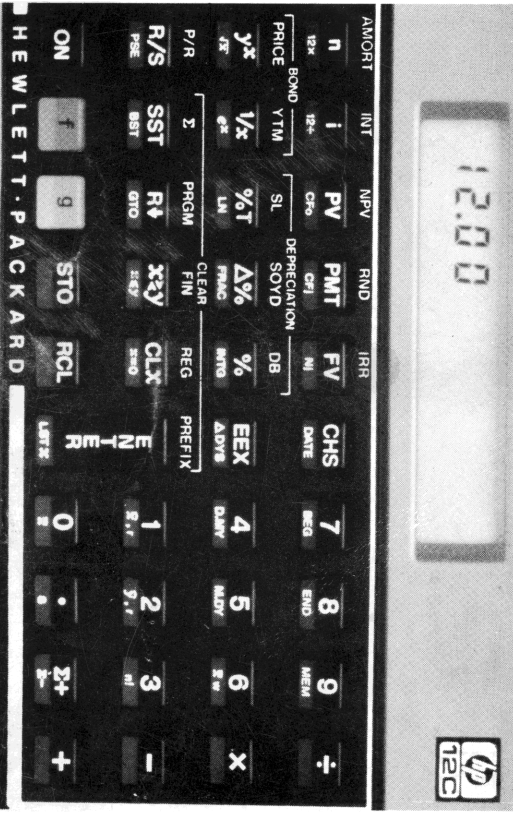
QUICK REFERENCE BOOK
FOR THE HP-12C



INCLUDING SAMPLE PROBLEMS
FOR EASY REFERENCE

The Quick Reference Book for the HP-12C is designed to be used as a training guide in learning to operate the HP-12C financial calculator. It can be carried in the case with the calculator to provide convenient reference material. The book is not intended as a replacement for the HP-12C Owner's Handbook and Problem-Solving Guide, but is designed as a supplement to reinforce concepts learned from the Owner's Handbook.

The keystroke procedures are in variance with the Owner's Handbook in two areas. First, the keystrokes for converting annual periods and interest to monthly figures referred to as [g] [12×] and [g] [12÷] in the Owner's Handbook are shown as [g] [n] ([12×]) and [g] [i] ([12÷]) in this book as a reminder that the monthly figures are entered into the "n" and "i" registers when the [12×] and [12÷] keys are pressed. Second, the redundant steps of keying "0" into financial registers which have zero values are included in this book to assist the user in understanding the problems.

The author makes no expressed or implied warranty with regard to the keystroke procedures and material contained herein. The keystroke procedures and material are made available on an "as is" basis, and the risk associated with their usage, quality, performance and fitness for use for any purpose rests entirely with the user. The author shall not be liable for damages of whatsoever nature, incidental or consequential, arising out of the usage or performance of keystroke procedures or material contained herein.

The author offers seminars on the usage of the HP-12C. For information concerning seminars of consultation, contact Evan G. Gost, Box 2275, Saratoga, CA 95070.

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ALPHABETICAL INDEX

KEYS WITH MULTIPLE FUNCTIONS

Primary function is printed in white on the key.
Second function is printed in gold above the key. Press gold [f] followed by the respective key to perform the secondary function.
Third function is printed in blue below the key. Press blue [g] followed by the respective key for the tertiary function.
Note: After pressing the [f] or [g], a small "f" or "g" will appear on the display below digits.

NEGATIVE NUMBERS

Press [CHS] to change a number from positive to negative and vice versa.

CLEARING KEYS

[CLx] clears the display (x register).
The symbol —— CLEAR —— printed in gold above and spanning 5 keys denotes clearing functions of those keys.
[f] CLEAR [FIN] clears financial registers, but not the display.
[f] CLEAR [REG] clears financial registers, storage registers, stack, last x and display.
[f] CLEAR [PRGM] clears all stored programs.
[f] CLEAR [Σ] clears statistic registers.
[f] CLEAR [PREFIX] clears "f" or "g" prefix.

DECIMAL DISPLAY

Press [f] 2 for .00 display.
[f] 4 for .0000 display.
[f] and any number (0-9) to set the digits after decimal in the display. The display is rounded to the digits shown; however, the unrounded number is retained for calculations. The display is normally set to display .00 for monetary calculations.

SIMPLE ARITHMETIC CALCULATIONS

The arithmetic operation (+ , − , × , ÷) is keyed after the 2nd number used in the problem. To add 2 + 3 , press

KEYSTROKES	DISPLAY	REMARKS
[CLx]	0.00	clears display
2	2	2 in x register
[ENTER]	2.00	2 in y register
3	3	3 in x register
[+]	5.00	x + y registers

For reference see "STACK" on page 34.

CHAIN CALCULATIONS

(2,000 X 60) + (480 x 20) + (110 X 120 X 6)=

KEYSTROKES	DISPLAY	REMARKS
[CLx]	0.00	clears display
2000 [ENTER] 60 [X]	120,000.00	line 2
480 [ENTER] 20 [X]	9,600.00	line 3
110 [ENTER] 120 [X]	13,200.00	line 4
6 [X]	79,200.00	line 5
[+]	88,800.00	lines 3 + 5
[+]	208,800.00	lines 2 + 6

LARGE NUMBERS

To enter 3,116,700,000,000 press 3.1167 [EEX] 12. The display shows 3.1167 12. The [EEX] key moves the decimal point a number of places (in this case 12).

STORAGE AND MEMORY

20 storage registers (numbered 0 thru 9 and .0 thru .9) are available for storing numbers and dates. To store, press [STO] followed by the desired storage register number. To recall, press [RCL] and the respective storage register number. A number stored in a register remains until cleared or replaced by a difference number.

KEYSTROKES	DISPLAY	REMARKS
50 [STO] 0	50.00	stores 50 in Register 0
15 [STO] 1	15.00	stores 15 in Register 1
25 [STO] 2	25.00	stores 25 in Register 2
[RCL] 0	50.00	recalls Register 0
[RCL] 1	15.00	recalls Register 1

The financial registers (n, i, PV, PMT and FV) also may be used for the storage of numbers.

PERCENTAGE OF A NUMBER

Find 6% of $195,000 and how much remains after 6% is deducted from $195,000.

KEYSTROKES	DISPLAY	REMARKS
[CLx]	0.00	clears display
195,000 [ENTER]	195,000.00	
6 [%]	11,700.00	1st answer
[−]	183,300.00	2nd answer

PERCENTAGE DIFFERENCE BETWEEN 2 NUMBERS

If a stock price drops from $66.00 to $47.50, what is the percentage change?

KEYSTROKES	DISPLAY	REMARKS
[CLx]	0.00	clears display
66 [ENTER]	66.00	
47.5 [△%]	−28.03	28% loss

PERCENTAGE OF TOTAL

$32,500 is what percentage of $60,000?

KEYSTROKES	DISPLAY	REMARKS
[CLx]	0.00	clears display
60000 [ENTER]	60,000.00	
32500 [%T]	54.17	54.17 percent

CALENDAR FUNCTIONS

For Day/Month/Year (European notation), press [g] [D.MY] . "D.MY" will be displayed under digits. For Month/Day/Year (U.S. notation), press [g] [M.DY] . The "D.MY" will disappear. The examples in this book use the U.S. notation. Find the day/date 90 days after 8/23/82.

KEYSTROKES	DISPLAY	REMARKS
[CLx]	0.00	clears display
[g] [M.DY]	0.00	Mo/Day/Year
[f] 6	0.000000	sets display
8.23 1982 [ENTER]	8.23 1982	reference date
90 [g] [DATE]	11,21,1982 7	11/21/82 Sunday

The last digit is the day of the week (1 = Monday; 2 = Tuesday; 3 = Wednesday; . . . 7 = Sunday).

Find the number of days between 7/25/83 and 11/1/83.

KEYSTROKES	DISPLAY	REMARKS
[CLx]	0.000000	clears display
7.25 1983 [ENTER]	7.251983	ref. date
11.01 1983 [g] [△DYS]	99.000000	365-day year
[x≷y]	96.000000	360-day year
[f] 2	96.00	sets display

SIGN CONVENTION

The calculator uses a sign convention of positive numbers for sums received and negative numbers for sums paid out. If you borrow money, you receive an amount which is given a positive sign. Payments of interest and principal on the loan are given a negative sign. If you lend money, the sum loaned is given a negative sign. Receipts from the loan (principal and interest) are given a positive sign.

SIMPLE INTEREST CALCULATIONS

Find the interest due on a $125,000 loan at 15.5% interest for 100 days? (From Borrower's View)

KEYSTROKES	DISPLAY	REMARKS
[CLx]	0.00	clears display
125000 [PV]	125,000.00	loan amount
15.5 [i]	15.50	interest rate
100 [n]	100.00	# days
[f] [INT]	–5,381.94	360-day Interest
[+]	–130,381.94	Prin + Interest
[x≷y]	–5,308.22	365-day Interest

The negative sign means that interest must be paid back if the sum was borrowed.

FINANCIAL KEYS

[n] = number of compounding periods.
[i] = interest rate per period.
[PV] = present value
[PMT] = payment per period.
[FV] = future value.

ANSWER BOX

An aid to understanding the operation of the financial keys and the solution to financial problems is a concept called an Answer Box. The box is drawn as follows:

	n
	i
	PV
	PMT
	FV

Known values are written down in the appropriate blanks. When 4 of the 5 blanks are filled, the problem can be solved. The 4 known values are keyed into their respective financial registers and then the key for the 5th or unknown value is pressed. The calculator calculates and displays the unknown value. The financial registers retain the last value entered until a new value is entered. To check or recall the number stored in a financial register, press [RCL] followed by the respective financial key. [f] CLEAR [FIN] clears the financial registers by entering a value of zero in each register. Accordingly, keystrokes are not required to enter zero in a financial register if [f] CLEAR [FIN] is pressed prior to beginning the problem.

NOTE: In order to emphasize that problem solving requires entries in 4 of the 5 financial registers, the examples in this book include keystrokes for entering values in 4 of the registers even if the value for one of the registers is zero. Although redundant, this keystroke procedure reinforces the Answer Box concept and prevents errors which may result from the failure to clear the financial registers at the beginning of a financial problem. The redundant keystrokes are annotated by an asterisk and the footnote "not a required keystroke."

The time frame for [PMT], [i] and [n] must be consistent. If [n] is entered as a number of months, [i]

must be entered as the monthly interest rate. Press [g] [i] ([12÷]) to convert an annual interest rate to a monthly figure and [g] [n] ([12×]) to convert from years to months. If a value is paid out, it is entered as a negative figure; if a value is received, as a positive figure. Note: ERROR 5 on the display usually is the result of an error in the sign of PV, PMT or FV.

The majority of financial institutions charge interest in arrears with the payment being made at the end of the period. To set the calculator for payments at the end of the period, press [g] [END]. If your calculations are for a problem which has payments at the beginning of the period, press [g] [BEG] ("BEGIN" will be displayed below the digits).

CASH FLOW DIAGRAMS

In order to visualize the timing of payments and receipts, a cash flow diagram is useful. The diagram is composed of a horizontal time line, representing the time frame of the problem, and vertical payment lines extending above and below the horizontal line, representing money received (above the line) and money paid out (below the line). The cash flow diagram of a $75,000 loan at 13% interest amortized over 30 years would be from the lender's view as follows:

[i] = interest rate = 13% annual = 1.08% monthly
[PMT] = + amount of monthly payment = $829.65

[FV] = 0
(value after 30 years)

[n] = 30 yrs. = 360 payments
[PV] = amount of loan = –$75,000

PROBLEMS FINDING THE PAYMENT:

PAYMENT ON A LOAN (MONTHLY)

$75,000 30 year loan at 13%.

30g	n
13g	i
–75,000	PV
	PMT
0	FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg.
g END	unchanged	timing of PMT
75000 CHS PV	–75,000.00	amount loaned
30 g n (12×)	360.00	# months
13 g i (12÷)	1.08	monthly interest
*0 FV	0.00	loan amortized
PMT	829.65	payment

What if the rate was 14%?

KEYSTROKES	DISPLAY	REMARKS
PV , n and FV	remain unchanged	
14 g i (12÷)	1.17	monthly int. rate
PMT	888.65	PMT @ 14%

PAYMENT TO AMASS FUTURE SUM

If you wish to accumulate $100,000 in 10 years in an account that earns 8.5% interest, how much will you have to save each year?

10	n
8.5	i
0	PV
	PMT
100,000	FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg.
100000 FV	100,000.00	future amount
*0 PV	0.00	starting with 0
10 n	10.00	# of years
8.5 i	8.50	annual interest
PMT	–6,740.77	annual savings

* – not a required keystroke

The answer is based upon the deposit in the account being made at the end of the year. For deposits made at the beginning of the year, press

KEYSTROKES	DISPLAY	REMARKS
g BEG	"BEGIN"	timing of PMT
PMT	–6,212.69	annual savings

How much would you have to save monthly?

10 g n (12×)	120.00	# of months
8.5 g i (12÷)	0.71	monthly interest
PMT	–527.79	monthly savings

The negative sign of PMT means that you must pay the sum to the savings account.

PROBLEMS FINDING PRESENT VALUE:

MAXIMUM LOAN FOR A GIVEN PAYMENT

If you can afford monthly payments of $950, how large of a 13% (30 year) loan can you afford?

30g	n
13g	i
	PV
–950	PMT
0	FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg
g END	unchanged	timing of PMT
950 CHS PMT	–950.00	monthly PMT
30 g n (12×)	360.00	# of months
13 g i (12÷)	1.08	monthly interest
*0 FV	0.00	amortized loan
PV	85,879.63	maximum loan

If the interest rate is 12.5%?

KEYSTROKES	DISPLAY	REMARKS
PMT, n and FV	remain unchanged	
12.5 g i (12÷)	1.04	monthly interest
PV	89,013.17	maximum loan

PRESENT VALUE OF A FUTURE RECEIPT

Assume that you can earn 10% on your money. What is the value of $50,000 to be received 5 years from today? *–not a required keystroke

5	n
10	i
	PV
0	PMT
50,000	FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg
50000 FV	50,000.00	received in 5 yrs
5 n	5.00	# of years
10 i	10.00	annual interest
*0 PMT	0.00	no payments
PV	–31,046.07	present value

of $50,000 to be received 5 years from today.

ANNUITY VALUE PROBLEM OR VALUE OF A STREAM OF FUTURE PAYMENTS

An insurance annuity provides payments of $400 per month at age 65. The life expectancy is 78 and the assumed yield on the annuity fund is 8%. What is the value of the annuity at age 65?

13g	n
8g	i
	PV
400	PMT
0	FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg.
400 PMT	400.00	monthly payments
13 g n (12×)	156.00	# of months
8 g i (12÷)	0.67	monthly interest
*0 FV	0.00	0 upon death
PV	–38,719.40	value of annuity

If the $400 payments were to be received at the beginning of the month

KEYSTROKES	DISPLAY	REMARKS
g BEG	"BEGIN"	timing of PMT
PV	–38,977.53	value of annuity

*–not a required keystroke

What if you wanted $450 and the assumed rate was 9%?

KEYSTROKES	DISPLAY	REMARKS
FV and n remain unchanged		
450 PMT	450.00	monthly payments
9 g i (12÷)	0.75	monthly interest
PV	–41,606.23	value of annuity

SECOND LOAN VALUE

A second loan has monthly payments (or receipts to the lender) of $500 for 5 years with a balloon of $50,000 at the end of 5 years. If you could earn 16% on a similar loan, what is the present value of this loan?

5g	n
16g	i
	PV
500	PMT
50,000	FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg.
g END	unchanged	timing of PMT
50000 FV	50,000.00	received in 5 years
5 g n (12×)	60.00	# of months
16 g i (12÷)	1.33	monthly interest
500 PMT	500.00	payments
PV	–43,146.38	amt. paid to earn 16%

PROBLEMS FINDING INTEREST RATE:

YIELD ON A SECOND LOAN

If you paid $40,000 for the loan which had $500 monthly payments and a $50,000 balloon at the end of 5 years, what would be your yield?

KEYSTROKES	DISPLAY	REMARKS
FV, PMT and n remain unchanged		
40000 CHS PV	–40,000.00	paid for loan
i	1.51	monthly yield
12 ×	18.11	annual yield

For converting the monthly yield to an effective annual yield, see page 30.

YIELD ON A LUMP SUM RETURN

If you invest $10,000 and receive $22,000 5 years and 6 months later, what is your yield?

5.5	n
	i
–10,000	PV
0	PMT
22,000	FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN registers
5.5 n	5.50	#years
10000 CHS PV	–10,000.00	amount invested
22000 FV	22,000.00	amount invested
*0 PMT	0.00	no payments
i	15.36	yield

ANNUAL PERCENTAGE RATE-FINDING i

Consider a loan in the amount of $30,000 at 15% interest, with monthly interest only payments for 3 years and a balloon payment at the end of 3 years. Payments would be $375. If 8 points (8%) were charged as loan fees, the borrower would receive only $27,600. What is the Annual Percentage Rate (APR) that the borrower pays?

3g	n
	i
27,600	PV
–375	PMT
–30,000	FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg.
27600 PV	27,600.00	amount received
375 CHS PMT	–375.00	payments
30000 CHS FV	–30,000.00	3 year balloon
3 g n (12×)	36.00	# of months
i	1.54	monthly interest
12 X	18.49	APR

*–not a required keystroke

NOTE: For all APR problems, PV is the amount actually received by the borrower (face amount of the loan minus the expenses associated with the loan).

PROBLEMS FINDING FUTURE VALUE:

APPRECIATION OF PROPERTY

Find the future value of $100,000 compounded annually at 8% for 5 years (or the FV of a $100,000 property which appreciates at a rate of 8% for 5 years).

5	n
8	i
–100,000	PV
0	PMT
	FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg.
100000 CHS PV	–100,000.00	value today
5 n	5.00	# of years
8 i	8.00	annual interest
*0 PMT	0.00	no payments
FV	146,932.81	value in 5 yrs

What if the appreciation rate is 5%?

5 i	5.00	annual interest
FV	127,628.16	value in 5 yrs

Note: The sign convention of the calculator requires that the present value be treated as a sum paid out and the future value as a sum received, or vice versa.

IRA OR PERIODIC SAVINGS

If you place $1,500 annually at the end of the year in an IRA earning 12.33% for 18 years, what is the future value?

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears display
1500 CHS PMT	–1,500.00	annual payment
*0 PV	0.00	starting with 0
18 n	18.00	# of years
12.33 i	12.33	interest rate
FV	86,474.27	future value

*–not a required keystroke

FINDING THE AMOUNT OF A BALLOON PAYMENT

If a loan of $100,000 at 12% had payments based upon a 30 year amortization schedule, but the entire remaining balance was due as a balloon payment in 5 years, what would be the amount of the balloon payment?

30g	5g	n
12g		i
100,000		PV
		PMT
0		FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg.
100000 PV	100,000.00	loan amount
12 g i (12÷)	1.00	monthly interest
30 g n (12×)	360.00	# of months
*0 FV	0.00	amortized loan
PMT	–1,028.61	payment
5 g n (12×)	60.00	time of balloon
FV	–97,663.22	balloon amount

FINDING THE NUMBER OF PAYMENTS:

A $5,000 loan at 9% interest can be paid off in how many $300 monthly payments?

	n
9g	i
5,000	PV
–300	PMT
0	FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg.
5000 PV	5,000.00	amount borrowed
300 CHS PMT	–300.00	payments
9 g i (12÷)	0.75	monthly interest
*0 FV	0.00	loan amortized
n	18.00	# of payments

Note: To determine if the loan is overpaid, press FV. In this case the display shows 38.61 indicating overpayment by $38.61 on the 18th payment. To determine the amount of the last payment, subtract the amount of overpayment from the payment.

*–not a required keystroke

KEYSTROKES	DISPLAY	REMARKS
FV	38.61	overpayment
RCL PMT	–300.00	PMT
+	–261.39	18 PMT

AMORTIZATION

Consider a 30 year $100,000 loan at 12% interest. How much interest is paid in the first 6 payments?

30g	n
12g	i
100,000	PV
	PMT
0	FV

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg
100000 PV	100,000.00	loan amount
30 g n (12×)	360.00	# of months
12 g i (12÷)	1.00	monthly interest
*0 FV	0.00	amortized
PMT	–1,028.61	payment
0 n	0.00	reset n to 0
6 f AMORT	–5,995.64	interest 6 PMT
$x \geq y$	–176.02	principal
RCL PV	99,823.98	balance after 6 PMT

How much interest and principal are paid in the next 12 payments? What is the remaining balance after 12 more payments?

KEYSTROKES	DISPLAY	REMARKS
12 f AMORT	–11,958.15	interest
$x \geq y$	–385.17	principal
RCL PV	99,438.81	balance (18 PMT)
RCL n	18.00	# PMT amortized.

*–not a required keystroke

BOND CALCULATIONS

Purchase date 11/20/82; maturity date 12/01/98; coupon $8; desired yield 15%; find price to pay.

KEYSTROKES	DISPLAY	REMARKS
f 6	0.000000	sets display
15 i	15.000000	desired yield
8 PMT	8.000000	annual coupon
11.20 1982 ENTER	11.201982	purchase date
12.01 1998	12.011998	maturity date
f PRICE	57.917563	$57.92

If you were to purchase the bond for $65.00, what would be your yield?

KEYSTROKES	DISPLAY	REMARKS
65 PV	65.000000	price paid
8 PMT	8.000000	annual coupon
11.20 1982 ENTER	11.201982	purchase date
12.01 1998	12.011998	maturity date
f YTM	13.342835	13.34% yield
f 2	13.34	sets display

NOTE: Maturity dates of May 31, Aug 29-31, Oct 31 and Dec 31 result in ERROR 8. To solve such problems offset the maturity date to the 1st day of the following month and adjust the purchase date accordingly.

DEPRECIATION

Determine the annual straight line depreciation for a $600,000 building (not including the value of the land) with a life of 15 years.

KEYSTROKES	DISPLAY	REMARKS
600000 PV	600,000.00	depreciable value
0 FV	0.00	salvage value
15 n	15.00	15 year life
1 f SL	40,000.00	annual depreciation
x≷y	560,000.00	remaining value

Using 175% declining balance, find the depreciation in the first 3 years.

KEYSTROKES	DISPLAY	REMARKS
175 i	175.00	DB rate
1 f DB	70,000.00	depreciation yr 1
2 f DB	61,833.33	depreciation yr 2
3 f DB	54,619.45	depreciation yr 3
x≷y	413,547.22	remaining value

Find the first 3 years depreciation using sum-of-the-years digits for a 30 year life.

KEYSTROKES	DISPLAY	REMARKS
30 [n]	30.00	30 year life
1 [f] [SOYD]	38,709.68	depreciation yr 1
2 [f] [SOYD]	37,419.35	depreciation yr 2
3 [f] [SOYD]	36,129.03	depreciation yr 3
[x≷y]	487,741.94	remaining value

INTERNAL RATE OF RETURN (IRR) AND NET PRESENT VALUE (NPV)

In problems where the amount of the payment or receipt (PMT) is not the same from period to period, IRR calculations are used to determine the interest rate, and NPV calculations, to determine present value.

IRR AND NPV WORKSHEET

AMOUNT	TIMING
	CFo
	CF1
	CF2
	CF3
	CF4
	CF5

The amount of the initial cash flow is the CFo and subsequent cash flows, CF1 . . . CF5. A maximum of 20 cash flows of uneven magnitude can be entered.

INTERNAL RATE OF RETURN PROBLEM

If you invest $500,000 and have the following after tax cash flow, what is your after tax IRR? Year 1 = –$25,000; year 2 = –$10,000; year 3 = +$5,000; year 4 = +$20,000; year 5 = $1,195,000 from the combination of cash flow and proceeds from the sale of the property.

–500,000	CFo
–25,000	CF1
–10,000	CF2
5,000	CF3
20,000	CF4
1,195,000	CF5

KEYSTROKES	DISPLAY	REMARKS
f CLEAR REG	0.00	
500000 CHS g CFo	–500,000.00	initial CF
25000 CHS g CFj	–25,000.00	CF1
10000 CHS g CFj	–10,000.00	CF2
5000 g CFj	5,000.00	CF3
20000 g CFj	20,000.00	CF4
1195000 g CFj	1,195,000.00	CF5
f IRR	18.33	IRR

VERIFYING OR CHANGING IRR ENTRIES

IRR and NPV calculations use storage registers 0-9 and .0-.9. The initial investment (CFo) is stored in register 0; the 1st CFj (CF1), in 1; CF2, in 2; etc. To verify CFo, press RCL 0, and –500,000.00 should be displayed. To verify CF2, press RCL 2, and –10,000 should be displayed. To change or correct an entry, key in the new entry and press STO followed by the respective storage register. The year 2 cash flow (CF2) could be changed to –$12,000 by pressing 12000 CHS STO 2.

An alternative means of checking all of the IRR and NPV entries is to press RCL g CFj . The last CFj will be displayed. Pressing RCL g CFj repeatedly will display the other CFj's in a reverse order from the last CFj to CFo. Entries can be changed as mentioned above. After verifying or changing the CFo or CFj figures using RCL g CFj, n must be set to the number of cash flow periods (the value of j for the last CFj). Change CF2 to–$12,000and find IRR.

KEYSTROKES	DISPLAY	REMARKS
12000 [CHS] [STO] 2	–12,000.00	new CF2
5 [n]	5.00	reset n
[f] [IRR]	18.27	new IRR

For IRR problems where the cash flow is the same for several periods, use the Nj key. In the above problem if the cash flow figures for years 2, 3, and 4 were –$10,000, what is the IRR?

–500,000	CFo
–25,000	CF1
–10,000	CF2 3X
1,195,000	CF3

KEYSTROKES	DISPLAY	REMARKS
[f] CLEAR [REG]	0.00	clears reg.
500000 [CHS] [g] [CFo]	–500,000.00	investment
25000 [CHS] [g] [CFj]	–25,000.00	CF1
10000 [CHS] [g] [CFj]	–10,000.00	CF2
3 [g] [Nj]	3.00	CF2 3 times
1195000 [g] [CFj]	1,195,000.00	CF3
[f] [IRR]	17.21	IRR

NET PRESENT VALUE

Consider the cash flow from the original investment ignoring the amount of the initial investment. How much could have been invested initially to earn an IRR of 20%?

KEYSTROKES	DISPLAY	REMARKS
[f] CLEAR [REG]	0.00	clears reg.
0 [g] [CFo]	0.00	CF0
25000 [CHS] [g] [CFj]	–25,000.00	CF1
10000 [CHS] [g] [CFj]	–10,000.00	CF2
5000 [g] [CFj]	5,000.00	CF3
20000 [g] [CFj]	20,000.00	CF4
1195000 [g] [CFj]	1,195,000.00	CF5
20 [i]	20.00	assumed IRR
[f] [NPV]	465,004.50	investment

NPV also can be used with the original investment of $500,000 in CFo to test for an assumed IRR of 20%.

KEYSTROKES	DISPLAY	REMARKS
500000 CHS STO 0	–500,000.00	changes CF0
5 n	5.00	resets n
f NPV	–34,995.50	NPV

The negative value means that the IRR is less than the assumed rate of 20%. A positive value of NPV means that the IRR is greater than the assumed rate (20%).

LEASE PROBLEM

Compare the following leasing alternatives from the viewpoint of lessor and lessee. Both leases begin one month from today.

Lease #1: $5,000 per month for months 1-12
$5,250 per month for months 13-24
$5,500 per month for months 25-36

Lease #2: $5,500 per month for months 4-12
$5,750 per month for months 13-24
$6,250 per month for months 25-36

The lessor's discount rate (alternative return on money) is 12%. The lessee's discount rate (cost of money) is 18%.

LEASE #1

0	CFo
5,000	CF1 12X
5,250	CF2 12X
5,500	CF3 12X

KEYSTROKES	DISPLAY	REMARKS
f CLEAR REG	0.00	clears registers
0 g CFo	0.00	initial cash flow
5000 g CFj	5,000.00	CF1
12 g Nj	12.00	12 months
5250 g CFj	5,250.00	CF2
12 g Nj	12.00	12 months
5500 g CFj	5,500.00	CF3
12 g Nj	12.00	12 months
12 g i (12÷)	1.00	lessor's discount
f NPV	157,466.66	NPV (value) to lessor
18 g i (12÷)	1.50	lessee's discount
f NPV	144,399.29	NPV (cost) to lessee

LEASE #2

0	CFo
0	CF1 3X
5,500	CF2 9X
5,750	CF3 12X
6,250	CF4 12X

KEYSTROKES	DISPLAY	REMARKS
f CLEAR REG	0.00	clears registers
0 g CFo	0.00	initial cash flow
0 g CFj	0.00	CF1
3 g Nj	3.00	3 months
5500 g CFj	5,500.00	CF2
9 g Nj	9.00	9 months
5750 g CFj	5,750.00	CF3
12 g Nj	12.00	12 months
6250 g CFj	6,250.00	CF4
12 g Nj	12.00	months
12 g i (12÷)	1.00	lessor's discount
f NPV	158,561.02	NPV (value) to lessor
18 g i (12÷)	1.50	lessee's discount
f NPV	144,120.10	NPV (cost) to lessee

In this case lease #2 is more advantageous for both lessor and lessee.

COMBINATION PROBLEMS

Complex problems should be broken down into several simple problems. The simple problems can be solved individually and combined to solve the more complex problem. An answer box or a cash flow diagram will be extremely helpful in visualizing the problem.

VARIABLE RATE MORTGAGE

What will be the payments on a variable rate mortgage in the amount of $90,000 (30 year) if the interest rate increases from 12% to 13% at the end of the first year and to 14% at the end of the second year? Draw an answer box as follows:

1st year	2nd year	3rd year	
30g	29g	28g	n
12g	13g	14g	i
90,000			PV
			PMT
0	0	0	FV

Now we proceed to solve the problem by filling in the blank spaces one at a time. First, we solve for the PMT at 12%.

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg.
30 g n (12×)	360.00	# of months
12 g i (12÷)	1.00	monthly interest
90000 PV	90,000.00	loan amount
*0 FV	0.00	amortized loan
PMT	–925.75	payment 1st yr

Now change n to 12 payments to determine the balance of the loan (FV) after one year which is the PV at the beginning of the second year.

1st year	2nd year	3rd year	
12	29g	28g	n
12g	13g	14g	i
90,000	89,673		PV
–925.75			PMT
–89,673	0	0	FV

12 n	12.00	# of payments
FV	–89,673.41	balance end yr 1
CHS PV	89,673.41	balance beg. yr 2

Entering the answer in the answer box, we find that we now have sufficient data to solve PMT for the 2nd year.

29 g n (12×)	348.00	months remaining
13 g i (12÷)	1.08	monthly interest
0 FV	0.00	amortized loan
PMT	–994.87	payments yr 2

Use the same method to solve for the 3rd year.

*–not a required keystroke

1st year	2nd year	3rd year	
12	12	28g	n
12g	13g	14g	i
90,000	89,673	89,375	PV
–925.75	–994.87		PMT
–89,673	–89,375	0	FV

KEYSTROKES	DISPLAY	REMARKS
12 [n]	12.00	12 payments
[FV]	–89,375.21	balance end yr 2
[CHS] [PV]	89,375.21	balance beg yr 3
28 [g] [n] ([12×])	336.00	remaining PMT
14 [g] [i] ([12÷])	1.17	monthly interest
0 [FV]	0.00	amortized loan
[PMT]	–1,064.31	payments yr 3

NEGATIVE AMORTIZATION

When the payment on a loan is based upon an interest rate which is less than the rate at which the loan accrues interest, the balance of the loan increases with time (negative amortization). What is the balance after 1 year of a $90,000 loan with payments based upon 12% interest amortized over 30 years if the loan accrues interest at 13%?

30g	12	n
12g	13g	i
90,000		PV
		PMT
0		FV

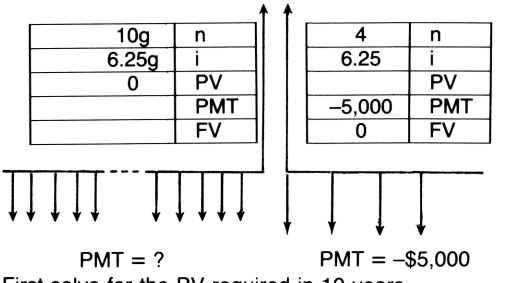
KEYSTROKES	DISPLAY	REMARKS
[f] CLEAR [FIN]	unchanged	clears FIN reg.
30 [g] [n] ([12×])	360.00	# of months
12 [g] [i] ([12÷])	1.00	monthly interest
90000 [PV]	90,000.00	loan amount
*0 [FV]	0.00	amortized loan
[PMT]	–925.75	payment 1st yr
13 [g] [i] ([12÷])	1.08	monthly interest
12 [n]	12.00	# of payments yr 1
[FV]	–90,627.50	balance end yr 1

*–not a required keystroke

COMPLEX ANNUITY PROBLEM

If your child will need $5,000 annually for 4 years to pay college expenses beginning 10 years from today, how much will you have to deposit monthly in an account that bears 6.25% after tax interest in order to finance the educational plans?

CASH FLOW DIAGRAM AND ANSWER BOX



First solve for the PV required in 10 years.

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg
g BEG	"BEGIN"	timing of PMT
4 n	4.00	# of payments
5000 CHS PMT	–5,000.00	amt. of payments
6.25 i	6.25	annual interest
*0 FV	0.00	FV after 4 years
PV	18,303.48	amt. required in 10yrs

Now make PV of this part equal to FV of the other part of the problem.

KEYSTROKES	DISPLAY	REMARKS
ENTER FV	18,303.48	required in 10 years
10 g n (12×)	120.00	# of months
6.25 g i (12÷)	0.52	monthly interest
0 PV	0.00	starting with 0
PMT	–109.61	monthly savings

In order to adjust the problem for inflation, see page 28 (Increasing/Decreasing Annuity).

*–not a required keystroke

YIELD ON A WRAPAROUND MORTGAGE

Consider a wraparound mortgage in the amount of $90,000 written at 12% interest with payments based on a 30 year amortization schedule and a balloon payment of the balance at the end of 5 years. Assume that the underlying first has a balance of $35,000 at 8% interest with 15 years remaining on the loan. What is the yield on the net loan of $55,000? Draw an answer box.

WRAPAROUND		UNDERLYING		NET	
Amort	Balloon	Amort	Balloon		
30g	5g	15g	5g	5g	n
12g		8g			i
–90,000		35,000		–55,000	PV
					PMT
0		0			FV

The PV for the wraparound and the net loans is negative because it represents money loaned; the PV for the underlying loan is positive because it represents money that still is borrowed. The PV, I and PMT are the same for the scheduled amortization and balloon. Because FV = 0 in an amortized loan, the PMT can be calculated. After calculating the PMT, we can calculate the FV of the balloon as we did in the example on page 13. Combining the figures on the wraparound with the underlying for PMT and FV, we determine the PMT and FV of the net loan. Solve individual questions and fill in the blanks as follows:

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN reg.
g END	unchanged	timing of PMT
90000 CHS PV	–90,000.00	WRAP principal
*0 FV	0.00	amortized
30 g n (12×)	360.00	# of months
12 g i (12÷)	1.00	monthly interest
PMT	925.75	monthly payment
STO 0	925.75	for future use
5 g n (12×)	60.00	# PMT until balloon

*–not a required keystroke

KEYSTROKES	DISPLAY	REMARKS
FV	87,896.90	amt. of balloon
STO 1	87,896.90	for future use
35000 PV	35,000.00	UNDERLYING prin
0 FV	0.00	amortized
15 g n (12×)	180.00	# of months
8 g i (12÷)	0.67	monthly interest
PMT	–334.48	monthly payment
RCL 0	925.75	recall WRAP PMT
+	591.27	NET payment
5 g n (12×)	60.00	# PMT until balloon
FV	–27,568.19	balance at balloon
RCL 1	87,896.90	recall WRAP balloon
+	60,328.71	NET balloon

Now we have solved all of the questions except the i of NET. Solve as follows:

FV	60,328.71	NET balloon
55000 CHS PV	–55,000.00	NET amt. loaned
5 g n (12×)	60.00	# of months
591.27 PMT	591.27	monthly payment
i	1.19	monthly yield
12 X	14.24	annual yield

*–not a required keystroke

BLENDED RATE MORTGAGE

A Blended Rate Mortgage is one which "blends" the interest rate that is being charged currently with an old below market rate on an existing loan. The blended rate is used in rewriting the existing loan. Solutions to Blended Rate Mortgage problems are similar to Wraparound Mortgage problems. After reviewing the above solution, consider a fully amortized Blended Rate Mortgage which has similar figures with the exception of the balloon payments. Assume that the lending institution charges $2,000 in loan fees to write the new loan. The net amount loaned is $53,000; the payments remain the same

The institution has loaned $53,000 for which they will receive $591.27 per month for 15 years, and $925.75 per month for the following 15 years. We now have an IRR problem which can be solved as follows.

–53,000	CFo
591.27	CF1 99X
591.27	CF2 81X
925.75	CF3 99X
925.75	CF4 81X

KEYSTROKES	DISPLAY	REMARKS
f CLEAR REG	0.00	clears storage reg.
53000 CHS g CFo	–53,000.00	new money loaned
591.27 g CFj	591.27	new money rec'vd
99 g Nj	99.00	# of months
591.27 g CFj	591.27	new money rec'vd
81 g Nj	81.00	# of months
925.75 g CFj	925.75	new money rec'vd
99 g Nj	99.00	# of months
925.75 g CFj	925.75	new money rec'vd
81 g Nj	81.00	# of months
f IRR	1.17	monthly yield
12 X	14.00	annual IRR

NOTE: The calculator is limited to a maximum of 99 constant payments with one CFj entry.

APR ON VARIABLE RATE MORTGAGES

Review the variable rate mortgage problem on page 20. Assume that the interest rate remains at 14% for years 3-30 and that the lender charges $2,500 in loan fees. What is the APR? The amount loaned is $90,000 –$2,500 = $87,500. The payments were calculated as follows:

1st year $925.75
2nd year $994.87
3-30 years $1,064.31
Solve using IRR procedures.

–87,500	CFo
925.75	CF1 12X
994.87	CF2 12X
1,064.31	CF3 99X
1,064.31	CF4 99X
1,064.31	CF5 99X
1,064.31	CF6 39X

KEYSTROKES	DISPLAY	REMARKS
f CLEAR REG	0.00	clears registers
87500 CHS g CFo	–87,500.00	amount loaned
925.75 g CFj	925.75	CF1
12 g Nj	12.00	12 payments
994.87 g CFj	994.87	CF2
12 g Nj	12.00	12 payments
1064.31 g CFj	1,064.31	CF3
99 g Nj	99.00	maximum Jj
1064.31 g CFj	1,064.31	CF4
99 g Nj	99.00	maximum Nj
1064.31 g CFj	1,064.31	CF5
99 g Nj	99.00	maximum Nj
1064.31 g CFj	1,064.31	CF6
39 g Nj	39.00	total of 360 PMT
f IRR	1.17	monthly IRR
12 ×	14.02	APR on loan

T-BILL DISCOUNT RATE

Given a purchase price of $9,758.80, a maturity value of $10,000 and a term of 91 days (13 weeks), calculate the discount rate based on a 360-day year.

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN registers
10000 PV	10,000.00	maturity value
9758.8 CHS FV	–9,758.80	purchase price
91 ENTER	91.00	# days
360 ÷ n	.25	n in years
* 0 PMT	0.00	no payments
i	–9.54	discount rate

*–not a required keystroke

T-BILL BOND EQUIVALENT YIELD

Bonds are typically based upon a 365-day year versus the 360-day year used for T-Bills. Given the data from the previous T-Bill problem, what is the equivalent bond yield?

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN registers
9758.8 CHS PV	–9,758.80	purchase price
10000 FV	10,000.00	maturity value
91 ENTER	91.00	# days
365 ÷ n	.25	n in years
*0 PMT	0.00	no payments
i	9.91	equivalent yield

PRESENT VALUE OF INCREASING/DECREASING ANNUITY

You desire to receive annual payments which start at $20,000 one year from today and increase at 5% per year continuing for a total of 10 payments. How much must you invest if the annual rate of return on your funds is 8%?

KEYSTROKES	DISPLAY	REMARKS
f CLEAR FIN	unchanged	clears FIN registers
g END	unchanged	timing of PMT
10 n	10.00	# of PMT
1.05 ENTER	1.05	increase factor
1.08 △% i	2.86	adjusted i
20000	20,000	PMT
x≷y ÷ PMT	19,047,62	adjusted PMT
PV	–163,671.08	PV of payments

The above procedure will work only for problems with payment at the end of the period (1 year from today in the above problem). For problems which require the payment to begin today (beginning of the period), use the procedure shown above to calculate PV and then increase the answer (PV) by an

*–not a required keystroke

amount equal to the annual rate of return.

KEYSTROKES	DISPLAY	REMARKS
8 [%]	- 13,093.69	amount increase
[+]	-176,764.76	amount of investment

STATISTICAL PROBLEM

A company's advertising expenses and gross sales figures for 6 months are as follows.

	ADVERTISING	GROSS SALES
JAN	$2,500.00	$45,000.00
FEB	$2,000.00	$35,000.00
MAR	$3,000.00	$52,000.00
APR	$3,200.00	$57,000.00
MAY	$2,800.00	$48,000.00
JUN	$3,500.00	$62,000.00

What were the mean advertising and sales figures? Standard deviation? Expected sales if advertising expenses were increased to $3,800?

KEYSTROKES	DISPLAY	REMARKS
[f] CLEAR [Σ]	0.00	clears registers
2500 [ENTER]	2,500.00	JAN
45000 [Σ+]	1.00	
2000 [ENTER]	2,000.00	FEB
35000 [Σ+]	2.00	
3000 [ENTER]	3,000.00	MAR
52000 [Σ+]	3.00	
3200 [ENTER]	3,200.00	APR
57000 [Σ+]	4.00	
2800 [ENTER]	2,800.00	MAY
48000 [Σ+]	5.00	
3500 [ENTER]	3,500.00	JUN
62000 [Σ+]	6.00	
[g] [$\bar{x}$]	49,833.33	mean sales
[$x \rightleftarrows y$]	2,833.33	mean advert.
[g] [s]	9,495.61	stand. dev. sales
[$x \rightleftarrows y$]	531.66	stand. dev. ads.
3800 [g] [$\hat{x}$,r]	67,173.08	estimated sales

WEIGHTED AVERAGE

Your investment performance on several investments is as follows:

YIELD	AMOUNT INVESTED
12%	$25,000
11%	$65,000
9.25%	$15,000
8.65%	$12,500

What is the weighted average of your yield?

KEYSTROKES	DISPLAY	REMARKS
f CLEAR Σ	0.00	clear statistical reg.
12 ENTER	12.00	enters yield
25000 Σ+	1.00	enters amount
11 ENTER	11.00	enters yield
65000 Σ+	2.00	enters amount
9.25 ENTER	9.25	enters yield
15000 Σ+	3.00	enters amount
8.65 ENTER	8.65	enters yield
12500 Σ+	4.00	enters amount
g x̄w	10.74	weighted average

CONVERTING A MONTHLY YIELD TO AN EFFECTIVE ANNUAL YIELD

If the monthly yield is 1.51%, what is the effective annual yield?

KEYSTROKES	DISPLAY	REMARKS
1.51 i	1.51	monthly yield
12 n	12.00	12 months
1 CHS PV	-1.00	$1 invested
0 PMT	0.00	0 payment
FV	1.20	future value
1 − 100 ×	19.70	effective annual yield

PROGRAMMING

Programs are used to automatically perform a series of keystrokes. If a real estate broker wanted to be able to project the future value of a property, he could write a program which would automatically perform the keystrokes used in the "Appreciation of Property" problem on page 12. To write such a program, review the problem and proceed as follows.

NOTE: The display format changes when the calculator is in the programming mode. The display 01– 45 0 means the following:
01–: the line number of the program.
45 : the row and column location of the key in that program line (in this case the 4th row, 5th column or the [RCL] key). Digits are displayed by the number not location.
0 : the digit number of the suffix key if a prefix key ([STO], [RCL] or [GTO]) is used.

KEYSTROKES	DISPLAY	REMARKS
[f] [P/R]	00–"PRGM"	programming mode
[f] [PRGM]	unchanged	clears program
[RCL] 0	01– 45 0	recalls Register 0
[CHS]	02– 16	changes sign of #
[PV]	03– 13	enters # in PV
5	04– 5	# of years
[n]	05– 11	enters 5 in n
8	06– 8	% appreciation
[i]	07– 12	enters 8 in i
* 0	08– 0	no payments
* [PMT]	09– 14	enters 0 in PMT
[FV]	10– 15	calculates FV
[R/S]	11– 31	displays results

With the exception of program line # 1 ([RCL] 0), the program is identical to the solution on page 12. We return to the program run mode (the normal mode of the calculator) by again pressing [f] [P/R] ("PRGM" disappears). Key in the value of the property followed by [STO] 0 and [R/S] to execute the program.

KEYSTROKES	DISPLAY	REMARKS
[f] [P/R]	0.00	return to run mode
100000 [STO] 0	100,000.00	stores PV in Reg. 0
[R/S]	146,932.81	calculates FV

The answer is obtained rapidly. If we wanted to execute the program one step at a time, we would press [SST] repeatedly.

*–not a required keystroke

The program can be altered to adjust for varied appreciation rates and time frames by using storage registers for [n] and [i] inputs. Press [P/R] to reenter programming mode. To move from step to step within the program without disturbing the program, use one of 3 methods. Press [g] [GTO] [.] followed by the 2 digit line number of the line directly before the line you wish to change; or press [SST] repeatedly until reaching the line before the one you wish to change; or press [g] [BST] (backstep) repeatedly backing the program to the line before the one you wish to change.

KEYSTROKES	DISPLAY	REMARKS
[f] [P/R]	00–	enters program mode
[g] [GTO] [.] 03	03–13	goes to line # 03
[RCL] 1	04–45 1	changes line #04
[SST]	05–11	steps forward 1 line
[RCL] 2	06–45 2	changes line #06
[g] [GTO] [.] 00	00–	goes to line #00
[f] [P/R]	0.00	returns to run mode

Now we can enter the value of any property in [STO] 0, the number of years in [STO] 1, the projected annual appreciation rate in [STO] 2 and calculate the future value of any property at any appreciation rate over any period of time.

KEYSTROKES	DISPLAY	REMARKS
200000 [STO] 0	200,000.00	property value
10 [STO] 1	10.00	# of years
8.75 [STO] 2	8.75	appreciation rate
[R/S]	462,724.67	value in 10 years

Programs of up to 99 lines can be stored in the calculator while leaving 7 storage registers (R0-R6) available for storage. As each additional storage register (R7-R9 and R.0-R.9) is used, the programming capacity of the calculator is dimininshed by 7 lines. Multiple programs can be stored and executed separately (use [g] [GTO] [.] followed by the 2 digit line number of the 1st line of the program to set the

calculator to the desired program). Branching and looping are made possible through the use of the [GTO] key. Pressing [g] [GTO] (not followed by [.]) and a 2 digit number directs the program to the 2 digit line number and executes the program beginning with that line. The keys [x≤y] and [x=0] allow conditional branching and looping. Numerous printed program are available in other manuals.

CANADIAN MORTGAGES

Loans in Canada are based upon a 365 day year and semi-annual compounding of interest. As a result, the Canadian figures for [i] differ from those pre-programmed into the HP-12C. The problems below show the keystrokes required to adjust the [i] inputs in order to answer problems involving Canadian Mortgages.

How much is the payment on a 30-year Canadian Mortgage of $50,000 at an interest rate of 11%?

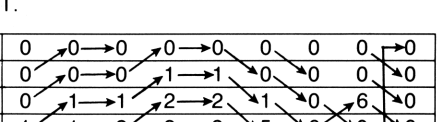
KEYSTROKES	DISPLAY	REMARKS
[f] CLEAR [FIN]	unchanged	clears FIN registers
6 [n]	6.00	these keystrokes
200 [ENTER]	200.00	for converting the
[PV]	200.00	[i] factor can be pro-
11 [+]	211.00	grammed and
[CHS] [FV]	–211.00	stored for future use
		—see programming
[i]	0.90	adjusted [i] factor
30 [g] [n] ([12×])	360.00	# of months
50000 [PV]	50,000.00	amount of loan
0 [FV]	0.00	fully amortized
[PMT]	–466.97	monthly payment

If solving a problem for the value of [i] (interest rate, yield on an investment or loan, Annual Percentage Rate, etc.) you calculate an answer of 18% (annual), what is the answer when converted to Canadian terms?

KEYSTROKES	DISPLAY	REMARKS
18 [g] [i] ([12÷])	1.50	monthly interest rate
6 [n]	6.00	these keystrokes for converting the [i] factor can be programmed and stored for future use
0 [PMT]	0.00	
200 [CHS] [PV]	–200.00	
[FV]	218.69	
[RCL] [PV]	–200.00	
[+]	18.69	Canadian annual interest

STACK (AUTOMATIC MEMORY STACK)

In addition to the 20 storage registers and the financial keys which are used for storage, there are 4 special registers which are used to retain numbers during calculations. The number in the X register is displayed when the calculator is on and not in the programming mode. The Y, Z and T registers can be visualized as resting on top of the X register in a "stack". When [ENTER] is pressed, the number in the X register moves to the Y register, Y to Z and Z to T. When [+] is keyed the number in the Y register is added to the number in the X register, the number in the T register drops to the Z register and the number in the Z register drops to the Y register. Other arithmetic operations are performed in a similar manner. Following an arithmetic operation, the stack will be lifted if a number is keyed. In summary, the stack provides an automatic storage area which makes chain calculations possible. The numbers in the stack can be manipulated through usage of the [$x \gtrless y$] and [R↓] keys. [$x \gtrless y$] exchanges the numbers which are in the X and Y registers. [R↓] rolls the stack by dropping T to Z, Z to Y, Y to X and rolling X to T.



KEY 1 [ENTER] 2 [ENTER] 3 [+] [+] [$x \gtrless y$] [R↓]

INDEX OF KEY FUNCTIONS

Functions printed in white:

[n], [i], [PV], [PMT], [FV] – defined on page 5.
[CHS]– changes sign of number in display.
[y^x] — raises number in y to x power.
[1/x]— calculates reciprocal of number.
[%T]— calculates percentage of total.
[Δ%]—calculates % difference between 2 numbers.
[%]— calculates percentage of a given number.
[EEX]— enters exponent, used for large numbers.
[R/S]– runs or stops program stored in memory.
[SST]– single step execution for stored program.
[R↓]— rolls stack to display Y, Z & T registers.
[$x \geq y$]– exchanges numbers in X & Y registers.
[CLx]— clears number displayed.
[ENTER] — used to enter number for calculation.
[ON]– turns calculator on and off.
[STO]— stores displayed # in storage registers.
[RCL]— recalls numbers stored in registers.
[0] – [9] — used to enter numbers.
[÷] , [X] , [−] , [+] — used to perform arithmetic.
[.] — used for decimal point and formatting.
[$\Sigma+$]— used for accumulating statistical data.

Functions printed in gold:

[f] — shift key used to access "gold" functions.
[AMORT] —amortizes number of payments selected.
[INT]— calculates simple interest.
[NPV]— net present value – max. of 20 CFj.
[RND]– rounds to number of digits displayed.
[IRR]— internal rate of return – max. of 20 CFj.
[PRICE]— price to pay for bond (yield given).
[YTM]– yield to maturity for bond (price given).
[SL] — calculates straight line depreciation.
[SOYD]— sum-of-the-years-digits depreciaiton.
[DB] — declining balance depreciation.
[P/R]— used to enter or exit program mode.
CLEAR keys — defined on page 1.

Functions printed in blue:

[g] — shift key to access "blue" functions.
[12×] — used to change n from years to months.
[12÷] — used to change i from annual to monthly.
[CF0] — initial investment for IRR & NPV.
[CFj] — periodic cash flow (max. of 20 entries).
[Nj] — number of even payments of a given CFj.
[DATE] — day and date a number of days from given date.
[BEG] — adjusts for PMT at beginning of period.
[END] — adjusts for PMT at end of period.
[MEM] — shows program memory used and available.
[$\sqrt{x}$] — calculates square root of # in display.
[e^x] — raises e (2.71+) to power in display.
[LN] — calculates natural logarithm of display.
[FRAC] — reduces number to fractional portion.
[INTG] — reduces number to integer portion.
[△DYS] — number of days between 2 dates.
[D.MY] — day/month/year format.
[M.DY] — month/day/year format.
[$\bar{x}_w$] — calculates weighted average.
[PSE] — brief pause in program execution.
[BST] — back-step program one line.
[GTO] — go to program line selected and execute.
[GTO] [.] — go to program line selected.
[$x \leq y$] — tests if x is less than or equal to y.
[x=0] — tests if x is equal to zero.
[LSTx] — displays previous number in x register.
[$\hat{x},r$] — linear estimate of x using x, y and $\Sigma+$ inputs.
[$\hat{y},r$] — linear estimate of y using x and y inputs.
[n!] — calculates factorial (4!=4 X 3 X 2 X 1).
[$\bar{x}$] — mean of x entries and y entries.
[s] — standard deviation of sample of x's and y's.
[$\Sigma-$] — cancels statistical data entered.

FOR A MORE COMPLETE DESCRIPTION OF KEY FUNCTIONS CONSULT HP-12C OWNER'S HANDBOOK.

ERROR MESSAGES

Error 0: Mathematical solution does not exist.
Error 1: Storage registers are overfilled.
Error 2: Statistical solution does not exist.
Error 3: Estimate of IRR required
Error 4: Memory overfilled or Program error.
Error 5: Financial, Amortization or Depreciation error. Check the signs of entries.
Error 6: Storage registers, IRR or NPV error.
Error 7: IRR solution does not exist. Check the signs of entries.
Error 8: Calendar entry error.
Error 9: Calculator requires service.
PR Error: Continuous Memory has been reset.

ELECTRONIC CIRCUITRY CHECK

If the response to keystrokes is not normal, verify proper operation of the circuits as follows:
With the calculator off, press and hold down the [ON] and [×] keys. Release the [ON] key followed by releasing the [×] key. "Running" will be displayed followed by –8,8,8,8,8,8,8,8,8,8, if the electronic circuitry is functioning normally.

STATUS INDICATORS

SYMBOL	MEANING	TO CLEAR
f	f prefix	[f] CLEAR [PREFIX]
g	g prefix	[f] CLEAR [PREFIX]
BEGIN	PMT at beginning of period	[g] [END]
C	compound interest for odd period	[STO] [EEX]
D.MY	day/month/yr format	[g] [M.DY]
PRGM	programming mode	[f] [P/R]

USER and GRAD are not functional on HP 12

DECIMAL AND COMMA

To change the position of the comma (,) and decimal (.), turn off the calculator, hold down the [.] key and press [ON]

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