

Business & Finance

for the



**Hewlett Packard
48-SX & 48-GX**

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1. PROGRAM DESCRIPTION

This program is intended for Engineers and Scientists that use the Hewlett Packard 48 SX/GX calculator and need to do business and finance calculations.

This program have been designed so that you do not need to know which input to enter before calculation. You simply decide which application to use (by push of the menu key). Then you select the output you want to calculate.

The required inputs will be asked before calculation. In order to reduce the number of key-push if you are changing only a few variables, just push enter with the input line empty (without typing a number). The old number will be visible on the top line of the display.

This program can be started from the CST menu by push of the [B&F] menu key when installed.

The following applications are available:

- * **CASH FLOW CALCULATIONS**
- * **TIME VALUE of MONEY w/ AMORTIZATION**
- * **INTEREST CONVERSION**
- * **BUSINESS PERCENTAGE CALCULATIONS**
- * **TIME APPLICATIONS**
- * **DEPRECIATION CALCULATIONS**
- * **BOND and NOTES CALCULATIONS**
- * **OPTION CALCULATIONS**
- * **CURRENCY CONVERSIONS**
- * **RATIO DEFINITIONS**

To exit an application and return to the opening menu use the [EXIT] key included in all application menus (normally the menu key to the right).

Some applications have an [CLEAR] key included in the menu. This function will only clear the stack (no stored data will be cleared).

Other useful functions for business like probability functions/distribution, regression analysis, printing utilities, etc. are included as part of the HP48's function set. Consult the HP48's owners manual to get to know these functions.

2. INSTALLATION

To make the installation process easy this program contain an installation function.

The installation function should only be used ones (the first time right after purchase). The installation program will do the following;

- 1) Create a new directory below the home directory with the name 'B&F'. (If a directory with the name 'B&F' already exist, you have to purge it before installation).
- 2) Add to the CST menu in the home directory a new command (B&F) that will on execution move to the 'B&F' directory and start the Business and Finance program.

To install the Business & Finance card into your HP48SX or HP48GX the first time, do the following steps;

- 1) Turn off the calculator. Do not press [ON] until you have completed the installation procedures.
- 2) Remove the port cover at the top of the calculator. Removing the cover exposes the two plug-in-ports.
- 3) Select an empty port for the B&F card, either port may be used.
- 4) Slide the B&F card firmly into the selected port until it stops.
- 5) Replace the port cover.
- 6) Turn on the calculator.
- 7) Get the LIBRARY menu (HP48SX: Shift Left [VAR], HP48GX: Shift Right [2]).
- 8) Push the [B&F] key
- 9) Push the [INST] key
- 10) To start the B&F program push the [B&F] key.

3. GETTING STARTED

After installation push the [B&F] key in the CST menu. This will move the calculators working are to the 'B&F' directory (where you normally should store the RAM variables) and start the Business and Finance program.

If you, while in the B&F program need to do some calculations using other functions that replace the menu, the [CST] key will bring back the B&F menu.



This display will always show up when you start the program.

Applications can be started by use of the menu keys.

This entry level menu have two pages. To access both pages use the [NXT] key to toggle between menu pages.



This shows the second page of the entry level menu.

From here you should try out some of the applications. The program have been designed to be operational without reading all of this manual. The next chapter (SYNTAX) can be recommended, but the rest of this manual should be studied if you get into problems using the program.

To leave the 'B&F' directory and terminate the program push the [HOME] key, and the CST menu in the HOME directory will show.

If you like to use another directory name than the 'B&F', use the [START→B&F] function. This will start the B&F program without generating any directory.

4. SYNTAX

To start calculation push the menu key applicable to the type of calculation you want to perform. This will prompt for the required inputs before the answer is calculated and presented on the display.

As a general rule during input the text will ask you to ENTER, SELECT or LIST.

* ENTER means to push the ENTER key. It is not necessary to type a number if you do not want to change the old value that shows on the top display line.

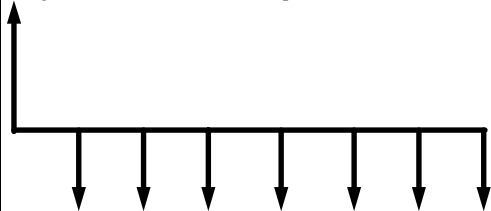
* SELECT means to use the menu keys. Options will be visible as menu keys.

* LIST means to input several numbers with space between, and then ENTER (only used for the CFLO input).

NOTE: It is recommended to use only two decimals for all applications in this program, to quickly set the display mode to show two decimals, push the [[2FIX]] key in the BUS% application.

5. CASH FLOW CALCULATIONS

Cash flows can be illustrated with cash flow diagrams. Cash flow diagrams are time lines divided into equal segments of time called payment periods or compounding periods. Arrows show the cash flows. Money received is a positive number, and the arrow points up. Money paid out is a negative number, and the arrow points down.

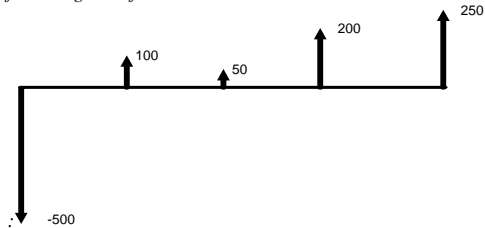


The cash flow diagram for a transaction depends on your point of view. A loan is an initial positive cash flow for the borrower, and an initial negative cash flow for the lender.

By pushing the [CFLO] menu-key you will enter the cash flow application. You will first be asked to enter the cash flows you want to do calculations for.

NOTE: It is very important to make a space between each cash flow when listing the input.

Example: You want to find the Internal Rate of Return (IRR%) and Net Present Value (NPV) for 10% interest rate of the following cash flows



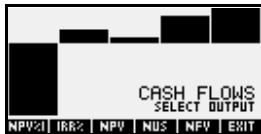
```

PRG
HOME 8&F.8IN 3 27.07.93 16:11:23
LIST CASH FLOWS
Ini 1st 2nd 3rd ..
-500 100 50 200 250
TIMES

```

Push the [CFLO] key and list cash flows as shown on this figure, and push the [ENTER] key.

500 [+/-] [SPC] 100 [SPC] 50 [SPC] 200 [SPC] 250 [ENTER]



This bar plot will show up to verify the cash flows. To calculate IRR% push the [IRR%] key. IRR% do not require any inputs other than the cash flows itself. The output will show as an tagged object in level 1 of the stack display.

```

...DME 8&F.BIN 3 27.07.93 20:43:53 PRG
8
Enter
INTEREST RATE %
10
NPV% IRR% NPV NUS NEV EXIT

```

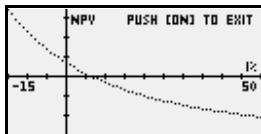
Then to calculate the NPV, push the [NPV] key, and you will be asked to enter the interest rate (as a percentage) as shown on this figure. In this case the old interest rate is 8%, so we have to type the new rate (10%) before pushing the [ENTER] key.

```

CASH FLOW CALCULATION
4: Select Output
3:
2: IRR%: 6.35
1: NPV[10%]: -46.75
NPV% IRR% NPV NUS NEV EXIT

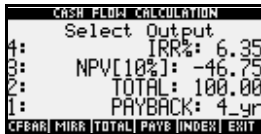
```

After these calculations the display will lock like this, Showing that the Internal Rate of return equals 6.35% and the 10% Net Present Value equals -46.75 for the cash flows in hand.



These calculations can be verified graphically by pushing the [NPV%I] key. This graph will always cover from -15 to 50 % on the interest rate axe (horizontal axe). The Net Present Value axe will adjust its scale so that we always get a graph shown on the display.

The CFLO menu have two pages. To access all functions you have to toggle these two menu pages with the [NXT] key.



If you push [TOTAL] and [PAYB] on the second page of this menu, the display will lock like this.

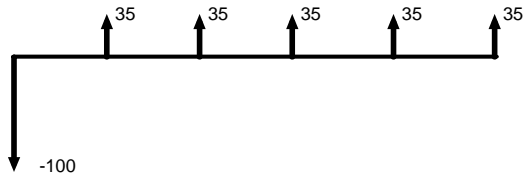
The cash flow input form that always pops up when starting the CFLO application have an menu function [TIMES], that is used for multiple cash flows of same value.

```
PRG
DME B&F.BIN 3 27.07.93 16:19:48
LIST CASH FLOWS
Ini 1st 2nd 3rd ..
-100 35 5 TIMES
TIMES
```

This shows how this function is used.

100 [+/-] [SPC] 35 [SPC] 5 [TIMES] ENTER

The following cash flows are used;





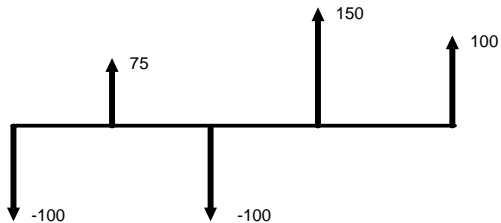
After pushing the [ENTER] key you can verify graphically the cash flows in hand. In this case an initial flow of 100 negative followed by five positive flows of value 35.

NOTE: Use the [+/-] key after the number have been typed to make negative numbers. Do not use the [-] key since this will separate the sign from the number.

While working with cash flows that have sign-change more than ones you should not use the IRR% function. This because there will not exist only one solution. In this case you might consider to use the Modified Internal Rate of Return function. The MIRR eliminate the sign change problem by utilising reinvestment and borrowing rates that you specify.

Example:

Calculate the Modified Internal Rate of Return with 10% borrowing rate and 12% reinvestment rate for the following cash flows;



```

PRG
TIME 8:48.81M 3 27.07.93 21:11:06
LIST CASH FLOWS
Ini 1st 2nd 3rd ..
-100 75 -100 150 100
TIMES
  
```

List the cash flows as shown on this figure and enter, like this;

100 [+/-] [SPC] 75 [SPC] 100 [+/-] [SPC] 150 [SPC] 100 [ENTER].



Verify that the cash flows was entered correct.



Push the [NXT] key to access the second page of the menu, and push the [MIRR] key. You first will be asked to enter the borrowing rate as a percentage. In this case we accept the value already in the memory (10%), so we push [ENTER] without typing a new number into the input line.

```
..DME B&F.BIN } 27.07.93 20:49:36 PRG
10
Enter
REINVESTMENT RATE %
12
CFBAR| MIRR| TOTAL| PAYE| INDEX| EXIT
```

Then you will be asked to enter the Reinvestment Rate. Now we have to type 12 and enter.

```
CASH FLOW CALCULATION
Select Output
4:
3:
2:
1: MIRR: 15.50
CFBAR| MIRR| TOTAL| PAYE| INDEX| EXIT
```

The result will show as a tagged object in level 1 of the stack display. In this case the Modified Internal Rate of Return equals 15.5.

<i>CFLO</i> <i>Menu Keys</i>	<i>Description</i>
[NPV%I]	Will display a plot of NPV versus I%.
[IRR%]	Calculates the Internal Rate of Return.
[NPV]	Calculates the Net Present Value.
[NUS]	Calculates the Net Uniform Series.
[NFV]	Calculates the Net Future Value.
[CFBAR]	Will display a bar plot of the current cash flows.
[MIRR]	Will calculate the Modified Internal Rate of Return.
[TOTAL]	Calculates the sum of the cash flows.
[PAYB]	Calculates the payback period in years.
[INDEX]	Calculates the Profitability Index.
[EXIT]	Exit the CFLO application.
[TIMES]	A function used for cash flow listing when multiple cash flows have the same value. (This function is active during cash flow input).

CPLO Inputs

CASH FLOWS
INTEREST RATE %
BORROWING RATE %
REINVESTMENT RATE %

CFLO Outputs

IRR%: XX.XX
NPV[ii%]: XX.XX
NUS[ii%]: XX.XX
NFV[ii%]: XX.XX
MIRR: XX.XX
TOTAL: XX.XX
PAYBACK: XX_yr
INDEX[ii%]: XX.XX

6. TIME VALUE OF MONEY

The phrase *Time Value of Money* describes calculations based on money earning interest over a period of time.

The TVM application is used for certain compound interest calculations. Specifically, use the TVM application when there is a series of cash flows and;

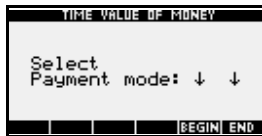
- 1) The amount is the same for each payment.
- 2) The payment occur at regular intervals.
- 3) Payment periods coincide with the compounding periods.

To enter the TVM application push the [TVM] key. At start-up you will be asked to select the payment mode (end- or begin- mode), and to enter the number of payments per year.

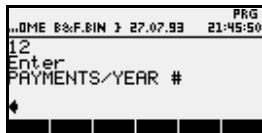
Example:

Part A. A home mortgage.

To purchase your new home, you have taken out a 30 year \$75,000 mortgage at 12.5% annual interest compounded monthly with payment end of each month. what are your monthly payment?



Push the [TVM] key, and select END as payment mode.



Enter 12 payments per year (monthly).

```

PRG
..DME B&F.BIN 3 28.07.93 11:40:04
12
Enter
NUMBER OF PAYMENTS #
12 30 *
N | I/YR | PV | PMT | FV | EXIT

```

Push the [PMT] key, and enter number of payments $12 * 30$ (12 payments per year in 30 years).

```

PRG
..DME B&F.BIN 3 28.07.93 11:40:13
8.57
Enter
INTEREST/YEAR %
12.5
N | I/YR | PV | PMT | FV | EXIT

```

Enter annual interest rate = 12.5%

```

PRG
..DME B&F.BIN 3 28.07.93 11:40:27
1000
Enter
PRESENT VALUE
75000
N | I/YR | PV | PMT | FV | EXIT

```

Enter 75,000 as Present Value.

```

PRG
DME B&F.BIN } 28.07.93 11:40:34
0
Enter
FUTURE VALUE
N | I%YR | PV | PMT | FV | EXIT

```

Enter 0 as Future Value.

```

TYPE: IE PMTS/YR END MODE
Select Output
4:
3:
2:
1: PMT: -800.44
N | I%YR | PV | PMT | FV | EXIT

```

Payment Value will be calculated and presented like this.

Monthly payments = 800.44

Part B. Amortisation Schedule.

Calculate the amount of the two first years payments that are applied towards principal and interest.

Push the [NXT] to access the second menu page. Then push the [AMRT] key.

The following questions will be asked the first time you push [AMRT] after you entered the TVM application;

INTEREST/YEAR %

PRESENT VALUE

PERIODIC PAYMENTS

In this example you should just push [ENTER] on all these questions, meaning that you do not want to change the values you used in the previous calculation.

The last question before calculation is PAYMENTS TO AMORTIZE #. Since we want to amortise the first two years you should answer 24.

```

AMORTIZATION
4:   Payment: "1-24"
3:   BAL: 74479.72
2:   INT: -18690.36
1:   PRI: -520.28
-P/Y -BEG -END [AMRT] [CLEAR] [EXIT]

```

After calculation the result will be presented like this. Showing what payments we amortised, the new balance after these payments, the interest part and the part paid towards principal.

Interest first two years = 18,690.36
and Payment Towards Principal = 520.28

If you want to amortise more than ones the next time you push [AMRT] you will be asked only one question PAYMENTS TO AMORTIZE #, and this amortisation will begin calculation where the last calculation left.

Example.

A Mortgage with a Balloon Payment.

You have taken out a 20 year, \$80,000 mortgage (monthly, end mode) at 10% annual interest. You anticipate that you will own the house for four years and then sell it, repaying the loan in a balloon payment. What will be the size of your balloon payment at the end of four years?

These calculations have to be done in two steps;

1) Calculate the monthly payment.

2) Calculate the balloon payment after 4 years.

KEYS	DISPLAY	DESCRIPTION
[TVM]		<i>Start the TVM application.</i>
[END]	Select Payment mode:	<i>Set END mode</i>
[ENTER]	12 Enter PAYMENTS/YEAR #	<i>Accept 12 payments per year, or type 12 before enter.</i>
[PMT]		<i>Start the PMT calculation.</i>
12 [SPC] 20 * [ENTER]	360 Enter NUMBER OF PAYMENTS #	<i>Enter 12 * 20 as total number of payments (12 payments per year in 20 years).</i>

10 [ENTER]	12.5 Enter INTEREST/YEAR %	<i>Enter 10% as annual interest.</i>
80000 [ENTER]	74479.72 Enter PRESENT VALUE	<i>Enter \$80,000 as Present Value.</i>
[ENTER]	0 Enter FUTURE VALUE	<i>Accept 0 as Future Value.</i>
	PMT: -772.02	<i>Display the monthly payments.</i>
[FV]		<i>Start the FV calculation.</i>
12 [SPC] 4 * [ENTER]	240 Enter NUMBER OF PAYMENTS #	<i>Enter 4 year payments.</i>

Example.

A savings Account.

You deposit \$5,000 into a savings account that pays 5.3% annual interest, compounded annually. If you make no other deposits into the account, how long will it take for the account to contain \$8,000?

KEYS	DISPLAY	DESCRIPTION
[TVM]		<i>Start the TVM application</i>
	Select Payment mode:	
[END]		<i>Select END mode.</i>
	12 Enter PAYMENTS/YEAR #	
1 [ENTER]		<i>Enter 1 payment per year.</i>
[N]		<i>Start the N calculation.</i>
	10 Enter INTEREST/YEAR %	
5.3 [ENTER]		<i>Enter 5.3% as annual interest.</i>

	80000	
	Enter	
	PRESENT VALUE	
5000 [+/-]		<i>Enter -5,000 as</i>
[ENTER]		<i>Present Value.</i>
	-772.02	
	Enter	
	PERIODIC PAYMENTS	
0 [ENTER]		<i>Enter 0 as</i>
		<i>Periodic</i>
		<i>Payments.</i>
	-73813.55	
	Enter	
	FUTURE VALUE	
8000 [ENTER]		<i>Enter 8,000 as</i>
		<i>Future Value.</i>
	N: 9.10	<i>Display the</i>
		<i>number of</i>
		<i>payments.</i>

It will take 9.1 years for the account to reach \$8,000. This means that the account will contain more than \$8,000 after 10 years. Find out how much more? (answer \$8380.19).

Example.

Calculating a Lease Payment.

A new equipment valued at \$20,000 is to be leased for 5 years, with an option to purchase the equipment for \$5,000 at the end of the leasing period. What monthly payments, payable at the beginning of each month, are necessary to yield the lessor 15% annually?

KEYS	DISPLAY	DESCRIPTION
[TVM]		Start the TVM application
	Select Payment mode:	
[BEGIN]		Enter BEGIN mode.
	1 Enter PAYMENTS/YEAR #	
12 [ENTER]		Enter 12 payments per year.
[PMT]		Start PMT calculation.
	9.1 Enter NUMBER OF PAYMENTS #	

12 [SPC] 5 * [ENTER]		<i>Enter 12 * 5 as number of payments (12 payments per year in 5 year).</i>
	5.3 Enter INTEREST/YEAR %	
15 [ENTER]		<i>Enter 15% as annual interest.</i>
	-5000 Enter PRESENT VALUE	
20000 [+/-] [ENTER]		<i>Enter -20,000 as Present Value.</i>
	8000 Enter FUTURE VALUE	
5000 [ENTER]		<i>Enter 5,000 as Future Value.</i>
	PMT: 414.17	<i>Display the calculated monthly payments.</i>

A monthly payment of \$414.17 is necessary to yield the lessor 15%.

<i>TVM menu keys</i>	<i>Description</i>
[N]	Calculates the total number of payments
[I%YR]	Calculates the nominal annual interest rate in %.
[PV]	Calculates the Present Value.
[PMT]	Calculates the amount of each periodic payment.
[FV]	Calculates the Future Value.
[-P/Y]	Change the number of payments or compounding periods per year.
[-BEG]	Set begin mode.
[-END]	Set end mode.
[AMRT]	Calculates an amortisation.
[CLEAR]	Clears the stack.
[EXIT]	Exit the TVM application.

<i>TVM Inputs</i>
Payment Mode
PAYMENTS/YEAR #
NUMBER OF PAYMENTS #
INTEREST/YEAR %
PRESENT VALUE
PERIODIC PAYMENTS
FUTURE VALUE
PAYMENTS TO AMORTIZE #

<i>TVM Outputs</i>
N: XX.XX
I%YR: XX.XX
PV: XX.XX
PMT: XX.XX
FV: XX.XX
Payment: "XX - YY"
BAL: XX.XX
INT: XX.XX
PRI: XX.XX

7. INTEREST RATE CONVERSION

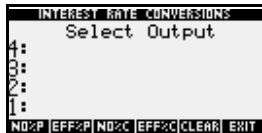
Interest rates are generally stated as nominal interest rates. A nominal interest rate is an annual rate that is compounded periodically.

When investments have different compounding periods, effective interest rates are used to compare them. The effective rate is the annual rate that would produce the same interest earnings as the nominal rate compounded P times per year. For example, earning 15% annual rate compounded monthly (nominal rate) is equivalent to earning 16.08% annual interest.

The ICONV application is used to convert between effective and nominal interest rates.

There is two compounding methods; Periodic and Continuous compounding. This program will handle both.

This shows the ICONV menu.



To calculate an interest conversion simply push the menu-key applicable to the value you want to calculate.

For example if you want to calculate an effective interest rate that is compounded periodically, push the [EFF%P] key. You will then be asked to enter the Nominal interest rate as a percentage, and the number of annual periods.

Example:

Converting from nominal to effective interest rate.

Which bank has the most favourable interest rate?

BANK A: 5.5% annual interest, compounded quarterly.

BANK B: 5.45% annual interest, compounded monthly.

BANK C: 5.45% annual interest, compounded continuously.

KEYS	DISPLAY	DESCRIPTION
[ICONV]		<i>Shows the ICONV menu.</i>
[EFF%P]		<i>Start first calculation</i>
5.5 [ENTER]	0 Enter NOMINAL INTEREST %	<i>Enter 5.5% as Nominal interest rate.</i>
4 [ENTER]	12 Enter ANNUAL PERIODS #	<i>Enter 4 periods.</i>
	PerEffl% : 5.61	<i>Display result A.</i>
[EFF%P]		<i>Start calculation for BANK B</i>
5.45 [ENTER]	5.5 Enter NOMINAL INTEREST %	<i>Enter 5.5% as nominal interest rate.</i>
	4 Enter ANNUAL PERIODS #	

12 [ENTER] *Enter 12 periods.*

PerEffl% : 5.59 *Display result B.*

[EFF%]C] *Start calculation
for BANK C*

5.45
Enter
NOMINAL INTEREST %

[ENTER] *Accept currently
used nominal
interest rate by
pushing enter
with the stack
empty.*

ConEffl% : 5.60 *Display result C.*

After these calculations the stack will show the three comparable results:

PerEffl% : 5.61
PerEffl% : 5.59
ConEffl% : 5.60

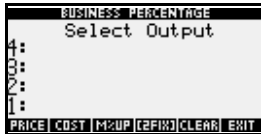
These results shows that BANK A is offering the most favourable interest rate.

<i>ICONV Menu Keys</i>	<i>Description</i>
[NO%P]	Calculates Periodic Compounded Nominal Interest rate.
[EFF%P]	Calculates Periodic Compounded Effective Interest rate.
[NO%C]	Calculates Continuous Compounded Nominal Interest rate.
[EFF%C]	Calculates Continuous Compounded Effective Interest rate.
[CLEAR]	Clears the stack.
[EXIT]	Will exit the ICONV application.

<i>ICONV Inputs</i>
EFFECTIVE INTEREST %
NOMINAL INTEREST %
ANNUAL PERIODS #

<i>ICONV Outputs</i>
PerNomI%: XX.XX
PerEffI%: XX.XX
ConNomI%: XX.XX
ConEffI%: XX.XX

8. BUSINESS PERCENTAGE



By pushing the [BUS%] key this display will show telling you that the business percentage application have been entered.

This application will calculate the relationship between price, cost and mark-up as a percentage. There are two definitions of mark-up:

- * Mark-up as a percentage of cost; the difference between price and cost expressed as a percentage of cost.
- * Mark-up as a percentage of price; the difference between price and cost expressed as a percentage of price.

These functions will calculate both, and use two lines for output.

Example:

Calculate the mark-up for a price value of 100 and a cost value of 80.

```
..DME 8&F.8IN 3 27.07.93 21:53:57 PAG
0
Enter
PRICE VALUE
100
PRICE COST M%UP (2FIX) CLEAR EXIT
```

Push the [M%UP] key and enter the price value (100).

```
..DME 8&F.8IN 3 27.07.93 21:54:05 PAG
0
Enter
COST VALUE
80
PRICE COST M%UP (2FIX) CLEAR EXIT
```

Enter the cost value (80).

```
BUSINESS PERCENTAGE
Select Output
4:
3:
2:  MarkUp%p: 20.00
1:  MarkUp%c: 25.00
PRICE COST M%UP (P%P) CLEAR EXIT
```

This shows the output after calculation.

For more business percentage functions consult your HP48 owners manual about the [%], [%CH] and the [%T] functions.

Example.

Part A:

New York Radio Inc. buys radios from Yamachita with an invoice cost of \$55 per unit. If NYR Inc. routinely uses a 15% mark-up on cost, for what price should it sell a radio?

KEYS	DISPLAY	DESCRIPTION
[BUS%]		<i>Display the BUS% menu</i>
[PRICE]		<i>Start the PRICE function</i>
	80 Enter COST VALUE	
55 [ENTER]		<i>Enter 55 as Cost Value</i>
	25 Enter MARKUP [%]	
15 [ENTER]		<i>Enter 15 as Markup</i>
	PRICEp: 64.71 PRICEc: 63.25	<i>Display Price results.</i>

The price on cost = \$63.25

Part B:

What is the mark-up on price?

KEYS	DISPLAY	DESCRIPTION
[M%UP]		Start the Markup function
	63.25 Enter PRICE VALUE	
[ENTER]		Accept previous value for price \$63.25.
	55 Enter COST VALUE	
[ENTER]		Accept previous value for cost \$55.
	MarkUP%p: 13.04 MarkUP%c: 15.00	Display Markup results.

Mark-up on price = \$13.04

<i>BUS%</i> <i>Menu keys</i>	<i>Description</i>
[PRICE]	Calculates the Price.
[COST]	Calculates the Cost
[M%UP]	Calculates the Mark Up as a percentage.
[[2FIX]]	Set the display to show two decimals.
[CLEAR]	Clears the stack.
[EXIT]	Exit the BUS% application.

<i>BUS% Inputs</i>
PRICE VALUE
COST VALUE
MARKUP %

<i>BUS% Outputs</i>
PRICEp: XX.XX
PRICEc: YY.YY

COSTp: XX.XX
COSTc: YY.YY
MarkUp%p: XX.XX
MarkUp%c: YY.YY

9. TIME

Push [TIME] and the following display will show with menu keys for TIME applications.



NOTE: The first time you enter the TIME application you will be asked to enter the difference between UTC and Local Time. At this time you should enter a real number specifying this difference.

You have now access to 3 zone time applications ([USA], [EUR] and [ASIA]), showing local time in selected cities across the globe, in addition to a stop watch application [S/W] and the calendar [CAL].

A screenshot of a calculator display showing the 'U.S.A. ZONE TIME' menu. The menu lists five cities with their corresponding UTC offsets: New York (+10:00), Chicago (+09:00), Denver (+08:00), Los Angeles (+08:00), and Anchorage (+07:00). Honolulu is listed with a blank offset. At the bottom, a navigation bar shows 'USA | EUR | ASIA | S/W | CAL | EXIT'.

U.S.A. ZONE TIME	
10.00	New York
09.00	Chicago
08.00	Denver
08.00	Los Angeles
07.00	Anchorage
	Honolulu

USA | EUR | ASIA | S/W | CAL | EXIT

Push [USA] and this display will show. Shift Left [USA] will allow you to change the relation between UTC and zone time for all cities covered by this application (used for daylight saving time adjustments).

A screenshot of a calculator display showing the 'EUROPA ZONE TIME' menu. The menu lists five cities with their corresponding UTC offsets: Reykjavik (+14:00), London (+01:00), Paris (+01:00), Athen (+02:00), and Moscow (+03:00). UTC is listed with a blank offset. At the bottom, a navigation bar shows 'USA | EUR | ASIA | S/W | CAL | EXIT'.

EUROPA ZONE TIME	
14.00	Reykjavik
01.00	London
01.00	Paris
02.00	Athen
03.00	Moscow
	UTC

USA | EUR | ASIA | S/W | CAL | EXIT

Push [EUR] and this display will show. Shift Left [EUR] will allow you to change the relation between UTC and zone time for all cities covered by this application (used for daylight saving time adjustments).

```

ASIA ZONE TIME
19.57 Tehran
11.07 New Delhi
08.07 Bangkok
08.07 Singapore
08.07 Hong Kong
0.27 Tokyo
*** USA | EUR | ASIA | S/W | CAL | EXIT ***

```

Push [ASIA] and this display will show. Shift Left [ASIA] will allow you to change the relation between UTC and zone time for all cities covered by this application (used for daylight saving time adjustments).

```

TUE 27.07.98 17:28:15
min→ 0.27 ←sec
***** PUSH ANY KEY TO STOP *****

```

By pushing the [S/W] key you have started the stop watch. Any key push when this clock is ticking will exit and display the time since start in the stack display.

WK	MON	TUE	WED	THU	FRI	SAT	SUN
27				1	2	3	4
28	5	6	7	8	9	10	11
29	12	13	14	15	16	17	18
30	19	20	21	22	23	24	25
31	26	27	28	29	30	31	
7 JULY 1993							

A calendar showing one month including week number and days as shown on this figure will be displayed after pushing the [CAL] key. Before the calendar shows you must answer the two questions specifying month and year of the calendar you want as output.

NOTE: Week numbers follows the American standard, where the first week in any year will be number one, regardless of how many days it contains. The European standard will use the first week with more than 3 days as week number one.

NOTE: The [S/W] and the [CAL] applications while active do not include a menu. To exit these, push any key.

<i>TIME Menu Keys</i>	<i>Description</i>
[USA]	Display Zone Times in U.S.A.
[EUR]	Display Zone Times in Europe.
[ASIA]	Display Zone Times in Asia.
[S/W]	Will start the Stop Watch.
[CAL]	Will display a calendar month.
[EXIT]	Will exit the TIME application.
[-UTC]	Will purge the old UTC local time relation and allow input of new data (used for daylight saving time adjustment).
Shift Left [USA]	Will allow modification on the UTC zone time relationship for the USA zones.
Shift Left [EUR]	Will allow modification on the UTC zone time relationship for the European zones.
Shift Left [ASIA]	Will allow modification on the UTC zone time relationship for the Asia zones.

If you want to use other cities to display in the zone time applications you can do so by editing the data string for the zone times you want to change. Consult your user manual for the HP48 on how to edit data.

10. DEPRECIATION



To access the depreciation application push the [DEPRC] key and this display will show.

Depreciation models supported by this application are:

- [SL] Straight Line Depreciation
- [SOYD] Sum of the Year Digit Depreciation
- [DB] Declining Balance Depreciation
- [ACRS] Accelerated Cost Recovery System

Calculations will output Depreciation Value together with remaining depreciable value (except for the ACRS), one year at a time

Example: Calculate Sum of the Year Digit Depreciation and Remaining Depreciable Value for year 10, when the cost basis are 10000, salvage value 500 and 20 years life time.

```
PRG
...DME B&F.BIN 1 27.07.93 21:59:01
20000
Enter
DEPRECIABLE COST BASIS
10000
SL SOYD DE ACBS CLEAR EXIT
```

Push the [SOYD] key and answer the first question (enter 10000 as Depreciable Cost Basis).

```
PRG
...DME B&F.BIN 1 27.07.93 21:59:12
1000
Enter
SALVAGE VALUE
500
SL SOYD DE ACBS CLEAR EXIT
```

Enter Salvage Value 500.

```

PRG
..DME B&F.BIN 3 27.07.93 21:59:19
10
Enter
EXPECTED LIFE [YEARS]
20
SL SOYD DB ACRS CLEAR EXIT

```

Enter Expected Life 20 Years.

```

PRG
..DME B&F.BIN 3 27.07.93 21:59:24
8
Enter
YEAR IN QUESTION #
10
SL SOYD DB ACRS CLEAR EXIT

```

Enter Year in Question 10.

```

DEPRECIATION
Select Type
4:
3:
2:      SOYD: 497.62
1:      rdw: 2488.10
SL SOYD DB ACRS CLEAR EXIT

```

Output after calculation show that the Sum of the Year Digit Depreciation for this example equals 497.62, and that we still have a value of 2488.10 for future years to depreciate.

Example. Declining Balance Depreciation. Part A.

A processing equipment, purchased for \$100,000 is to be depreciated over 5 years. Its salvage value is estimated at \$5,000. Find the depreciation and remaining depreciable value for each of the first 3 years of the equipment's life using the double-declining-balance method (200% of the straight line rate)

KEYS	DISPLAY	DESCRIPTION
[DEPRC]		<i>Start the DEPRC application</i>
[DB]		<i>Start the DB calculation</i>
	10000 Enter	
	DEPRECIABLE COST BASIS	
100000 [ENTER]		<i>Enter \$100,000 as cost basis</i>
	500 Enter	
	SALVAGE VALUE	
5000 [ENTER]		<i>Enter \$5,000 as salvage value</i>
	100 Enter	
	DECL. BALL. FAC. %	
200 [ENTER]		<i>Enter 200% as factor</i>

	20 Enter EXPECTED LIFE [YEARS]	<i>Enter 5 years as life</i>
5 [ENTER]		
	10 Enter YEAR IN QUESTION #	<i>Enter first year</i>
1 [ENTER]		
	DBD: 40000.00 rdv: 55000.00	<i>Display result for first year</i>
[DB]		<i>Start calculation for year 2</i>
	100000 Enter DEPRECIABLE COST BASIS	<i>Accept previous value for cost basis</i>
[ENTER]		
	5000 Enter SALVAGE VALUE	<i>Accept previous value for salvage value</i>
[ENTER]		

[ENTER]	200 Enter DECL. BALL. FAC. %	<i>Accept previous value as factor</i>
[ENTER]	5 Enter EXPECTED LIFE [YEARS]	<i>Accept previous value for life</i>
2 [ENTER]	1 Enter YEAR IN QUESTION #	<i>Enter 2 as year</i>
	DBD: 24000.00 rdv: 31000.00	<i>Display result for second year.</i>
[DB]		<i>Start calculation for year 3</i>
[ENTER]	100000 Enter DEPRECIABLE COST BASIS	<i>Accept previous value for cost basis</i>
[ENTER]	5000 Enter SALVAGE VALUE	<i>Accept previous value for salvage value</i>

200
Enter
DECL. BALL. FAC. %
[ENTER] *Accept previous
value as factor*

5
Enter
EXPECTED LIFE [YEARS]
[ENTER] *Accept previous
value for life*

2
Enter
YEAR IN QUESTION #
3 [ENTER] *Enter 3 as year*

DBD: 14400.00
rdv: 16600.00 *Display result for
third year.*

Depreciation 1.st year \$40,000.0
2.nd year \$24,000.00
3.rd year \$14,400.00

*Part B.**For comparison, calculate the straight line depreciation for year 3.*

KEYS	DISPLAY	DESCRIPTION
[SL]		<i>Start the SL calculation</i>
	100000 Enter	
[ENTER]	DEPRECIABLE COST BASIS	<i>Accept previous value for cost basis</i>
	5000 Enter	
[ENTER]	SALVAGE VALUE	<i>Accept previous value as salvage value</i>
	5 Enter	
[ENTER]	EXPECTED LIFE [YEAR]	<i>Accept previous life value</i>
	3 Enter	
[ENTER]	YEAR IN QUESTION #	<i>Accept year 3</i>
	SLD: 19000.00 rdv: 38000.00	<i>Display result</i>

Example.

ACRS Deduction.

Use the ACRS method to find the income-tax deduction for a \$25,000 asset over 3 years of a 5 year life. Use the following ACRS table.

<i>Year</i>	<i>Deductible %</i>
<i>1</i>	<i>15</i>
<i>2</i>	<i>25</i>
<i>3</i>	<i>20</i>
<i>4</i>	<i>20</i>
<i>5</i>	<i>20</i>

KEYS	DISPLAY	DESCRIPTION
[ACRS]		<i>Start the ACRS calculation</i>
	100000 Enter	
25000 [ENTER]	DEPRECIABLE COST BASIS	<i>Enter 25,000 as cost basis</i>
	0 Enter	
15 [ENTER]	ACRS FROM TABLE %	<i>Enter 15% from table</i>
	ACRS: 3750.00	<i>Deduction first year</i>

[ACRS] *Start next calculation*

25000
Enter
DEPRECIABLE COST BASIS

[ENTER] *Accept previous cost basis*

15
Enter
ACRS FROM TABLE %

25 [ENTER] *Enter 25% from table*

ACRS: 6250.00 *Deduction second year*

[ACRS] *Start next calculation*

25000
Enter
DEPRECIABLE COST BASIS

[ENTER] *Accept previous cost basis*

25
Enter
ACRS FROM TABLE %

20 [ENTER] *Enter 20% from table*

ACRS: 5000.00 *Deduction third year*

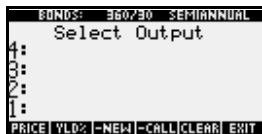
<i>DEPRC Menu Keys</i>	<i>Description</i>
[SL]	Calculates Straight Line Depreciation and Remaining Depreciable Value.
[SOYD]	Calculates Sum of the Year Digit Depreciation and Remaining Depreciable Value.
[DB]	Calculates Declining Balance Deprecation and Remaining Depreciable Value.
[ACRS]	Calculates the Accelerated Cost Recovery System.
[CLEAR]	Clears the stack.
[EXIT]	Exit the DEPRC application.

<i>DEPRC Inputs</i>
DEPRECIABLE COST BASIS
SALVAGE VALUE
EXPECTED LIFE [YEARS]
YEAR IN QUESTION #
DECL. BALL. FAC: %
ACRS FROM TABLE %

<i>DEPRC Outputs</i>
SLD: XX.XX
SOYD: XX.XX
DBD: XX.XX
ACRL: XX.XX
rdv: XX.XX

11. BONDS and NOTES

To calculate price or yield for a Bond or Note, push the [BOND] key, then you will be asked to select between actual [A/A] or 360/30 [360] as calendar basis, and to select the interest period between annual [ANNU] or semiannual [SEMI]. Then you have to enter the purchase and maturity dates.



```
BOND: 360/30 SEMI ANNUAL
Select Output
4:
3:
2:
1:
PRICE | YLD% | -NEW| -CALL| CLEAR| EXIT
```

After these initial inputs the display will look like this.

To calculate the Bond Price push the [PRICE] key, this will output the Bond Price together with the accrued interest from the last coupon payment date until the settlement date, per \$100 face value. PRICE will ask for the annual coupon rate and desired yield before calculation.

To calculate Bond Yield to maturity or yield to call date, expressed as an annual percentage, push the [YLD%] key. This will initiate two questions before calculation, annual coupon rate and bond price.

When you enter the bond application the Call value is set to \$100. This can be changed by pushing the [-CALL] key. (To calculate yield to maturity, CALL must equal 100).

To restart the BOND application while it is activated push the [-NEW] key. This will allow you to change the calendar basis, interest period and the dates.

Example: Price and Yield of a bond, Part A.

What price should you pay on July 28, 1993 for a 6% Revenue bond that matures on June 20, 2005 if you desire a yield of 8% ? The calendar basis is 360/30 and the coupon payments are semi-annual (the example assumes DD.MMYYYY date format).

```
BONDS
Select
Calendar basis ↓ ↓
| | | | A/A | 360
```

Push the [BOND] key, and select calendar basis 360/30 by pressing the [360] key.

```
BONDS
Select
Interest period ↓ ↓
| | | | ANNU | SEMI
```

Then select semi-annual by pushing the [SEMI] key.

```
...DME B&F.BIN 1 28.07.93 01:30:35 PRG
0.000000
Enter
PURCHASE DATE
28.071993◀
```

Enter the purchase date, by typing 28.071993 and push [ENTER].

```

..DME B&F.BIN 3 28.07.93 01:31:06 PRG
0.000000
Enter
MATURITY DATE
20.062005

```

Enter maturity date by typing 20.062005 and push [ENTER].

```

BOND: 260790 SEMI ANNUAL
Select Output
4:
3:
2:
1:
PRICE | YLD% | -NEW | -CALL | CLEAR | EXIT

```

To initiate the Bond Price calculation push the [PRICE] key.

```

..DME B&F.BIN 3 28.07.93 01:33:16 PRG
0
Enter
ANNUAL COUPON RATE %
6
PRICE | YLD% | -NEW | -CALL | CLEAR | EXIT

```

Then enter the annual coupon rate, by typing 6 and push [ENTER].

```

USER      PRG
...DME 8&F.BIN 3 28.07.93 01:33:20
0
Enter
DESIRED YIELD %
8
PRICE YLD% -NEW- -CALL CLEAR EXIT

```

Enter the desired yield, by typing 8 and [ENTER].

```

BONDS: 360.00 SEMIANNUAL
Select Output
4:
3:
2: BondPRICE: 84.82
1: Accrued: 0.63
PRICE YLD% -NEW- -CALL CLEAR EXIT

```

The result will be presented like this.

Bond Price = 84.82

Part B:

If the market quote for the bond were 90, what yield would that represent?

```

PRG
..DME 8:F.BIN 3 28.07.93 01:37:18
C
Enter
ANNUAL COUPON RATE %
PRICE YLD% -NEW -CALL CLEAR EXIT

```

Push the [YLD%] key, and enter with the input line empty to accept the last annual coupon rate (6%).

```

PRG
..DME 8:F.BIN 3 28.07.93 01:37:36
84.82
Enter
BOND PRICE
90
PRICE YLD% -NEW -CALL CLEAR EXIT

```

Enter 90 as the new Bond Price.

```

BONDS: 280790 SEMIANNUAL
Select Output
4:
3: BondPRICE: 84.82
2: Accrued: 0.63
1: BondYIELD%: 7.27
PRICE YLD% -NEW -CALL CLEAR EXIT

```

The new Bond Yield equals 7.27%.

<i>BOND Menu Keys</i>	<i>Description</i>
[PRICE]	Will calculate Bond Price and accrued interest.
[YLD%]	Will calculate Bond Yield as a percentage.
[-NEW]	Will restart the Bond application with option to change Calendar basis, Interest period and dates for purchase and maturity. This will also reset the Call Value to 100.
[-CALL]	Will allow you to change the Call Value.
[CLEAR]	Clears the stack.
[EXIT]	Exit the BOND application.

<i>BOND inputs</i>
Calendar basis
Interest period
PURCHASE DATE
MATURITY DATE
ANNUAL COUPON RATE %
DESIRED YIELD %
BOND PRICE
CALL VALUE

<i>BOND Outputs</i>
BondPRICE: XX.XX
Accrued: YY.YY
BondYIELD%: XX.XX

12. OPTION VALUATION

To calculate an option value, push the [OPTIO] key, and you have started the Black-Scholes option valuation model. Before calculation you will be asked to enter; Current Stock Price, Exercise Price, Variance on Return, Risk Free Interest and Time to Exercise.

There are some differences between European and American options. The Black-Scholes model can not be used directly for all option valuation. Consult textbooks in finance for detailed analyses of the Black-Scholes model (and its limitations).

NOTE: The time element have to be harmonised in this calculation, that is, if the variance on return is annual the risk free interest and the time to exercise must be annual values.

Example: What is the Put Value (sell option) of a stock that can be sold at \$100 after 200 days if it is selling for \$85 and the variance on return equals 25% per year? Risk free interest rate (yield of US treasury bonds) equals 6% (annual).

```
USER PRG
..DME B&F.BIN J 28.07.93 11:28:08
0
Enter
CURRENT STOCK PRICE
85
DEPRC|BOND|OPTIO|CURR|RATIO|HOME
```

Push the [OPTIO] key, and enter Current Stock Price, by typing 85 and push the [ENTER] key.

```
USER PRG
..DME B&F.BIN J 28.07.93 11:28:20
0
Enter
EXERCISE PRICE
100
DEPRC|BOND|OPTIO|CURR|RATIO|HOME
```

Enter the Exercise Price, by typing 100 and hit the [ENTER] key.

```
USER PRG
..DME B&F.BIN J 28.07.93 11:28:29
0
Enter
VARIANCE ON RETURN %
25
DEPRC|BOND|OPTIO|CURR|RATIO|HOME
```

Enter Variance on Return, by typing 25 and enter.

```

USER      PRG
..DME B&F.BIN  28.07.93  11:28:37
0
Enter
RISK FREE INTEREST %
6
DEPRC|BOND|OPTIO|CURR|BATIO|HOME

```

Enter 6% Risk free interest.

```

USER      PRG
..DME B&F.BIN  28.07.93  11:29:04
0
Enter
TIME TO EXERCISE
200 365 /
DEPRC|BOND|OPTIO|CURR|BATIO|HOME

```

Enter Time to Exercise. Since all the other variables is annual values, you have to enter time in years. 200 days expressed in years are 200 divided by 365.

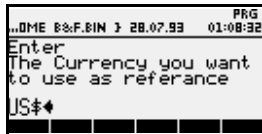
```
BUSINESS & FINANCE
VER 2.0 ©TDR HELGESEN 1993
4:
3:
2:   CallValue: 8.26
1:   PutValue: 20.03
DEPRC|BOND|OPTIO|CURR|RATIO|HOME
```

As output you will always get both the Call Value and the Put Value.

In this case the answer is Put Value = 20.03, meaning that an option to sell this stock is worth 20.03.

13. CURRENCY CONVERSIONS

This application is used for conversion between different currencies. When you start this application the first time you will be asked to enter the currency rate you want to use as reference. This should normally be the currency in the country you live.



This is how the display look like the first time you enter the CURR application.

In this example we want to use US\$ as reference rate.



After the reference rate have been specified the display will lock like this.

This will also be the normal opening display when you later start the CURR application.



To add more rates push the [→NEW] key.

In this case we want to add UK£.

```
...DME B&F.BIN 3 28.07.93 01:12:31 PRG
[1, UK£ = X, US$]
Enter EXCHANGE RATE X
1.73
US$ |>NEW| EXIT |
```

The next question is the exchange rate between the new currency and your reference rate.

Once the currencies are specified with unit and rate, you can convert any number of units of one currency to the other.

To use this application for calculation follow these steps. Type the amount and push the currency key applicable to the currency you want to use. You can add, and subtract currency objects of different currency units, the result will be displayed in the currency unit of the level 1 currency.

Example:

I have 8,000 Swedish Kroner, 5,000 Norwegian Kroner, 1,000 English Pounds and 1,500 US\$. How much is this in US\$?

```

...DME B&F.BIN 3 28.07.93 01:23:41
4:      8000.00_SEK
3:      5000.00_NOK
2:      1000.00_UK£
1:      1500.00_US$
[SEK] [NOK] [UK£] [US$] [NEW] [EXIT]

```

Type 8000 and hit the [SEK] key, type 5000 and hit the [NOK] key, type 1000 and hit the [UK£] key & type 1500 and hit the [US\$] key.

Afterwards the display will lock like this.

```

...DME B&F.BIN 3 28.07.93 01:24:30
4:
3:
2:
1:      5087.14_US$
[SEK] [NOK] [UK£] [US$] [NEW] [EXIT]

```

To add these together hit the [+] key 3 times, and the display will show the sum in US\$.

<i>CURR Menu Keys</i>	<i>Description</i>
[→NEW]	To change or add new currency.
[EXIT]	Exit the CURR application.

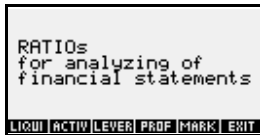
In addition there will be generated new menu keys for each currency you specify. These will have the following menu functionality;

Enter a real number, then push the menu key with the applicable currency to make this real number a currency object.

To convert from one currency to another enter the known amount and push the menu key applicable to the currency. Then push the Shift Left key and the menu key with the currency you want as output.

NOTE: A push of the [CST] key will also exit the CURR menu and return to the main menu.

14. RATIOS



To access the ratio definitions push the [RATIO] key, and the following display will show.

These ratios have been organised into five groups as shown on the menu.

These are;

- | | |
|---------|----------------------|
| [LIQUI] | Liquidity Ratios |
| [ACTIV] | Activity Ratios |
| [LEVER] | Leverage Ratios |
| [PROF] | Profitability Ratios |
| [MARK] | Market Ratios |

ACTIVITY RATIOS					
1	Inventory Turnover				
	Acc.Receiv.Turnover				
	Sales to Total Asset				
	Storage Period				
	Average Collection				
	Period				
1	2	3	4	5	↑

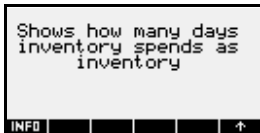
As an example lets assume you are locking for the definition of an activity ratio. Push the [ACTIV] key and this display will show. Then you want to see the definition of Storage Period.

Storage Period					
=					
Average Inventory *365					

Cost of Goods Sold					
INFO					↑

Push the [4] key and this display will show defining Storage Period.

What does it really mean?



Shows how many days
inventory spends as
inventory

INFO | | | | | ↑

Push the [INFO] key and this display will show.

NOTE: RATIO is a text only application intended for quick reference to the most common ratio definitions.

Bellow follows an alphabetic list of all ratio definitions included (and group);

- * Account Receivables Turnover (ACTIV).
- * Acid Test Ratio (LIQUI)
- * Average Collection Period (ACTIV)
- * Book Value per Share of Common Stock (MARK)
- * Cash Ratio (LIQUI)
- * Current Ratio (LIQUI)
- * Debt Ratio (LEVER)
- * Debt to Assets (LEVER)
- * Debt to Equity (LEVER)
- * Dividend Yield (MARK)
- * Interval Measure (LIQUI)
- * Inventory Turnover (ACTIV)
- * Market to Book (MARK)
- * Net Working Capital to Total Assets (LIQUI)
- * Payout Ratio (PROF)
- * Price Earning Ratio (MARK)
- * Profit Margin (PROF)
- * Return on Asset (PROF)
- * Return on Common Stockholders Equity (PROF)
- * Return on Equity (PROF)
- * Sales to Equity (PROF)
- * Sales to Total Asset (ACTIV)
- * Storage Period (ACTIV)
- * Times Interest Earned (LEVER)
- * Tobin's q (MARK)

<i>RATIO Menu Keys</i>	<i>Description</i>
[LIQUI]	Will bring the Liquidity Ratios Menu, with applicable text to the display.
[ACTIV]	Will bring the Activity Ratios Menu, with applicable text to the display.
[LEVER]	Will bring the Leverage Ratios Menu, with applicable text to the display.
[PROF]	Will bring the Profitability Ratios Menu, with applicable text to the display.
[MARK]	Will bring the Market Ratios Menu, with applicable text to the display.
[EXIT]	Will exit the RATIO application.
[1]..[5]	For selection of definitions.
[INFO]	To get more information on a definition.

15. SHARED INTEREST RATE VARIABLES

Normally in Cash Flow and Time Value of Money calculations we use nominal interest rate. The nominal interest rate in the Interest Conversion application (ICONV) are shared with the interest rate for the Cash flow application (CFLO) and the interest per year in the TVM application. This will reduce the number of key push when you calculate a nominal interest rate in the ICONV for use in CFLO or TVM.

Example.

Calculating the payment for a Canadian mortgages.

What is the monthly payment required to fully amortise a 30 year \$50,000 Canadian mortgage if the interest rate is 10%?

In Canadian mortgages, interest is compounded semi-annual while payments are made monthly. The Canadian mortgage factor is calculated by converting the stated nominal interest rate (compounded semi-annually) to the nominal interest rate compounded monthly. The factor is then used as the TVM variable I%YR.

KEYS	DISPLAY	DESCRIPTION
[ICONV]		<i>Display the ICONV menu</i>
[EFF%P]		<i>Start the first conversion.</i>
15 Enter	NOMINAL INTEREST %	
10 [ENTER]		<i>Enter 10% as interest rate</i>
12 Enter	ANNUAL PERIODS #	
2 [ENTER]		<i>Enter 2 periods</i>
	PerEffl%: 10.47	<i>Display calculated effective interest rate</i>
[NO%P]		<i>Start conversion to new nominal interest rate</i>
10.47 Enter	EFFECTIVE INTEREST %	
[ENTER]		<i>Accept effective interest rate as calculated</i>

	2 Enter ANNUAL PERIODS #	
12 [ENTER]		<i>Enter 12 periods</i>
	PerNomI%: 9.80	<i>Display the new mortgage factor</i>
[CLEAR]		<i>Clear the stack.</i>
[EXIT]		<i>Exit the ICONV menu.</i>
[TVM]		<i>Start the TVM application.</i>
	Select Payment Mode	
[END]		<i>Select END mode.</i>
	12 Enter PAYMENTS/YEAR #	
[ENTER]		<i>Accept 12 payments per year.</i>

[PMT]		<i>Start the PMT calculation.</i>
	12 Enter NUMBER OF PAYMENTS	
12 [SPC] 30 * [ENTER]		<i>Enter 30 years payments with 12 payments per year.</i>
	9.8 Enter INTEREST/YEAR %	
[ENTER]		<i>Accept interest from the ICONV calculation.</i>
	0 Enter PRESENT VALUE	
30000 [ENTER]		<i>Enter 30,000 as present value.</i>
	0 Enter FUTURE VALUE	
[ENTER]		<i>Accept 0 as future value.</i>
	PMT: -258.80	<i>Calculated monthly payments.</i>

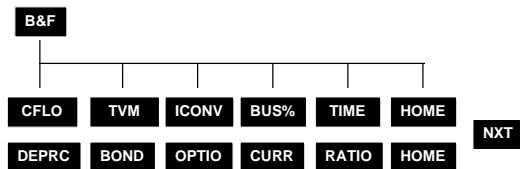
Monthly payments for this Canadian mortgage = \$258.80.

16. RAM Variables generated by the program.

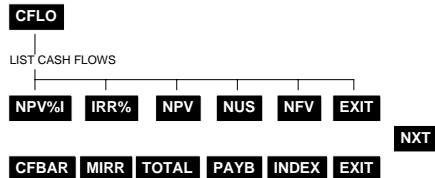
NAME	CONTENT
b&f	Numeric string containing variables used in all numeric calculations.
eur.b&f	Alphanumeric string containing name and time difference compared to UTC for the EUR time application.
usa.b&f	Alphanumeric string containing name and time difference compared to UTC for the USA time application.
asia.b&f	Alphanumeric string containing name and time difference compared to UTC for the ASIA time application.
utc.b&f	A real number used together with the EUR, USA & ASIA time applications specifying the difference between UTC and Local Time (Calculator Time).
refrate.b&f	The reference currency used in the CURR application stored as a string.
curr.b&f	A list containing all visible menu keys used in the CURR application. (NOTE; in addition all added currencies will generate a unit variable).
CST	A list specifying the custom menu.

17. MENUS

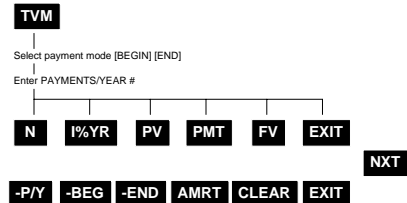
Main menu

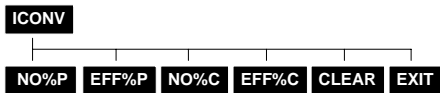
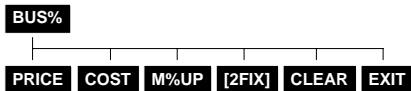


Cash flow menu.



Time Value of Money menu.



Interest Conversion menu.**Business Percentage menu.**

Time menu.**Depreciation menu.**

Bond menu.**BOND**

Select Calendar basis [A/A] [360]

Select Interest Period [ANNU] [SEMI]

Enter PURCHASE DATE

Enter MATURITY DATE

PRICE**YLD%****-NEW****-CALL****CLEAR****EXIT**

Currency Conversion menu.



NOTE: The CURRE menu is not fixed. The only fixed part is the [-NEW] and the [EXIT] keys, the rest of the menu have to be defined by the user.

Ratio definitions menu.



18. BUSINESS AND FINANCE EQUATIONS

CASH FLOW

Internal Rate of Return

$$0 = \sum_{k=0}^N \frac{cfo_k}{1 + \frac{IRR\%}{100}}$$

Net Present Value

$$NPV = \sum_{k=0}^N \frac{cfo_k}{1 + \frac{I\%}{100}}$$

Net Uniform Series

$$NUS = \frac{\frac{I\%}{100}}{\sum_{k=1}^N 1 + \frac{I\%}{100}} NPV$$

Net Future Value

$$NFV = NPV \sum_{k=1}^N \left(\frac{1}{1 + I\%} \right)^k$$

Modified Internal Rate of Return

$$MIRR = 100 \left(\frac{NFV_p}{NPV_n} \right)^{1/n} - 1$$

Total Sum

$$TOTAL = \sum_{n=0}^N cfto_n$$

Payback Period

$$PAYB = N'$$

for

$$\sum_{k=0}^{N'} cflo_k \geq 0$$

if

$$N' \leq N$$

Profitability Index

$$INDEX = \frac{PV}{-cflo_0} = \frac{\sum_{k=1}^N \frac{cflo_k}{1 + \frac{I\%}{100}}}{-cflo_0}$$

cfo - Cash flow.

PV - Present Value.

N - Number of Cash flows.

I% - Interest Rate as a percentage.

NFVp - Net Future Value of the positive cash flows with reinvestment rate as interest rate.

NPVp - Net Present Value of the negative cash flows with borrow rate as interest rate.

TIME VALUE OF MONEY

$$0 = PV + \sum_{t=1}^n \frac{PMT}{(1+i)^t} + \frac{FV}{(1+i)^n}$$

$$i = \frac{I\%}{100}$$

PV - Present Value.

PMT - Periodic Payments.

FV - Future Value.

n - Number of compounding periods.

I% - Periodic interest rate.

AMORTISATION

$$INT' = BAL \cdot i$$

$$INT = INT'$$

$$PRIN = PMT + INT'$$

$$BAL_{new} = BAL_{old} + PRIN$$

$$\sum INT_{new} = \sum INT_{old} + INT$$

$$\sum PRIN_{new} = \sum PRIN_{old} + PRIN$$

ΣINT - Accumulated interest.

$\Sigma PRIN$ - Accumulated principal.

i - Periodic interest rate.

INTEREST CONVERSION

$$EFF\%P = \left(\frac{NO\%P}{100 \cdot P\#} + 1 \right)^{P\#} - 1$$

$$EFF\%C = \left(\frac{NO\%C}{100} + 1 \right)^{1/360} - 1$$

NO%P - Nominal interest periodic compounded.

EFF%P - Effective interest periodic compounded.

NO%C - Nominal interest continuous compounded.

EFF%C - Effective interest continuous compounded.

P# - Compound periods.

BUSINESS PERCENTAGE

$$\text{MarkUp}\% c = \frac{\text{PRICE} - \text{COST}}{\text{COST}} \cdot 100$$

$$\text{MarkUp}\% p = \frac{\text{PRICE} - \text{COST}}{\text{PRICE}} \cdot 100$$

DEPRECIATION**Accelerated Cost Recovery System**



$$\text{ACRS} = \frac{\text{ACRS \%}}{100} \cdot \text{BASIS}$$

Straight line



$$\text{SL} = \frac{\text{BASIS} - \text{SALV}}{\text{LIFE}}$$

Sum of the Year Digit

Declining Balance

$$DB = \frac{BASIS \cdot \frac{FACT\%}{100}}{LIFE} - \frac{FACT\%}{100} \frac{WV_{AR-1}}{LIFE}$$



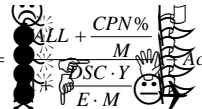
For the last year

$$DB = \frac{BASIS \cdot \frac{FACT\%}{100}}{LIFE} - \frac{FACT\%}{100} \frac{WV_{AR-2}}{LIFE} - SALV - AccD$$



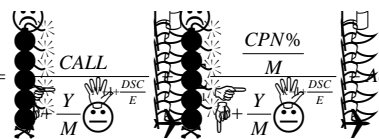
remaining depreciable value

$$rdv = BASIS - SALV - AccD$$

BONDS and NOTES**For one or fewer coupon period to redemption**

$$\text{BondPRICE} = \frac{\text{CALL} + \frac{\text{CPN}\%}{M} \cdot \text{Accrued}}{1 + \frac{\text{DSC} \cdot Y}{E \cdot M}}$$


for more than one coupon periods to redemption

$$\text{BondPRICE} = \frac{\text{CALL} + \frac{\text{CPN}\%}{M} \cdot \text{Accrued}}{1 + \frac{\text{DSC} \cdot Y}{E \cdot M}}$$


$$\text{Accrued} = \frac{A}{E} \cdot \frac{\text{CPN}\%}{M}$$

A - Accrued days, the number of days from beginning of coupon period to settlement date.

E - Number of days in coupon period bracketing settlement date. By convention, E is 180 (or 360) if the calendar basis is 360/30.

DSC - Number of days from settlement date to next coupon date ($DSC=E-A$).

M - Coupon periods per year (1=annual, 2=semiannual).

N - Number of coupon periods between settlement and redemption dates. If N has a fractional part it should be rounded to next higher integer.

Y - Annual yield as a decimal fraction.

OPTION VALUATION

Black-Scholes Model

Call Value

$$PV_{call} = P_{asset} \cdot N(d_1) - P_{ex} \cdot e^{-r_f \cdot t} \cdot N(d_2)$$

$$d_1 = \frac{\log\left(\frac{P_{asset}}{P_{ex}}\right) + r_f \cdot t + \frac{\sigma^2 \cdot t}{2}}{\sigma \cdot \sqrt{t}}$$

$$d_2 = \frac{\log\left(\frac{P_{asset}}{P_{ex}}\right) + r_f \cdot t - \frac{\sigma^2 \cdot t}{2}}{\sigma \cdot \sqrt{t}}$$

Put Value

$$PV_{put} = PV_{call} + PV_{ex} - P_{asset}$$

$N(d)$ - Cumulative normal probability density function.

P_{ex} - Exercise price of option.

P_{asset} - Price of asset.

t - Time to exercise.

σ^2 - Variance per period of rate of return on asset.

r_f - Risk free interest rate.