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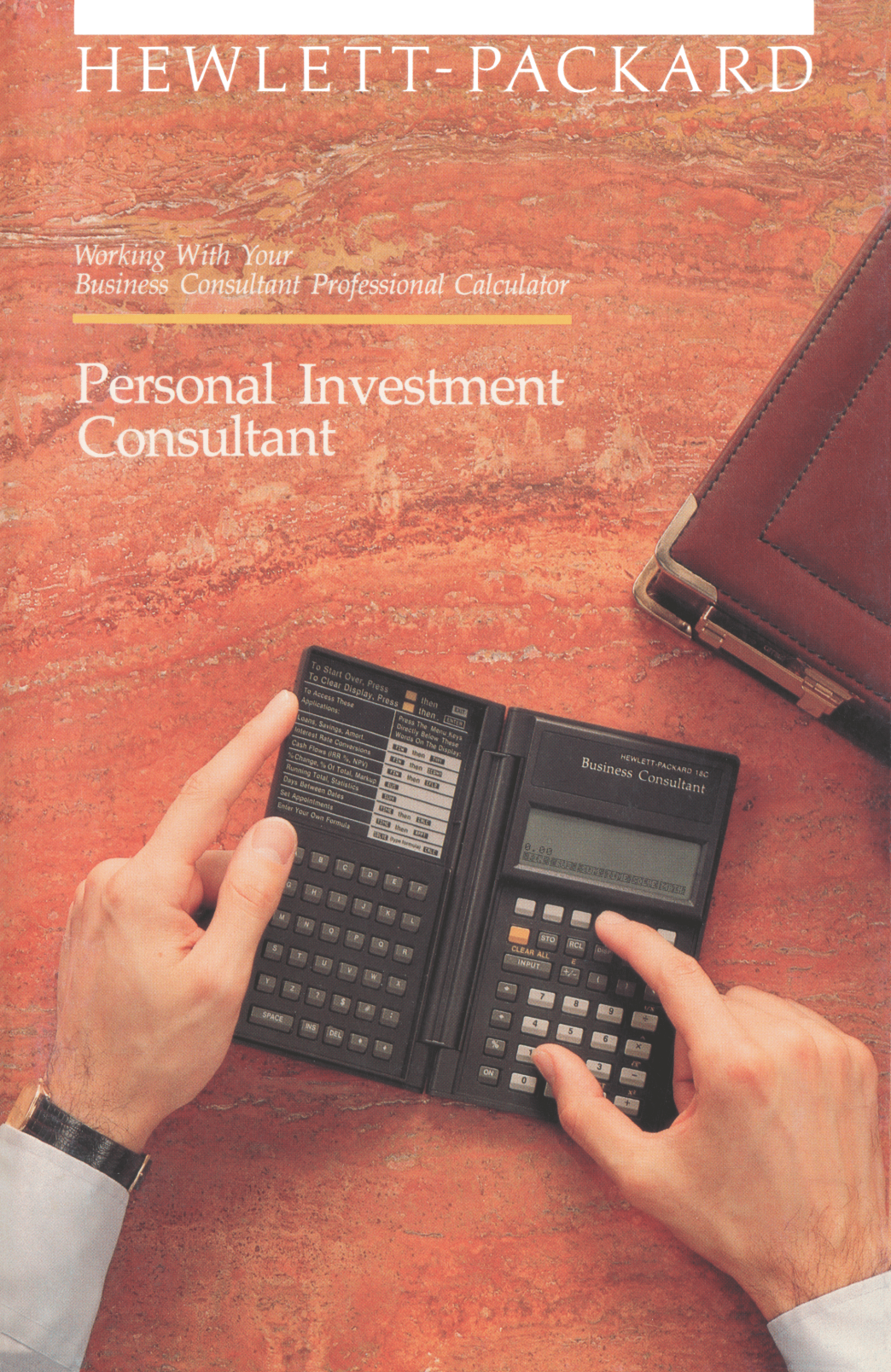
Working With Your
Business Consultant Professional Calculator

Personal Investment Consultant



Personal Investment Consultant

Business Consultant
Professional Calculator

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Portable Computer Division
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Welcome...

... to the Consultant applications series! This series is designed to help you get the most from your Business Consultant professional calculator.

The purpose of the *Personal Investment Consultant* is to provide a set of keystrokes and routines to assist you in analyzing your savings, housing, and other investments. The *Personal Investment Consultant* is designed to serve as a reference to analyze many of your personal financial needs, and show you how your Business Consultant can help.

Before you use the solutions in this book, you should be familiar with certain concepts from the owner's manual:

- Chapter 1: the basics of your calculator—how to move from menu to menu, identify and move to the MAIN menu, and use the menu keys to do calculations.
- Chapter 4: Time Value of Money (TVM menu) and the cash flow sign convention (cash paid out is entered as a negative number and cash received is entered as a positive number).
- Chapter 9: entering and using formulas.

The examples in this book show two decimal places. If your display is set to something other than two, the answers in your display will not match exactly what is in this book. Refer to your owner's manual for more information about changing the number of decimal places.

For more information about the topics in the *Personal Investment Consultant*, refer to a basic textbook on the subject. Specific sources on the more specialized topics are included at the end of those topics.

Contents

When Entering Formulas...

When entering formulas into your Business Consultant, follow the instructions in chapter 9 of your owner's manual. Here are hints to help you in common error situations:

1. If the calculator displays `INVALID FORMULA` when you press CALC, the calculator doesn't understand something in the formula. When the formula returns to the screen, the cursor is positioned where your calculator detected the error. Check the formula in the screen against the formula in the book. Make sure the parentheses match and that the operators are where they should be.
2. If the calculator accepts the formula but your answer doesn't match the example, check the values stored in the menu key variables by recalling them (press RCL, then the menu key). If the values are correct, return to the SOLVE menu and check the formula. (Press EXIT to return to the SOLVE menu and press EDIT to view and edit the formula.) Check the formula against the one in this book for accuracy. When you find an error, edit the formula and press CALC to display the custom menu again.
3. If the calculator displays `INSUFFICIENT MEMORY` when you press INPUT or CALC, you must free portions of memory. Refer to pages 188 and 189 of the owner's manual for additional information.

The formulas in the *Personal Investment Consultant* use variable names that are intended to remind you of what to store. Feel free to change them to something more meaningful to you.

Savings Plans

These examples are presented as guidelines for evaluating savings plans when the payment period coincides with the compounding period.* Since the Time Value of Money (TVM) menu is used, remember the cash flow sign convention when entering dollar amounts (money paid out is entered as a negative number, money received is entered as a positive number).

Information is entered into the TVM menu as follows:

1. From the MAIN menu, press FIN, then TVM.
2. Clear the TVM variables, store the number of payments per year in #P/Y, and set either Begin or End mode (as appropriate).
3. Store values in at least three of the following variables. (Both N and I%YR must be a part of a problem. Either both values are known, or one is known and the other is to be computed.)
   - Number of periodic deposits in N.
   - Annual interest rate in I%YR.
   - Initial investment in PV.
   - Periodic deposit in PMT.
   - Future value in FV.
4. Press the menu key of the unknown variable to calculate its value.

* If the periodic deposits do not coincide with the compounding periods, the account must be evaluated in another manner. Use the Compounding Periods Different From Payment Periods procedure on page 17.

Example 1: Balance of a Savings Account After Initial Deposit and Regular Deposits. You have just opened a savings account with a $200 deposit. If you deposit $50 a month, and the account earns 5¼% compounded monthly, how much will you have in the account in 3 years?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL	0.00	Clears the TVM variables.
OTHER CLEAR ALL EXIT		Sets 12 payments per year; End mode.
3 × 12 N	N=36.00	Stores known values.
5.25 I%YR	I%YR=5.25	
200 +/- PV	PV=-200.00	
50 +/- PMT	PMT=-50.00	
FV	FV=2,178.94	Calculates amount in savings account in 3 years.

Example 2: Number of Deposits or Withdrawals to Reach a Specified Balance. Part 1. Your savings account presently contains $18,000 and earns 5¼% compounded monthly. You wish to withdraw $300 a month until the account is depleted. How long will this take?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL	0.00	Clears the TVM variables.
OTHER CLEAR ALL EXIT		Sets 12 payments per year; End mode.
5.25 I%YR	I%YR=5.25	Stores known values.
18000 +/-		
PV	PV=-18,000.00	
300 PMT	PMT=300.00	

N	N=69.75	Calculates number of months. (The 70th withdrawal will be less than $300.)

Part 2. If you wish to reduce the account to $5,000, how many withdrawals can you make?

5000 FV	FV=5,000.00	Stores remaining balance.
N	N=52.41	Calculates number of monthly withdrawals. (The 53rd withdrawal reduces the account balance to less than $5,000.)

Example 3: Amount to Deposit Today to Have a Certain Future Balance. How much money would you have to invest today if you want $10,000 in 10 years? Assume the interest rate is 9%, compounded annually.

Start from the MAIN menu.

Keys:	**Display:**	**Description:**
FIN TVM		Displays the TVM menu.
CLEAR ALL		Clears the TVM variables.
OTHER 1 #P/Y END EXIT		Sets 1 payment per year; End mode.
10000 FV 9 I%YR 10 N	FV=10,000.00 I%YR=9.00 N=10.00	Stores known values.
PV	PV=-4,224.11	Calculates the amount to deposit today to have $10,000 in the future.

Example 4: Monthly Deposits to Reach a Future Balance. You plan to replace your car in 3 years, and you want to have $6,000 to help pay for the new one. How much should you save each month, beginning today, to accumulate $6,000 in 3 years? Assume 7.5% interest, compounded monthly.

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
↑ CLEAR ALL		Clears the TVM variables.
OTHER ↑ CLEAR ALL BEG		Sets 12 payments per year; Begin mode.
3 × 12 N 7.5 I%YR 6000 FV	N=36.00 I%YR=7.50 FV=6,000.00	Stores known values.
PMT	PMT=-148.21	Calculates the monthly payment.

Example 5: Periodic Deposits and Withdrawals. Part 1. You are presently depositing $50 at the end of each month into a local savings and loan, earning 5¼% compounded monthly. Your account balance is $1,023.25. How much will you accumulate in 5 months?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
↑ CLEAR ALL	0.00	Clears the TVM variables.
OTHER ↑ CLEAR ALL EXIT		Sets 12 payments per year; End mode.

5 N	N=5.00	Stores known values.
5.25 I%YR	I%YR=5.25	
1023.25 +/-		
PV	PV=-1,023.25	
50 +/- PMT	PMT=-50.00	
FV	FV=1,298.03	Calculates account balance after five months.

Part 2. At the beginning of the sixth month, you withdraw $80. What is the new balance?

− 80 =	1,218.03	Calculates new balance.

Part 3. At the end of months six, seven and eight, you deposit $65. How much will you have in the account at the end of month eight?

+/- PV	PV=-1,218.03	Stores the beginning balance.
65 +/- PMT	PMT=-65.00	Stores known values.
3 N	N=3.00	
FV	FV=1,429.94	Calculates balance after an additional three months.

Part 4. You decide not to make deposits for the next two months. What is the balance in the account after those two months?

+/- PV	PV=-1,429.94	Stores the beginning balance.
2 N	N=2.00	Stores known values.
0 PMT	PMT=0.00	
FV	FV=1,442.48	Calculates balance after an additional two months.

This procedure can be continued for any length of time, and can be modified to meet your needs.

Savings Account Compounded Daily

The formula below determines the value of a savings account when interest is compounded daily. You can calculate the total amount in the account after a series of transactions on specified dates.

Entering and Using the SAVFV Formula:

1. From the MAIN menu, press SOLVE to display the SOLVE menu.
2. Enter the SAVFV formula as follows:

   ```
   SAVFV=(PV+PMT)×SPFV(I%YR÷365;
   DDAYS(DATE1;DATE2;1))
   ```

3. Press CALC to verify the formula and display the custom menu.
4. Store five of the following variables:
   - Value of the account on the second date in SAVFV.
   - Value of the account on the first date in PV.
   - Payment to the account in PMT.
   - Annual interest rate as a percent in I%YR.
   - First date in DATE1.
   - Second date in DATE2.
5. Press the menu key to calculate the unknown value.

Example. An account earns 5.25%, compounded daily. Calculate the amount in this account after the following transactions:

1. January 19, 1987 deposit $125.00.
2. February 24, 1987 deposit $60.00.
3. March 16, 1987 deposit $70.00.
4. April 6, 1987 withdraw $50.00.
5. June 1, 1987 deposit $175.00.
6. July 6, 1987 withdraw $100.00.

Start from the SAVFV menu.

Keys:	Display:	Description:
125 PV	PV=125.00	Stores the amount deposited on the first date.
0 PMT	PMT=0.00	Stores 0 as the payment amount.
5.25 I%YR	I%YR=5.25	Stores the nominal annual interest rate.
1.191987 DATE1	DATE1=1.19	Stores the first date.
2.241987 DATE2	DATE2=2.24	Stores the second date.
SAVFV	SAVFV=125.65	Calculates the value of the account on the second date.
STO PV	PV=125.65	Stores the balance of the savings account.
60 PMT	PMT=60.00	Stores amount of deposit.
RCL DATE2 STO DATE1	DATE1=2.24	Stores DATE2 as the first date.
3.161987 DATE2	DATE2=3.16	Stores the second date.
SAVFV	SAVFV=186.18	Calculates the value of the account on the second date.
STO PV	PV=186.18	Stores the balance of the savings account.
70 PMT	PMT=70.00	Stores amount of deposit.
RCL DATE2 STO DATE1	DATE1=3.16	Stores DATE2 as the first date.
4.061987 DATE2	DATE2=4.06	Stores the second date.
SAVFV	SAVFV=256.96	Calculates the value of the account on the second date.

STO PV	PV=256.96	Stores the balance of the savings account.
50 +/- PMT	PMT=-50.00	Stores amount of withdrawal.
RCL DATE2 STO DATE1	DATE1=4.06	Stores DATE2 as the first date.
6.011987 DATE2	DATE2=6.01	Stores the second date.
SAVFV	SAVFV=208.63	Calculates the value of the account on the second date.
STO PV	PV=208.63	Stores the balance of the savings account.
175 PMT	PMT=175.00	Stores amount of deposit.
RCL DATE2 STO DATE1	DATE1=6.01	Stores DATE2 as the first date.
7.061987 DATE2	DATE2=7.06	Stores the second date.
SAVFV	SAVFV=385.57	Calculates the value of the account on the second date.
- 100 =	285.57	Final amount in the savings account.

Compounding Periods Different From Payment Periods

Savings account deposits and withdrawals may not occur at the same time as the bank's compounding periods. The TVM menu, however, assumes these two periods are the same. This procedure shows you how to adjust the interest rate so that you can use the TVM menu in situations when the compounding period is different from the payment period.

When the bank's interest rate is known, adjust the annual interest rate to correspond to the payment period, then use the TVM menu to calculate the unknown value.

1. From the MAIN menu, press FIN ICONV EFFCT to display the effective interest rate conversion menu.
2. Store the following variables. The bank provides this information.
   - Nominal annual interest rate in NOM%.
   - Number of compounding periods per year in P.
3. Press EFF% to calculate the effective annual interest rate.
4. Store the number of payments or withdrawals per year in P.
5. Press NOM% to calculate the nominal rate that corresponds to the payment period.
6. Press ■ MAIN FIN TVM to display the TVM menu.
7. Press STO I%YR to store the adjusted nominal rate.
8. Store the number of payments per year in #P/Y and set either Begin or End mode (as appropriate).
9. Store or calculate the following variables. Remember to use the cash flow sign convention (money paid out is negative; money received is positive).
   - Total number of periodic deposits in N.
   - Initial deposit in PV.
   - Amount of periodic deposit or withdrawal in PMT.
   - Future value in FV.

When the interest rate is the unknown variable, calculate I%YR in the TVM menu (this is the nominal rate that corresponds to the payment period). Then use the ICONV menu to calculate the nominal annual interest rate.

Example 1: Balance of a Savings Account. Starting today, you make monthly deposits of $25 into an account paying 5% interest compounded daily (365-day basis). At the end of 7 years, how much will you receive from the account?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN ICONV EFFCT		Displays the EFFCT menu.
5 NOM%	NOM%=5.00	Stores the known values.
365 P	P=365.00	
EFF%	EFF%=5.13	Calculates the effective interest rate for daily compounding.
12 P	P=12.00	Stores the number of deposits per year.
NOM%	NOM%=5.01*	Calculates the equivalent nominal interest rate for monthly compounding.
EXIT EXIT TVM		Displays the TVM menu.
STO I%YR	I%YR=5.01	Stores the interest rate.
OTHER 12 #P/Y BEG EXIT		Sets 12 payments per year; Begin mode.

* Because compounding is less frequent, a higher nominal interest rate is needed to achieve the same effective rate.

7 [×] 12 [N] 25 [+/-] [PMT] 0 [PV]	N=84.00 PMT=-25.00 PV=0.00	Stores the known values.
[FV]	FV=2,519.61	Calculates the value of the account in seven years.

Example 2: Amount to Deposit Today to Have a Certain Future Balance. You wish to make weekly deposits for eight years into a savings account paying 5¼% interest compounded quarterly. How much should you deposit each week to accumulate $6,000?

Start from the MAIN menu.

Keys:	Display:	Description:
[FIN] [ICONV] [EFFCT]		Displays the EFFCT menu.
5.25 [NOM%] 4 [P]	NOM%=5.25 P=4.00	Stores the known values.
[EFF%]	EFF%=5.35	Calculates the effective rate for quarterly compounding.
52 [P]	P=52.00	Stores the number of deposits per year.
[NOM%]	NOM%=5.22	Calculates the equivalent nominal interest rate for weekly compounding.
[EXIT] [EXIT] [TVM]		Displays the TVM menu.
[STO] [I%YR]	I%YR=5.22	Stores the interest rate.
[OTHER] 52 [#P/Y] [BEG] [EXIT]		Sets 52 payments per year; Begin mode.
8 [×] 52 [N] 6000 [FV] 0 [PV]	N=416.00 FV=6,000.00 PV=0.00	Stores the known values.
[PMT]	PMT=-11.62	Calculates amount of weekly deposit.

Example 3: Length of Time to Accumulate a Balance. You make weekly deposits of $10 into an account paying 5¼% compounded daily (365-day basis). How long will it take to accumulate $1,000?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN ICONV EFFCT		Displays the EFFCT menu.
5.25 NOM% 365 P	NOM%=5.25 P=365.00	Stores the known values.
EFF%	EFF%=5.39	Calculates the effective rate for daily compounding.
52 P	P=52.00	Stores the number of deposits per year.
NOM%	NOM%=5.25*	Calculates the equivalent nominal interest rate for weekly compounding.
EXIT EXIT TVM		Displays the TVM menu.
STO I%YR	I%YR=5.25	Stores the interest rate.
OTHER 52 #P/Y BEG EXIT		Sets 52 payments per year; Begin mode.
10 +/- PMT 1000 FV 0 PV	PMT=-10.00 FV=1,000.00 PV=0.00	Stores the known values.
N	N=95.22	Calculates the number of weeks. (The 96th deposit places the balance over $1,000.)

* To see the difference between the two nominal rates, display more than two digits past the decimal point.

Example 4: Calculating Interest Rate. Your bank statement indicates that you earned $4.63 in interest for one month. Your beginning balance was $975.46. What interest rate is your bank quoting, assuming daily compounding on a 365-day basis?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL		Clears the TVM variables.
OTHER 12 #P/Y BEG EXIT		Sets 12 payments per year; Begin mode.
1 N 975.46 +/-	N=1.00	Stores the known values.
PV +/- + 4.63	PV=-975.46	
FV	FV=980.09	
I%YR	I%YR=5.70	Calculates the periodic interest rate.
EXIT ICONV EFFCT		Displays the EFFCT menu.
STO NOM%	NOM%=5.70	Stores the nominal interest rate.
12 P	P=12.00	Stores the number of deposits per year.
EFF%	EFF%=5.85	Calculates the effective rate for monthly compounding.
365 P	P=365.00	Stores the number of compounding periods per year.
NOM%	NOM%=5.68	Calculates the nominal interest rate quoted by the bank.

Deposits Needed to Meet a Future Cash Flow Need

Sometimes you want to know how much money you need to save now to accumulate money for a future series of outflows. An example of this situation is saving money for college. The following procedure helps determine how much you need to save each period. You need to know when you need the money, how much is needed and at what interest rate you can invest.

Part 1. Calculate the present value of the future withdrawals.

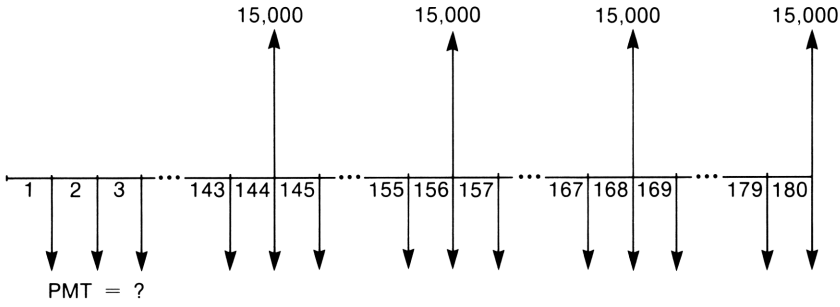
1. From the MAIN menu, press FIN then CFLO to display the CFLO menu.
2. Press ■ CLEAR ALL YES to clear the list. (If you don't want to delete the list, name your old list and get a new list.)
3. Store 0 as the initial cash flow.
4. Store 0 as FLOW(1), and the number of payment periods until the withdrawals begin as the number of times.
5. Store the withdrawal amount as FLOW(2). Continuing entering cash flows of 0 and withdrawals through the last withdrawal.
6. Press CALC to display the CFLO CALC menu.
7. Store the periodic interest rate in I% .
8. Press NPV to calculate the net present value of the future cash flows.

Part 2. Solve for the payment amount. Remember to use the cash flow sign convention (cash paid out is negative; cash received is positive).

1. Press EXIT EXIT TVM to display the TVM menu.
2. Store the net present value (NPV) from Part 1 in PV .
3. Store the number of deposits per year in #P/Y and set either Begin or End mode.

4. Store the following variables:
   - Total number of deposits in N.
   - Nominal interest rate in I%YR.
   - 0 in FV.
5. Press PMT to solve for the periodic payment amount.

Example. Your daughter will be going to college in 12 years and you are starting a fund for her education. She will need $15,000 at the beginning of each year for four years. The fund earns 9%, compounded monthly, and you plan to make monthly deposits, starting at the end of the current month. The cash flow diagram looks like this:



How much should you deposit each month to meet her educational expenses?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN CFLO *		Selects the CFLO menu.
CLEAR ALL YES		Clears the list.
0 INPUT		Stores the initial cash flow.

* If you want to preserve the current list, skip the next step (pressing CLEAR ALL), name the list, then press GET *NEW.

0 INPUT 12 × 12 − 1 INPUT	143.00	Stores the cash flows until withdrawals begin as FLOW(1).
15000 INPUT INPUT		Stores first withdrawal as FLOW(2).
0 INPUT 11 INPUT		Stores cash flows of zero for the rest of the year as FLOW(3).
15000 INPUT INPUT		Stores second withdrawal as FLOW(4).
0 INPUT 11 INPUT		Stores cash flows of zero for the rest of the year as FLOW(5).
15000 INPUT INPUT		Stores third withdrawal as FLOW(6).
0 INPUT 11 INPUT		Stores cash flows of zero for the rest of the year as FLOW(7).
15000 INPUT INPUT		Stores fourth withdrawal as FLOW(8).
CALC		Displays the CFLO CALC menu.
9 ÷ 12 I%	I%=0.75	Stores the monthly interest rate.
NPV	NPV=17,973.48	Solves for the net present value of the withdrawals.
EXIT EXIT TVM	17,973.48	Displays the TVM menu.
STO PV	PV=17,973.48	Stores the present value.
OTHER CLEAR ALL EXIT		Sets 12 payments per year; End mode.

15 [×] 12 N	N=180.00	Stores the total number of monthly deposits.
9 I%YR	I%YR=9.00	Stores the nominal interest rate.
0 FV	FV=0.00	Stores the future value.
PMT	PMT=-182.30	Calculates the monthly payment.

Basic Mortgage Components

Many of the analytical techniques illustrated in this book require that you know certain basic mortgage components. For a particular problem, some of these values may not be known. However, if any three elements are known (mortgages with balloon payments have four known elements), the remaining unknown value can be calculated.

The basic financial functions are summarized below for quick reference. Refer to Chapter 4 (Time Value of Money) in the owner's manual for additional information.

Storing Financial Data

Key	Value Stored
N	Total number of payments.
I%YR	Annual interest rate as a percent.
PV	Initial loan balance.*
PMT	Periodic payment.*
FV	Future value or balloon payment.*
#P/Y	Number of payments per year.
END	Sets End mode.
BEG	Sets Begin mode.

* Use the cash flow sign convention.

Solving for Values

Unknown Value	Known Values Required to Solve
N	I%YR, PV, PMT, FV,* #P/Y, End or Begin
I%YR	N, PV, PMT, FV,* #P/Y, End or Begin
PV	N, I%YR, PMT, FV,* #P/Y, End or Begin
PMT	N, I%YR, PV, FV,* #P/Y, End or Begin
FV	N, I%YR, PV, PMT, #P/Y, End or Begin

* FV is zero if there is no balloon payment.

Example 1. A broker lists a property that has an assumable loan. The original loan amount was $150,000 at 7% annual interest, fully amortized with monthly payments in 25 years. The loan originated 11 years and 8 months ago. What is the loan balance?

Solution. The broker needs to know the monthly payment to calculate the loan balance. The known basic mortgage components are the original number of payments (N), the annual interest (I%YR), and the original balance (PV). There is no balloon payment, so FV=0. The monthly payment (PMT) is unknown. The balance can be calculated as a balloon payment (FV) due after 11 years and 8 months (140 payments). The broker must first calculate the monthly payment, then use the four known values (N, I%YR, PV, and PMT) to calculate the amount of the balloon payment.

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL	0.00	Clears TVM variables.
OTHER		Displays secondary TVM menu.
CLEAR ALL		Sets 12 payments per year; End mode.
EXIT		Displays TVM menu.
25 × 12 N	N=300.00	Stores total number of payments.
7 I%YR	I%YR=7.00	Stores annual interest rate.
150000 PV	PV=150,000.00	Stores original loan amount.
PMT	PMT=-1,060.17	Calculates monthly payment amount.
11 × 12 + 8 N	N=140.00	Calculates and stores number of payments already made.
FV	FV=-110,080.32	Calculates loan balance.

Example 2. A property has an existing loan of $100,000 with monthly payments of $1,106.20 for 30 years. What is the annual interest rate of the loan?

Solution. The interest rate is the unknown value. The loan amount, remaining number of payments, and monthly payment are known.

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL	0.00	Clears TVM variables.
OTHER		Displays secondary TVM menu.
CLEAR ALL		Sets 12 payments per year; End mode.
EXIT		Displays the TVM menu.
30 × 12 N	N=360.00	Stores total number of payments.
100000 PV	PV=100,000.00	Stores loan amount.
1106.20 +/− PMT	PMT=-1,106.20	Stores monthly payment. (Remember to use the sign convention.)
I%YR	I%YR=13.00	Calculates annual interest rate.

Example 3. What is the balloon payment due at the end of year 10 for a $750,000 loan with monthly payments of $9,483.33 and a 15% annual interest rate?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL	0.00	Clears TVM variables.
OTHER		Displays secondary TVM menu.
CLEAR ALL		Sets 12 payments per year; End mode.
EXIT		Displays the TVM menu.
10 × 12 N	N=120.00	Stores total number of payments.
15 I%YR	I%YR=15.00	Stores annual interest rate.
750000 PV	PV=750,000.00	Stores loan amount.
9483.33 +/− PMT	PMT=-9,483.33	Stores payment amount.
FV	FV=-720,185.74	Calculates amount of balloon payment.*

* The balloon payment amount occurs coincident with, and does not include, the last periodic payment amount.

Example 4. Mr. Seller takes a $200,000 purchase money mortgage at 12% annual interest with quarterly payments and a $150,000 balloon payment due at the end of five years. What is the quarterly payment?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL	0.00	Clears TVM variables.
OTHER		Displays secondary TVM menu.
4 #P/Y END		Sets 4 payments per year; End mode.
EXIT		Displays the TVM menu.
5 × 4 N	N=20.00	Stores total number of payments.
12 I%YR	I%YR=12.00	Stores annual interest rate.
200000 PV	PV=200,000.00	Stores loan amount.
150000 +/- FV	FV=-150,000.00	Stores balloon payment amount.
PMT	PMT=-7,860.79	Calculates quarterly payment amount.

Example 5. A loan at 15% annual interest, with monthly payments of $1,283.62, has a balloon payment of $100,000 due at the end of year 10. What is the remaining balance if the loan is paid in full at the end of the sixth year?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL	0.00	Clears TVM variables.
OTHER		Displays secondary TVM menu.
CLEAR ALL		Sets 12 payments per year; End mode.
EXIT		Displays the TVM menu.
10 − 6 × 12 N	N=48.00	Stores total number of remaining payments.
15 I%YR	I%YR=15.00	Stores annual interest rate.
1283.62 +/− PMT	PMT=-1,283.62	Stores monthly payment amount.
100000 +/− FV	FV=-100,000.00	Stores amount of balloon payment.
PV	PV=101,208.02	Calculates loan balance at the end of year 6.

Homeowner's Monthly Payment Estimator

When comparison shopping for a mortgage, it is often useful to estimate the monthly payment. This procedure calculates the approximate mortgage payment given the purchase price, tax rate per $1000, down payment (as a percent), interest rate, and term of the loan.

The calculation assumes that the assessed value is 100% of the sale price and does not include financing of the closing costs.

The following procedure may be used to calculate the monthly payment. Remember to use the cash flow sign convention (money paid out is negative; money received is positive).

1. From the MAIN menu, press FIN then TVM to select the TVM menu.
2. Clear the TVM variables, store the number of payments per year in #P/Y, and set either Begin or End mode.
3. Store the annual interest rate in I%YR.
4. Store the number of payments in N.
5. Store the purchase price in register 1.
6. Calculate the loan amount (purchase price minus the down payment) and store in PV.
7. Press PMT to calculate the mortgage payment.
8. Add the approximate monthly taxes to the payment. To determine the monthly taxes, divide the tax rate by 1000, multiply by the house value and divide by the number of payments per year.

Example. You are considering a $65,000 house in a neighborhood with a $25 per thousand tax rate. If you put 10% down, and receive a 10¾% loan for 35 years, what would be your monthly payment?

Start from the MAIN menu:

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL		Clears TVM variables.
OTHER CLEAR ALL EXIT		Sets 12 payments per year; End mode.
35 × 12 N	N=420.00	Stores the number of payments.
10.75 I%YR	I%YR=10.75	Stores the annual interest rate.
65000 STO 1 − 10 % PV	PV=58,500.00	Stores the purchase price less the down payment.
PMT	PMT=-536.74	Calculates the loan payment amount.
25 ÷ 1000 ×	0.03×	Tax rate per dollar value of the house.
RCL 1 ÷	1,625.00÷	Approximately yearly tax amount.
12 =	135.42	Approximate monthly tax amount.
+ RCL PMT +/− =	672.16	Approximate monthly payment including taxes.

APR of a Loan With Fees

The Annual Percentage Rate (APR) incorporates the fact that fees are usually charged when a mortgage is issued, which raises the interest rate. The actual amount received by the borrower (PV) is reduced, while the periodic payments remain the same. Given the life or term of the mortgage, the interest rate, the mortgage amount, and the basis of the fee charged (how the fee is calculated), the Annual Percentage Rate (APR) can be calculated.

Information is entered as follows. Remember to use the cash flow sign convention (money paid out is negative, money received is positive).

1. From the MAIN menu, press FIN, then TVM.
2. Clear the TVM variables, store the number of payments per year in #P/Y, and set the payment mode (Begin or End, as appropriate).
3. Store the total number of payments in N.
4. Store the payment amount in PMT.
5. Store the balloon payment plus any prepayment penalties in FV.
6. Subtract any origination fees from the loan amount and store the result (the net proceeds) in PV.
7. Press I%YR to calculate the annual percentage rate.

Example 1. A borrower is charged two points for the issuance of his mortgage. (One point is equal to 1% of the mortgage amount.) If the mortgage amount is $60,000 for 30 years and the interest rate is 11½%, with monthly payments, what APR is the borrower paying?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL	0.00	Clears TVM variables.
OTHER CLEAR ALL EXIT		Sets 12 payments per year; End mode.
30 × 12 N	N=360.00	Stores number of payments.
11.5 I%YR	I%YR=11.50	Stores annual interest rate.
60000 PV	PV=60,000.00	Stores loan amount.
PMT	PMT=-594.17	Calculates monthly payment.
RCL PV − 2 % PV	PV=58,800.00	Stores actual amount received by borrower.
I%YR	I%YR=11.76	Calculates annual percentage rate.

Example 2. Using the information given in example 1, calculate the APR if the mortgage fee is stated as $150 instead of as a percentage.

These steps are necessary if you have not done example 1.

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
OTHER CLEAR ALL EXIT		Sets 12 payments per year; End mode.
CLEAR ALL	0.00	Clears TVM variables.
30 × 12 N	N=360.00	Stores number of payments.
11.5 I%YR	I%YR=11.50	Restores annual interest rate.
60000 PV	PV=60,000.00	Restores loan amount.
PMT	PMT=-594.17	Calculates monthly payment.
RCL PV − 150 PV	PV=59,850.00	Stores actual amount received.
I%YR	I%YR=11.53	Calculates APR.

Example 3. Using the information given in example 1 again, what is the APR if the mortgage fee is stated as 2 points plus $150?

These steps are necessary if you have not done examples 1 or 2.

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
OTHER CLEAR ALL EXIT		Sets 12 payments per year; End mode.
CLEAR ALL	0.00	Clears TVM variables.
30 × 12 N	N=360.00	Stores number of payments.
11.5 I%YR	I%YR=11.50	Restores annual interest rate.
60000 PV	PV=60,000.00	Restores loan amount.
PMT	PMT=-594.17	Calculates monthly payment.
RCL PV −		Stores actual amount borrowed.
2 % − 150		
PV	PV=58,650.00	
I%YR	I%YR=11.80	Calculates APR.

Example 4. A $1,000,000, 10-year, 12% interest-only loan has an origination fee of 3 points. What is the yield to the lender? Assume that monthly payments are made. (The monthly payment amount must first be calculated. The balloon payment is the entire loan amount, or $1,000,000.)

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL	0.00	Clears TVM variables.
OTHER CLEAR ALL EXIT		Sets 12 payments per year; End mode.
10 × 12 N	N=120.00	Stores number of payments.
1000000 × 12 % ÷	120,000.00÷	Calculates amount of annual interest.
12 +/− PMT	PMT=-10,000.00	Calculates and stores monthly payment.
1000000 +/− FV	FV=-1,000,000.00	Stores balloon payment.
− 3 % = +/− PV	PV=970,000.00	Calculates and stores actual amount borrowed.
I%YR	I%YR=12.53	Calculates APR.

Rent Versus Buy Decision

The question of whether to rent or buy a house is not always easy to answer, especially when the time period over which you would rent or own is short. This procedure is one way to analyze the financial aspects of a rent versus buy decision.

The problem is best broken into parts:

Part 1. Calculate an estimated selling price and gross proceeds on the sale of a house, assuming a reasonable appreciation rate.

Part 2. Calculate the net proceeds from the sale of the house.

Part 3. Calculate the yield on your investment in the house using the net proceeds from part 2 for the future value.

Part 4. Compare the yield on your investment in the house to a typical savings account interest rate to arrive at your decision.

Part 5. To determine the lowest average annual appreciation rate for buying to be the better option, calculate the value of a savings account, where the initial deposit is the down payment, and the monthly deposits are equal to the difference between monthly house expenditures (mortgage payment, monthly property taxes, repairs, improvements and insurance) and rent, compounded over the same time period, at a typical savings account rate. Store this value as future value and calculate I%YR.

Parts 1 through 5 may be performed using the following keystrokes. Remember to use the cash flow sign convention (money paid out is negative; money received is positive).

Part 1. Calculate the estimated selling price and gross proceeds on the sale.

1. From the MAIN menu, press FIN then TVM to display the TVM menu.
2. Clear the TVM variables, store 1 payment per year in #P/Y, and set End mode.

3. Store the following variables:
   - Number of years in N.
   - Annual appreciation rate of the property in I%YR.
   - Present value of the property in PV.
4. Press FV to calculate the future selling price.
5. Calculate the sales commission and subtract it from the future value to obtain the gross proceeds on the sale. Store it in register 0.

Part 2. Calculate the net proceeds on the sale.

1. Store the number of payments per year in #P/Y, and set either Begin or End mode.
2. Store the following variables:
   - Number of periods in N.
   - Annual interest rate on the mortgage in I%YR.
   - Loan amount in PV.
   - Periodic payment amount in PMT.
3. Press FV to calculate the mortgage balance and store the value in register 1.
4. Add the value in register 0 (gross proceeds on the sale) to the mortgage balance, to get the net proceeds from the sale of the house. Store this value in FV.

Part 3. Calculate the yield on your housing investment.

1. Store the following variables:
   - Down payment plus closing costs in PV.
   - Total monthly expenditures (mortgage payment, monthly property tax, repairs, improvements and insurance), less rent, in PMT.
   - Number of periods in N.
2. Press I%YR to obtain the yield on your housing investment.

Part 4. Compare the yield found in part 3 with that paid on a savings account.

Part 5. Calculate the value of a savings account and find the lowest average annual appreciation rate at which buying is the better option.

1. Store the annual rate of a typical savings account in I%YR.
2. Press FV to calculate the value of an alternative bank account if you deposited the down payment and the difference in monthly payments.
3. Store 1 payment per year in #P/Y, and set End mode.
4. Store the following variables:
   - Sum of the savings account balance and the loan balance, less the sales commission in FV.
   - Number of years in N.
   - Amount of the loan in PV.
   - 0 in PMT.
5. Press I%YR to calculate the appreciation rate to break even.

Example. Real estate is appreciating 5% annually. The house you want to buy costs $60,000, with $7,500 down. Financing is available at 10.75% interest with monthly payments of $490.08; taxes, insurance, repairs and improvements would add another $250 per month. Closing costs would be about $2,000 on the purchase and 6% on the sale. Rent in the area is about $400 for suitable housing, and you could save the difference between house costs and rent in a special savings account that draws 7% interest. Compare the two investments.

Start from the MAIN menu.

Part 1. Calculate the selling price and gross proceeds on the sale.

Keys:	Display:	Description:
FIN TVM		Selects the TVM menu.
CLEAR ALL		Clears TVM variables.
OTHER 1 #P/Y END EXIT		Sets 1 payment per year; End mode.
4 N	N=4.00	Stores the number of years.
5 I%YR	I%YR=5.00	Stores the annual appreciation rate.
60000 +/- PV	PV=-60,000.00	Stores the value of the house.
FV	FV=72,930.38	Calculates the market value of the house in four years.
- 6 % =	68,554.55	Calculates the market value less sales commission (gross proceeds).
STO 0		Stores gross proceeds in register 0.

Part 2. Calculate the net proceeds from the sale.

OTHER 12 #P/Y EXIT		Sets 12 payments per year; End mode.
48 N	N=48.00	Stores the number of payments.
10.75 I%YR	I%YR=10.75	Stores the annual interest rate.

60000 [−] 7500 PV	PV=52,500.00	Stores the purchase price less the down payment (loan amount).
490.08 [+/−] PMT	PMT=-490.08	Stores the monthly payment.
FV	FV=-51,320.97	Calculates the loan balance after four years.
[STO] 1		Stores this value in register 1.
[+] [RCL] 0 [=] FV	FV=17,233.58	Calculates the net proceeds on sale of the house and stores it as the future value.

Part 3. Calculate the yield on the investment in the house.

7500 [+] 2000 [=] [+/−] PV	PV=-9,500.00	Stores the down payment and closing costs in present value.
490.08 [+] 250 [−] 400 [=] [+/−] PMT	PMT=-340.08	Stores the difference between monthly house expenditures and rent.
48 N	N=48.00	Stores the number of periods.
I%YR	I%YR=-15.69	Calculates the annual yield on your investment.

Part 4. Given the conditions in this example, purchasing a house would not be a wise investment, because the annual rate of return is negative.

Part 5. Calculate the lowest average annual appreciation rate for which buying would be the better investment.

7 I%YR	I%YR=7.00	Stores the savings interest rate.
FV	FV=31,335.07	Calculates the future value of the savings account.
OTHER 1 #P/Y EXIT		Sets 1 payment per year; End mode.
RCL FV + RLC 1 +/- ÷	82,656.04÷	Calculates the loan balance plus the savings account balance.
(1 − 6 %) = FV	FV=87,931.96	Calculates the 6% sales commission and stores the difference in FV.
4 N	N=4.00	Stores the number of years.
60000 +/- PV	PV=-60,000.00	Stores the present value.
0 PMT	PMT=0.00	Stores 0 in payment.
I%YR	I%YR=10.03	Percent annual appreciation rate to break even.

Reverse Annuity Mortgage Payment

A reverse annuity mortgage allows people over 62 years of age to use the equity in their homes to generate regular monthly income. The following procedure calculates the monthly payment one could receive from a reverse annuity mortgage. Remember to use the cash flow sign convention (money paid out is negative; money received is positive).

1. From the MAIN menu, press FIN then TVM to display the TVM menu.
2. Clear the TVM variables, store the number of payments per year in #P/Y, and set either Begin or End mode.
3. Store the total number of payments in N.
4. Store the annual interest rate in I%YR.
5. If an initial payment is received, store the amount in PV.
6. Store the total loan amount in FV.
7. Press PMT to calculate the periodic payment.

Example: Part 1. You plan to take out a reverse annuity mortgage and you want to know how much money you will receive at the beginning of each month, given the following: loan amount is $64,000, 5-year term, 13% interest rate, and an initial payment of $2,500.

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL		Clears the TVM variables.
OTHER 12 #P/Y BEG EXIT		Sets 12 payments per year; Begin mode.
5 × 12 N	N=60.00	Stores the number of payments.

13 I%YR	I%YR=13.00	Stores the annual interest rate.
2500 PV	PV=2,500.00	Stores the initial payment.
64000 +/- FV	FV=-64,000.00	Stores the total amount of the loan.
PMT	PMT=698.41	Calculates the monthly payment.

Part 2. Suppose you need only $500 per month. For how many months could you receive these payments?

500 PMT	PMT=500.00	Stores the new payment amount.
N	N=75.31	You could receive these payments for 75 months.

Source: Reverse Annuity Mortgage Program, San Francisco Development Fund, San Francisco, Ca.

The Cost of an Insurance Policy

The cost of an insurance policy, other than term life insurance, is rarely apparent at first glance. The cost should include not only the premium payments, but also the interest that could have been earned on the cash value or "savings portion" of the policy.

The following procedure calculates a cost per $1,000 of protection and the interest rate earned on the savings portion of the policy.

To calculate cost, you must assume some value for interest—for example, the interest rate you could earn on a one-year savings certificate after tax. Similarly, to calculate interest, you must assume a price per $1,000 for alternative insurance; for example, a low cost term policy of the one-year renewable type.

Even complex policies like the minimum-deposit plans can be analyzed with this procedure. Use policy surrender values for cash values and the actual (after-tax) amounts for payments (premiums) and dividends.

Entering and Using the ICOST Formula:

1. From the MAIN menu, press SOLVE to enter the SOLVE menu.
2. Type in the formula as follows:

   ```
   ICOST=((PREM+LVAL)×(1+I%÷100)-VAL-DIV)
   ÷(.001×(FACE-VAL))
   ```

3. Press CALC to verify the formula and to display the custom menu.
4. Store the following variables:
   - Annual premium amount in PREM.
   - Value of the policy at the end of last year in LVAL.
   - Rate of return, as a percent, on a saving account in I%.
   - Value of the policy at the end of the current year in VAL.
   - Dollar value of the dividend in DIV.
   - Face value of the policy in FACE.
5. Press ICOST to calculate the cost of the insurance policy per $1,000.

Example: Part 1. You are evaluating your $50,000 policy. The premium of $1,010 is due at the beginning of the year, and a dividend of $165 is received at the end of the policy year. A cash value of $3,302 at the beginning of the year will grow to $4,104 by the end of the year. You can earn 6% on a savings account. What is the cost per $1,000 of protection?

Start from the ICOST custom menu.

Keys:	Display:	Description:
1010 PREM	PREM=1,010.00	Stores the annual premium.
3302 LVAL	LVAL=3,302.00	Stores the value of the policy at the end of the last year.
6 I%	I%=6.00	Stores the interest rate that could be received elsewhere.
4104 VAL	VAL=4,104.00	Stores the value of the policy at the end of the present year.
MORE		
165 DIV	DIV=165.00	Stores the annual dividend.
50000 FACE	FACE=50,000.00	Stores the face value of the policy.
MORE		
ICOST	ICOST=6.57	Calculates the cost per $1000 of protection.

Part 2. Insurance protection could be purchased for $3 per $1,000. Calculate the rate of return on your savings.

3 ICOST	`ICOST=3.00`	Stores the cost of the alternate insurance.
I%	`I%=2.20`	Calculates the percent rate of return on your savings.

Source: Joseph M. Belth, *Life Insurance-A Consumer's Handbook,* Indiana University Press, 1973, p. 234.

Value of Tax-Free and Taxed Accounts at Retirement

Many people save part of their income for retirement. IRA and Keogh plans keep the income from being taxed until it is used. The savings due to tax-free status are often considerable, but complex to calculate. The procedures in the following two sections show you how to figure the amount and the purchasing power of a tax-free account and of a taxed account.

Value of an IRA or Keogh Account

Use the TVM menu to calculate the amount in your account at retirement. Remember to use the cash flow sign convention (money paid out is negative; money received is positive).

1. From the MAIN menu, press FIN then TVM to display the TVM menu.
2. Clear the TVM variables, store the number of payments per year in #P/Y, and set either Begin or End mode.
3. Store the following variables:
   - Number of payments until you retire in N.
   - Annual dividend rate in I%YR.
   - Payment amount in PMT.
4. Press FV to calculate the amount in the account at retirement.

Example: Part 1. Assume a 35-year investment period with a dividend rate of 8.175%. If you invest $2,000 at the beginning of each year in an IRA, how much will you have at retirement?

Start from the MAIN menu.

Keys:	Display:	Description:
FIN TVM		Displays the TVM menu.
CLEAR ALL		Clears the TVM variables.
OTHER 1 #P/Y BEG EXIT		Sets 1 payments per year; Begin mode.
35 N	N=35.00	Stores the number of years until retirement.
8.175 I%YR	I%YR=8.18	Stores the dividend rate.
2000 +/- PMT	PMT=-2,000.00	Stores the payment amount.
FV	FV=387,640.45	Calculates the amount in the IRA at retirement.

Part 2. How much have you paid into the IRA?

RCL PMT ×	-2,000.00	Recalls the payment amount.
RCL N =	-70,000.00	Total amount paid in.

Part 3. How much interest have you earned?

+ RCL FV =	317,640.45	Calculates the interest you have earned (the difference between what you paid in and the future value of the account).

Part 4. Your tax rate was 40% before retirement. After retirement, you withdraw cash such that it is taxed at one-half the tax rate paid during the pay-in period. What is the after-tax value?

1 [−] [(] .4 [÷] 2 [)] [=]	0.80	Calculates the fraction of the account you will receive after taxes are paid.
[×] [RCL] FV [=]	310,112.36	Calculates the value of the account after taxes are paid at 20%.

Part 5. What is the purchasing power of that amount, in today's dollars, assuming 10% annual inflation?

[÷] [(] [(] 1 [+] 10 [%] [)] [■] [^] [RCL] N [=]	11,035.07	Divides the amount found in part 4 by $(1+10\%)^{35}$, the amount by which a 10% inflation rate reduces purchasing power in 35 years.

Value of a Taxed Account

You can calculate the value of a non-tax-free account using the following formula.

Entering and Using the TAXFV Formula:

1. From the MAIN menu, press SOLVE to display the SOLVE menu.
2. Type in the following formula:

   ```
   TAXFV=PMT÷(I%÷100)×(1+I%÷100×(1-TAX%÷100))×
   ((1+I%÷100×(1-TAX%÷100))^YEARS-1)
   ```

3. Press CALC to verify the formula and display the custom menu.

4. Store the following variables:
   - Payment amount in PMT.
   - Interest rate, as a percent, earned by this account in I%.
   - Your tax rate today as a percent in TAX%.
   - Number of years to retirement in YEARS.
5. Press TAXFV to calculate the future value of a taxed investment.

Example 2: Part 1. If you invest $2,000 each year, with dividends taxed as ordinary income, how much will you have in the account at retirement? Assume a dividend rate of 8.175%, tax rate of 40% and the investment period is 35 years.

Start from the TAXFV custom menu.

Keys:	Display:	Description:
2000 PMT	PMT=2,000.00	Stores the annual payment.
8.175 I%	I%=8.18	Stores the annual interest rate.
40 TAX%	TAX%=40.00	Stores the tax rate.
35 YEARS	YEARS=35.00	Stores the number of years to retirement.
TAXFV	TAXFV=111,488.07	Calculates the future value of a taxed investment.

Part 2. What is the purchasing power of that amount in today's dollars, assuming 10% annual inflation?

÷ ((1 + 10 %) y^x RCL YEARS =	3,967.20	Divides the amount found in part 4 by $(1+10\%)^{35}$, the amount by which a 10% inflation rate reduces purchasing power in 35 years.

Riskiness of a Stock Portfolio

Beta is a measure of the degree of riskiness of an individual security or a portfolio. This measure for an individual stock can be obtained from any of several firms that calculate and report these measures. You can measure the riskiness of a portfolio of common stocks using a weighted average of the betas of all the stocks in the portfolio. The following procedure shows you how to do this using the SUM menu.

1. From the MAIN menu, press SUM to display the SUM menu.
2. Press CLEAR ALL YES to clear the list. (If you don't want to delete the list, name the old list and get a new list.)
3. Enter the market values of the stocks. (Market value can be estimated by multiplying current price per share by number of shares held.)
4. Store the total in register 0.
5. Clear the list. (Name the old list if you don't want to delete it.)
6. For each stock, multiply the market value by its beta value and enter the value into the list.
7. Divide the total by the value in register 0.

Example. Your portfolio consists of four common stocks. The market value of each holding and the beta of the stock are listed below:

Stock	Market Value of Holding	Beta
1	$2,000	1.2
2	$7,000	1.1
3	$3,500	1.9
4	$5,550	1.4

Start from the MAIN menu:

Keys:	**Display:**	**Description:**
SUM *		Displays the SUM menu.
CLEAR ALL YES		Clears the SUM list.
2000 INPUT 7000 INPUT 3500 INPUT 5550 INPUT	TOTAL=18,050.00	Inputs the market values of the stocks.
STO 0		Stores the total market value in register 0.
CLEAR ALL YES		Clears the SUM list.
1.2 × 2000 INPUT 1.1 × 7000 INPUT 1.9 × 3500 INPUT 1.4 × 5550 INPUT	TOTAL=24,520.00	Inputs beta times market values of the stocks.
÷ RCL 0 =	1.36	Calculates the weighted portfolio beta for these four stocks.

* If you want to preserve the current list, skip the next step, name the list, then press GET *NEW.

After-Tax Equivalent Bond Yield

Interest payments on most municipal bonds are not taxed by the federal government as income to the recipient. In most states, interest payments from municipal bonds issued by institutions in the state where you live are not taxed by the state.

The following formulas may be used to equate the current yield (not yield to maturity) of a bond whose interest is fully taxable (a corporate bond) with the current yield of a municipal bond totally free of taxes.

Entering and Using the Formulas:

1. From the MAIN menu, press SOLVE to display the SOLVE menu.
2. Type in the YIELD formula as follows:

   `YIELD=$I÷PRICE×100`
3. Press INPUT to verify the formula.
4. Type in the ATY formula as follows:

   `ATY=YIELD×(1-TAX%÷100)`
5. Press INPUT to verify the formula.
6. Using the YIELD formula:
   - **a.** Move the list pointer to the YIELD formula in the SOLVE formula list. Press CALC.
   - **b.** Store two of the following variables:
     - Current yield of the bond in YIELD.*
     - Dollar amount of interest received each year in $I.
     - Current market price of the bond in PRICE.
   - **c.** Press the menu key to solve for the unknown variable.

* The YIELD and ATY formulas share the YIELD variable. If you have a YIELD value in one formula, the same value is used in the other formula.

7. Using the ATY formula:

a. Move the list pointer to ATY formula in the SOLVE formula list. Press CALC.

b. Store two of the following variables:

- After-tax yield in ATY.
- Current yield of the bond in YIELD.*
- Tax rate (as a percent) in TAX%.

c. Press the menu key to solve for the unknown variable.

Example. A $950 bond pays $100 interest each year. If the interest is taxable at 30%, what is the after-tax yield?

Start from the YIELD custom menu:

Keys:	**Display:**	**Description:**
100 $I	$I=100.00	Stores dollars of interest received each year.
950 PRICE	PRICE=950.00	Stores the current market price of the bond.
YIELD	YIELD=10.53	Calculates the current yield of the bond.
EXIT		Displays the SOLVE menu and list of equations.
↓ or ↑	ATY=YIELD×(1-	Moves the list pointer to the ATY formula.
CALC		Verifies the formula and displays the ATY menu.
30 TAX%	TAX%=30.00	Stores the tax rate, entered as a percent.
ATY	ATY=7.37	Calculates the after-tax yield.

* The YIELD and ATY formulas share the YIELD variable. If you have a YIELD value in one formula, the same value is used in the other formula.

Conserving Memory

A

The formulas in this book are intended to provide useful solutions. The variable names are several characters long to be meaningful to you. The formulas change a percent to a decimal so you don't have to remember to do it. These features make the formulas longer and take up more memory. Here are a few hints to help you conserve memory, should you need to:

- Shorten variable names. Variables are named to be as intuitive as possible. One way to save memory is to use single letter variable names.
- Delete division by 100. The formulas using a percent are written so you enter the percentage rather than the decimal value. Examples of this are tax rate as a percent, discount rate as a percent, or interest rate. If you do delete division by 100 from the formulas, remember to divide the percent by 100, or key in the percent and press [%], before storing the value in the variable.
- Delete variables for other formulas. When the SOLVE menu is displayed and you press [CLEAR ALL] VARS, the variables are erased, giving you more usable memory. (If you select BOTH instead of VARS, all formulas and their variables will be gone.)
- Delete individual formulas. When the SOLVE menu is displayed, move the pointer to the formula you want to delete, and press DELET BOTH.

Working With Your Business Consultant Professional Calculator

The *Personal Investment Consultant* contains a variety of applications, formulas and keystrokes to help you solve the specialized problems of your profession.

- Savings Plans
- Savings Account Compounded Daily
- Compounding Periods Different From Payment Periods
- Deposits Needed to Meet a Future Cash Flow Need
- Basic Mortgage Calculations
- Homeowner's Monthly Payment Estimator
- APR of a Loan With Fees
- Rent versus Buy Decision
- Reverse Annuity Mortgage Payment
- Cost of an Insurance Policy
- Value of Tax-Free and Taxed Accounts at Retirement
- Riskiness of a Stock Portfolio
- After-Tax Equivalent Bond Yield

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