and on the HP-38E as [9] [12×]. In such cases, *the keystroke solution omits the prefix key and indicates only the operation* (as here, [12×]). As you work through the example problems, take care to press the appropriate prefix keys (if any) for your calculator.

In addition, it should be noted that certain clearing functions on the two calculators have different key mnemonics. *Clear finance* on the HP-37E is represented as [CL FIN], and is represented as [FIN] on the HP-38E. *Clear all* is represented as [CL ALL] and [ALL] on the HP-37E and HP-38E respectively. Unless otherwise specified, this book will use the key mnemonics of the HP-37E, although the keystrokes are applicable to both machines.

All results are carried internally to ten significant digits. If intermediate answers are rounded by the user, slightly different final values may be obtained.

Contents

Lending

Annual Percentage Rate Calculations With Fees

Borrowers are sometimes charged fees in connection with the issuance of a mortgage, which effectively raises the interest rate. The actual amount received by the borrower (PV) is reduced, while the periodic payments remain the same. Given the life or term of the mortgage, the interest rate, the mortgage amount, and the basis of the fee charge (how the fee is calculated), the true Annual Percentage Rate may be calculated. Information is entered as follows:

1) Set the Payment switch to END and press [CL FIN].

2) Calculate and enter the periodic payment amount of the loan.
   a) Key in the total number of payment periods; press [n].
   b) Key in the periodic interest rate; press [i].
   c) Key in the mortgage amount; press [PV].*
   d) To obtain the periodic payment amount press [PMT].*

3) Calculate and key in the actual net amount dispersed.*
   a) If fees are stated as a percentage of the mortgage amount (points), recall the mortgage amount ([RCL][PV]); key in the fee (percentage) rate; press [%][−][PV].
   b) If fees are stated as a flat charge, recall the mortgage amount ([RCL][PV]); key in the fee amount (flat charge); press [−][PV].
   c) If fees are stated as a percentage of the mortgage amount plus a flat charge, recall the mortgage amount ([RCL][PV]); key in the fee (percentage) rate, press [%][−]; key in the fee amount (flat charge); press [−][PV].

4) Press [i] to obtain the percentage rate per compounding period.

5) To obtain the annual nominal percentage rate, key in the number of periods per year, and press [×].

* Positive for cash received; negative for cash paid out.

Example 1:

A borrower is charged 2 points for the issuance of his mortgage. If the mortgage amount is $50,000 for 30 years, and the interest rate is 9% per year, with monthly payments, what annual percentage rate is the borrower paying? (1 point is equal to 1% of the mortgage amount.)

Keystrokes	Display	
BEGIN ▮▮▮ END		
[CL FIN]		
30 [12×]	*360.00*	Months (into n)
9 [12÷]	*0.75*	% monthly interest rate (into i)
50000 [PV]	*50,000.00*	Loan amount (into PV)
[PMT]	*-402.31*	Monthly payment (calculated)
[RCL] [PV] 2 [%] [−] [PV]	*49,000.00*	Actual amount paid by lender (into PV)
[i]	*0.77*	% monthly interest rate (calculated)
12 [×]	*9.23*	Annual percentage rate

For repeated use of this routine, the following HP-38E program could be beneficial:

KEY ENTRY	DISPLAY
[g] [P/R] [g] [CL P]	*00-*
[PV]	*01- 13*
[g] [R↓]	*02- 25 33*
[g] [12÷]	*03- 25 12*
[g] [R↓]	*04- 25 33*
[g] [12×]	*05- 25 11*
[PMT]	*06- 14*
[R/S]	*07- 74*
[RCL] [PV]	*08- 22 13*

KEY ENTRY	DISPLAY
[x≷y]	*09- 33*
[%]	*10- 23*
[−]	*11- 41*
[g] [PSE]	*12- 25 4*
[PV]	*13- 13*
[i]	*14- 12*
[RCL] [g] [12÷]	*15- 22,25 12*
[g] [GTO] 00	*16- 25 7 00*
[g] [P/R]	

1) Key in the program.
2) Set the Payment switch to END and press [f] [FIN].
3) Key in the total number of years; press [ENTER↑].
4) Key in the annual interest rate; press [ENTER↑].
5) Key in the mortgage amount and press [R/S] to obtain the monthly payment amount.
6) Key in the fee stated as a percentage of the mortgage amount; press [R/S]. The actual net amount dispersed is "paused" on the display, and then the program continues to calculate the annual interest rate.
7) For a new case return to step 3.

Keystrokes	Display	
BEGIN END		
[f] [FIN]		
30 [ENTER↑]		
9 [ENTER↑]		
50000 [R/S]	*-402.31*	Monthly payment
2 [R/S]	*49,000.00*	Actual loan amount (paused)
	9.23	Annual percentage rate

Example 2:

Using the same information as given in Example 1, calculate the APR if the mortgage fee is $150 instead of a percentage.

Keystrokes	Display	
BEGIN END		
[CL FIN]		
30 [12×]	*360.00*	Months (into n)
9 [12÷]	*0.75*	% monthly interest rate (into i)
50000 [PV]	*50,000.00*	Loan amount (into PV)
[PMT]	*-402.31*	Monthly payment (calculated)
[RCL] [PV] 150 [−] [PV]	*49,850.00*	Effective mortgage amount (new balance into PV)
[i]	*0.75*	Monthly interest rate (calculated)
12 [×]	*9.03*	Annual percentage rate

Example 3:

Again using the information given in Example 1, what is the APR if the mortgage fee is stated as 2 points plus $150?

Keystrokes	Display	
BEGIN END		
CL FIN		
30 12×	*360.00*	Months (into n)
9 12÷	*0.75*	% monthly interest rate (into i)
50000 PV	*50,000.00*	Loan amount (into PV)
PMT	*–402.31*	Monthly payment (calculated)
RCL PV 2 % −		
150 − PV	*48,850.00*	Effective mortgage amount (into PV)
i	*0.77*	Monthly interest rate (calculated)
12 ×	*9.26*	Annual percentage rate

Price of a Mortgage Traded at a Discount/Premium

Mortgages may be bought and/or sold at prices lower (discounted) or higher (at a premium) than the remaining balance of the loan at the time of purchase. Given the amount of the mortgage, the periodic payment, the timing and amount of the balloon or prepayment, and the *desired* yield rate, the price of the mortgage may be found. It should be noted that the balloon payment amount (if it exists) occurs coincident with, and does not include, the last periodic payment amount.

Information is entered as follows:

1) Set the Payment switch to END and press CL FIN.
2) Key in the total number of periods until the balloon payment or prepayment occurs; press n.
3) Key in the *desired* periodic interest rate (yield) and press i.

4) Key in the periodic payment amount; press [PMT].*

5) Key in the balloon payment amount and press [FV].*

6) Press [PV] to obtain the purchase price of the mortgage.

Example 1:

A lender wants to induce the borrower to prepay a low interest rate loan. The interest rate is 5% with 6 years (72 payments) remaining of $137.17 and a balloon payment at the end of the sixth year of $2000. If the lender is willing to discount the future payments at 7½%, how much would the borrower need to prepay the note?

Keystrokes	Display	
BEGIN [■] END		
[CL FIN]		
72 [n] 7.5 [12÷]		
137.17 [PMT]		
2000 [FV] [PV]	*–9,210.48*	Amount necessary to prepay note

Example 2:

A 9½% mortgage with 28 years remaining may be acquired which has a remaining balance of $49,350. Determine the price to pay for this mortgage if the desired annual yield is 12%. (Since the payment amount is not given, it must be calculated.)

Keystrokes	Display	
BEGIN [■] END		
[CL FIN]		
28 [12×]	*336.00*	Months (into n)
9.5 [12÷]	*0.79*	% monthly interest rate (into i)
49350 [CHS] [PV] [PMT]	*420.40*	Monthly payment to be received
12 [12÷]	*1.00*	Desired % monthly interest rate (into i)
[PV]	*–40,555.50*	Purchase price to achieve the desired yield (calculated)

* Positive for cash received; negative for cash paid out.

Yield of a Mortgage Traded at a Discount/Premium

The annual yield of a mortgage bought at a discount or premium may be calculated, given the original mortgage amount, interest rate, and periodic payment, as well as the number of payment periods per year, the price paid for the mortgage, and the balloon payment amount (if it exists).

Information is entered as follows:

1) Set the Payment switch to END and press [CL FIN].
2) Key in the total number of periods until the balloon payment occurs and press [n].
3) Key in the periodic payment amount and press [PMT].*
4) Key in the purchase price of the mortgage; press [PV].*
5) Key in the balloon payment amount and press [FV].*
6) Press [i] to obtain the yield per period.
7) Key in the number of periods per year and press [×] to obtain the nominal annual yield.

Example 1:

Find the annual yield of a 7%, 21 year mortgage prepaid in full at the end of the 12th year, if the mortgage amount is $100,000, the purchase price is $86,000, and equal monthly payments of $758.47 are received. The remaining balance at the end of the 12th year is $60,647.67.

Keystrokes	Display	
BEGIN END		
[CL FIN]		
12 [12×]	*144.00*	Balloon payment occurs at end of 144th month (into n)
758.47 [PMT]	*758.47*	Monthly payment received (into PMT)
86000 [CHS] [PV]	*–86,000.00*	Amount loaned (into PV)
60647.67 [FV]	*60,647.67*	Balloon payment (into FV)
[i]	*0.77*	Percent monthly yield (calculated)
12 [×]	*9.23*	Percent annual yield

* Positive for cash received; negative for cash paid out.

Loans With a Constant Amount Paid Towards Principal

This type of loan is structured such that the principal is repaid in equal installments with the interest paid in addition. Therefore each periodic payment has a constant amount applied toward the principal and a varying amount of interest.

Loan Reduction Schedule

If the constant periodic payment to principal, annual interest rate, and loan amount are known, the total payment, interest portion of each payment, and remaining balance for each successive payment may be calculated as follows:

1) Key in the constant periodic payment to principal; press [STO] 0.
2) Key in periodic interest rate and press [ENTER↑] [ENTER↑] [ENTER↑].
3) Key in the loan amount.
   If you wish to skip to another time period, press [ENTER↑]. Then key in the number of payments to be skipped, and press [RCL] 0 [×] [−].
4) Press [x≷y] [%] to obtain the interest portion of the payment.
5) Press [RCL] 0 [+] to obtain the total payment.
6) Press [CLx] [RCL] 0 [−] to obtain the remaining balance of the loan.
7) Return to step 4 for each successive payment.

Example 1:

A $60,000 land loan at 10% interest calls for equal semi-annual principal payments over a 6-year maturity. What is the loan reduction schedule for the first year? (Constant payment to principal is $5000 semi-annually.) What is the fourth year's schedule (skip 4 payments)?

Keystrokes	Display	
5000 [STO] 0		
10 [ENTER↑] 2 [÷] [ENTER↑]		
[ENTER↑] [ENTER↑]	*5.00*	Semi-annual interest rate
60000 [x≷y] [%]	*3,000.00*	First payment's interest
[RCL] 0 [+]	*8,000.00*	Total first payment
[CLx] [RCL] 0 [−]	*55,000.00*	Remaining balance

Keystrokes	Display	
x⇄y %	2,750.00	Second payment's interest
RCL 0 +	7,750.00	Total second payment
CLx RCL 0 −	50,000.00	Remaining balance after first year
4 RCL 0 × −		
x⇄y %	1,500.00	Seventh payment's interest
RCL 0 +	6,500.00	Total seventh payment
CLx RCL 0 −	25,000.00	Remaining balance
x⇄y %	1,250.00	Eighth payment's interest
RCL 0 +	6,250.00	Total eighth payment
CLx RCL 0 −	20,000.00	Remaining balance after fourth year

Add-On Interest Rate Converted to APR

An add-on interest rate determines what portion of the principal will be added on for repayment of a loan. This sum is then divided by the number of months in the loan to determine the monthly payment. For example, a 10% add-on rate for 36 months on $3000 means add one-tenth of $3000 for 3 years (300 × 3)—usually called the "finance charge"—for a total of $3900. The monthly payment is $3900/36.

This keystroke procedure converts an add-on interest rate to an annual percentage rate when the add-on rate and number of months are known.

1) Set the Payment switch to END and press CL FIN.
2) Key in the number of months in loan; press n ENTER↑ RCL 12×.
3) Key in the add-on rate; press ×.
4) Key in the amount of loan; press PV* x⇄y % +.
5) Press x⇄y ÷ CHS PMT.
6) Press i 12 × to obtain the APR.

Example 1:

Calculate the APR and monthly payment of a 5%, $1000 add-on loan which has a life of 18 months.

* Positive for cash received; negative for cash paid out.

Keystrokes	Display	
BEGIN END		
CL FIN		
18 n ENTER↑		
RCL 12× 5 ×		
1000 PV x≷y % +	*1,075.00*	Amount of loan
x≷y ÷ CHS PMT	*-59.72*	Monthly payment
i 12 ×	*9.27*	% annual interest rate

APR Converted to Add-On Interest Rate

Given the number of months and annual percentage rate, this procedure calculates the corresponding add-on interest rate.

1) Set the Payment switch to END and press CL FIN.

2) Enter the following information:
   a) Key in number of months of loan, press n.
   b) Key in APR, press 12÷.
   c) Key in 100, press PV PMT.

3) Press RCL PV RCL n ÷ + CHS 12 × to obtain add-on rate.

Example 1:

What is the equivalent add-on rate for an 18-month loan with an APR of 14%?

Keystrokes	Display	
BEGIN END		
CL FIN		
18 n 14 12÷ 100 PV		
PMT RCL PV RCL n		
÷ + CHS 12 ×	*7.63*	Percent add-on rate

Add-On Rate Loan With Credit Life

This HP-38E program calculates the monthly payment amount, credit life amount (an optional insurance which cancels any remaining indebtedness at the death of the borrower), total finance charge, and annual percentage rate (APR) for an add-on interest rate loan. The monthly payment is rounded (in the normal manner) to the nearest cent. If other rounding techniques are used, slightly different results may occur.

KEY ENTRY	DISPLAY
g P/R g CL P	00-
1	01- 1
RCL 0	02- 22 0
1	03- 1
2	04- 2
0	05- 0
0	06- 0
÷	07- 71
STO 4	08- 21 4
RCL 2	09- 22 2
×	10- 61
−	11- 41
g LAST x	12- 25 31
RCL 1	13- 22 1
×	14- 61
RCL 4	15- 22 4
×	16- 61
−	17- 41
RCL 4	18- 22 4
RCL 1	19- 22 1
×	20- 61
1	21- 1
+	22- 51
x⇄y	23- 33
÷	24- 71
RCL 3	25- 22 3
×	26- 61
RCL 0	27- 22 0
÷	28- 71

KEY ENTRY	DISPLAY
f RND	29- 24 14
CHS	30- 32
PMT	31- 14
R/S	32- 74
RCL PMT	33- 22 14
RCL 0	34- 22 0
×	35- 61
CHS	36- 32
PV	37- 13
RCL PV	38- 22 13
RCL 2	39- 22 2
%	40- 23
RCL 0	41- 22 0
×	42- 61
1	43- 1
2	44- 2
÷	45- 71
STO 5	46- 21 5
g EEX	47- 25 32
2	48- 2
×	49- 61
g FRAC	50- 25 61
g x=0	51- 25 6
g GTO 60	52- 25 7 60
RCL 5	53- 22 5
.	54- 73
0	55- 0
1	56- 1
+	57- 51

KEY ENTRY	DISPLAY
f RND	58- 24 14
STO 5	59- 21 5
RCL 5	60- 22 5
R/S	61- 74
RCL PV	62- 22 13
x≷y	63- 33
−	64- 41
RCL 3	65- 22 3
−	66- 41
CHS	67- 32
R/S	68- 74

KEY ENTRY	DISPLAY
RCL 5	69- 22 5
RCL 3	70- 22 3
+	71- 51
PV	72- 13
RCL 0	73- 22 0
n	74- 11
i	75- 12
RCL g 12÷	76- 22,25 12
g GTO 00	77- 25 7 00
g P/R	

REGISTERS			
R_0 N	R_1 AIR	R_2 CL	R_3 AMT
R_4 N/1200	R_5 Used	R_6	R_7

1) Key in the program.
2) Set the payment switch to END and press CL FIN.
3) Key in the number of monthly payments in the loan; press STO 0.
4) Key in the annual add-on interest rate as a percent; press STO 1.
5) Key in the credit life as a percent; press STO 2.
6) Key in the amount; press STO 3.
7) Press R/S to find the monthly payment amount.
8) Press R/S to obtain the amount of credit life.
9) Press R/S to calculate the total finance charge.
10) Press R/S to calculate the annual percentage rate.
11) For a new loan return to step 3.

Example 1:

You wish to quote a loan on a $3100 balance, payable over 36 months at an add-on rate of 6.75%. Credit life is 1%. What are the monthly payment amount, credit life amount, total finance charge, and APR?

Keystrokes	Display	
BEGIN [redacted] END		
[CL FIN]		
36 [STO] 0		
6.75 [STO] 1		
1 [STO] 2		
3100 [STO] 3		
[R/S]	*-107.42*	Monthly payment
[R/S]	*116.02*	Credit life
[R/S]	*-651.10*	Finance charge
[R/S]	*12.39*	APR

Interest Rebate—Rule of 78's

This procedure finds the unearned interest rebate, as well as the remaining principal balance due for a prepaid consumer loan using the Rule of 78's. The known values are the current installment number, the total number of installments for which the loan was written, and the total finance charge (amount of interest). The information is entered as follows:

1) Key in number of months in the loan; press [STO] 1.
2) Key in payment number when prepayment occurs; press [−] [STO] 2 1 [+].
3) Key in total finance charge; press [×] [RCL] 1 [ENTER↑] [×] [RCL] 1 [+] [÷] [RCL] 2 [×] to obtain the unearned interest (rebate).
4) Key in periodic payment amount; press [RCL] 2 [×] [x≷y] [−] to obtain the amount of principal outstanding.

Example 1:

A 30 month, $1,000 loan having a finance charge of $180, is being repaid at $39.33 per month. What is the rebate and balance due after the 25th regular payment?

Keystrokes	Display	
30 [STO] 1		
25 [−] [STO] 2		
1 [+] 180 [×]		
[RCL] 1 [ENTER↑]		
[×] [RCL] 1 [+]		
[÷] [RCL] 2 [×]	*5.81*	Rebate
39.33 [RCL] 2 [×]		
[x≷y] [−]	*190.84*	Outstanding principal

This HP-38E program can be used to evaluate the previous example:

KEY ENTRY	DISPLAY
[g] [P/R] [g] [CL P]	*00-*
[STO] 0	*01- 21 0*
[g] [R↓]	*02- 25 33*
[STO] 2	*03- 21 2*
[g] [R↓]	*04- 25 33*
[STO] 1	*05- 21 1*
[RCL] 2	*06- 22 2*
[−]	*07- 41*
[STO] 2	*08- 21 2*
1	*09- 1*
[+]	*10- 51*
[RCL] 0	*11- 22 0*
[×]	*12- 61*
[RCL] 1	*13- 22 1*

KEY ENTRY	DISPLAY
[ENTER↑]	*14- 31*
[×]	*15- 61*
[RCL] 1	*16- 22 1*
[+]	*17- 51*
[÷]	*18- 71*
[RCL] 2	*19- 22 2*
[×]	*20- 61*
[R/S]	*21- 74*
[RCL] 2	*22- 22 2*
[×]	*23- 61*
[x≷y]	*24- 33*
[−]	*25- 41*
[g] [GTO] 00	*26- 25 7 00*
[g] [P/R]	

REGISTERS			
R_0 FC	R_1 Payment #	R_2 Total n	R_3
R_4	R_5	R_6	R_7

1) Key in the program.
2) Key in the number of months in the loan; press [ENTER↑].
3) Key in the payment number when prepayment occurs; press [ENTER↑].
4) Key in the total finance charge; press [R/S] to obtain the unearned interest (rebate).
5) Key in the periodic payment amount; press [R/S] to find the amount of principal outstanding.
6) For a new case return to step 2.

Keystrokes	**Display**	
30 [ENTER↑]		
25 [ENTER↑]		
180 [R/S]	***5.81***	Rebate
39.33 [R/S]	***190.84***	Outstanding principal

Savings

An annual effective 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 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.

Nominal Rate Converted to Effective Rate

Given a nominal interest rate and the number of compounding periods per year, this keystroke procedure computes the effective annual interest rate.

1) Press [CL FIN].
2) Key in the nominal rate; press [ENTER↑].
3) Key in the number of compounding periods per year; press [n] [÷] [i].
4) Key in 100; press [CHS] [ENTER↑] [PV].
5) Press [FV] [+] to obtain the effective annual interest rate.

Example 1:

What is the effective annual rate of interest if the annual nominal rate of 5¼% is compounded quarterly?

Keystrokes	Display	
[CL FIN]		
5.25 [ENTER↑] 4 [n] [÷] [i]	*1.31*	% quarterly interest rate
100 [CHS] [ENTER↑] [PV] [FV] [+]	*5.35*	% effective interest rate

For repeated calculations the following HP-38E program can be used:

KEY ENTRY	DISPLAY
g P/R g CL P	00-
f FIN	01- 24 32
n	02- 11
÷	03- 71
i	04- 12
1	05- 1
0	06- 0
0	07- 0

KEY ENTRY	DISPLAY
CHS	08- 32
ENTER↑	09- 31
PV	10- 13
FV	11- 15
+	12- 51
g GTO 00	13- 25 7 00
g P/R	

1) Key in the program.
2) Key in the nominal rate; press ENTER↑.
3) Key in the number of compounding periods; press R/S to obtain the effective annual interest rate.
4) For a new case return to step 2.

Example 2:

What is the effective annual rate of interest if the annual nominal rate of 5¼% is compounded monthly?

Keystrokes	Display	
5.25 ENTER↑		
12 R/S	5.38	% effective interest rate

Effective Rate Converted to Nominal Rate

Given an effective interest rate and the number of compounding periods per year, this routine calculates the nominal interest rate.

1) Press CL FIN.
2) Key in the number of periods per year; press n.
3) Key in 100; press ENTER↑ PV.
4) Key in the effective annual rate; press + CHS FV i.
5) Press RCL n × to obtain the nominal rate.

Example 1:

Find the nominal rate if the effective annual rate is 5.35% compounded quarterly.

Keystrokes	Display	
CL FIN		
4 n 100 ENTER↑ PV		
5.35 + CHS		
FV i		
RCL n ×	*5.25*	% nominal interest rate

Nominal Rate Converted to Continuous Effective Rate

This procedure converts a nominal annual interest rate to the continuous effective rate.

1) Key in 1; press ENTER↑.
2) Key in the nominal rate; press %.
3) Press e^x △% to obtain the continuous effective rate.

Example 1:

What is the effective rate resulting from a 5¼% passbook rate with continuous compounding?

Keystrokes	Display	
1 ENTER↑ 5.25 % e^x △%	*5.39*	% continuous rate

This section gives keystroke procedures to evaluate frequently encountered savings problems. Also included is a generalized routine to evaluate a savings plan when deposits and withdrawals are made at irregular intervals.

Initial Deposit With Periodic Deposits

Given an initial deposit into a savings account, and a series of periodic deposits coincident with the compounding period, the future value (or accumulated amount) may be calculated as follows:

1) Set the Payment switch to END and press [CL FIN].
2) Key in the initial investment and press [CHS] [PV].
3) Key in the number of additional periodic deposits and press [n].
4) Key in the periodic interest rate and press [i].
5) Key in the periodic deposit and press [CHS] [PMT].
6) Press [FV] to determine the value of the account at the end of the time period.

Example 1:

You have just opened a savings account with a $200 deposit. If you deposit $50 a month, and the account earns 5¼% compounded monthly, how much will you have in 3 years?

Keystrokes	Display	
BEGIN  END		
[CL FIN]		
200 [CHS] [PV] 3 [12×]		
5.25 [12÷]		
50 [CHS] [PMT] [FV]	*2,178.94*	Value of the account

Note: If the periodic deposits do not coincide with the compounding periods, the account must be evaluated in another manner. First, find the future value of the initial deposit and store it. Then use the procedure for Compounding Periods Different from Payment Periods to calculate the future value of the periodic deposits. Recall the future value of the initial deposit and add to obtain the value of the account.

Number of Periods to Deplete a Savings Account or to Reach a Specified Balance

Given the current value of a savings account, the periodic interest rate, the amount of the periodic withdrawal, and a specified balance, this

procedure determines the number of periods to reach that balance (the balance is zero if the account is depleted.)

1) Set the Payment switch to END and press [CL FIN].
2) Key in the value of the savings account and press [CHS] [PV].
3) Key in the periodic interest rate and press [i].
4) Key in the amount of the periodic withdrawal and press [PMT].
5) Key in the amount remaining in the account and press [FV]. This step may be omitted if the account is depleted (FV = 0).
6) Press [n] to determine the number of periods to reach the desired balance.

Example 1:

Your savings account presently contains $18,000 and earns 5½% compounded monthly. You wish to withdraw $300 a month until the account is depleted. How long will this take? If you wish to reduce the account to $5,000, how many withdrawals can you make?

Keystrokes	Display	
BEGIN END		
[CL FIN]		
18000 [CHS] [PV]		
5.5 [12÷]		
300 [PMT] [n]	*70.32*	Months
12 [÷]	*5.86*	Years to deplete account
5000 [FV] [n]	*52.95*	Months
12 [÷]	*4.41*	Years to reduce account to $5,000

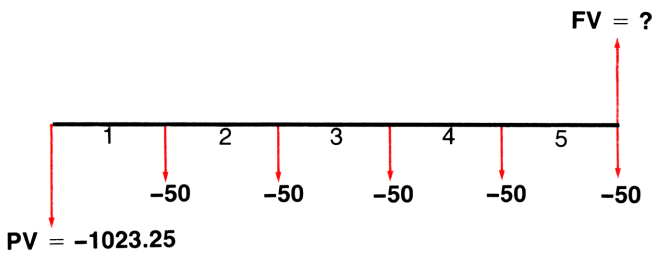
Periodic Deposits and Withdrawals

This section is presented as a guideline for evaluating a savings plan when deposits and withdrawals occur at irregular intervals. One problem is given, and a step-by-step method for setting-up and solving the problem is presented.

Problem

You are presently depositing $50 at the end of each month into a local savings and loan, earning 5½% compounded monthly. Your current balance is $1023.25. How much will you have accumulated in 5 months?

The cash flow diagram looks like this:



The keystrokes are:

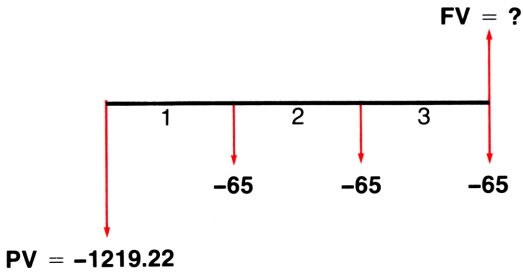
Keystrokes	Display	
BEGIN END		
CL FIN		
50 CHS PMT 5.5 12÷		
1023.25 CHS PV		
5 n FV	*1,299.22*	Amount in account

Now suppose that at the beginning of the 6th month you withdraw $80. What is the new balance?

Keystrokes	Display	
80 −	*1,219.22*	New balance

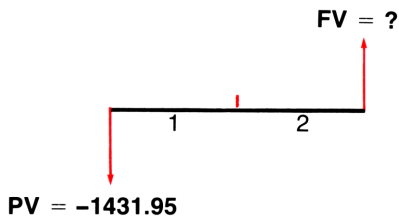
You increase your monthly deposit to $65. How much will you have in 3 months?

The cash flow diagram now looks like this:



Keystrokes	Display	
CHS PV 65 CHS PMT 3 n FV	*1,431.95*	Account balance

Suppose that for 2 months you decide not to make a periodic deposit. What is the balance in the account?



Keystrokes	Display	
CHS PV 2 n 0 PMT FV	*1,445.11*	Account balance

This type of procedure may be continued for any length of time, and may be modified to meet the user's particular needs.

Savings Account Compounded Daily

This HP-38E program determines the value of a savings account when interest is compounded daily, based on a 365 day year. The user is able to calculate the total amount remaining in the account after a series of transactions on specified dates.

KEY ENTRY	DISPLAY
g P/R g CL P	00-
CHS	01- 32
PV	02- 13
g R↓	03- 25 33
3	04- 3
6	05- 6
5	06- 5
÷	07- 71
i	08- 12
g R↓	09- 25 33
STO 0	10- 21 0
RCL PV	11- 22 13
CHS	12- 32
R/S	13- 74
STO 2	14- 21 2
g R↓	15- 25 33
STO 1	16- 21 1
RCL 0	17- 22 0
RCL 1	18- 22 1
f △DAYS	19- 24 41

KEY ENTRY	DISPLAY
n	20- 11
FV	21- 15
f RND	22- 24 14
FV	23- 15
ENTER↑	24- 31
RCL PV	25- 22 13
+	26- 51
STO + 3	27- 21 51 3
RCL FV	28- 22 15
RCL 2	29- 22 2
+	30- 51
CHS	31- 32
PV	32- 13
RCL 1	33- 22 1
STO 0	34- 21 0
RCL PV	35- 22 13
CHS	36- 32
g GTO 13	37- 25 7 13
g P/R	

REGISTERS			
R_0 Initial date	R_1 Next date	R_2 $ amount	R_3 Interest
R_4	R_5	R_6	R_7

1) Key in the program.
2) Set the Payment switch to END and press f ALL.
3) Key in the date (MM.DDYYYY) of the first transaction; press ENTER↑.
4) Key in the annual nominal interest rate as a percent; press ENTER↑.

5) Key in the amount of the initial deposit; press [R/S].
6) Key in the date of the next transaction; press [ENTER↑].
7) Key in the amount of the transaction (positive for money deposited, negative for cash withdrawn); press [R/S] to determine the amount in the account.
8) Repeat steps 6 and 7 for subsequent transactions.
9) To see the total interest to date, press [RCL] 3.
10) For a new case press [g] [CL P] and go to step 2.

Example:

Compute the amount remaining in this 5.25% account after the following transactions:

1) January 18, 1978 deposit $125.00
2) February 24, 1978 deposit $60.00
3) March 16, 1978 deposit $70.00
4) April 5, 1978 withdraw $50.00
5) June 1, 1978 deposit $175.00
6) July 6, 1978 withdraw $100

Keystrokes	Display	
BEGIN END		
[f] [ALL]		
1.181978 [ENTER↑]		
5.25 [ENTER↑]		
125 [R/S]	*125.00*	Initial deposit
2.241978 [ENTER↑]		
60 [R/S]	*185.67*	Balance in account February 24, 1978
3.161978 [ENTER↑]		
70 [R/S]	*256.20*	Balance in account March 16, 1978
4.051978 [ENTER↑]		
50 [CHS] [R/S]	*206.94*	Balance in account April 5, 1978

6.011978 ENTER↑		
175 R/S	*383.64*	Balance in account June 1, 1978
7.061978 ENTER↑		
100 CHS R/S	*285.58*	Balance in account July 6, 1978
RCL 3	*5.58*	Total interest

Compounding Periods Different From Payment Periods

In financial calculations involving a series of payments equally spaced in time with periodic compounding, both periods of time are normally equal and coincident. This assumption is programmed into the HP-37E and HP-38E.

In savings plans however, money may become available for deposit or investment at a frequency different from the compounding frequencies offered. The HP-37E and HP-38E can easily be used in these calculations. However, because of the assumptions mentioned, the compounding period interest rate must be adjusted to correspond to an equivalent rate for the payment period.

These procedures present solutions for future value, payment amount, and number of payments. In addition, it should be noted that only annuity due (payments at the beginning of payment period) calculations are shown since this is most common in savings plan calculations.

To calculate the equivalent payment period interest rate, information is entered as follows:

1) Set the Payment switch to BEGIN and press CL FIN.
2) Key in the annual interest rate (as a percent); press ENTER↑.
3) Key in the number of compounding periods per year; press n ÷ i.
4) Key in 100; press PV FV.
5) Key in the number of payments (deposits) per year; press n i CL FIN i.

The interest rate which corresponds to the payment period is now in register "i" and you are ready to proceed.

Example 1: Solving for future value.

Starting today you make monthly deposits of $25 into an account paying 5% compounded daily (365-day basis). At the end of 7 years, how much will you receive from the account?

Keystrokes	Display	
BEGIN END		
CL FIN		
5 ENTER↑		
365 n ÷ i		
100 PV FV		
12 n i		
CL FIN i	*0.42*	Equivalent periodic interest rate
7 12× 25 CHS PMT		
FV	*2,519.61*	Future value

Example 2: Solving for payment amount.

For 8 years you wish to make weekly deposits in a savings account paying 5.5% compounded quarterly. What amount must you deposit each week to accumulate $6000?

Keystrokes	Display	
BEGIN END		
CL FIN		
5.5 ENTER↑		
4 n ÷ i		
100 PV FV		
52 n i		
CL FIN i	*0.11*	Equivalent periodic interest rate
8 ENTER↑ 52 × n		
6000 FV PMT	*-11.49*	Periodic payment

Example 3: Solving for number of payment periods.

You can make weekly deposits of $10 into an account paying 5.25% compounded daily (365-day basis). How long will it take you to accumulate $1000?

Keystrokes	Display	
BEGIN [▮] END		
[CL FIN]		
5.25 [ENTER↑]		
365 [n] [÷] [i]		
100 [PV] [FV]		
52 [n] [i]		
[CL FIN] [i]	*0.10*	Equivalent periodic interest rate
10 [CHS] [PMT] 1000 [FV]		
[n]	*95.22*	Weeks
52 [÷]	*1.83*	Years

Leasing

Advance Payments

Situations may exist 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.

This first procedure finds 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 second procedure calculates the periodic yield.

To calculate the payment, information is entered as follows:

1) Set the Payment switch to END and press [CL FIN].
2) Key in the total number of payments in the lease and press [ENTER↑].
3) Key in the total number of payments made in advance and press [STO] 0 [−] [n].
4) Key in or calculate the periodic interest rate as a percent and press [i].
5) Key in 1; press [CHS] [PMT] [PV] [RCL] 0 [+].
6) Key in the initial loan amount and press [x≷y] [÷] to obtain the periodic payment to be received by the lessor.

Example 1:

Equipment worth $750 is leased for 12 months. The equipment is assumed to have no salvage value at the end of the lease. The lessee has agreed to make 3 payments at the time of closing. What monthly payment is necessary to yield the lessor 10% annually?

Keystrokes	Display	
BEGIN [redacted] END		
[CL FIN]		
12 [ENTER↑]		
3 [STO] 0 [−] [n]		
10 [12÷] 1 [CHS] [PMT]		
[PV] [RCL] 0 [+]		
750 [x≷y] [÷]	*64.45*	Monthly payment to be received

For repeated leases of this type use the following HP-38E program:

KEY ENTRY	DISPLAY
[g] [P/R] [g] [CL P]	*00-*
[f] [FIN]	*01- 24 32*
[STO] 1	*02- 21 1*
[g] [R↓]	*03- 25 33*
[i]	*04- 12*
[g] [R↓]	*05- 25 33*
[STO] 0	*06- 21 0*
[−]	*07- 41*
[n]	*08- 11*
1	*09- 1*

KEY ENTRY	DISPLAY
[CHS]	*10- 32*
[PMT]	*11- 14*
[PV]	*12- 13*
[RCL] 0	*13- 22 0*
[+]	*14- 51*
[RCL] 1	*15- 22 1*
[x≷y]	*16- 33*
[÷]	*17- 71*
[g] [GTO] 00	*18- 25 7 00*

REGISTERS			
R_0 A	R_1 PV	R_2	R_3
R_4	R_5	R_6	R_7

1) Key in the program.
2) Set the Payment switch to END.
3) Key in the total number of payments in the lease; press [ENTER↑].
4) Key in the total number of payments made in advance; press [ENTER↑].

5) Key in the periodic interest rate as a percent; press [ENTER↑].

6) Key in the initial loan amount and press [R/S] to obtain the periodic payment to be received by the lessor.

7) For a new case, return to step 3.

Keystrokes	Display	
BEGIN END		
12 [ENTER↑]		
3 [ENTER↑]		
10 [ENTER↑] 12 [÷]		
750 [R/S]	***64.45***	Monthly payment to be received

Example 2:

In the previous example, what monthly payment is necessary to yield the lessor 10% annually if one payment is due at the time of closing?

Keystrokes	Display	
BEGIN END		
[CL FIN]		
12 [ENTER↑]		
1 [STO] 0 [−] [n]		
10 [12÷] 1 [CHS] [PMT]		
[PV] [RCL] 0 [+]		
750 [x≷y] [÷]	***65.39***	Monthly payment to be received

Since this is an annuity due situation (one payment at the beginning of the period) the calculation could also be done as follows:

Keystrokes	Display	
BEGIN END		
[CL FIN]		
12 [n] 10 [12÷]		
750 [CHS] [PV] [PMT]	***65.39***	Monthly payment to be received

To calculate the periodic yield, information is entered as follows:

1) Set the Payment switch to END and press [CL FIN].
2) Key in the total number of payments in the lease and press [ENTER↑].
3) Key in the total number of payments made in advance and press [STO] 0 [−] [n].
4) Key in the periodic payment to be received and press [PMT].
5) Key in the total amount of the loan and press [CHS] [RCL] 0 [RCL] [PMT] [×] [+] [PV].
6) Press [i] to obtain the periodic yield.

Example 1:

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 ($1800). What is the annual yield to the lessor?

Keystrokes	Display	
BEGIN END		
[CL FIN]		
60 [ENTER↑]		
3 [STO] 0 [−] [n]		
600 [PMT]		
25000 [CHS] [RCL] 0		
[RCL] [PMT] [×] [+] [PV]		
[i]	*1.44*	Monthly yield
12 [×]	*17.33*	Annual yield as a %

Advance Payments With Residual

Situations may arise where a transaction has advance payments and a residual value (salvage value) at the end of the normal term.

To calculate the payment amount, information is entered as follows:

1) Set the Payment switch to END and press [CL FIN].
2) Key in the total number of payments and press [n].
3) Key in or calculate the periodic interest rate and press [i].

4) Key in the residual value and press [FV] [PV].

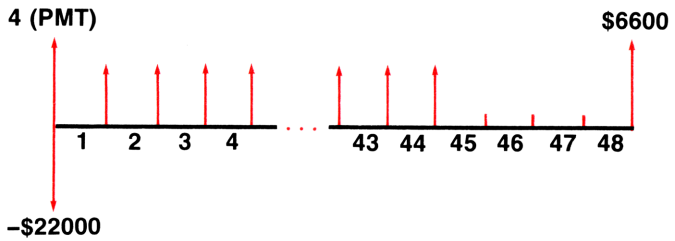
5) Key in the loan amount and press [+] [STO] 0.

6) Press 0 [FV] [RCL] [n].

7) Key in the total number of payments made in advance and press [STO] 1 [−] [n] 1 [CHS] [PMT] [PV] [RCL] 1 [+] [RCL] 0 [x≷y] [÷] to obtain the payment amount received by the lessor.

Example 1:

A copier worth $22,000 is to be leased for 48 months. The lessee has agreed to make 4 payments in advance, with a purchase option at the end of 48 months enabling him to buy the copier for 30% of the purchase price. What monthly payment is necessary to yield the lessor 12% annually?



Keystrokes	Display	
BEGIN END		
[CL FIN]		
48 [n] 12 [12÷]		
22000 [STO] 2		
30 [%] [FV] [PV]		
[RCL] 2 [+] [STO] 0		
0 [FV]		
[RCL] [n] 4 [STO] 1 [−]		
[n] 1 [CHS] [PMT] [PV]		
[RCL] 1 [+]		
[RCL] 0 [x≷y] [÷]	***453.84***	Monthly payment received by lessor

To calculate the periodic yield on the HP-37E, an iteration (trial and error) procedure must be used. Information is entered as follows:

1) Set the Payment switch to END and press [CL FIN].

2) Key in the total number of payments made in advance and press [STO] 0.

3) Key in the total number of payments and press [STO] 1.

4) Key in the periodic payment amount and press [STO] 2.

5) Key in the loan amount and press [CHS] [STO] 3.

6) Key in the residual value and press [STO] 4.

7) Choose a best-guess periodic interest rate and press [i] [RCL] 1 [n] [RCL] 4 [FV] [PV] [STO] 5 to obtain the present value of the residual value at the chosen interest rate.

8) Press 0 [FV] [RCL] [n] [RCL] 0 [−] [n] [RCL] 2 [PMT] [PV] [STO] [+] 5 to obtain the present value of the periodic cash flows at the chosen interest rate.

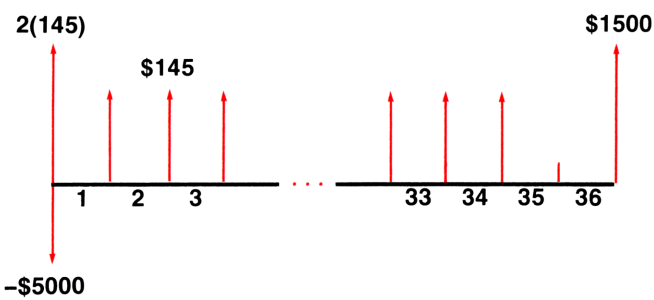
9) Press [RCL] 3 [RCL] 0 [RCL] 2 [×] [+] [RCL] 5 [−] to obtain the net present value (NPV) of all the cash flows at the chosen interest rate.

10) If the NPV is negative, the yield is lower than the value chosen in step 7. If the NPV is positive, the yield is higher than the value chosen in step 7.

11) Repeat steps 7-10 until the net present value is sufficiently close to zero.

Example 1:

Equipment worth $5000 is leased for 36 months, at $145 per month. The lessee has agreed to pay the first and last month's payments in advance. At the end of the lease, the equipment may be purchased for $1500. What is the annual yield to the lessor?



Keystrokes	Display	
BEGIN END		
CL FIN		
2 STO 0	*2.00*	Number of advance payments
36 STO 1	*36.00*	Total number of payments
145 STO 2	*145.00*	Monthly payment
5000 CHS STO 3	*-5,000.00*	Amount given by lessor
1500 STO 4	*1,500.00*	Residual value

Choose 20% as the first guess of the annual yield.

20 12÷ RCL 1 n		
RCL 4 FV PV		
STO 5	*-827.30*	Present value of residual
0 FV RCL n		
RCL 0 − n		
RCL 2 PMT PV		
STO + 5	*-3,740.39*	Present value of periodic payments
RCL 3 RCL 0		
RCL 2 × +		
RCL 5 −	*-142.31*	Net present value

Since the NPV is negative, the yield is less than 20%; choose 18% as next guess.

CL FIN		
18 12÷ RCL 1 n		
RCL 4 FV PV		
STO 5	*-877.63*	Present value of residual
0 FV RCL n		
RCL 0 − n		
RCL 2 PMT PV		
STO + 5	*-3,839.85*	Present value of periodic payments
RCL 3 RCL 0		
RCL 2 × +		
RCL 5 −	*7.49*	Net present value

The yield to the lessor is slightly higher than 18%. (It is actually 18.0978%.)

The following HP-38E routine could be used to give a direct solution to the previous example:

Keystrokes (HP-38E)	**Display**	
BEGIN [■] END		
[f] [ALL]		
5000 [CHS] [ENTER↑]		
145 [ENTER↑] 2 [×] [+]		
[g] [CF_0]	*-4,710.00*	Net amount of cash advanced
145 [g] [CF_j] 34 [g] [N_j]	*34.00*	34 cash flows of $145.00
0 [g] [CF_j]	*0.00*	35^{th} cash flow
1500 [g] [CF_j]	*1,500.00*	36^{th} cash flow
[f] [IRR] 12 [×]	*18.10*	Annual yield to lessor

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.

To find the monthly payment amount necessary to amortize the loan in the specified amount of time, information is entered as follows:

1) Set the Payment switch to END and press [CL FIN].
2) Key in the number of the last payment period before payments close the first time; press [n].
3) Key in the annual interest rate as a percent; press [12÷] 1 [PMT] [FV].
4) Press [CHS] [PV] 12 [RCL] [n] [−] [n] 0 [PMT] [FV] [STO] 0 [RCL] [n].
5) Key in the number of payments which are skipped; press [−] [n] 1 [PMT] 0 [PV] [FV] [STO] [+] 0.

6) Press 0 [PMT] 12 [n] 100 [PV] [FV] [RCL] [PV] [+] [CHS] [CL FIN] [i].

7) Key in the total number of years in the loan; press [n].

8) Key in the loan amount; press [PV] [PMT] [RCL] 0 [÷] to obtain the monthly payment amount when the payment is made at the end of the month.

9) Press [CHS] [FV] 0 [PMT] 1 [n].

10) Key in the annual interest rate as a percent; press [12÷] [PV] to find the monthly payment amount when the payment is made at the beginning of the month.

Example 1:

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 8¾%, what is the monthly payment necessary to amortize the loan?

Keystrokes	Display	
BEGIN [redacted] END		
[CL FIN]		
3 [n]	*3.00*	Number of payments made before a group of payments is skipped
8.75 [12÷] 1 [PMT] [FV]		
[CHS] [PV]		
12 [RCL] [n] [−] [n]		
0 [PMT] [FV] [STO] 0		
[RCL] [n] 3 [−] [n]		
1 [PMT] 0 [PV] [FV]		
[STO] [+] 0		
0 [PMT] 12 [n]		
100 [PV] [FV]		
[RCL] [PV] [+] [CHS]		
[CL FIN] [i]		
5 [n] 100000 [PV]		
[PMT] [RCL] 0 [÷]	*2,761.44*	Monthly payment in arrears

Financial Formulas

Compound Interest

n = number of compounding periods
i = periodic interest rate, expressed as %
PV = present value
FV = future value or balance
PMT = periodic payment
S = BEGIN/END switch position factor (0 or 1) indicating treatment of PMT; 0 corresponds to END, 1 to BEGIN.
r = i/100, periodic interest rate expressed as decimal

$$0 = PV + (1 + rS)\,PMT\left[\frac{1 - (1 + r)^{-n}}{r}\right] + FV\,(1 + r)^{-n}$$

Loans With a Constant Amount Paid Towards Principal

BAL_K = remaining balance after time period K
CPMT = constant payment to principal
$BAL_K = PV - (K \cdot CPMT)$
K^{th} payment to interest = $i(BAL_K) = (PMT_i)_K$
K^{th} total payment = $CPMT + (PMT_i)_K$

Add-On Interest Rate to APR

r = add-on rate as a decimal
n = number of monthly payments
APR = 1200i, where i is the solution in the following equation:

$$\frac{n}{1 + \frac{n}{12}\,r} = \frac{1 - (1 + i)^{-n}}{i}$$

Add-On to APR With Credit Life

CL = credit life as decimal
AMT = loan amount
FC = finance charge

$$\left[\frac{1+\left(\frac{n}{12}\right)r}{1-\left(\frac{n}{12}\right)CL-\left(\frac{n}{12}\right)^2 CL\cdot r}\right] AMT = G$$

$$\frac{G}{n} = PMT$$

$$\frac{G \cdot CL \cdot n}{12} = \text{amount of credit life}$$

$$FC = (G - AMT - CL)$$

Rule of 78's Rebate

PV = finance charge
I_k = interest charged at month k
n = number of months in loan

$$I_k = \frac{2(n - k + 1)}{n(n + 1)} PV$$

$$\text{Rebate} = \frac{(n - k)\, I_k}{2}$$

$$BAL_k = (n - k) \cdot PMT - \text{Rebate}_k$$

Interest Rate Conversions

Finite compounding

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

where C = number of compounding periods per year

Continuous compounding

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

Compounding Periods Different From Payment Periods

$$i_{PMT} = \left((1 + {}^{r}/_{C})^{C/P} - 1\right) 100$$

where C = number of compounding periods per year
P = number of payment periods per year

Advance Payments

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

where:

A = number of payments made in advance

Skip Payments

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

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

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

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

OTHER APPLICATIONS BOOKS WHICH ARE AVAILABLE

INVESTMENT ANALYSIS AND STATISTICS APPLICATIONS FOR BUSINESS PROFESSIONALS AND STUDENTS (00038-90026)

Modified IRR (FMRR); Lease vs Purchase; Break-Even Analysis; Bonds; Exponential, Logarithmic and Power Curve Fits; Exponential Smoothing; Standard Error of the Mean; Grouped Data; Chi-Square; Normal Distribution; Covariance; Permutation; Combination; Random Number Generator

REAL ESTATE APPLICATIONS (00038-90024)

APR With Fees; Discounted Mortgages; Present Value and Yield of a Mortgage With Balloon Payment One Period After Last Payment; Deferred Annuities; Present Value of Increasing/Decreasing Annuity; Equity Yield Rate; Equity Investment Value and Present Value; Future Sales Price and Overall Depreciation/Appreciation Rate; Mortgage Constant; Refinancing; Wrap-Around Mortgages; Modified IRR (FMRR); Canadian Mortgages; Depreciation; Exponential Curve Fit

REAL ESTATE II: INCOME PROPERTY ANALYSIS APPLICATIONS (00038-90051)

Annual Property Cash Flow Analysis: Before-Tax Cash Flows and Reversions; After-Tax Cash Flows (including Multiple Mortgages); After-Tax Net Cash Proceeds of Resale. **Mortgage-Equity (Ellwood) Analysis:** Basic Rate and Overall Rate; Value (Present Worth) with R; Equity Dividend Rate; Cash Throw-Off to Equity; Value (Present Worth) with Dollar Amounts Given; Capital Appreciation or Depreciation on Resale; Equity Yield Rate from Dollar Figures. **Investment and Feasibility Analysis:** Feasibility Tests; Present Worth; Net Present Value; Profitability Index; Internal Rate of Return; Payback Period.

MARKETING AND FORECASTING APPLICATIONS (00038-90049)

Moving Average; Seasonal Variation Factors; Exponential Curve Fit; Gompertz Curve Fit; Forecasting with Exponential Smoothing; Breakeven Analysis; Operating Leverage; Profit and Loss Analysis; Markup and Margin Calculations; List and Net Prices; Learning Curve; Queuing and Waiting Line Theory; Cash Flow Loader; Percentage Tabulator.

PERSONAL FINANCE APPLICATIONS (00038-90052) (HP-38E/38C ONLY)

IRA or Keogh Plan; Stock Portfolio Evaluation; U.S. Treasury Bill Valuation; True Annual Growth Rate of an Investment Portfolio; Bond Purchased Between Coupons; The True Cost of an Insurance Policy; Real Estate Equity Investment Analysis; Homeowner's Monthly Payment Estimator; True Annual Percentage Interest Rate on a Mortgage with Fees; Rent versus Buy.

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For additional sales and service information contact your local Hewlett-Packard Sales Office or call 800/648-4711. (In Nevada call 800/992-5710.)

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