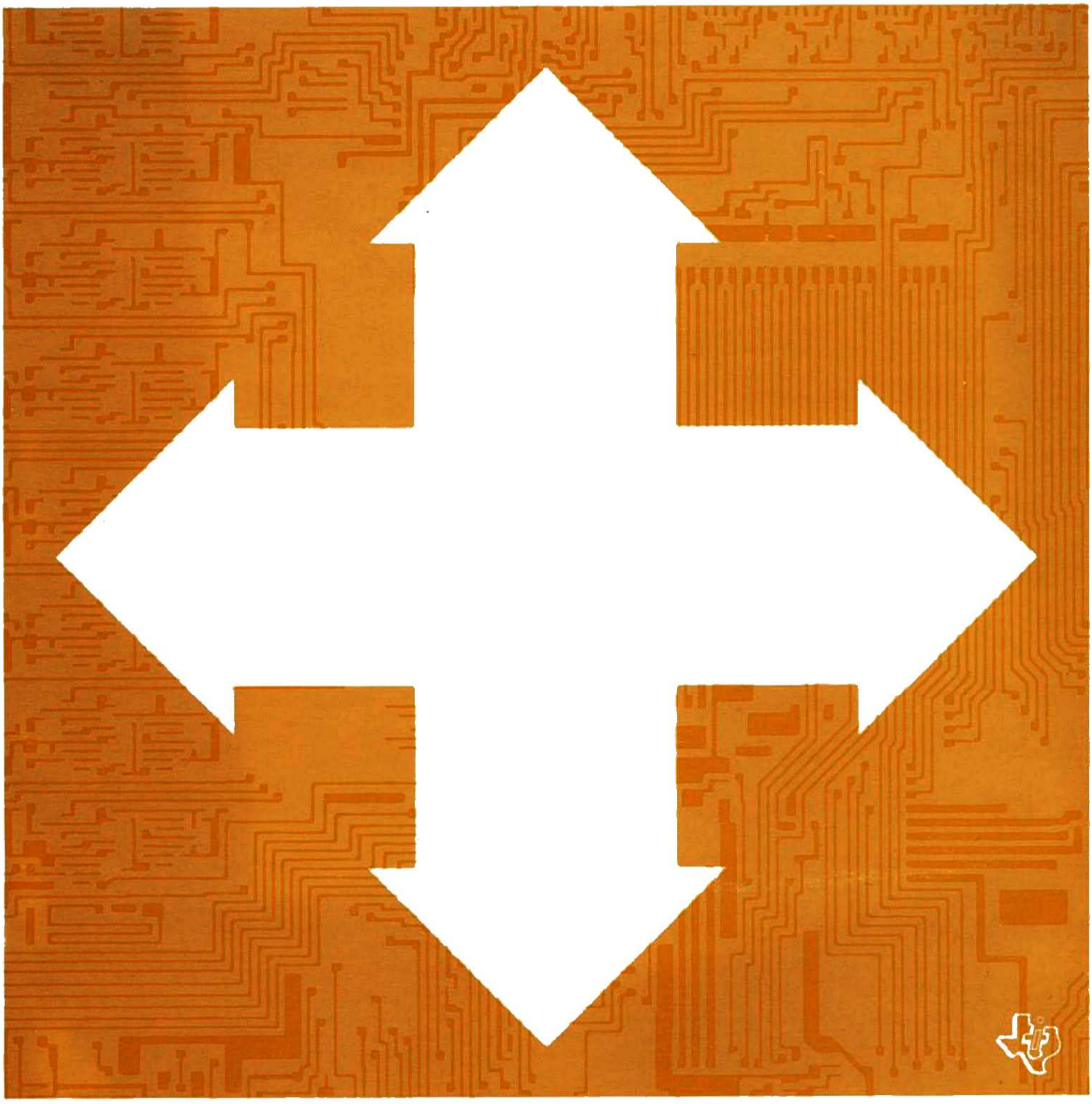
TI Programmable 58/59

Real Estate/Investment

Using the power of your *Solid State Software*™ module



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INTRODUCTION

The Real Estate/Investment Module places at your fingertips a library of programs relating to real estate and investment situations. Within seconds you can install this *Solid State Software** module which tailors your calculator to solve problems related specifically to these professional fields. Your self-contained *Solid State Software* module provides easy-to-use calculating power that you can carry with you for on-the-spot calculations.

USING THIS MANUAL

Following this brief introduction, you will find the description, principal equations, user instructions, and example problems for each of the 16 programs in the R.E./Investment Library. Each program is easily identified by the "RE" number in the upper corner of the page. This number corresponds with the call number you use to tell the calculator which program in the *Solid State Software* module you wish to use.

The primary reference point in this manual for each program is the User Instructions. These user instructions are also available for you in the handy pocket guide furnished with the library. The program description and sample problems should be used when you first run a program, to help you understand its full capabilities and limitations. Nonmagnetic label cards to identify the user-defined keys are also included in the library. Carefully remove the cards from the sheet and insert them in the card carrying case for convenient storage. Note that a special holder has been built into the case for storage of the library module.

When using the *Solid State Software* programs as subroutines to your own programs, you will also want to check Register Contents for the program and check Program Reference Data provided in Appendix A.

USING THE OPTIONAL PRINTER

If you have the optional PC-100A printer*, a printed record of entries and results is automatic. The User Instructions and example problems are marked to show exactly which values are printed in addition to being displayed.

Use the Calculator Mounting procedure in the PC-100A Owner's Manual to mount your calculator on the PC-100A. The switch called out in step 2 should be to "OTHER" for your calculator. Always turn the calculator and printer off before mounting or unmounting the calculator.

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*Note: The TI Programmable 58 and TI Programmable 59 will not operate on the PC-100 print cradle.

INTRODUCTION

TIPS FOR RUNNING PROGRAMS

Before you begin using the *Solid State Software* programs on your own, here are a few things to keep clearly in mind until you become familiar with your calculator.

1. Press [CLR] before running a program if you are not sure of the status of the calculator. (To be completely sure of calculator status, turn it off and on again – but remember that this will clear the program memory.)

2. Some programs will leave the calculator in fix-decimal format (see Appendix A). In that event, you should press [INV] [2nd] [fix] before running another program if this format is not desired.

3. There is no visual indication of which *Solid State Software* program has been called. If you have any doubts, the safest method is to call the desired program with [2nd] [Pgm] mm, where mm is the two-digit program number. The calculator will remain at this program number until another program is called, [RST] is pressed or the calculator is turned off.

4. A flashing display normally indicates an improper key sequence or that a numerical limit has been exceeded. When this occurs, always repeat the program sequence and check that each step is performed as directed by the User Instructions. Any unusual limits of a program are given in the User Instructions or related notes. The In Case of Difficulty portion of Appendix A in the Owner's Manual may be helpful in isolating a problem.

5. Some of the *Solid State Software* programs may run for several minutes depending on input data. If you desire to halt a running program, press the [RST] key. This is considered as an emergency halt operation which returns control to the main memory. A program must be recalled to be run again.

USING *SOLID STATE SOFTWARE* PROGRAMS AS SUBROUTINES

Any of the *Solid State Software* programs may be called as a subroutine to your own program in the main memory. Either of two program sequences may be used: 1) [2nd] [Pgm] mm (User Defined Key) or 2) [2nd] [Pgm] mm [SBR] (Common Label). Both will send the program control to program mm, run the subroutine sequence, and then automatically return to the main program without interruption. Following [2nd] [Pgm] mm with anything other than [SBR] or a user-defined key is not a valid key sequence and can cause unwanted results.

It is very important to consider the Program Reference Data in Appendix A for any program called as a subroutine. You must plan and write your own program such that the data registers, flags, subroutine levels, parentheses levels, T-register, angular mode, etc., used by the called subroutine are allowed for in your program. In addition, a Register Contents section of each program description provides a guide to determine where data is or must be located to run the program. A sample program that calls a *Solid State Software* program as a subroutine is provided in the PROGRAMMING CONSIDERATIONS section of the Owner's Manual.

If you need to examine and study the content of a *Solid State Software* program, you can download as described in the following paragraphs.

DOWNLOADING *SOLID STATE SOFTWARE* PROGRAMS

If you need to examine a *Solid State Software* program, it can be downloaded into the main program memory.* This will allow you to single step through a program in or out of the learn mode. It also allows using the program list or trace features of the optional printer. The only requirement for downloading a *Solid State Software* program is that the memory partition be set so there is sufficient space in the main program memory to receive the downloaded program. The key sequence to download a program is [2nd] [CP] [2nd] [Pgm] mm [2nd] [Op] 09, where mm is the program number to be downloaded. This procedure places the requested program into program memory beginning at program location 000. The downloaded program writes over any instructions previously stored in that part of program memory. Remember to press [RST] before running or tracing the downloaded program.

Please note that RE-02 and RE-13 cannot be downloaded in the TI Programmable 58 due to the length of these programs. Also, the partition must be reset from the power-up condition in the TI Programmable 58 for programs RE-07, 08, 09, 10, 11, and 12. The key sequence to repartition the main memory for RE-09 is 0 [2nd] [Op] 17. The sequence for RE-10 and RE-11 is 1 [2nd] [Op] 17. The sequence for RE-07, RE-08, and RE-12 is 2 [2nd] [Op] 17. Repartitioning must be performed before the downloading sequence.

The partition must be changed from the power-up condition in the TI Programmable 59 for RE-02 and RE-13. The key sequence to repartition the main memory for RE-02 is 4 [2nd] [Op] 17. The sequence for RE-13 is 0 [2nd] [Op] 17.

REMOVING AND INSTALLING MODULES

The R.E./Investment Module can easily be installed in the calculator or replaced with another. It is a good idea to leave the module in place in the calculator except when replacing it with another module. Be sure to follow these instructions when you need to remove or replace a module.

CAUTION

Be sure to touch some metal object before handling a module to prevent possible damage by static electricity.

1. **Turn the calculator OFF.** Loading or unloading the module with the calculator ON may cause the keyboard or display to lock out. Also, shorting the contacts can damage the module or calculator.

2. Slide out the small panel covering the module compartment at the bottom of the back of the calculator. (See Diagram on following page.)

3. Remove the module. You may turn the calculator over and let the module fall out into your hand.

*Unless the library is a protected special-purpose library.

4. Insert the module, notched end first with the labeled side up into the compartment. The module should slip into place effortlessly.

5. Replace the cover panel, securing the module against the contacts.

Don't touch the contacts inside the module compartment as damage can result.

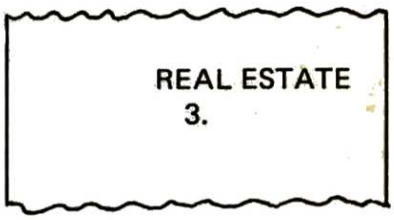
R.E./INVESTMENT LIBRARY DIAGNOSTIC

This program performs the following functions separately.

1. Diagnostic/Library Module Check
2. Linear Regression Initialization

Diagnostic/Library Module Check

This routine checks the operation of your calculator and most of its functions, including conversion and statistics functions that are preprogrammed in the calculator, trigonometric functions, data register operations, program transfers, and comparisons. It also uses other R.E./Investment Library programs to verify that the module is connected and operating correctly. If this diagnostic routine runs successfully, in approximately 15 seconds the number 3. will be displayed. If the calculator is attached to a PC-100A print cradle, the following will be printed:



If there is a malfunction in the calculator or the *Solid State Software* module, a flashing number will be displayed. Refer to Appendix A of the Owner's Manual for an explanation of the various procedures to be followed when you have difficulties.

When you simply want to know which of your *Solid State Software* modules is in the calculator without physically looking at it, you can call the Library Module check portion of the routine directly. If the R.E./Investment Library Module is in the calculator, the number 3. will be displayed. This number is unique to the R.E./Investment Library (other optional libraries use other identifying digits).

Linear Regression Initialization

This routine initializes the calculator for linear regression by clearing data registers R_{01} through R_{06} and the T-register. It should be used whenever linear regression or other built-in statistics functions are to be started. You can also use the routine at any time to clear these registers selectively without disturbing any other registers.

USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
	Diagnostic/Module Check			
A1	Select Program		**[2nd] [Pgm] 01**	
A2	Run Diagnostic		**[SBR] [=]**	3.[1,2]
	or			
A3	Library Module Check		**[SBR] [2nd] [R/S]**	3.[2]
	Initialize Linear Regression			
B1	Select Program		**[2nd] [Pgm] 01**	
B2	Initialize Linear Regression		**[SBR] [CLR]**	0.

NOTES: This output is obtained if the calculator is operating properly.
2. The number 3. indicates the R.E./Investment Library.

Example 1: Diagnostic

PRESS	DISPLAY	OPTIONAL PRINTOUT
[2nd] [Pgm] 01		
[SBR] [=]	3.	REAL ESTATE 3.

Example 2: Library Module Check

PRESS	DISPLAY	OPTIONAL PRINTOUT
[2nd] [Pgm] 01		
[SBR] [2nd] [R/S]	3.	REAL ESTATE 3.

Example 3: Initialize Linear Regression

PRESS	DISPLAY	OPTIONAL PRINTOUT
[2nd] [Pgm] 01		
[SBR] [CLR]	0.	

ANNUITIES

Given the requisite input variables from the following list, the program will calculate the unknown value: number of payment periods, interest rate, payment per period, present value, future value, and balloon payment. The combination of this program and Program RE-04, "Compound Interest", provides you with the capability to perform any calculation involving the six functions of money at interest.

The program performs the necessary calculations for loans and transactions involving beginning-of-period payments, end-of-period payments, and sinking funds (where, for example, money is put into a savings account at the end of each payment period to pay a future lump sum reversion). Not only can the program compute the individual values listed above, it can also be used to calculate mortgage constants, annual percentage rates, effective yields of mortgages with and without fees, effective yields of wraparound mortgages, yields of leases, constant payment to principal loan values, standing mortgage values, last payment amounts, and a variety of other financial calculations.

Solid State Software TI ©1977				
ANNUITIES				RE-02
Snkg Fund	Ann Due/FV	Ord Ann/PV	Ann Due/PV	INIT
N	%I	PMT	PV or FV	Balloon

USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 02	
2	Initialize (This sets the value for the balloon payment to zero. Do *not* enter zero for the balloon payment, unless it is the unknown.)		[2nd] [E′]	0.
3	Determine the type of problem			
	a. Sinking fund (end of period payment)		[2nd] [A′]	0.
	b. Annuity due/FV (beginning of period payment)		[2nd] [B′]	0.
	c. Ordinary annuity (end of period payment)		[2nd] [C′]	0.
	d. Annuity due /PV (beginning of period payment)		[2nd] [D′]	0.
4	Enter the known variables in any order:			
	Number of payments	N	[A]	N†
	Interest rate	%I	[B]	%I†
	Payment per period	PMT	[C]	PMT†
	Present value *or* future value	PV or FV	[D]	PV or FV†
	Balloon payment (If balloon payment does not apply, do *not* enter zero. Go to the next step.)	Balloon	[E]	Balloon PMT†
5	To solve for the unknown, enter zero, then press the appropriate key.			
	N	0	[A]	N†
	%I	0	[B]	%I†*
	PMT	0	[C]	PMT†
	PV or FV	0	[D]	PV or FV†
	Balloon PMT	0	[E]	Balloon PMT†
6	To work a new problem:			
	(1) of the same type: go to Step 4			
	(2) of a different type: go to Step 2			
	(3) If the balloon payment was *not* zero in the previous problem, and *is* zero in the new problem: go to Step 2.			

NOTES: † These values are printed if the PC-100A is connected.

* Relatively long calculating time for this step.

Register Contents

R_{00}	R_{05} Balloon PMT	R_{10} Used	R_{15}	R_{20}
R_{01} N	R_{06} Used	R_{11} Used	R_{16}	R_{21}
R_{02} %I	R_{07} Used	R_{12} Used	R_{17}	R_{22}
R_{03} PMT	R_{08} I/100	R_{13} Used	R_{18}	R_{23}
R_{04} PV or FV	R_{09} I/100 + 1	R_{14} Used	R_{19}	R_{24}

Example 1: What is the monthly payment on a $35,000 mortgage at 8.75% interest for a term of 25 years?

What if the interest were 8.5%?

What if the interest were 8.25%?

What if the term were 30 years, at 8.75% interest?

What if the term were 20 years, at 8.75% interest?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Ordinary annuity		[2nd] [C′]	0.
4	Enter in any order:			
	Number of payments	25	[x] 12 [=] [A]	300.†
	Interest %	8.75	[÷] 12 [=] [B]	0.7292†
	Mortgage amount	35000	[D]	35000.00†
5	Solve for monthly payment	0	[C]	287.75†
4	Enter new interest %	8.5	[÷] 12 [=] [B]	0.7083
5	Solve for monthly payment	0	[C]	281.83†
4	Enter new interest %	8.25	[÷] 12 [=] [B]	0.6875
5	Solve for monthly payment	0	[C]	275.96†
4	Reenter 8.75% interest	8.75	[÷] 12 [=] [B]	0.7292
4	Enter 30-year term	30	[x] 12 [=] [A]	360.†
5	Solve for monthly payment	0	[C]	275.35†
4	Enter 20-year term	20	[x] 12 [=] [A]	240.†
5	Solve for monthly payment	0	[C]	309.30†

† These values are printed if the PC-100A is connected.

Example 2: Your clients can afford monthly mortgage payments of no more than $350. If 8.75% is the going interest rate, and the typical term is 25 years, what is the largest mortgage they can afford?

What if the term could be extended to 30 years?

What if the interest rate could be lowered to 8.5%?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Ordinary annuity		[2nd] [C′]	0.
4	Enter in any order:			
	Number of payments	25	[x] 12 [=] [A]	300.†
	Interest rate	8.75	[÷] 12 [=] [B]	0.7292†
	Payment per period	350	[C]	350.00†
5	Solve for PV	0	[D]	42571.64†
4	Enter N	30	[x] 12 [=] [A]	360.†
5	Solve for PV	0	[D]	44489.62†
4	Enter %I	8.5	[÷] 12 [=] [B]	0.7083
5	Solve for PV	0	[D]	45518.78†

Example 3: What is the annual interest rate on a $45,000 mortgage with a term of 25 years and monthly payments of $377.64?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Ordinary annuity		[2nd] [C′]	0.
4	Enter in any order:			
	Number of payments	25	[x] 12 [=] [A]	300.†
	Payment per period	377.64	[C]	377.64†
	Present value	45000	[D]	45000.00†
5	Solve for %I	0	[B]	0.7500†*
			[x] 12 [=]	9.0001

Example 4: How many years will it take to amortize a $135,000 mortgage with monthly payments of $1,369.25, at 9% annual interest?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Ordinary annuity		[2nd] [C′]	0.
4	Enter in any order:			
	Interest rate	9	[÷] 12 [=] [B]	0.7500†
	Payment per period	1369.25	[C]	1369.25†
	Present value	135000	[D]	135000.00†
5	Solve for N	0	[A]	180.0027431†
			[÷] 12 [=]	15.00022859

†These values are printed if the PC-100A is connected.
*Relatively long calculating time for this step.

Example 5: On a $42,500 mortgage at 8.75% interest with a term of 25 years, 2 points are charged. What is the effective yield of the mortgage?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Ordinary annuity		[2nd] [C′]	0.
4	Enter in any order:			
	Number of payments	25	[x] 12 [=] [A]	300.†
	Interest rate	8.75	[÷] 12 [=] [B]	0.7292†
	Present value	42500	[D]	42500.00†
5	Solve for PMT	0	[C]	349.41†
4	Enter discounted PV	42500	[x] .98 [=] [D]	41650.00†
5	Solve for yield	0	[B]	0.7497
			[x] 12 [=]	8.9960

Example 6: What is the present worth of a net lease with monthly payments in advance of $875, if the lease has a term of 10 years, and the rate of discount is 11.5%?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Annuity due/PV		[2nd] [D′]	0.
4	Enter in any order:			
	Number of payments	10	[x] 12 [=] [A]	120.†
	Interest rate	11.5	[÷] 12 [=] [B]	0.9583†
	Payment per period	875	[C]	875.00†
5	Solve for PV	0	[D]	62831.72†

Example 7: John Doe wishes to buy a parcel of land for $50,000. He can afford to pay $425 per month. If the owner of the land desires a 9% return on his investment, how long will it take to pay off the loan, with beginning-of-period payments?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Annuity due/PV		[2nd] [D′]	0.
4	Enter in any order:			
	Interest rate	9	[÷] 12 [=] [B]	0.7500†
	Payment per period	425	[C]	425.00†
	Present value	50000	[D]	50000.00†
5	Solve for N	0	[A]	279.1399405†
			[÷] 12 [=]	23.26166171

† These values are printed if the PC-100A is connected.

Example 8: A $50,000 mortgage at 8.5% for 25 years requires monthly payments in advance of $399.78. What is the annual yield of this mortgage, if it was purchased for $39,000?

For the same mortgage, end-of-period payments would be $402.61. What would the annual yield be, making only this change?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Annuity due/PV		[2nd] [D′]	0.
4	Enter in any order:			
	Number of payments	25	[x] 12 [=] [A]	300.†
	Payment per period	399.78	[C]	399.78†
	Present value	39000	[D]	39000.00†
5	Solve for %I	0	[B]	0.9795†
	Convert to annual rate		[x] 12 [=]	11.7543
2	Initialize		[2nd] [E′]	0.
3	Ordinary annuity		[2nd] [C′]	0.
4	Enter number of payments	25	[x] 12 [=] [A]	300.†
	Enter payment per period	402.61	[C]	402.61†
	Enter present value	39000	[D]	39000.00†
5	Solve for %I	0	[B]	0.9764†*
	Convert to annual rate		[x] 12 [=]	11.7165

Example 9: The owner of an apartment complex is planning to replace the carpeting in the complex in 4 years. He will need to order 2800 square yards of carpeting. The current price of the carpeting is $5.60 per square yard. Projecting an increase in cost of 6% per year, how much should he deposit quarterly, at 5.25% annual interest, compounded quarterly to cover this expense?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Sinking fund		[2nd] [A′]	0.
4	Enter in any order:			
	Number of payments	4	[x] 4 [=] [A]	16.†
	Interest rate	5.25	[÷] 4 [=] [B]	1.3125†
	Future value	19795.64	[D]	19795.64†
5	Solve for PMT	0	[C]	1119.93†

Example 10: If you deposit $50 per month in a savings account at 5.25% compounded monthly, how long will it take you to amass $5,000?

How much would you have at the end of 3 years?

†These values are printed if the PC-100A is connected.
*Relatively long calculating time for this step.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Sinking fund		[2nd] [A′]	0.
4	Enter in any order:			
	Interest rate	5.25	[÷] 12 [=] [B]	0.4375†
	Payment per period	50	[C]	50.00†
	Future value	5000	[D]	5000.00†
5	Solve for N	0	[A]	83.13114786†
4	Enter new N	3	[x] 12 [=] [A]	36.†
5	Solve for FV	0	[D]	1944.90†

Example 11: An office building and land worth $275,000 are leased for 10 years with monthly payments in advance of $2875. The area around the property has been redeveloping rapidly and by the end of the ten-year period, the building will be demolished. The tenant has a purchase option at the end of the lease which would enable him to buy the land for $50,000. If the tenant exercises this option, what would the lessor's yield be?

Suppose the lessor desires an 8% annual yield. What must the monthly payments be?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Annuity due/PV		[2nd] [D′]	0.
4	Enter in any order:			
	Number of payments	10	[x] 12 [=] [A]	120.†
	Payment per period	2875	[C]	2875.00†
	Present value	275000	[D]	275000.00†
	Balloon payment	50000	[E]	50000.00†
5	Solve for yield	0	[B]	0.5767†*
	Convert to annual rate		[x] 12 [=]	6.9205
4	Enter new yield	8	[÷] 12 [=] [B]	0.6667†
5	Solve for payment	0	[C]	3042.92†

Example 12: What is the balloon payment for a $40,000 mortgage at 8.75% interest and a term of 25 years, if the monthly payments are $325?

If the desired annual yield is 12%, what is the price of this mortgage?

†These values are printed if the PC-100A is connected.
*Relatively long calculating time for this step.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Ordinary annuity		[2nd] [C′]	0.
4	Enter in any order:			
	Number of payments	25	[x] 12 [=] [A]	300.†
	Interest rate	8.75	[÷] 12 [=] [B]	0.7292†
	Payment per period	325	[C]	325.00†
	Present value	40000	[D]	40000.00†
5	Solve for balloon PMT	0	[E]	4148.83†
4	Enter desired yield	12	[÷] 12 [=] [B]	1.0000
5	Solve for PV	0	[D]	31067.29†

Example 13: An investor wishes to assume a $135,000 mortgage at 9.5% for 15 years. If he specified that the balloon payment due on the mortgage not exceed $15,000, what would the minimum monthly payment be?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′]	0.
3	Determine type of problem:			
	Ordinary annuity		[2nd] [C′]	0.
4	Enter in any order:			
	Number of payments	15	[x] 12 [=] [A]	180.†
	Interest rate	9.5	[÷] 12 [=] [B]	0.7917†
	Present value	135000	[D]	135000.00†
	Balloon payment	15000	[E]	15000.00†
5	Solve for PMT	0	[C]	1371.82†

METHOD

1. Sinking Fund

$$FV = PMT \times \frac{(1+i)^N - 1}{i}$$

$$N = \ln\left[\frac{FV \times i}{PMT} + 1\right] \Big/ \ln(1+i)$$

$$PMT = FV \times i/[(1+i)^N - 1]$$

I is determined by the Newton – Raphson Method

† These values are printed if the PC-100A is connected.

2. Annuity Due/FV

$$FV = PMT \times (1 + i) \times \frac{(1 + i)^N - 1}{i}$$

$$N = \ln \left[\frac{FV}{PMT} \times i + (1+i) \right] \Big/ \ln(1+i) - 1$$

$$PMT = FV \Big/ \left[(1+i) \times \frac{(1+i)^N - 1}{i} \right]$$

I is determined by the Newton – Raphson Method

3. Ordinary Annuity/PV

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

$$N = \ln \left[(PMT - iBAL)/(PMT - iPV) \right] / \ln(1+i)$$

$$PMT = \left[PV - BAL(1+i)^{-N} \right] \Big/ \left[\frac{1-(1+i)^{-N}}{i} \right]$$

I is determined by the Newton – Raphson Method

$$BAL = \left[PV - PMT \times \frac{1-(1+i)^{-N}}{i} \right] \Big/ (1+i)^{-N}$$

4. Annuity Due/PV

$$PV = PMT \times (1+i) \times \left[\frac{1-(1+i)^{-N}}{i} \right] + \left[BAL \times (1+i)^{-N} \right.$$

$$N = \ln \left[\left(\frac{PMT(1+i)}{i} - BAL \right) \Big/ \left(\frac{PMT\,(1+i)}{i} - PV \right) \right] \Big/ \ln(1+i)$$

$$PMT = \left[PV - BAL \times (1+i)^{-N} \right] \Big/ \left[(1+i) \times \frac{1-(1+i)^{-N}}{i} \right]$$

I is determined by the Newton – Raphson Method

$$BAL = \left[PV - PMT \times (1+i) \times \left(\frac{1-(1+i)^{-N}}{i} \right) \right] \Big/ (1+i)^{-N}$$

Where

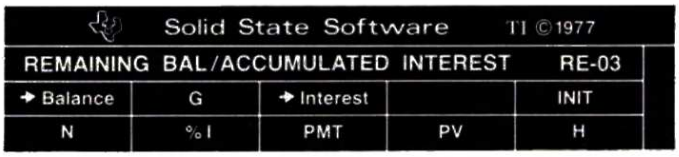
N	=	Number of Payment Periods
PV	=	Present Value
FV	=	Future Value
BAL	=	Balloon Payment
I	=	Periodic Interest
i	=	I/100

RE-03

REMAINING BALANCE/ACCUMULATED INTEREST

This program calculates the balance remaining on a mortgage after a specified number of payments. It also computes the payments to interest for any period of time during the life of the mortgage.

The program also offers the feature of computing any unknown mortgage values, such as the payment per period, so that the real estate professional can compare values for a variety of mortgages without collecting large amounts of information beforehand. Also, the program computes the remaining balance and accumulated interest for mortgages with "rounded" payments.



USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 03	
2	Initialize		[2nd] [E′]	0.
3	Enter known variables in any order:			
	a. Number of payments	N	[A]	N†
	b. Interest rate	%I	[B]	%I†
	c. Payment per period	PMT	[C]	PMT†
	d. Present value	PV	[D]	PV†
4	Solve for unknown: *Enter zero,* then press appropriate key	0	[A]	N†
		0	[B]	%I†
		0	[C]	PMT†
		0	[D]	PV†
5	Enter number of payment immediately preceding balance	H	[E]	H†
6	Calculate remaining balance		[2nd] [A′]	Balance†
7	Enter first payment number in period for which you wish to calculate interest	G	[2nd] [B′]	G†
8	Calculate interest		[2nd] [C′]	Interest†
9	Steps 5 and 7 can be entered in any order			

NOTES:

1. For interest calculations, the number for the final payment must be greater than the number for the initial payment of the period.
2. For balance and interest calculations, the number entered must not exceed the term of the mortgage.

† These values are printed if the PC-100A is connected.

Register Contents

R_{00}		R_{05}	BAL	R_{10}	Used	R_{15}	LAST PMT/BAL	R_{20}	
R_{01}	N	R_{06}	Used	R_{11}	Used	R_{16}	LAST PMT/I	R_{21}	
R_{02}	%I	R_{07}	Used	R_{12}	Used	R_{17}	$BALANCE_{H-1}$	R_{22}	
R_{03}	PMT	R_{08}	I/100	R_{13}	Used	R_{18}		R_{23}	
R_{04}	PV	R_{09}	I/100 + 1	R_{14}	Used	R_{19}		R_{24}	

RE-03

Example 1: Given a payment of $2265.83 a month on a $270,000 mortgage that has an interest rate of 9% a year, find the remaining balance after the 12th payment.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 03	
2	Initialize		[2nd] [E′]	0.
3	Enter: %I	9	[÷] 12 [=] [B]	0.7500†
	PMT	2265.83	[C]	2265.83†
	PV	270000	[D]	270000.00†
4	Solve for N	0	[A]	300.0000903†
5	Enter payment number	12	[E]	12.†
6	Solve for balance		[2nd] [A′]	266987.80†

Example 2a: On a $35,000 mortgage at 8.75% interest for a term of 25 years, what is the remaining balance after 3 years of payments (or 36 payments)?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 03	
2	Initialize		[2nd] [E′]	0.
3	Enter: term	25	[x] 12 [=] [A]	300.†
	PV	35000	[D]	35000.00†
	%I	8.75	[÷] 12 [=] [B]	0.7292†
4	Solve for PMT	0	[C]	287.75†
5	Enter payment number	36	[E]	36.†
6	Solve balance		[2nd] [A′]	33665.87†

Example 2b: What is the accumulated interest?

STEP	OPERATION	ENTER	PRESS	DISPLAY
7	Enter first payment number	1	[2nd] [B′]	1.†
8	Solve for accumulated interest		[2nd] [C′]	9024.88†

Example 2c: What are the interest payments which can be deducted from income tax for each of the first three years?

STEP	OPERATION	ENTER	PRESS	DISPLAY
5	Enter last payment of the year	12	[E]	12.†
8	Solve for the first year's interest		[2nd] [C′]	3046.45†
7	Enter the first payment of the second year	13	[2nd] [B′]	13.†
5	Enter the last payment of the second year	24	[E]	24.†
8	Solve for the second year's interest		[2nd] [C′]	3009.42†
7	Repeat the procedure for	25	[2nd] [B′]	25.†
5	the third year	36	[E]	36.†
8			[2nd] [C′]	2969.01†

† These values are printed if the PC-100A is connected.

Method

To find the remaining balance the following equation is used.

$$BAL_H = PMT \frac{1-(1+i)^{H-N}}{i}$$

where

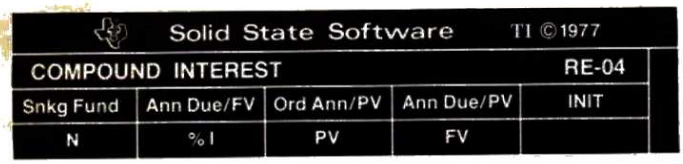
PMT = payment for period
H = current payment
N = number of total payment periods
i = %/1000

To calculate accumulated interest from payment G through payment H the following equation is used.

$$INTEREST_{G-H} = (H-G+1)\,PMT - (BAL_{G-1} - BAL_H)$$

COMPOUND INTEREST

Given any three of the following four variables – number of periods, compound interest rate, present value, and future value – this program computes the unknown value. The program is useful for computations involving the "future worth of one" and the "present worth of one," such as market value appreciation, and it can be used to solve for nominal and effective interest rates.



USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 04	
2	Initialize		[2nd] [E′]	0.00
3	Enter three of the four variables in any order:			
	Number of periods	N	[A]	N†
	Interest rate	%I	[B]	%I†
	Present value	PV	[C]	PV†
	Future value	FV	[D]	FV†
4	Solve for the remaining variable. Remember to enter zero!			
	Number of periods	0	[A]	N†
	Interest rate	0	[B]	%†
	Present value	0	[C]	PV†
	Future value	0	[D]	FV†

NOTE: † These values are printed if the PC-100A is connected.

Register Contents

R_{00}	R_{05}	R_{10}	R_{15}	R_{20}
R_{01} N	R_{06}	R_{11}	R_{16}	R_{21}
R_{02} I	R_{07}	R_{12} $(I/100 + 1)^N$	R_{17}	R_{22}
R_{03} PV	R_{08} I/100	R_{13}	R_{18}	R_{23}
R_{04} FV	R_{09} I/100 + 1	R_{14}	R_{19}	R_{24}

Example 1: What is the value of $500 after 24 months, with interest compounded monthly, if the nominal annual interest rate is 5.75%?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 04	
2	Initialize		[2nd] [E′]	0.00
3	Enter: periods	24	[A]	24.00†
	interest	5.75	[÷] 12 [=] [B]	0.48†
	present value	500	[C]	500.00†
4	Calculate future value	0	[D]	560.78†

Example 2: Compare the investment of $1000 for one year at the nominal annual interest rate of 5.75%, compounded daily, with the same amount invested at 6%, compounded quarterly.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 04	
2	Initialize		[2nd] [E′]	0.00
3	Enter: periods	365	[A]	365.00†
	interest	5.75	[÷] 365 [=] [B]	0.02†
	present value	1000	[C]	1000.00†
4	Calculate future value	0	[D]	1059.18†
3	Enter: periods	4	[A]	4.00†
	interest	6	[÷] 4 [=] [B]	1.50†
4	Calculate future value	0	[D]	1061.36†
	Note that it was not necessary to enter 1000 for the present value the second time.			

Example 3: What is the effective rate of interest, if the nominal annual rate is 5.25%, compounded quarterly?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 04	
2	Initialize		[2nd] [E′]	0.00
3	Enter: periods	4	[A]	4.00†
	interest rate	5.25	[÷] 4 [=] [B]	1.31†
	present value	1	[C]	1.00†
4	Solve for future value	0	[D]	1.05†
			[2nd] [Fix] 4	1.0535
			[−] 1 [=] [x] 100 [=]	5.3543

† These values are printed if the PC-100A is connected.

Example 4: An investor bought a parcel of land four years ago for $21,500. He recently sold it for $30,000. What was the annual rate of appreciation?

Suppose that he desired a return of 12% per year, ignoring costs of holding. For what price would he have had to sell it?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 04	
2	Initialize		[2nd] [E′]	0.00
3	Enter: periods	4	[A]	4.00†
	present value	21500	[C]	21500.00†
	future value	30000	[D]	30000.00†
4	Solve for interest rate	0	[B]	8.69†
3	Enter new interest rate	12	[B]	12.00†
4	Solve for future value	0	[D]	33830.67†

Example 5: A property sold recently for $125,000. If the initial purchase price was $85,000, and the market rate of increase has been 9% per year, how long was the property held?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 04	
2	Initialize		[2nd] [E′]	0.00
3	Enter: interest rate	9	[B]	9.00†
	present value	85000	[C]	85000.00†
	future value	125000	[D]	125000.00†
4	Solve for number of periods	0	[A]	4.48†

Example 6: Ignoring holding and sales costs, how long would it take an investor to double his money if he could earn 7% annually? To triple his money?

Returning to the original problem, how long would it take him to double his money if the compounding were quarterly? Monthly?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 04	
2	Initialize		[2nd] [E′]	0.00
3	Enter: interest rate	7	[B]	7.00†
	present value	1	[C]	1.00†
	future value	2	[D]	2.00†
4	Solve for number of periods	0	[A]	10.24†
3	Enter new future value	3	[D]	3.00†
4	Solve for number of periods	0	[A]	16.24†
3	Enter: original future value	2	[D]	2.00†
	interest rate	7	[÷] 4 [=] [B]	1.75†
4	Solve for number of periods	0	[A]	39.95†
			[÷] 4 [=]	9.99
3	Enter interest rate	7	[÷] 12 [=] [B]	0.58†
4	Solve for number of periods	0	[A]	119.17†
			[÷] 12 [=]	9.93

† These values are printed if the PC-100A is connected.

METHOD

Compound Interest Formula

$FV = PV\ (1+i)^N$

Where:

FV = Future Value
PV = Present Value
I = Interest Rate Per Period
i = I/100
N = Number of Periods

This equation is also used in the following forms:

$PV = FV\ (1+i)^{-N}$

$I = [(FV/PV)^{1/N} - 1] \times 100$

$N = \ln (FV/PV)/\ln (1+i)$

Annuity Formulas

Sinking Fund

$[(1+i)^N - 1]/i$

Annuity Due/FV

$[(1+i)^{N+1} - (1+i)]/i$

Ordinary Annuity/PV

$[1 - (1+i)^{-N}]/i$

Annuity Due/PV

$[(1+i) - (1+i)^{1-N}]/i$

NOTES ON ANNUITY FORMULAS

The purpose of the annuity formulas accessed by user-defined keys [A'], [B'], [C'], and [D'] is to allow you to generate your own annuity tables or to write your own programs using these functions as subroutines.

The decimal periodic interest rate must be stored in R_{08} and this quantity plus one in R_{09}. This is done by user-defined key [B] in Program 04. N is stored in R_{01} by [A] in Program 04.

The following example shows how to access the ordinary annuity routine and use it to generate an annuity table. First key in the following sequence of instructions.

PRESS	DISPLAY	PRESS	DISPLAY
[RST]	0.	[B]	011 00
[LRN]	000 00	[INV] [SBR]	012 00
[2nd] [Lbl]	001 00	[2nd] [Lbl]	013 00
[A]	002 00	[C]	014 00
[STO]	003 00	[2nd] [Pgm]	015 00
[0] [1]	004 00	[0] [4]	016 00
[2nd] [Prt]	005 00	[2nd] [C']	017 00
[INV] [SBR]	006 00	[INV] [SBR]	018 00
[2nd] [Lbl]	007 00	[LRN]	0.
[B]	008 00	[2nd] [Fix] 9	0.
[2nd] [Pgm]	009 00		
[0] [4]	010 00		

RE-04

Now use this program to generate an ordinary annuity table for I = 8 and N = 1, 2, 3, ···, 10. If the PC-100A is connected, all of the displayed values will be printed.

ENTER	PRESS	DISPLAY
8	[B]	8.
1	[A]	1.
	[C]	.9259259259
2	[A]	2.
	[C]	1.783264746
3	[A]	3.
	[C]	2.577096987
4	[A]	4.
	[C]	3.31212684
5	[A]	5.
	[C]	3.992710037
6	[A]	6.
	[C]	4.622879664
7	[A]	7.
	[C]	5.206370059
8	[A]	8.
	[C]	5.746638944
9	[A]	9.
	[C]	6.246887911
10	[A]	10.
	[C]	6.710081399

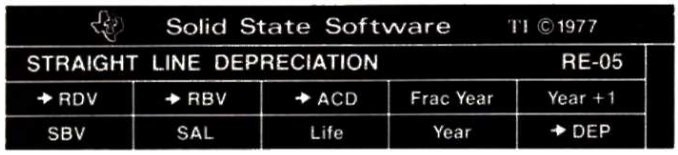
STRAIGHT LINE DEPRECIATION

Using the straight line method of depreciation, this program calculates the depreciable basis of a property, the amount depreciated during any time period in the life of the property, the remaining depreciable value of the property, the remaining book value of the property, and the total amount of depreciation claimed up to that point in time. When used in combination with the PC-100A Print/Security Cradle, the program can be used to print depreciation schedules.

The straight line method of depreciation assumes that the property to be depreciated is wearing out at an equal rate during each full year of its useful life. So, the depreciation claimed for each full year in the life of the property will be the same as for every other full year.

At present, the straight line method of depreciation may be applied to any property, providing that a reasonable salvage value and useful life are established for that property.

RE-05



USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		**[2nd] [Pgm] 05**	
2	Enter the following in any order:			
	a. starting book value	SBV	**[A]**	SBV†
	b. salvage value	SAL	**[B]**	SAL†
	c. useful life	LIFE	**[C]**	LIFE†
3	Enter year (If initial year in the schedule is fractional, see Step 10.)	YEAR	**[D]**	YEAR†
4	Calculate depreciation for the year		**[E]**	DEP†
5	Calculate remaining depreciable value		**[2nd] [A′]**	RDV†
6	Calculate remaining book value		**[2nd] [B′]**	RBV+
7	Calculate depreciation to date		**[2nd] [C′]**	ACD†
8	To calculate values for next year (If next year is last year of useful life, *and* it is fractional, press [2nd] [D′])		**[2nd] [E′]** **[2nd] [D′]**	Year + 1† Life†
9	For a new case, make necessary changes in Steps 2a, 2b, and 2c, then go to Step 3.			
10	If initial year in the schedule is fractional, enter number of months	MONTHS	**[÷] 12 [=] [D]**	Fraction†
11	Calculate depreciation to date		**[2nd] [C′]** **[STO] 20**	1st yr: DEP + ACD† Succeeding yrs: ACD†
12	Values of interest, repeat Steps 5-7.			
13	For depreciation during succeeding year		**[2nd] [E′]** **[2nd] [C′]** **[STO] 21 [–]** **[RCL] 20 [=]**	ACD† DEP
14	Repeat Steps 5-7, if desired			
15	For the following year		**[2nd] [E′]** **[2nd] [C′]** **[STO] 20 [–]** **[RCL] 21 [=]**	ACD† DEP
16	Repeat Steps 5-7, if desired			
17	For succeeding years, repeat Steps 13-16, alternating storage registers for ACD			

NOTES:

1. All dollar amounts will be displayed to 2 decimal places.
2. Error indications (flashing display):
   a. Starting book value, life, or year entered as less than, or equal to, zero.
   b. Salvage value entered as less than zero.
3. The value for life will flash in the display after the length of the life has been exceeded when using the "year + 1" operation.
4. The value for life *must* be entered *before* the value for year or months.

† These values are printed if the PC-100A is connected.

Register Contents

R_{00}	R_{05} Used	R_{10}	R_{15}	R_{20}
R_{01} SBV	R_{06}	R_{11}	R_{16}	R_{21}
R_{02} SAL	R_{07}	R_{12}	R_{17}	R_{22}
R_{03} LIFE	R_{08}	R_{13}	R_{18}	R_{23}
R_{04} YR	R_{09}	R_{14}	R_{19}	R_{24}

Example 1: A used office building was purchased for $235,000. With an estimated salvage value of $25,000 and a useful life of 25 years, calculate the straight line depreciation schedule for the first two years of ownership.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 05	
2	Enter: starting book value	235000	[A]	235000.00†
	salvage value	25000	[B]	25000.00†
	life	25	[C]	25.†
3	Enter year 1	1	[D]	1.†
4	Calculate depreciation for year 1		[E]	8400.00†
5	Calculate remaining depreciable value		[2nd] [A′]	201600.00†
6	Calculate remaining book value		[2nd] [B′]	226600.00†
7	Calculate depreciation to date		[2nd] [C′]	8400.00†
8	Go to year 2		[2nd] [E′]	2.†
4	Calculate depreciation for year 2		[E]	8400.00†
5	Calculate remaining depreciable value		[2nd] [A′]	193200.00†
6	Calculate remaining book value		[2nd] [B′]	218200.00†
7	Calculate depreciation to date		[2nd] [C′]	16800.00†

Example 2: You took ownership of the Chez Cheval Restaurant on April 1 of this year. The purchase price was $145,000 and you estimate the salvage value at $15,000, with 20 remaining years of useful life. Calculate the straight line depreciation you can claim for this year and for the two subsequent years.

† These values are printed if the PC-100A is connected.

RE-05

STEP.	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 05	
2	Enter: starting book value	145000	[A]	145000.00†
	salvage value	15000	[B]	15000.00†
	life	20	[C]	20.†
10	Enter first period	9	[÷] 12 [=] [D]	0.75†
11	Calculate depreciation to date		[2nd] [C′] [STO] 20	4875.00†
5	Calculate remaining depreciable value		[2nd] [A′]	125125.00†
6	Calculate remaining book value		[2nd] [B′]	140125.00†
8	Go to next year		[2nd] [E′]	1.75†
13	Calculate depreciation for the year		[2nd] [C′] [STO] 21	11375.00†
			[−] [RCL] 20 [=]	6500.00
5	Calculate remaining depreciable value		[2nd] [A′]	118625.00†
6	Calculate remaining book value		[2nd] [B′]	133625.00†
8	Go to next year		[2nd] [E′]	2.75†
15	Calculate depreciation for the year		[2nd] [C′] [STO] 20	17875.00†
			[−] [RCL] 21 [=]	6500.00
5	Calculate remaining depreciable value		[2nd] [A′]	112125.00†
6	Calculate remaining book value		[2nd] [B′]	127125.00†

METHOD

Straight line depreciation assumes that the decrease in value is directly proportional to the age of the item in question. This program calculates the depreciation (DEP), the remaining depreciable value (RDV), remaining book value (RBV) and depreciation to date (ACD) using this method.

$$DEP = \frac{SBV - SAL}{LIFE} \qquad RBV = RDV + SAL$$

$$RDV = (LIFE - YR)\ DEP \qquad ACD = (DEP)\ YR$$

Where:

DEP = depreciation for each year
RDV = remaining depreciable value
RBV = remaining book value
ACD = accumulated depreciation
SBV = starting book value
SAL = salvage value
LIFE = life expectancy in years
YR = specific year of schedule

†These values are printed if the PC-100A is connected.

DECLINING BALANCE DEPRECIATION

Using any of the declining balance methods of depreciation, this program computes the amount depreciated during any time period in the life of the property, the remaining depreciable value of the property, the remaining book value of the property, and the total amount of depreciation claimed up to that point in time. When used in combination with the PC-100A Print/Security Cradle, the program can be used to print depreciation schedules.

Declining balance depreciation is an accelerated method of depreciation. The assumption is that the greatest amount of depreciation occurs during the early years in the life of the property. As a result, declining balance depreciation involves greater amounts of depreciation than the straight line method *during the early life of the property.* However, because the depreciable basis declines over time, the amount depreciated becomes smaller with each passing year.

Because the declining balance methods result initially in greater depreciation deductions for tax purposes, they are not applicable to all properties. For properties acquired after July 24, 1969, the following methods are applicable.

200% Declining Balance or Double Declining Balance

(1) First-user residential rental property. To qualify as residential rental property, at least 80% of the gross income from the building must come from the rental of dwelling units. The 80% calculation is applicable to every year, so that the owner of the property may be eligible to use 200% declining balance depreciation in some years and not in others.

(2) All first-user personal property with a life of three years or more.

150% Declining Balance

(1) First-user commercial property.

(2) First-user residential rental property that does not meet the 80% test.

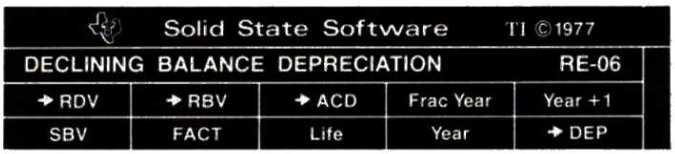
(3) Used personal property with a remaining life of three years or more.

125% Declining Balance

(1) Used residential rental property with a remaining life of twenty years or more.

These are the maximum rates of depreciation allowed for these properties, using declining balance depreciation. Any less-accelerated method could be applied to these properties, if the owner so desired.

Salvage value is not considered for declining balance depreciation.



USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 06	
2	Enter the following in any order:			
	a. starting book value	SBV	[A]	SBV†
	b. depreciation factor	FACT	[B]	FACT†
	c. useful life	LIFE	[C]	LIFE†
3	Enter year (If initial year in the schedule is fractional, see Step 10.)	YEAR	[D]	YEAR†
4	Calculate depreciation for the year		[E]	DEP†
5	Calculate remaining depreciable value		[2nd] [A′]	RDV†
6	Calculate remaining book value		[2nd] [B′]	RBV†
7	Calculate depreciation to date		[2nd] [C′]	ACD†
8	To calculate values for next year (If next year is last year of useful life, *and* it is fractional, press [2nd] [D′].)		[2nd] [E′]	Year + 1†
			[2nd] [D′]	Life†
9	For a new case, make the necessary changes in Steps 2a, 2b, and 2c, then go to Step 3.			
10	If initial year in the schedule is fractional, enter number of months	MONTHS	[÷] 12 [=] [D]	Fraction†
11	Calculate depreciation to date		[2nd] [C′] [STO] 20	1st yr: DEP + ACD† Succeeding yrs: ACD†
12	Values of interest, repeat Steps 5-7.			
13	For depreciation during succeeding year		[2nd] [E′] [2nd] [C′] [STO] 21 [–] [RCL] 20 [=]	ACD† DEP
14	Repeat Steps 5-7, if desired			
15	For the following year		[2nd] [E′] [2nd] [C′] [STO] 20 [–] [RCL] 21 [=]	ACD† DEP
16	Repeat Steps 5-7, if desired			
17	For succeeding years, repeat Steps 13-16, alternating storage registers for ACD			

NOTES:
1. All dollar amounts will be displayed to 2 decimal places.
2. Error indications (flashing display):
   a. Starting book value, life, or year entered as less than, or equal to, zero.
   b. FACT ≤ 1 or FACT > 2
3. The value for life will flash in the display after the length of the life has been exceeded when using the "year + 1" operation.
4. The value for life *must* be entered *before* the value for year or months.

† These values are printed if the PC-100A is connected.

Register Contents

R_{00}	R_{05} Used	R_{10}	R_{15}	R_{20}
R_{01} SBV	R_{06}	R_{11}	R_{16}	R_{21}
R_{02} FACT	R_{07} Used	R_{12}	R_{17}	R_{22}
R_{03} LIFE	R_{08}	R_{13}	R_{18}	R_{23}
R_{04} YEAR	R_{09}	R_{14}	R_{19}	R_{24}

Example 1: A new apartment complex has a shell which is valued at $875,000, with a useful life of 40 years. Compute a depreciation schedule for the first 3 years, using the double declining balance method.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 06	
2	Enter in any order:			
	Starting book value	875000	[A]	875000.00†
	Depreciation factor	2	[B]	2.†
	Life	40	[C]	40.†
3	Enter year	1	[D]	1.†
4	Calculate year's depreciation		[E]	43750.00†
5	Calculate remaining depreciable value		[2nd] [A′]	831250.00†
6	Calculate remaining book value		[2nd] [B′]	831250.00†
7	Calculate depreciation to date		[2nd] [C′]	43750.00†
8	For the next year		[2nd] [E′]	2.†
4	Calculate DEP, Year 2		[E]	41562.50†
5	Calculate RDV, Year 2		[2nd] [A′]	789687.50†
7	Calculate ACD, Year 2		[2nd] [C′]	85312.50†
8	Go to year 3		[2nd] [E′]	3.†
4	Calculate DEP, Year 3		[E]	39484.37†
5	Calculate RDV, Year 3		[2nd] [A′]	750203.12†
7	Calculate ACD, Year 3		[2nd] [C′]	124796.88†

These values are printed if the PC-100A is connected.

Example 2: The shell of a new office building is valued at $118,000 with a life of 45 years. Compute the depreciation and accumulated depreciation for the first three years. Assume 150% declining balance depreciation.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 06	
2	Enter in any order:			
	Starting book value	118000	[A]	118000.00†
	Depreciation factor	1.5	[B]	1.5†
	Life	45	[C]	45.†
3	Enter year	1	[D]	1.†
4	Calculate the year's depreciation		[E]	3933.33†
7	Calculate the depreciation to date		[2nd] [C′]	3933.33†
8	For the next year		[2nd] [E′]	2.†
4	Calculate DEP, Year 2		[E]	3802.22†
7	Calculate ACD, Year 2		[2nd] [C′]	7735.56†
8	Go to Year 3		[2nd] [E′]	3.†
4	Calculate DEP, Year 3		[E]	3675.48†
7	Calculate ACD, Year 3		[2nd] [C′]	11411.04†

Example 3: You purchase a building which was previously owned. The estimated remaining life of the used furnace is 15 years, and its estimated value is $1700. If you assume ownership on July 1, what is the depreciation claimed this year and next year?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 06	
2	Enter in any order:			
	Starting book value	1700	[A]	1700.00†
	Depreciation factor	1.5	[B]	1.5†
	Useful life	15	[C]	15.†
10	Enter number of months	6	[÷] 12 [=] [D]	0.5†
11	Calculate depreciation to date		[2nd] [C′] [STO] 20	85.00†
5	Calculate remaining depreciable value		[2nd] [A′]	1615.00†
6	Calculate remaining book value		[2nd] [B′]	1615.00†
8	Go to next year		[2nd] [E′]	1.5†
13	Calculate depreciation for the year		[2nd] [C′] [STO] 21	246.50†
			[−] [RCL] 20 [=]	161.50†

†These values are printed if the PC-100A is connected.

METHOD

Declining balance depreciation assumes decrease in value is a constant percentage of the book value at the beginning of the year. This program calculates the depreciation, remaining depreciable value, remaining book value, and depreciation to date using this method.

$$DEP = SBV \left(1 - \frac{FACT}{LIFE}\right)^{YR-1} \times \frac{FACT}{LIFE}$$

For Fractional Years

$$DEP_{YR} = (DEP)_{|YR+1|} \text{ (FRACTION)}$$

$$RDV = SBV - ACD$$

$$RBV = RDV$$

$$ACD_{YR} = SBV \left[1 - \left(1 - \frac{FACT}{LIFE}\right)^{YR}\right]$$

Where:

DEP = depreciation for each year
RDV = remaining depreciable value
RBV = remaining book value
ACD = accumulated depreciation
SBV = starting book value
LIFE = life expectancy in years
YR = year of schedule
FACT = declining rate factor

RE-07

SUM-OF-THE-YEARS'-DIGITS DEPRECIATION

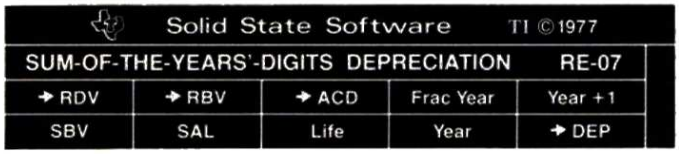
Using the sum-of-the-years'-digits method of depreciation, this program calculates the depreciable basis, the amount depreciated during any time period in the life of the property, and the total amount of depreciation claimed up to that point in time. When used in combination with the PC-100A Print/Security Cradle, the program can be used to print depreciation schedules.

SOYD is another accelerated method of depreciation. In fact, it is the most accelerated method of depreciation, claiming the greatest amount of depreciation during the early years of the life of the property. Consequently, its applications are limited to the same properties which quality for 200% declining balance depreciation.

(1) First-user residential rental property which meets the 80% tests.

(2) First-user personal property with a life of three years or more.

Salvage value must be considered with SOYD depreciation, and the program computes the depreciable basis automatically.



USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 07	
2	Enter the following in any order:			
	a. starting book value	SBV	[A]	SBV†
	b. salvage value	SAL	[B]	SAL†
	c. useful life	LIFE	[C]	LIFE†
3	Enter year (If initial year in the schedule is fractional, see Step 10.)	YEAR	[D]	YEAR†
4	Calculate depreciation for the year		[E]	DEP†
5	Calculate remaining depreciable value		[2nd] [A′]	RDV†
6	Calculate remaining book value		[2nd] [B′]	RBV†
7	Calculate depreciation to date		[2nd] [C′]	ACD†
8	To calculate values for next year (If next year is last year of useful life, *and* it is fractional, press [2nd] [D′].)		[2nd] [E′]	Year + 1†
			[2nd] [D′]	Life†
9	For a new case, make necessary changes in Steps 2a, 2b, and 2c, then go to Step 3.			
10	If initial year in the schedule is fractional, enter number of months	MONTHS	[÷] 12 [=] [D]	Fraction†
11	Calculate depreciation to date		[2nd] [C′] [STO] 20	1st yr: DEP + ACD† Succeeding yrs: ACD†
12	Values of interest, repeat Steps 5-7.			
13	For depreciation during succeeding year		[2nd] [E′] [2nd] [C′]	ACD†
			[STO] 21 [−] [RCL] 20 [=]	DEP
14	Repeat Steps 5-7, if desired			
15	For the following year		[2nd] [E′] [2nd] [C′]	ACD†
			[STO] 20 [−] [RCL] 21 [=]	DEP
16	Repeat Steps 5-7, if desired			
17	For succeeding years, repeat Steps 13-16, alternating storage registers for ACD			

RE-07

NOTES:
1. All dollar amounts will be displayed to 2 decimal places.
2. Error indications (flashing display):
   a. Starting book value, life, or year entered as less than, or equal to, zero.
   b. Salvage value entered as less than zero.
3. The value for life will flash in the display after the length of the life has been exceeded when using the "year + 1" operation.
4. The value for life *must* be entered *before* the value for year or months.

† These values are printed if the PC-100A is connected.

Register Contents

R_{00}	R_{05} W of LIFE	R_{10}	R_{15}	R_{20}
R_{01} SBV	R_{06} Used	R_{11}	R_{16}	R_{21}
R_{02} SAL	R_{07} Used	R_{12}	R_{17}	R_{22}
R_{03} LIFE	R_{08}	R_{13}	R_{18}	R_{23}
R_{04} YEAR	R_{09}	R_{14}	R_{19}	R_{24}

Example: The shell of your new apartment building is valued at $300,000, with a salvage value of $30,000 and a life of 40 years. Using the SOYD method of depreciation, compute the first two years in the depreciation schedule of the building.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 07	
2	Enter in any order:			
	starting book value	300000	[A]	300000.00†
	salvage value	30000	[B]	30000.00†
	life	40	[C]	40.†
3	Enter year	1	[D]	1.†
4	Calculate 1st year's depreciation		[E]	13170.73†
5	Calculate remaining depreciable value		[2nd] [A′]	256829.27†
6	Calculate remaining book value		[2nd] [B′]	286829.27†
7	Calculate depreciation to date		[2nd] [C′]	13170.73†
8	Go to Year 2		[2nd] [E′]	2.†
4	Calculate DEP, Year 2		[E]	12841.46†
5	Calculate RDV, Year 2		[2nd] [A′]	243987.80†
6	Calculate RBV, Year 2		[2nd] [B′]	273987.80†
7	Calculate ACD		[2nd] [C′]	26012.20†

METHOD

Sum-of-the-years'-digits is an accelerated method of computing depreciation where the total of the digits corresponding to each year of life is used as a factor. This program calculates the depreciation, remaining depreciable value, remaining book value, and depreciation to date using this method.

$$SOYD = \frac{(W+1)\ (W+2F)}{2}$$

For INTEGER YR: $DEP = ACD_{YR} - ACD_{YR-1}$;

For FRACTIONAL YR: $DEP = ACD_{YR} - ACD_{|YR|}$

$$RDV = \frac{(W-|YR|+1)\ (W-|YR|+2F) - [2R \times (W+F-|YR|)]}{2 \times SOYD} \times (SBV - SAL)$$

$$RBV = RDV + SAL$$

$$ACD = (SBV - SAL - RDV)$$

where:

SOYD = sum of years' digits
DEP = depreciation for each year
RDV = remaining depreciable value
RBV = remaining book value
ACD = accumulated depreciation
SBV = starting book value
SAL = salvage value
LIFE = life expectancy in years
YR = year of schedule desired
W = integral part of life
F = fractional part of life
R = fractional part of year

RE-08

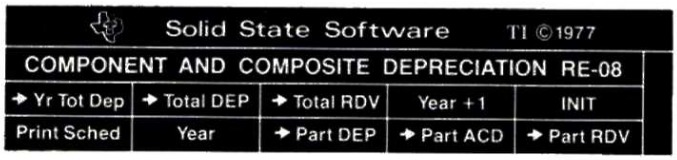
COMPONENT AND COMPOSITE DEPRECIATION

This program calculates component and/or composite depreciation for up to sixteen* pieces of real and/or personal property. It computes the depreciable basis, where applicable, for each property, the amount depreciated during any time period in the life of the property, the remaining depreciable value of the property, the remaining book value of the property, and the total amount of depreciation claimed for that property up to that point in time. In addition, the program determines the component or composite depreciation for any time period, as well as the total depreciation claimed and total remaining depreciable value. When used in conjunction with the PC-100A Print/Security Cradle, the program will print component or composite depreciation schedules.

The depreciation rate under the composite method represents the *average* depreciation of the individual parts of the building during that time period. The same life and method are applied to each part, and a single depreciable basis is determined, in effect. The composite method treats the collection of parts as a single item.

Under the component method of depreciation, each individual part of the property can be assigned its own life, salvage value (where applicable), and method. The depreciations taken for the individual components are added to arrive at the total component depreciation. The methods allowable for the components are determined by the class of asset — residential or commercial or personal — and whether the component is new or used.

*Eight when used with the TI Programmable 58. If there is fractional year input these numbers are increased to twenty and ten.



USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 08	
2	Initialize		[2nd] [E′]	0.
3	Enter values in following order:			
	a. Number of components	No. of comp	[R/S]	No. of components† (See Note 2)
	For each component:			
	b. Starting book value	SBV	[R/S]	SBV†
	c. Salvage value *or* declining balance factor	SAL or F	[R/S]	SAL or F†
	d. Life		[R/S]	LIFE†
	e. Method:			
	Straight line	1	[R/S]	1.†
	Declining balance	2	[R/S]	2.†
	Sum-of-the-years'-digits	3	[R/S]	3.†
4	Enter year (If the initial year in the schedule is fractional, see Step 13.)	YEAR	[B]	YEAR†
5	Calculate the depreciation for the year for individual component		[C]	PART DEP†
6	Calculate the accumulated depreciation for individual component		[D]	PART ACD†
7	Calculate the remaining depreciable value for individual component		[E]	PART RDV†
8	Repeat Steps 5-7, as desired, for each component			
9	Calculate the component (or composite) depreciation for the year		[2nd] [A′]	YR TOTAL DEP†
10	Calculate the accumulated component (or composite) depreciation		[2nd] [B′]	TOTAL DEP†
11	Compute the total remaining depreciable value		[2nd] [C′]	TOTAL RDV†
12	Go to next year		[2nd] [D′]	YEAR + 1†
13	For fractional initial year, all components must begin at the same time, observe the following procedure. Increase the number of available registers to 100 (60).	10 (6)	[2nd] [Fix] 9 [2nd] [Op] 17	159.99 (0.59)
14	Enter fractional part of first year	Fraction	[B]	Fraction†
15	Calculate ACD for first component, then store		[D] [STO] 84(52)	ACD, 1st†

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
16	Calculate ACD for the second component, then store		[D] [STO] 85(53)	ACD, 2nd†
17	Repeat for all components, incrementing storage register by one each time			
18	When you have completed the first year, go to the second year		[2nd] [D']	1 + Fraction†
19	Calculate ADC for the first component		[D]	ACD†
20	To determine depreciation for the year		[−] [2nd] [EXC] 84(52) [=]	DEP
21	For second component		[D] [−] [2nd] [EXC] 85(53) [=]	ACD† DEP
22	Repeat process for all components and all years			
23	Upon completion, return to original partition before proceeding to next program	6 (3)	[2nd] [Fix] 9 [2nd] [Op] 17	479.59 (239.29)
24	Steps 13 and 23 can be used to increase the capacity of the program from 9(2) components to 19(9) components			
25	To print schedule follow Steps 1-3 for all components		[A]	

NOTES:

1. Values in parentheses are for the TI Programmable 58.
2. Perform Step 13 if number of components is more than 2 for the TI Programmable 58 or more than 9 for the TI Programmable 59. See Step 24.
3. If there is no fractional year input, 10 and 20 components can be handled on the TI Programmable 58 and 59 respectively.

† These values are printed if the PC-100A is connected.

Register Contents

R_{00}		R_{05}	W	R_{10}	YR Component	R_{15}	No. of Components	R_{20}	*
R_{01}	SBV	R_{06}	F	R_{11}	Total Component	R_{16}	Pointer	R_{21}	
R_{02}	SAL or F	R_{07}	Used	R_{12}	Total RDV	R_{17}	Used	R_{22}	
R_{03}	LIFE	R_{08}	Used	R_{13}	Pointer	R_{18}	Used	R_{23}	
R_{04}	YEAR	R_{09}	Used	R_{14}	Used	R_{19}	Used	R_{24}	

*R_{20} through R_{29} are used, as a minimum.

Example 1: You have just purchased the Moo To You Drive-In Restaurant from the original owner. You wish to deduct depreciation for the building and its components, using the straight line method of depreciation, based upon the information given below. What would the depreciation be for the first full year?

Component	Book Value	Salvage Value	Life
Shell	$ 85,000	$10,000	25 yrs.
Roof	10,000	1,000	25 yrs.
Stoves	7,500	750	10 yrs.
Refrigeration Units	5,000	500	10 yrs.
	$107,500	$12,250	

1st Year Depreciation

	Depreciation	Remaining Depreciable Value
Shell	$3,000	$72,000
Roof	360	8,640
Stoves	675	6,075
Refrigeration Units	450	4,050
	$4,485	$90,765

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 08*	
2	Initialize		[2nd] [E']	0.
3	Enter: No. of components	4	[R/S]	4.†
	SBV, 1st component	85000	[R/S]	85000.†
	SAL, 1st component	10000	[R/S]	10000.†
	LIFE, 1st component	25	[R/S]	25.†
	METHOD, 1st component	1	[R/S]	1.†
	SBV, 2nd component	10000	[R/S]	10000.†
	SAL, 2nd component	1000	[R/S]	1000.†
	LIFE, 2nd component	25	[R/S]	25.†
	METHOD, 2nd component	1	[R/S]	1.†
	SBV, 3rd component	7500	[R/S]	7500.†
	SAL, 3rd component	750	[R/S]	750.†
	LIFE, 3rd component	10	[R/S]	10.†
	METHOD, 3rd component	1	[R/S]	1.†
	SBV, 4th component	5000	[R/S]	5000.†
	SAL, 4th component	500	[R/S]	500.†
	LIFE, 4th component	10	[R/S]	10.†
	METHOD, 4th component	1	[R/S]	1.†

†These values are printed if the PC-100A is connected.
*For TI Programmable 58, repartition by pressing 6 [2nd] [Op] 17.

STEP	OPERATION	ENTER	PRESS	DISPLAY
4	Enter Year 1	1	[B]	1.†
5	Calculate the depreciation for the year for the shell		[C]	3000.00†
7	Calculate the remaining depreciable value for the shell		[E]	72000.00†
5	Calculate the depreciation for the year for the roof		[C]	360.00†
7	Calculate the remaining depreciable value for the roof		[E]	8640.00†
5	Calculate the depreciation for the year for the stoves		[C]	675.00†
7	Calculate the remaining depreciable value for the stoves		[E]	6075.00†
5	Calculate the depreciation for the year for the refrigeration units		[C]	450.00†
7	Calculate the reamining depreciable value for the refrigeration units		[E]	4050.00†
9	Calculate the component depreciation for Year 1		[2nd] [A′]	4485.00*†
11	Calculate the total remaining depreciable value		[2nd] [C′]	90765.00*†

Example 2: What would be the depreciation if the composite method were used? Average life = 25 years.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 08	0.
2	Initialize		[2nd] [E′]	0.
3	Enter: No. of components	1	[R/S]	1.†
	SBV	107500	[R/S]	107500.†
	SAL	12250	[R/S]	12250.†
	LIFE	25	[R/S]	25.†
	METHOD	1	[R/S]	1.†
4	Enter year 1	1	[B]	1.†
5	Calculate depreciation		[C]	3810.00†

METHOD

This program computes component depreciation, remaining depreciable value, and accumulated depreciation by using the appropriate program (RE-05, RE-06, RE-07).

Component depreciation = sum of depreciation for each part

Total remaining depreciable value = sum of remaining depreciable value for each component.

†These values are printed if the PC-100A is connected.
*Prints each component plus the total.

EXCESS DEPRECIATION RECAPTURE FOR REAL PROPERTY

This program calculates the depreciation deducted in excess of the straight line method during the holding period of the property and the amount of this excess depreciation which is subject to recapture as ordinary income (the "applicable amount") upon the sale or other disposition of the property, in accordance with Section 1250 of the Internal Revenue Code and the Tax Reform Act of 1976.

The intention underlying excess depreciation recapture is to prevent owners of real property from converting an ordinary income deduction, which lowers the basis of their property, into a capital gain at the time of the disposition of the property. However, the amount of depreciation deducted in excess of the straight line method is simply the *maximum* amount which could be subjected to recapture as ordinary income.* The actual amount subject to recapture is determined by a variety of factors, such as the length of the holding period of the property, the amount of depreciation deducted prior to 1964, prior to 1970, prior to 1976, post 1975, and the type of property. The program computes the amount of gain from the disposition which is subject to recapture as ordinary income and the amount which is subject to treatment as capital gain.

*This maximum amount subject to recapture is computed also in the "Cash Flow Analysis" program, RE-13. Should you wish to determine the actual amount subject to recapture as ordinary income, this program should be used.

USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 09	
2	Initialize		[2nd] [E′]	0.
3	Enter inputs in the following order:			
	a. depreciable basis	Amount	[R/S]	Depreciable Basis†
	b. useful life	Years	[R/S]	# Years†
	c. entire holding period	Years	[R/S]	# Years†
	d. holding period prior to 1964	Years	[R/S]	# Years†
	e. holding period prior to 1970	Years	[R/S]	# Years†
	f. holding period prior to 1976	Years	[R/S]	# Years†
	g. Type (1 – Residential)	1	[R/S]	1.†
	(0 – Commercial)	0		0.†
	h. depreciable factor (0 for sum of the digits)	Factor	[R/S]	Factor†
	i. Selling Costs	Amount	[R/S]	Selling costs†
	j. Selling Price	Amount	[R/S]	Selling price†
4	Calculate total depreciation %		[A]	Total depreciation %†
5	Calculate total depreciation amount		[R/S]	Amount total depreciation†
6	Calculate adjusted basis		[R/S]	Adjusted basis†
7	Calculate realized gain		[R/S]	Realized gain†
8	Calculate % ACD prior to 1964 accelerated method		[B]	% ACD prior to 1964 accelerated†
9	Calculate % ACD prior to 1964 straight line		[R/S]	% ACD prior to 1964 straight line†
10	Calculate % ACD, 1964-69, accelerated method		[C]	% ACD, 1964-69 accelerated†
11	Calculate % ACD, 1964-69, straight line		[R/S]	% ACD, 1964-69 straight line†
12	Calculate % ACD, 1970-75, accelerated method		[D]	% ACD, 1970-75 accelerated†
13	Calculate % ACD, 1970-75, straight line		[R/S]	% ACD, 1970-75 straight line†
14	Calculate excess depreciation prior to 1970		[E]	Excess depreciation prior to 1970†
15	Calculate excess depreciation 1970-75		[2nd] [A′]	Excess depreciation 1970-75†
16	Calculate excess depreciation after 1975		[2nd] [B′]	Excess depreciation after 1975†
17	Calculate ordinary income recapture prior to 1970		[2nd] [C′]	Ordinary income prior to 1970†

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
18	Calculate ordinary income recaptured 1970-75		[R/S]	Ordinary income 1970-75†
19	Calculate ordinary income recaptured after 1975		[R/S]	Ordinary income after 1975†
20	Calculate total ordinary income recaptured		[R/S]	Total ordinary income†
21	Calculate capital gain realized		[2nd] [D']	Capital gain realized†

NOTES:

1. This program is applicable only to *real* property. Personal property, which is covered by Section 1245 of the Internal Revenue Code, is treated differently in this context.
2. Low-income housing receives special treatment under these provisions, and consequently, this program is not strictly applicable.
3. Depreciation deducted in excess of the straight line method for property held less than one year is subject to full recapture as ordinary income.

† These values are printed if the PC-100A is connected.

Register Contents

R_{00}	R_{08} Depreciable basis	R_{15} Depreciation factor	R_{22} Used
R_{01} Used	R_{09} Useful life	R_{16} Selling costs	R_{23} % ACD claimed 1970-75
R_{02}	R_{10} Holding period	R_{17} Selling price	R_{24} Excess dep. prior to 1970
R_{03} Used	R_{11} Holding period prior to 1964	R_{18} % total dep.	R_{25} Excess dep. 1970-75
R_{04} Used	R_{12} Holding period prior to 1970	R_{19} Realized gain	R_{26} Excess dep. after 1975
R_{05} Used	R_{13} Holding period prior to 1976	R_{20} % ACD claimed prior to 1964	R_{27} Used
R_{06} Used	R_{14} Type	R_{21} % ACD claimed 1964-69	R_{28} Used
R^{07} Used			

Example 1: Mamacita's Tortilleria was purchased new in 1972. Since it was a new commercial property, 150% declining balance depreciation was the method applied. The depreciable basis of the property was $85,000.

The property was sold in July, 1978 for $95,000. The costs of sales were $5,700. Calculate the depreciation recaptured as ordinary income, and the capital gain realized.

RE-09

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 09	
2	Initialize		[2nd] [E′]	0.
3	Enter in order:			
	Depreciable basis	85000	[R/S]	85000.†
	Useful life	30	[R/S]	30.†
	Holding period	6.5	[R/S]	6.5†
	Holding period prior to 1964	0	[R/S]	0.†
	Holding period prior to 1970	0	[R/S]	0.†
	Holding period prior to 1976	4	[R/S]	4.†
	Type (0 – Commercial)	0	[R/S]	0.†
	Depreciation factor	1.5	[R/S]	1.5†
	Selling costs	5700	[R/S]	5700.†
	Selling price	95000	[R/S]	95000.†
4	Calculate total depreciation %		[A]	28.3521†
5	Calculate total depreciation amount		[R/S]	24099.29
6	Calculate adjusted basis		[R/S]	66600.71†
7	Calculate realized gain		[R/S]	28399.29†
8	Calculate % ACD prior to 1964 accelerated		[B]	0.0000†
9	Calculate % ACD prior to 1964 straight line		[R/S]	0.0000†
10	Calculate % ACD, 1964-69, accelerated		[C]	0.0000†
11	Calculate % ACD, 1964-69, straight line		[R/S]	0.0000†
12	Calculate % ACD, 1970-75, accelerated		[D]	18.5494†
13	Calculate % ACD, 1970-75, straight line		[R/S]	13.3333†
14	Calculate excess depreciation prior to 1970		[E]	0.00†
15	Calculate excess depreciation 1970-75		[2nd] [A′]	4433.64†
16	Calculate excess depreciation after 1975		[2nd] [B′]	1248.99†
17	Calculate ordinary income recaptured prior to 1970		[2nd] [C′]	0.00†
18	Calculate ordinary income recaptured 1970-75		[R/S]	4433.64†
19	Calculate ordinary income recaptured after 1975		[R/S]	1248.99†
20	Calculate total ordinary income recaptured		[R/S]	5682.62†
21	Calculate capital gain realized		[2nd] [D′]	22716.67†

†These values are printed if the PC-100A is connected.

Example 2: Hemlock Lake Apartments were purchased new in 1969 for $295,000 (not including land) and were sold at the beginning of 1978 for $350,000. As new residential property, the double decling balance method was applied to the depreciable basis of $295,000. The costs of sale were $30,000. Calculate the depreciation recaptured as ordinary income and the capital gain realized.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 09	
2	Initialize		[2nd] [E′]	0.
3	Enter in order:			
	Depreciable basis	295000	[R/S]	295000.†
	Useful life	40	[R/S]	40.†
	Holding period	9	[R/S]	9.†
	Holding period prior to 1964	0	[R/S]	0.†
	Holding period prior to 1970	1	[R/S]	1.†
	Holding period prior to 1976	7	[R/S]	7.†
	Type (1 — Residential)	1	[R/S]	1.†
	Depreciation factor	2	[R/S]	2.†
	Selling costs	30000	[R/S]	30000.†
	Selling price	350000	[R/S]	350000.†
4	Calculate total depreciation %		[A]	36.9751†
5	Calculate total depreciation		[R/S]	109076.42†
6	Calculate adjusted basis		[R/S]	215923.58†
7	Calculate realized gain		[R/S]	134076.42†
8	Calculate % ACD prior to 1964 accelerated		[B]	0.0000†
9	Calculate % ACD prior to 1964 straight line		[R/S]	0.0000†
10	Calculate % ACD 1964-1969, accelerated		[C]	5.0000†
11	Calculate % ACD 1964-1969, straight line		[R/S]	2.5000†
12	Calculate % ACD 1970-1975, accelerated		[D]	25.1663†
13	Calculate % ACD 1970-1975, straight line		[R/S]	15.0000†
14	Calculate excess depreciation prior to 1970		[E]	7375.00†
15	Calculate excess depreciation 1970-1975		[2nd] [A′]	29990.50†
16	Calculate excess depreciation after 1975		[2nd] [B′]	5335.93†
17	Calculate ordinary income recaptured prior to 1970		[2nd] [C′]	885.00†
18	Calculate ordinary income recaptured 1970-1975		[R/S]	27591.26†
19	Calculate ordinary income recaptured after 1975		[R/S]	5335.93†
20	Calculate total ordinary income		[R/S]	33812.18†
21	Calculate capital gain realized		[2nd] [D′]	100264.24†

†These values are printed if the PC-100A is connected.

RE-09

METHOD

This program is used to compute the excess of accelerated depreciation over the straight line method.

To calculate the depreciation % during the entire holding period the following equation is used:

FOR DECLINING BALANCE: $$\left(1-\left[1-\frac{\text{FACTOR}}{\text{LIFE}}\right]^{\text{HOLDING PERIOD}}\right) \times 100$$

FOR SUM OF THE YEARS' DIGITS:

$$100 \times \left(1-\frac{(W-|YR|+1)\,(W-|YR|+2F)-2R\,(W+F-|YR|)}{2 \times SOYD}\right)$$

Where:

W = Integer Part of Life
F = Fractional Part of Life
R = Fractional Part of YR
YR = Year of Schedule

Total depreciation = (Depreciation % X Depreciable Basis)/100

Adjusted Basis = Depreciable Basis – Total Depreciation + Selling Cost

Realized Gain = Selling Price – Adjusted Basis

Excess Depreciation Priot to 1970 = [% of Accumulated Depreciation between 1/1/64 and 12/31/69 by the Accelerated Method – % of Accumulated Depreciation between 1/1/64 and 12/31/69 by the Straight Line Method] X Depreciable Basis/100

Excess Depreciation from 1/1/1970 to 12/31/1975 = [% of Accumulated Depreciation between 1/1/70 and 12/31/1975 by the Accelerated Method – % of Accumulated Depreciation between 1/1/1970 and 12/31/1975 by the Straight Line Method] X Depreciable Basis/100

Excess Depreciation During Entire Holding Period = (Total Depreciation % – % Accumulated Depreciation Prior to 1964 Accelerated – % Accumulated Depreciation between 1/1/64 and 12/31/69 Accelerated – % Accumulated Depreciation between 1/1/70 and 12/31/75, Accelerated – Straight Line % over Holding Period + % Accumulated Depreciation Prior to 1964, Straight Line + % Accumulated Depreciation between 1/1/64 and 12/31/69, Straight Line + % Accumulated Depreciation between 1/1/70 and 12/31/75, Straight Line) X Depreciable Basis

Ordinary Income Recaptured Prior to 1/1/70 = (120 – holding period, in months)/100 X Excess Depreciation Prior to 1970

Ordinary Income Recaptured between 1/1/70 and 12/31/75 =

a. Commercial — Excess Depreciation between 1/1/70 and 12/31/75

b. Residential — (200 — holding period, in months)/100 X Excess Depreciation between 1/1/70 and 12/31/75

Ordinary Income Recaptured after 1/1/75 = Excess Depreciation during entire holding period

Capital Gain Realized = Realized Gain — Total Ordinary Income Recaptured

CURVE FITS

This program provides you with the capability to make short-term projections, based on any of four different models: linear regression, exponential curve, power curve, and logarithmic curve. Through the use of these models, it is possible to forecast future values for sales volume, expenses, taxes, sale prices, and the like. It is also possible to use these calculations to examine the effects of hypothetical changes: to answer questions like, "what increase in sales volume will accompany this particular increased level of advertising expenditures?"

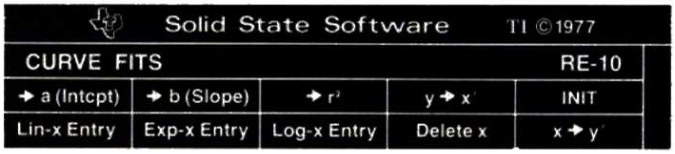
The linear regression model assumes that there is relationship between the independent variable (the variable you are using as the basis for predicting) and the dependent variable (the variable whose values you are trying to predict). It assumes that there is a relationship such that an increase or decrease of one unit in the value of the independent variable is accompanied by an increase or decrease of some relatively constant number of units in the dependent variable. It may be 5 units, .5 units, or 5000000 units, so long as it is roughly the same for each unit change in the independent variable.

In the exponential curve model, the dependent variable changes in a manner similar to compound interest. That is, for each unit change in the independent variable, there is a proportional increase in the value of the dependent variable. Here, each unit change in the value of the independent variable is accompanied by, for example, a 5% or −5% or 20% change in the value of the dependent variable.

The power curve assumes a relationship between the proportionate changes in *both* the independent and dependent variables. That is, each percentage increase or decrease (in the sense of compound interest) in the value of the independent variable is accompanied by a relatively stable percentage change in the dependent variable.

Finally, the logarithmic curve assumes that each proportional change in the independent variable is accompanied by a relatively stable unit change in the value of the dependent. That is, for example, each time the independent variable increases by 5%, the dependent variable decreases by 2000 units.

The program also provides features which allow you to determine the quality of the particular applications of these models. The "coefficient of determination" or r^2 varies in value between 0 and 1. The closer the value of this measure to 1, the better the fit between the model and the data. With a small number of cases, say 5 to 10, it is important that this measure be around .9 or above in value. You can also determine the quality of a particular application through the use of the [E] and [D'] keys, which are used for projecting values. You can input the values of the independent or dependent variable, determine the projected values, and compare these projected values to the actual observed values. If there is a close correspondence, then you can have confidence in the projections of the unknown values.



USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 10	
2	Initialize		[2nd] [E′]	0.
3	Choose the type of curve			
	a. Linear	x	[A]	x†
		y†	[R/S]	number of pairs
	b. Exponential	x	[B]	x†
		y†	[R/S]	number of pairs
	c. Logarithmic	x	[C]	x†
		y†	[R/S]	number of pairs
	d. Power	x	[R/S]	x†
		y†	[R/S]	number of pairs
	(Repeat Step 3 for all cases)			
4	Delete data			
	a. Enter x	x	[D]	x†
	b. Enter y	y	[R/S]	y†
5	Calculate coefficient of determination		[2nd] [C′]	r^2 †
6	Calculate coefficients before computing estimated points		[2nd] [A′]	a (intercept)†
			[2nd] [B′]	b (slope)†
7	Compute estimated point for			
	x′ given y	y	[2nd] [D′]	x′†
	y′ given x	x	[E]	y′†

NOTES:

1. For the exponential, power, and logarithmic curves, the following conditions must be met for the independent (x) and dependent (y) variables or the display will flash:

exponential	$y > 0$
power	$y > 0, x > 0$
logarithmic	$x > 0$

† These values are printed if the PC-100A is connected.

Register Contents

R_{00}	R_{05} Σx^2, $\Sigma \ln x^2$	R_{10}	R_{15} b	R_{20}
R_{01} Σy, $\Sigma \ln y$	R_{06} Σxy, $\Sigma \ln xy$	R_{11}	R_{16} a	R_{21}
R_{02} Σy^2, $\Sigma \ln y^2$	R_{07} Used	R_{12}	R_{17} Used	R_{22}
R_{03} n	R_{08}	R_{13}	R_{18}	R_{23}
R_{04} Σx, $\Sigma \ln x$	R_{09}	R_{14} Used	R_{19}	R_{24}

Example 1: The following data has been compiled for an established mail order business. Assume a **linear** relationship between the number of advertisements and sales volumes, what would sales be if the number of ads were increased to 21,000? 22,000?

Ads	Sales
15,000	$13,800,000
16,500	15,300,000
17,000	15,800,000
18,000	16,900,000
20,000	19,100,000

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 10	
2	Initialize		[2nd] [E′]	0.
3	Enter Values:			
	Ads, Year 1 (x)	15000	[A]	15000.†
	Sales, Year 1 (y)	13800000†	[R/S]	1.
	Ads, Year 2	16500	[A]	16500.†
	Sales, Year 2	15300000†	[R/S]	2.
	Ads, Year 3	17000	[A]	17000.†
	Sales, Year 3	15800000†	[R/S]	3.
	Ads, Year 4	18000	[A]	18000.†
	Sales, Year 4	16900000†	[R/S]	4.
	Ads, Year 5	20000	[A]	20000.†
	Sales, Year 5	19100000†	[R/S]	5.
5	Calculate r^2		[2nd] [C′]	.9992395663†
7	Analyze data fit	15000	[E]	13733333.33†
		16500	[E]	15328985.51†
		17000	[E]	15860869.57†
		18000	[E]	16924637.68†
		20000	[E]	19052173.91†
7	Calculate Projected Values	21000	[E]	20115942.03†
		22000	[E]	21179710.14†

Example 2: Sales volume for a certain business was as follows:

Year	$ Volume
1	6500
2	7020
3	7581
4	8188
5	8843

What will the sales be the next two years, using the **exponential** curve fit?

†These values are printed if the PC-100A is connected.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 10	
2	Initialize		[2nd] [E′]	0.
3	Enter values:			
	Year (x)	1	[B]	1.†
	$ Volume (y)	6500†	[R/S]	1.
	Year	2	[B]	2.†
	$ Volume	7020†	[R/S]	2.
	Year	3	[B]	3.†
	$ Volume	7581†	[R/S]	3.
	Year	4	[B]	4.†
	$ Volume	8188†	[R/S]	4.
	Year	5	[B]	5.†
	$ Volume	8843†	[R/S]	5.
5	Calculate r^2		[2nd] [C′]	.9999999356†
6	Calculate coefficient		[2nd] [A′]	6018.481187†
7	Analyze data fit	1	[E]	6499.923318†
		2	[E]	7019.877912†
		3	[E]	7581.425731†
		4	[E]	8187.893982†
		5	[E]	8842.87603†
7	Calculate projected values	6	[E]	9550.252684†
		7	[E]	10314.2152†

Example 3: Sales volume for a business had been as follows:

Year	$ Volume
1	3,000,000
2	7,500,000
3	10,500,000
4	12,500,000
5	14,000,000

What volume of sales would be projected for the following year using the **logarithmic** curve fit?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 10	
2	Initialize		[2nd] [E′]	0.
3	Enter values:			
	Year 1	1	[C]	1.†
	Sales volume	3000000†	[R/S]	1.
	Year 2	2	[C]	2.†
	Sales volume	7500000†	[R/S]	2.
	Year 3	3	[C]	3.†
	Sales volume	10500000†	[R/S]	3.
	Year 4	4	[C]	4.†
	Sales volume	12500000†	[R/S]	4.
	Year 5	5	[C]	5.†
	Sales volume	14000000†	[R/S]	5.

†These values are printed if the PC-100A is connected.

STEP	OPERATION	ENTER	PRESS	DISPLAY
5	Calculate r^2		[2nd] [C′]	.9994237914†
7	Analyze data fit	1	[E]	2912940.413†
		2	[E]	7681410.027†
		3	[E]	10470785.94†
		4	[E]	12449879.64†
		5	[E]	13984983.98†
7	Calculate projection	6	[E]	15239255.55†

Example 4: Assuming a **power** curve relationship between the number of sales associates and sales volume, what volume would be expected if the number of associates were increased to 25?

No. of Associates	$ Volume
10	40,000
12	57,600
15	90,000
18	129,600
20	160,000
23	211,600

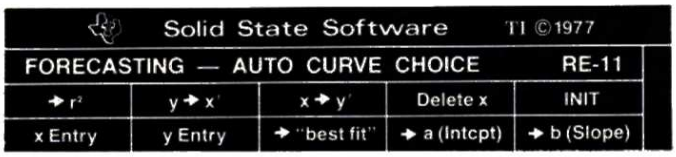
STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 10	
2	Initialize		[2nd] [E′]	0.
3	Enter values:			
	# Sales Associates	10	[R/S]	10.†
	Sales volume	40000†	[R/S]	1.
	# Sales Associates	12	[R/S]	12.†
	Sales volume	57600†	[R/S]	2.
	# Sales Associates	15	[R/S]	15.†
	Sales volume	90000†	[R/S]	3.
	# Sales Associates	18	[R/S]	18.†
	Sales volume	129600†	[R/S]	4.
	# Sales Associates	20	[R/S]	20.†
	Sales volume	160000†	[R/S]	5.
	# Sales Associates	23	[R/S]	23.†
	Sales volume	211600†	[R/S]	6.
5	Calculate r^2		[2nd] [C′]	1.†
6	Calculate coefficient		[2nd] [A′]	400.000001†
7	Analyze data fit	10	[E]	40000.00002†
		12	[E]	57600.00001†
		15	[E]	90000.†
		18	[E]	129600.†
		20	[E]	160000.†
		23	[E]	211599.9999†
7	Calculate projection	25	[E]	249999.9999†

†These values are printed if the PC-100A is connected.

FORECASTING: AUTOMATIC CURVE CHOICE

This program, like program RE-10, "Curve Fits", also computes the linear regression, exponential curve, power curve, and logarithmic curve solutions to the relationship between two variables. However, this program calculates the coefficients of determination for each of the four solutions and *automatically* selects the model which yields the highest coefficient of determination: the model which "best fits" the available data. Thus, the program provides the user with the model which is most appropriate for the available values. Nonetheless, although the user automatically obtains the best model, it may be the case that none of the four is particularly accurate in yielding predictions. So, it is a good idea to check the coefficient of determination for the model and to determine how well the model "predicts" the known values of the dependent variable.

RE-11



USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 11	
2	Initialize		[2nd] [E′]	0.
3	Enter x Enter y Repeat Step for all data pairs	x y†	[A] [B]	x† No. of pairs
4	Delete data x y		[2nd] [D′] [R/S]	x† y†
5	Determine best fit		[C]	1 = Linear† 2 = Power† 3 = Exponential† 4 = Logarithmic†
6	Calculate the coefficient of determination		[2nd] [A′]	r² †
7	Calculate coefficients		[D] [E]	a (intercept)† b (slope)†
8	Compute estimated value for: x′ given y y′ given x	 y x	 [2nd] [B′] [2nd] [C′]	 x′† y′†

NOTE: † These values are printed if the PC-100A is connected.

Register Contents

R_{00}	R_{05} Σx^2	R_{10} $\Sigma(\ln y)^2$	R_{15} b	R_{20} *
R_{01} Σy	R_{06} Σxy	R_{11} $\Sigma \ln x \ln y$	R_{16} a	R_{21}
R_{02} Σy^2	R_{07} $\Sigma \ln x$	R_{12} $\Sigma x \ln y$	R_{17} Used	R_{22}
R_{03} n	R_{08} $\Sigma(\ln x)^2$	R_{13} $\Sigma y \ln x$	R_{18} Used	R_{23}
R_{04} Σx	R_{09} $\Sigma \ln y$	R_{14} Used	R_{19} Used	R_{24}

*Registers 20 through 29 are used.

Example 1: You are interested in estimating the sale price of home you are listing. You have gathered information on a set of homes in the same neighborhood which are comparable to your listing, and you want to use this information to estimate the sale price of your house. You update the sale prices of the other homes, and then use the square footage of these houses as the basis of your estimated price. If your listing has an area of 1875 square feet, what do you estimate for its sale price?

Square Footage	Updated Sale Price
1700	$41000
1925	$45500
1850	$44000
1765	$42300
1900	$45000
1975	$46500
1875	**$44500**

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 11	
2	Initialize		[2nd] [E′]	0.
3	Enter:			
	square footage (x)	1700	[A]	1700.†
	sale price (y)	41000†	[B]	1.
	square footage	1925	[A]	1925.†
	sale price	45500†	[B]	2.
	square footage	1850	[A]	1850.†
	sale price	44000†	[B]	3.
	square footage	1765	[A]	1765.†
	sale price	42300†	[B]	4.
	square footage	1900	[A]	1900.†
	sale price	45000†	[B]	5.
	square footage	1975	[A]	1975.†
	sale price	46500†	[B]	6.
5	Determine best model		[C]	1.†
6	Compute r^2		[2nd] [A′]	1.†
8	Analyze data fit	1700	[2nd] [C′]	41000.†
		1925	[2nd] [C′]	45500.†
		1850	[2nd] [C′]	44000.†
		1765	[2nd] [C′]	42300.†
		1900	[2nd] [C′]	45000.†
		1975	[2nd] [C′]	46500.†
8	Project sale price	1875	[2nd] [C′]	44500.†

Now that you are getting the hang of this program, you may want to use it on the examples in the previous section for program RE-10, "Curve Fits". It might also be a good idea to try some of the "inappropriate" models for some of the examples, to determine the effects of these choices on the predicted values.

† These values are printed if the PC-100A is connected.

RE-12

INTERNAL RATE OF RETURN

Internal rate of return, which is a form of discounted cash flow analysis, is one of the most widely used measures of return in real estate investments. Essentially, the internal rate of return is compound interest in reverse, it discounts the cash flows arising from an investment at the interest rate at which they exactly equal the present value of the initial investment. The internal rate of return measure may be applied to both before-tax and after-tax cash flows, depending upon the information available to, and the interests of, the analyst.

The major assumptions of internal rate of return are as follows:

(1) the "time value" of money: because it works like compound interest in reverse, the technique is based on the assumption that "money now is better than money later"; future income streams are discounted more, as they are in all present value calculations due to the opportunity costs which arise from the fact that investments are passed by because the income necessary to make them is not yet available

(2) the initial investment is the initial cash outlay, not the total cost of the investment; in leveraged investments, which are practically all investments in real estate, only a portion of the price is covered through the initial payment; the remainder is covered by financing

(3) the income stream resulting from the investment can be reinvested at the calculated IRR

(4) negative cash flows are discounted at the same rate as positive cash flows

When utilizing IRR to compare alternative investments, the investments should be of similar capital outlays, duration, and risk. The IRR will provide a single measure for each which can be useful for comparing investments, but risk and other nonfinancial considerations must be taken into account, independent of the technique.

This program can be utilized to measure the yield from a wide variety of investments. It is capable of using any initial investment, and will accommodate up to 80 positive or negative cash flows, when used with the TI Programmable 59. Up to 40 cash flows can be handled with the TI Programmable 58.

USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 12	
2	Initialize		[2nd] [E′]	0.
3	Enter the following in order: 1 Cash flows 2 Investment			
	Cash flow (enter each cash flow)	CF†	[A]	CF#
	Investment	PV	[B]	PV†
4	To change a cash flow before the calculation has been made. This step can be repeated as many times as necessary	CF# New CF	[2nd] [A′] [2nd] [B′]	CF# New CF
5	Solve for internal rate of return		[C]	IRR†
6	To change a cash flow after the calculation has been made. This step may be repeated as many times as necessary.	CF# New CF	[2nd] [A′] [2nd] [C′]	CF# New CF
7	After change, calculate IRR		[E]	IRR†**
8	To increase the capability of the program from 40 to 80 (10 to 40) cash flows*	10 (6)	[2nd] [Op] 17	159.99 (0.59)
9	Upon completion of calculations, return to original mode, before proceeding to next program*	6 (3)	[2nd] [Op] 17	479.59 (239.29)

NOTES: † These values are printed if the PC-100A is connected.
* Numbers in parenthesis are for TI Programmable 58. Be sure to press [2nd] [Fix] 9 before repartitioning.
** Relatively long calculating time for the step.

Register Contents

R_{00}		R_{05}	$\Sigma CFn \times n$	R_{10}	Used	R_{15}	R_{20}	Cash flows	
R_{01}	Counter	R_{06}	Used	R_{11}	Used	R_{16}	R_{21}		
R_{02}	N	R_{07}	Used	R_{12}	Used	R_{17}	R_{22}		
R_{03}	PV	R_{08}	Used	R_{13}		R_{18}	R_{23}		
R_{04}	ΣCF_n	R_{09}	Used	R_{14}		R_{19}	R_{24}		

RE-12

Example 1: E.S. West III, noted land speculator, purchased a parcel of 20 acres at $5,000 an acre. He paid $10,000 down and obtained a $90,000 mortgage at 8.5% interest for 25 years. Five years later, he sold the entire parcel for $170,000. If his annual taxes were $1,700, what was his IRR on the investment?

initial investment = $10,000
annual debt service on the mortgage = $725 × 12 = $8700
taxes + annual debt service = cash flow = $10,400
balance on the mortgage at the time of sale = $83,542.36

YEAR	CASH FLOW
1	−$10,400
2	−$10,400
3	−$10,400
4	−$10,400
5	$170,000 − $10,400 − $83,542.36 = $76,057.64

Internal Rate of Return = **13.2955**

What if he had sold the land for $200,000?

YEAR	CASH FLOW
1	−$10,400
2	−$10,400
3	−$10,400
4	−$10,400
5	$200,000 − $10,400 − $83,542.36 = $106,057.64

Internal Rate of Return = **25.2030**

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 12	
2	Initialize		[2nd] [E′]	0.
3	Enter cash flows in order:			
	1st cash flow	10400†	[+/−] [A]	1.00
	2nd cash flow	10400†	[+/−] [A]	2.00
	3rd cash flow	10400†	[+/−] [A]	3.00
	4th cash flow	10400†	[+/−] [A]	4.00
	5th cash flow	76057.64†	[A]	5.00
4	Enter initial investment	10000	[B]	10000.00†*
5	Compute internal rate of return		[C]	13.2955†
6	Enter new reversion	5	[2nd] [A′]	5.
		106057.64	[2nd] [C′]	106057.64
7	Compute internal rate of return		[E]	25.2030†

†These values are printed if the PC-100A is connected.
*Number of cash flows is also printed.

Example 2: A developer purchased a parcel of land and constructed an apartment complex. His down payment was $500,000. If his after-tax cash flows, including reversion, were as follows, what was his after-tax IRR?

YEAR	AFTER-TAX CASH FLOW
1	–$ 95,775
2	–$ 177,450
3	$ 30,760
4	$ 109,615
5	$ 139,975
6	$ 140,225
7	$ 122,720
8	$ 177,647
9	$ 109,922
10	$ 105,771
11	$ 104,629
12	$1,108,450

Internal Rate of Return = **12.5682**

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 12	
2	Initialize		[2nd] [E′]	0.
3	Enter cash flows in order:			
	1st cash flow	95775†	[+/–] [A]	1.00
	2nd cash flow	177450†	[+/–] [A]	2.00
	3rd cash flow	30760†	[A]	3.00
	4th cash flow	109615†	[A]	4.00
	5th cash flow	139975†	[A]	5.00
	6th cash flow	140225†	[A]	6.00
	7th cash flow	122720†	[A]	7.00
	8th cash flow	177647†	[A]	8.00
	9th cash flow	109922†	[A]	9.00
	10th cash flow	105771†	[A]	10.00
	11th cash flow	104629†	[A]	11.00
	12th cash flow	1108450†	[A]	12.00
4	Enter initial investment	500000	[B]	500000.00†*
			[C]	12.5682†

†These values are printed if PC-100A is connected.
*Number of cash flows is also printed.

Example 3: What was Humphrey Mumford's after-tax IRR on Valle Magnifico Apartments? (See Program RE-13, "Cash Flow Analysis", example 1.)

Internal Rate of Return = **10.1416**

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 12	
2	Initialize		[2nd] [E′]	0.
3	Enter cash flows in order:			
	1st cash flow	2043.45†	[+/–] [A]	1.00
	2nd cash flow	8254.20†	[A]	2.00
	3rd cash flow	8230.83†	[A]	3.00
	4th cash flow	8227.99†	[A]	4.00
	5th cash flow	3883.02†	[A]	5.00
	6th cash flow	2368.35†	[A]	6.00
	7th cash flow	2290.15†	[A]	7.00
	8th cash flow	550.48†	[A]	8.00
	9th cash flow	2736.89†	[+/–] [A]	9.00
	10th cash flow	2723.23†	[+/–] [A]	10.00
	11th cash flow	2722.39†	[+/–] [A]	11.00
	12th cash flow	179390.03†	[A]	12.00
4	Enter initial investment	75000	[B]	75000.00†
5	Compute IRR		[C]	10.1416†

†These values are printed if the PC-100A is connected.

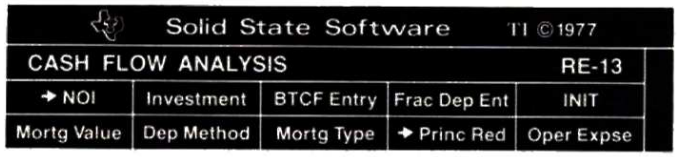
CASH FLOW ANALYSIS

The cash flow analysis program provides the basis for a systematic analysis of particular real estate investments and for the comparison of alternative investments. It allows the investor to determine the income stream from an investment, the effects of financing and other expenses, and the tax consequences which arise from the investment.

This program calculates the payments to principal and interest on available mortgages, depreciation schedules, net operating income, taxable income, the before-tax cash flows and after-tax cash flows, and the proceeds arising from sale of the property. This information can then be utilized for discounted cash flow analysis, should the investor or broker desire.

The program is capable of performing the necessary financing computations for up to three mortgages, and it performs these computations on standard simple mortgages, mortgages with balloon payments, standing mortgages, and constant payment to principal loans. It is capable of computing depreciation schedules for straight line method, declining balance method, and the sum-of-the-years'-digits method.

Two of the tax computations performed in the analysis of sale proceeds provide *estimates* of the tax consequences of the sale of the property, and *not* the precise figures for the individual investor. Both estimates provide the *maximum* taxable income, and they would overestimate the investor's tax liabilities, if anything. Thus, they provide a conservative analysis of the investor's gain from sale. The excess depreciation calculation computes the depreciation deducted in excess of the straight line method, and therefore gives the maximum amount of depreciation subject to recapture as ordinary income. The capital gains tax liabilities calculations are based upon rates of 25% for the first $50,000 and 35% for any gain in excess of $50,000. Again, these are the maximum rates, and they may result in overestimates for particular investors. Nonetheless, they provide a reasonable, if conservative, basis for the analysis of particular investments.



USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 13	
2	Initialize		[2nd] [E′]	0.
3	Inputs must be in order:[1]			
	a. Mortgage	PV†	[A]	PV
	b. Remaining term	Term†	[R/S]	Term
	c. Periods/yr	Periods†	[R/S]	Periods
	d. Interest rate	Rate†	[R/S]	Rate
	e. Payment/period (On mortgages with balloon payment — enter balloon payment here; on standing mortgages enter 0 here; for constant payment to principal loans, enter principal payment)	PMT†	[R/S]	PMT
	f. Building value	SBV†	[R/S]	SBV
	g. Depreciation factor or salvage	FACT, SAL†	[R/S]	FACT, SAL
	h. Life	Life†	[R/S]	Life
	i. Type of depreciation (Building) 1 — Straight Line 2 — Declining Balance 3 — Sum-of-Years'-Digits	Type†	[B]	Type
	j. Personal property	Amount†	[R/S]	Amount
	k. Depreciation factor or salvage value	FACT, SAL†	[R/S]	FACT, SAL
	l. Life of personal property	Life†	[R/S]	Life
	m. Type of depreciation (Personal Property) 1 — Straight Line 2 — Declining Balance 3 — Sum-of-Years'-Digits	Type†	[B]	Type
	n. Enter 1 or fraction	1 or Frac.†	[R/S]	1 or Frac.
	o. Type of mortgage 1 — Amortized 2 — Amortized with balloon payment 3 — Constant payment to principal loan or standing mortgage	Type†	[C]	Type
4	Compute prinicpal reduction when principal is paid (see Note 2), for standing mortgage, enter principal and add to figure in display to obtain total principal reduction		[D]	Principal Reduction†*
5	Enter gross income	gross income	[R/S]	Gross Income†
6	Enter vacancy and credit losses			
	a. Enter 0 if amount is known; then enter amount	0 V&C Losses	[R/S] [R/S]	1.00 V&C Losses†
	b. Enter 1 if you want value computed; then enter percentage	1 %	[R/S] [R/S]	1.00 V&C Losses†

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
7	Enter operating expenses	Op. Exp.	[E]	Op. Exp.†
8	Enter growth rate %	%	[R/S]	%†
9	Compute net operating income		[2nd] [A′]	NOI†
10	Enter non-operating expenses	Non-op. exp.	[R/S]	Non-op. exp.
11	Compute interest		[R/S]	Interest†
12	Compute depreciation		[R/S]	Depreciation†
13	Compute taxable income		[R/S]	Taxable Inc.†
14	Enter funded reserves	Funded res.	[R/S]	Funded res.
15	Enter capital additions	Cap. add.	[R/S]	Cap. add.†
16	Cash flow before taxes a. Compute b. Enter	 CF	 [R/S] [2nd] [C′]	 CF before taxes† CF before taxes†
17	Enter tax bracket (%)	%	[R/S]	Income tax†
18	Compute cash flow after taxes		[R/S]	CF after taxes†
	Repeat Steps 4-18 for each year of the total term, then go to Step 19.			
19	Enter original investment	OI	[2nd] [B′]	OI†
20	Enter capital improvements	CI	[R/S]	CI†
21	Enter costs of sale	COS	[R/S]	COS†
22	Total depreciation a. Compute b. Enter in case of fractional years	 Amount	 [R/S] [2nd] [D′]	 Total dep.† Total dep.†
23	Enter partial sales	Partial sale	[R/S]	Part. sales†
24	Compute adjusted basis		[R/S]	Adju. basis†
25	Enter total S.L. depreciation	SL Dep.	[R/S]	SL Dep.†
26	Compute excess depreciation		[R/S]	Excs. Dep.†
27	Enter % of excess counted on total tax liability	%	[R/S]	%†
28	Enter sales price	Price	[R/S]	Price†
29	Compute capital gain		[R/S]	Cap. gain†
30	Compute total tax liability		[R/S]	Total tax†
31	Compute proceeds after taxes		[R/S]	Proc. after tax†

NOTES:

1. For more than one mortgage, enter data for all mortgages by repeating Step 3 as required.
2. For initial year new mortgages take effect, store the new number of mortgages in Register 15 before pressing [D].
3. If an input value is not applicable, enter a 0.
4. If net operating income is changing by a growth rate or is not changing, Steps 5, 6, 7, and 8 may be skipped.
5. To enter a new value for net operating income, enter the amount and press [STO] 53.
6. To enter a new value for growth rate, enter rate and press [÷] 100 [=] [STO] 07.
7. The power-up partition must be changed on the TI Programmable 58 before running this program. The key sequence required if 6 [2nd] [Op] 17.

† These values are printed if the PC-100A is connected.

* Relatively long calculating time for this step.

RE-13

Register Contents

R_{00}	R_{05} B PMT	R_{10} Used	R_{15} Sum	R_{20} Interest Rate
R_{01} N	R_{06} Used	R_{11} Used	R_{16} Sum	R_{21} Payment/ Period
R_{02} %I	R_{07} Used	R_{12} Used	R_{17} Mortgage	R_{22} Building Value
R_{03} PMT	R_{08} I/100	R_{13} Used	R_{18} Term	R_{23} Dep FACT or SAL Value
R_{04} PV	R_{09} I/100 + 1	R_{14} Used	R_{19} Period	R_{24} Life, Type

R_{25} Personal Property	R_{30} Term	R_{35} Dep FACT SAL	R_{40} Starting Year	R_{45} Payment/ Period
R_{26} Salvage, Factor	R_{31} Period	R_{36} Life, Type	R_{41} Mortgage	R_{46} Building Value
R_{27} Life + Type	R_{32} Interest Rate	R_{37} Personal Property	R_{42} Term	R_{47} FACT or SAL
R_{28} Starting Year	R_{33} Payment/ Period	R_{38} SAL, FACT	R_{43} Period	R_{48} Life, Type
R_{29} Mortgage	R_{34} Building Value	R_{39} LIFE + TYPE	R_{44} Interest Rate	R_{49} Personal Property

R_{50} SAL, FACT	R_{55} No. of Years	R_{60}	R_{65}	R_{70}
R_{51} LIFE + TYPE	R_{56} Used	R_{61}	R_{66}	R_{71}
R_{52} Starting Year	R_{57} Used	R_{62}	R_{67}	R_{72}
R_{53} Net Income	R_{58} Used	R_{63}	R_{68}	R_{73}
R_{54} Used	R_{59} Used	R_{64}	R_{69}	R_{74}

Example: Humphrey Mumford enjoys investing. In fact, he enjoys investing so much that he appreciates cash outflows as much as he does inflows – just so something is happening. Fortunately, his accountant and property managers have managed to keep him solvent.

Humphrey purchased Valle Magnifico Apartments 12 years ago (building $510,000, land $50,000) paying $75,000 down, and assuming a $485,000 mortgage (our story is set in 1984) at 9% for 20 years. He assumed ownership on July 1, 1973 and began mortgage payments and depreciation deductions in that month. His net operating income increased at an approximate rate of 3% per year, no thanks to him, until increasing utility costs caused a disruption in the schedule.

A few years down the line, Humphrey needed extra cash to finance speculative investment in Belize and Mauritania. His first mortgage had a fifteen year lock-in period, and besides, he did not want to sacrifice the then favorable financing terms, so on April 1, 1977 he took out a second mortgage for $70,000 at 9.5% for 15 years. His investments continued to get the better of him, and on January 1, 1980 he arranged a standing mortgage of $30,000 at 10% for 10 years.

As the length of the holding period increased, his deductions for depreciation and interest payments became smaller, and the investment became a burden. Fortunately, he had a "friend" who was in the market for a used apartment complex, and Humphrey was able to unload Valle Magnifico for $750,000 on December 31, 1984.

Determine his cash after taxes for each of the 12 years of ownership and also determine his proceeds after taxes for the sale of the property.

In addition to the information above the following applies to the mortgages.

First Mortgage: monthly payments of $4365, starting book value $510,000, depreciation factor of 2 for declining balance depreciation with life of 40 years.

Second Mortgage: monthly payments of $731

Third Mortgage: payments are made semi-annually

The following operating data is also available from his records on RNMI form 1-75-F612 (Cash Flow Analysis).

Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Total gross income	50000	103000	106100	109300	112600	116000	119500	123100	126800	130600	134500	138500
Vacancy & credit losses	10000	5150	5305	5465	5630	5800	5975	6155	6340	6530	6725	6925
Operating expenses	22500	41200	42440	43720	45040	46400	47800	49240	56500	57750	59000	60000
Growth rate	0	0	0	0	0	0	0	0	0	0	0	0
Non-operating expenses	0	0	0	0	0	0	0	0	0	0	0	0
Funded reserves	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	0
Capital additions	0	0	0	0	0	0	0	0	0	0	0	0
Tax bracket %	45	45	45	45	45	45	45	45	45	45	45	45

The costs of the sale of the property were $52,500. Straight line depreciation at this point was $146,625 and tax on excess depreciation is figured at 45%.

Now enter the data in the program.

RE-13

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program*		[2nd] [Pgm] 13	
2	Initialize		[2nd] [E′]	0.
	Mortgage 1			
3	Enter:			
	a. Mortgage	485000†	[A]	485000.
	b. Remaining term	20†	[R/S]	20.
	c. Periods/yr	12†	[R/S]	12.
	d. Interest rate	9†	[R/S]	9.
	e. Payment/period	4365†	[R/S]	4365.
	f. Building value	510000†	[R/S]	510000.
	g. Depreciation factor	2†	[R/S]	2.
	h. Life	40†	[R/S]	40.
	i. Type of depreciation	2†	[B]	2.
	j. Personal property	0†	[R/S]	0.
	k. Salvage value	0†	[R/S]	0.
	l. Life	0†	[R/S]	0.
	m. Type of depreciation	1†	[B]	1.
	n. Fraction of year	.5†	[R/S]	0.5
	o. Type of mortgage	1†	[C]	1.
	Mortgage 2			
3	Enter:			
	a. Mortgage	70000†	[A]	70000.
	b. Remaining term	15†	[R/S]	15.
	c. Periods/yr	12†	[R/S]	12.
	d. Interest rate	9.5†	[R/S]	9.5
	e. Payment/period	731†	[R/S]	731.
	f. Building value	0†	[R/S]	0.
	g. Salvage value	0†	[R/S]	0.
	h. Life	0†	[R/S]	0.
	i. Type of depreciation	1†	[B]	1.
	j. Personal property	0†	[R/S]	0.
	k. Salvage value	0†	[R/S]	0.
	l. Life	0†	[R/S]	0.
	m. Type of depreciation	1†	[B]	1.
	n. Fraction of year	.75†	[R/S]	.75
	o. Type of mortgage	1†	[C]	1.
	Mortgage 3			
3.	Enter:			
	a. Mortgage	30000†	[A]	30000.
	b. Remaining term	10†	[R/S]	10.
	c. Periods/yr	2†	[R/S]	2.
	d. Interest rate	10†	[R/S]	10.
	e. Payment/period	0†	[R/S]	0.
	f. Building value	0†	[R/S]	0.
	g. Salvage value	0†	[R/S]	0.
	h. Life	0†	[R/S]	0.
	i. Type of depreciation	1†	[B]	1.
	j. Personal property	0†	[R/S]	0.

†These values are printed if the PC-100A is connected.
*Remember to repartition the TI Programmable 58.

STEP	OPERATION	ENTER	PRESS	DISPLAY
3	Enter:			
	k. Salvage value	0†	[R/S]	0.
	l. Life	0†	[R/S]	0.
	m. Type of depreciation	1†	[B]	1.
	n. Fraction of year	1†	[R/S]	1.
	o. Type of mortgage	3†	[C]	3.
	1973 Operations			
4	Set for one mortgage	1	[STO] 15	1.
	Compute principal reduction		[D]	4447.67†*
5	Enter gross income	50000	[R/S]	50000.00†
6	a. V&C losses known	0	[R/S]	1.00
	Enter V&C losses	10000	[R/S]	10000.00†
7	Enter operating expenses	22500	[E]	22500.00†
8	Enter growth rate	0	[R/S]	0.†
9	Compute net op. income		[2nd] [A′]	17500.00†
10	Enter non-op. expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	21742.33†
12	Compute depreciation		[R/S]	12750.00†
13	Compute taxable income		[R/S]	−16992.33†
14	Enter funded reserves	1000	[R/S]	1000.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	−9690.00†
17	Enter tax %, compute tax	45	[R/S]	−7646.55†
18	Compute cash flow after taxes		[R/S]	−2043.45†
	1974 Operations			
4	Compute principal reduction		[D]	9516.49†*
5	Enter gross income	103000	[R/S]	103000.00†
6	a. V&C losses known	0	[R/S]	1.00†
	Enter V&C losses	5150	[R/S]	5150.00†
7	Enter operating expenses	41200	[E]	41200.00†
8	Enter growth rate	0	[R/S]	0.†
9	Compute net op. income		[2nd] [A′]	56650.00†
10	Enter non-op. expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	42863.51†
12	Compute depreciation		[R/S]	24862.50†
13	Compute taxable income		[R/S]	−11076.01†
14	Enter funded reserves	1000	[R/S]	1000.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	3270.00†
17	Enter tax %, compute tax	45	[R/S]	−4984.20†
18	Compute cash flow after taxes		[R/S]	8254.20†

†These values are printed if the PC-100A is connected.
*Relatively long calculating time for this step.

STEP	OPERATION	ENTER	PRESS	DISPLAY
	1975 Operations			
4	Compute principal reduction		[D]	10409.20†*
5	Enter gross income	106100	[R/S]	106100.00†
6	a. V&C losses known	0	[R/S]	1.00
	Enter V&C losses	5305	[R/S]	5305.00†
7	Enter operating expenses	42440	[E]	42440.00†
8	Enter growth rate	0	[R/S]	0.†
9	Compute net op. income		[2nd] [A′]	58355.00†
10	Enter non-op. expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	41970.80†
12	Compute depreciation		[R/S]	23619.37†
13	Compute taxable income		[R/S]	−7235.17†
14	Enter funded reserves	1000	[R/S]	1000.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	4975.00†
17	Enter tax %, compute tax	45	[R/S]	−3255.83†
18	Compute cash flow after taxes		[R/S]	8230.83†
	1976 Operations			
4	Compute principal reduction		[D]	11385.66†*
5	Enter gross income	109300	[R/S]	109300.00†
6	a. V&C losses known	0	[R/S]	1.00
	Enter V&C losses	5465	[R/S]	5465.00†
7	Enter operating expenses	43720	[E]	43720.00†
8	Enter growth rate	0	[R/S]	0.†
9	Compute net op. income		[2nd] [A′]	60115.00†
10	Enter non-op. expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	40994.34†
12	Compute depreciation		[R/S]	22438.41†
13	Compute taxable income		[R/S]	−3317.75†
14	Enter funded reserves	1000	[R/S]	1000.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	6735.00†
17	Enter tax %, compute tax	45	[R/S]	−1492.99†
18	Compute cash flow after taxes		[R/S]	8227.99†
	1977 Operations			
4	Set for two mortgages	2	[STO] 15	2.00
	Compute principal reduction		[D]	14096.55†
5	Enter gross income	112600	[R/S]	112600.00†*
6	a. V&C losses known	0	[R/S]	1.00
	Enter V&C losses	5630	[R/S]	5630.00†
7	Enter operating expenses	45040	[E]	45040.00†
8	Enter growth rate	0	[R/S]	0.00†
9	Compute net op. income		[2nd] [A′]	61930.00†
10	Enter non-op. expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	44862.45†
12	Compute depreciation		[R/S]	21316.49†

†These values are printed if the PC-100A is connected.
*Relatively long calculating time for this step.

STEP	OPERATION	ENTER	PRESS	DISPLAY
13	Compute taxable income		[R/S]	−4248.93†
14	Enter funded reserves	1000	[R/S]	1000.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	1971.00†
17	Enter tax %, compute tax	45	[R/S]	−1912.02†
18	Compute cash flow after taxes		[R/S]	3883.02†
	1978 Operations			
4	Compute principal reduction		[D]	16001.88†*
5	Enter gross income	116000	[R/S]	116000.00†
6	a. V&C losses known	0	[R/S]	1.00
	Enter V&C losses	5800	[R/S]	5800.00†
7	Enter operating expenses	46400	[E]	46400.00†
8	Enter growth rate	0	[R/S]	0.†
9	Compute net op. income		[2nd] [A′]	63800.00†
10	Enter non-op. expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	45150.12†
12	Compute depreciation		[R/S]	20250.66†
13	Compute taxable income		[R/S]	−1600.78†
14	Enter funded reserves	1000	[R/S]	1000.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	1648.00†
17	Enter tax %, compute tax	45	[R/S]	−720.35†
18	Compute cash flow after taxes		[R/S]	2368.35†
	1979 Operations			
4	Compute principal reduction		[D]	17515.92†*
5	Enter gross income	119500	[R/S]	119500.00†
6	a. V&C losses known	0	[R/S]	1.00
	Enter V&C losses	5975	[R/S]	5975.00†
7	Enter operating expenses	47800	[E]	47800.00†
8	Enter growth rate	0	[R/S]	0.†
9	Compute net op. income		[2nd] [A′]	65725.00†
10	Enter non-op. expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	43636.08†
12	Compute depreciation		[R/S]	19238.13†
13	Compute taxable income		[R/S]	2850.79†
14	Enter funded reserves	1000	[R/S]	1000.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	3573.00†
17	Enter tax %, compute tax	45	[R/S]	1282.85†
18	Compute cash flow after taxes		[R/S]	2290.15†

†These values are printed if the PC-100A is connected.
*Relatively long calculating time for this step.

STEP	OPERATION	ENTER	PRESS	DISPLAY
	1980 Operations			
4	Set for three mortgages	3	[STO] 15	3.00
	Compute principal reduction		[D]	19173.26†*
5	Enter gross income	123100	[R/S]	123100.00†
6	a. V&C losses known	0	[R/S]	1.00
	Enter V&C losses	6155	[R/S]	6155.00†
7	Enter operating expenses	49240	[E]	49240.00†
8	Enter growth rate	0	[R/S]	0.†
9	Compute net op. income		[2nd] [A′]	67705.00†
10	Enter non-op. expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	44978.74†
12	Compute depreciation		[R/S]	18276.22†
13	Compute taxable income		[R/S]	4450.04†
14	Enter funded reserves	1000	[R/S]	1000.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	2553.00†
17	Enter tax %, compute tax	45	[R/S]	2002.52†
18	Compute cash flow after taxes		[R/S]	550.48†
	1981 Operations			
4	Compute principal reduction		[D]	20987.49†*
5	Enter gross income	126800	[R/S]	126800.00†
6	a. V&C losses known	0	[R/S]	1.00
	Enter V&C losses	6340	[R/S]	6340.00†
7	Enter operating expenses	56500	[E]	56500.00†
8	Enter growth rate	0	[R/S]	0.†
9	Compute net op. income		[2nd] [A′]	63960.00†
10	Enter non-op. expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	43164.51†
12	Compute depreciation		[R/S]	17362.41†
13	Compute taxable income		[R/S]	3433.08†
14	Enter funded reserves	1000	[R/S]	1000.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	−1192.00†
17	Enter tax %, compute tax	45	[R/S]	1544.89†
18	Compute cash flow after taxes		[R/S]	−2736.89†
	1982 Operations			
4	Compute principal reduction		[D]	22973.47†*
5	Enter gross income	130600	[R/S]	130600.00†
6	a. V&C losses known	0	[R/S]	1.00
	Enter V&C losses	6530	[R/S]	6530.00†
7	Enter operating expenses	57750	[E]	57750.00†
8	Enter growth rate	0	[R/S]	0.†
9	Compute net op. income		[2nd] [A′]	66320.00†
10	Enter non-op expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	41178.53†

†These values are printed if the PC-100A is connected.
*Relatively long calculating time for this step.

STEP	OPERATION	ENTER	PRESS	DISPLAY
12	Compute depreciation		[R/S]	16494.29†
13	Compute taxable income		[R/S]	8647.17†
14	Enter funded reserves	1000	[R/S]	1000.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	1168.00†
17	Enter tax %, compute tax	45	[R/S]	3891.23†
18	Compute cash flow after taxes		[R/S]	−2723.23†
	1983 Operations			
4	Compute principal reduction		[D]	25147.44†*
5	Enter gross income	134500	[R/S]	134500.00†
6	a. V&C losses known	0	[R/S]	1.00
	Enter V&C losses	6725	[R/S]	6725.00†
7	Enter operating expenses	59000	[E]	59000.00†
8	Enter growth rate	0	[R/S]	0.†
9	Compute net op. income		[2nd] [A′]	68775.00†
10	Enter non-op. expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	39004.56†
12	Compute depreciation		[R/S]	15669.58†
13	Compute taxable income		[R/S]	14100.86†
14	Enter funded reserves	1000	[R/S]	1000.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	3623.00†
17	Enter tax %, compute tax	45	[R/S]	6345.39†
18	Compute cash flow after taxes		[R/S]	−2722.39†
	1984 Operations			
4	Compute principal reduction		[D]	27527.23†*
5	Enter gross income	138500	[R/S]	138500.00†
6	a. V&C losses known	0	[R/S]	1.00
	Enter V&C losses	6925	[R/S]	6925.00†
7	Enter operating expenses	60000	[E]	60000.00†
8	Enter growth rate	0	[R/S]	0.†
9	Compute net op. income		[2nd] [A′]	71575.00†
10	Enter non-op. expenses	0	[R/S]	0.00†
11	Compute interest		[R/S]	36624.77†
12	Compute depreciation		[R/S]	14886.10†
13	Compute taxable income		[R/S]	20064.13†
14	Enter funded reserves	0	[R/S]	0.00†
15	Enter capital additions	0	[R/S]	0.00†
16	Compute cash flow before taxes		[R/S]	7423.00†
17	Enter tax %, compute tax	45	[R/S]	9028.86†
18	Compute cash flow after taxes		[R/S]	−1605.86†

†These values are printed if the PC-100A is connected.
*Relatively long calculating time for this step.

RE-13

STEP	OPERATION	ENTER	PRESS	DISPLAY
	Proceeds of Sale			
19	Enter original investment	560000	[2nd] [B′]	560000.00†
20	Enter capital improvments	0	[R/S]	0.00†
21	Enter costs of sale	52500	[R/S]	52500.00†
22	Compute total depreciation		[R/S]	227164.15†
23	Enter partial sales	0	[R/S]	0.00†
24	Compute adjusted basis		[R/S]	385335.85†
25	Enter total S.L. depreciation	146625	[R/S]	146625.00†
26	Compute excess depreciation		[R/S]	80539.15†
27	Enter % of tax on excess	45	[R/S]	45.0000†
28	Enter sales price	750000	[R/S]	750000.00†
29	Compute capital gain		[R/S]	284125.00†
30	Compute total tax liability		[R/S]	130686.37†
31	Compute proceeds after taxes		[R/S]	180995.89†

METHOD

The following equation is used to calculate the reduction to principal of an amortized mortgage:

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

where:

PR = Principal Reduction
PV = Present Value
PMT = Payment/Period
N = Number of Periods
i = Interest Rate Per Period

Net Operating Income = Total Gross Income – Vacancy and Credit Losses – Operating Expenses

Taxable Income = Net Operating Income – Non-Operating Expenses – Interest Paid on all Mortgages – Depreciation

Cash Flow Before Taxes = Net Operating Income – Total Mortgage Payments – Funded Reserves – Capital Additions

Cash Flow After Taxes = Cash Flow Before Taxes – Tax Bracket % × Taxable Income

Adjusted Basis = Original Investment + Capital Improvements + Costs of Sale – Depreciation – Partial Sales

Excess Depreciation = Total Depreciation – Straight Line Depreciation

†These values are printed if PC-100A is connected.

Capital Gain = Sales Price – Adjusted Basis – Excess Depreciation

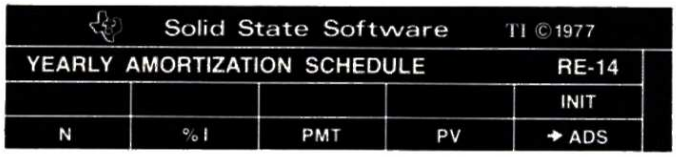
Total Tax Liability = 100% of Excess Over Basis + 25% of 1st $50,000 in Capital Gains + 30% of Capital Gains Over $50,000

Sales Proceeds After Taxes = Sales Price – Sales Costs – Outstanding Mortgage Balance(s) – Total Tax Liability

YEARLY AMORTIZATION SCHEDULE

This program calculates the payments to principal and interest, as well as the remaining balance, for each year in the life of the mortgage. It also calculates the total payments to principal and interest up to that point.

For comparative purposes, the program also computes the annual debt service and mortgage constant for the mortgage.



USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program 02		**[2nd] [Pgm] 02**	
2	Initialize		**[2nd] [E′]** **[2nd] [C′]**	0. 0.
3	Enter known variables in any order:			
	N (in months)	N	**[A]**	N†
	i (in percent/month)	i	**[B]**	i†
	Monthly payment	PMT	**[C]**	PMT†
	Present value	PV	**[D]**	PV†
4	To solve for the unknown, enter zero, then press the appropriate key			
	N	0	**[A]**	N†
	i%	0	**[B]**	i†
	PMT	0	**[C]**	PMT†
	PV	0	**[D]**	PV†
5	Select program 14		**[2nd] [Pgm] 14**	
6	Compute annual debt service		**[E]**	ADS†
7	Compute mortgage constant %		**[R/S]**	Mort. C %†
8	Compute first year		**[R/S]**	1.†
9	To see payment to principal		**[RCL] 10**	Prin. pmt.
	To see payment to interest		**[RCL] 11**	Int. PMT
	To see total pmt to principal		**[RCL] 19**	Tot. prin.
	To see total pmt to interest		**[RCL] 18**	Tot. int.
	To see remaining balance		**[RCL] 04**	Rem. bal.
10	Compute next year		**[R/S]**	Year no.†
11	Go to Step 9			

NOTE: † These values are printed when the PC-100A is connected.

Register Contents

R_{00}		R_{05}	Used	R_{10}	Principal PMT	R_{15}	Annual Debt Serv	R_{20}	
R_{01}	N	R_{06}	Year No.	R_{11}	Interest Rate	R_{16}		R_{21}	
R_{02}	% i	R_{07}	Used	R_{12}	Used	R_{17}	Used	R_{22}	
R_{03}	PMT	R_{08}	i	R_{13}	Used	R_{18}	Total Interest	R_{23}	
R_{04}	PV	R_{09}	i + 1	R_{14}	Used	R_{19}	Total Principal	R_{24}	

Example: Compute the first year of the amortization schedule for a $42,500 mortgage at 8.5% interest, with a term of 20 years.

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Call Annuities program		[2nd] [Pgm] 02	
2	Initialize		[2nd] [E′] [2nd] [C′]	0.
3	Enter:			
	Term of mortgage	20	[x] 12 [=] [A]	240.†
	Interest rate	8.5	[÷] 12 [=] [B]	0.7083†
	Value of mortgage	42500	[D]	42500.00†
4	Compute monthly payment	0	[C]	368.82†
5	Call Amortization Schedule program		[2nd] [Pgm] 14	368.82†
6	Compute annual debt service		[E]	4425.90†
7	Compute mortgage constant		[R/S]	10.41†
8	Compute 1st year of schedule (Note: With PC-100A Printer, each year of schedule is printed when [R/S] key is pressed)		[R/S]	1.00
9	To display:			
	Remaining balance		[RCL] 04	41654.15
	Principal payments		[RCL] 10	845.85
	Interest payments		[RCL] 11	3580.05
	Total payment to principal		[RCL] 19	845.85
	Accumulated interest		[RCL] 18	3580.05
10	To compute next year		[R/S]	2.00†
11	Return to Step 9			

†These values are printed if the PC-100A is connected.

INVESTMENT FEASIBILITY PROGRAM

The investment feasibility model is used to determine the quality of a real estate investment based on the cost of money, the income produced from the property, and the risks involved. It can also be used to determine the required income based on a desired return on equity; or the risks involved can be determined based on a required return on equity and the income produced. The five variables used in this model are:

$$\text{Net Income} = \text{Gross Rent} - (\text{Gross Rent} \times \text{Vacancy Rate}) - \text{Operating Expense}$$

$$\text{Debt Coverage} = \frac{\text{Net Income}}{\text{Debt Service or (Interest + Principal Payment)}}$$

$$\text{Mortgage Constant} = \frac{\text{Debt Service}}{\text{Loan Amount}}$$

$$\text{Return on Equity} = \frac{\text{Net Income} - \text{Debt Service}}{\text{Down Payment}}$$

Property Price = Available loan amount + down payment compatible with desired return on equity

USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 15	
2	Enter net income, if known	Net Income	[A]	Net Income†
3	Enter debt coverage ratio, if known	Debt Coverage	[B]	Debt Coverage†
4	Enter mortgage constant %, if known	Mort. Constant	[C]	Mort. Constant†
5	Enter return on equity %, if known	Return on Equity	[D]	Return on Equity†
6	Enter price, if known	Price	[E]	Price†
7	To solve for net income		[2nd] [A′]	Net Income†
8	To solve for debt coverage ratio		[2nd] [B′]	Debt Cov. Ratio†
9	To solve for mortgage constant		[2nd] [C′]	Mort. Constant†
10	To solve for return on equity		[2nd] [D′]	Return on Equity†
11	To solve for price		[2nd] [E′]	Price†
12	Execute Steps 2-6 as necessary to change known factors			
13	Execute Steps 7, 8, 9, 10, or 11 to solve for new unknown factor			
14	For a new problem, go to Step 2			

NOTE: † These values are printed if the PC-100A is connected.

Register Contents

R_{00}		R_{05} Price	R_{10}	R_{15}	R_{20}
R_{01}	Net Income	R_{06}	R_{11}	R_{16}	R_{21}
R_{02}	Debt Coverage Ratio	R_{07}	R_{12}	R_{17}	R_{22}
R_{03}	Mortgage Constant	R_{08}	R_{13}	R_{18}	R_{23}
R_{04}	Return on Equity	R_{09}	R_{14}	R_{19}	R_{24}

RE-15

Example: An investor is considering buying an apartment house if he can realize a 10% return on his investment. The apartment produces a gross rent of $30,000.00 per year. Vacancies and bad debts account for 10% of the rent and operating expense is $3,000.00 per year. The mortgage company requires a mortgage constant of at least 11% on its loans; and it feels the investor can qualify for a loan if the debt coverage ratio is 1.2 or greater. What is the maximum price the investor should pay for the apartment and what are the terms of the loan if current interest rates are 9.5%?

Solution:

Gross Income	$30,000
Vacancy Cost ($30,000 × .1)	−3,000
Operating Expense	−3,000
Net Income	$24,000

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 15	
2	Enter net income	24000	[A]	24000.†
3	Enter debt coverage ratio	1.2	[B]	1.20000†
4	Enter mortgage constant	11	[C]	11.0†
5	Enter return on equity	10	[D]	10.000†
6	Solve for price		[2nd] [E′]	221818.†

METHOD

Let A = Net Income
B = Debt Coverage Ratio
C = Mortgage Constant
D = Return on Equity
E = Price

Then $$A = \frac{BE}{1/C + B/D + 1/D}$$

$$B = \frac{A/C\ (D - C)}{D\ E - A}$$

$$C = \frac{AD}{B\ D\ E - B\ A + A}$$

$$D = \frac{A\ C\ (B - 1)}{B\ C\ E - A}$$

$$E = \frac{A\ (D + C\ B - C)}{B\ C\ D}$$

To evaluate an investment in any income producing property where the majority of the purchase price must be financed, there are four factors which primarily determine the quality of the investment. These are:

Net Income – This is the income after allowance for all expenses. For example, if an apartment house is being evaluated, net income is the gross potential income less vacancy costs and less operating costs. If the property is being considered as a tax shelter, the tax savings and depreciation allowance can be added to net income.

Debt Coverage Ratio – This is a measure of the investment risk. It is the ratio of net income to debt service. A high risk investment would be where net income would just cover interest payments.

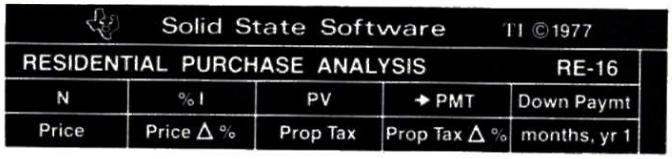
Mortgage or Loan Constant – This is a measure of the cost of money. It is the ratio of debt service to the loan amount. Since debt service can vary by the going interest rate and the amortization schedule, the mortgage constant will vary as a function of the type of financing planned. However, it will normally be about one percentage point above the interest rate on home mortgages (except for balloon notes) or about 10%.

Return on Equity – This is a measure of the profit on the investment. It is the ratio of cash flow to down payment. It should be at least as good as the rate on other similar risk investment opportunities.

RE-16

RESIDENTIAL PURCHASE ANALYSIS

This program calculates the total monthly payment (mortgage + property taxes), the income tax deductions, and the equity buildup resulting from the purchase of a home. The program will also compute any of the mortgage variables, so that salespeople and their clients can play "what if?" with a variety of homes and mortgages. When used in conjunction with the PC-100A Print/Security Cradle, the program will provide a five-year schedule of these values, which is especially important in allowing the clients to see the increase in their equity position over time.



USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		**[2nd] [Pgm] 16**	
2	Initialize		**[SBR] [CLR]**	0.00
3	Enter term of loan	Years	**[2nd] [A′]**	Term (mos.)†
4	Enter annual interest rate	i%	**[2nd] [B′]**	i% (%/mo.)†
5	Enter mortgage amount	PV	**[2nd] [C′]**	PV†
6	Compute monthly mortgage payment	0	**[2nd] [D′]**	PMT†
7	Enter down payment	$	**[2nd] [E′]**	Down payment†
8	Enter sale price	$	**[A]**	Price†
9	Enter market appreciation rate	Annual %	**[B]**	Mkt. app. rate†
10	Enter annual taxes	$	**[C]**	Taxes†
11	Enter annual tax increase rate	%	**[D]**	Tax Inc. rate†
12	Enter months left in first year	Months	**[E]**	Monthly PMT, mortg † taxes†
13	Compute equity buildup		**[R/S]**	Total equity buildup†
14	Compute income tax deductions		**[R/S]**	Income tax deductions†
15	For subsequent years, go to Step 13			

NOTE: † These values are printed if the PC-100A is connected.

Register Contents

R_{00}		R_{05}	BAL	R_{10}	Used	R_{15}	Down PMT	R_{20}	
R_{01}	N	R_{06}	Used	R_{11}	Used	R_{16}	Sale Price	R_{21}	
R_{02}	%I	R_{07}	Used	R_{12}	Used	R_{17}	Used	R_{22}	
R_{03}	PMT	R_{08}	I ÷ 100	R_{13}	Used	R_{18}	Taxes/12	R_{23}	Months
R_{04}	PV	R_{09}	I ÷ 100 + 1	R_{14}	Used	R_{19}	Tax inc. rate	R_{24}	Used
								R_{25}	Months

Example: John and Martha Pankratz are interested in purchasing a particular house. The sale price of the property is $50,000, and they would be able to pay $7,500 down. They should be able to obtain a $42,500 mortgage at 8.5% interest for 25 years. The annual property taxes are $850 and are expected to increase at a rate of 5% per year. The homes in the area have been appreciating in value at a rate of about 6% per year. Assume that they will take possession of the house on July 1, 1977. What is their equity buildup and income tax deductions for the first two years?

STEP	OPERATION	ENTER	PRESS	DISPLAY
1	Select program		[2nd] [Pgm] 16	
2	Initialize		[SBR] [CLR]	0.00
3	Enter term of mortgage, in years	25	[2nd] [A′]	300.†
4	Enter interest rate	8.5	[2nd] [B′]	0.7083†
5	Enter value of mortgage	42500	[2nd] [C′]	42500.00†
6	Compute monthly mortgage payment	0	[2nd] [D′]	342.22†
7	Enter down payment	7500	[2nd] [E′]	7500.00†
8	Enter sale price	50000	[A]	50000.00†
9	Enter market value appreciation rate	6	[B]	6.00†
10	Enter annual property taxes	850	[C]	850.00†
11	Enter tax increase rate	5	[D]	5.00†
12	Enter number of months remaining in first year Display: monthly mortgage payment + property taxes	6†	[E]	413.05†
13	Compute equity buildup 1st yr.		[R/S]	9251.50†
14	Compute income tax deductions, 1st yr.		[R/S]	2226.83†
15	Compute equity buildup, 2nd yr.		[R/S]	12877.60†
16	Compute income tax deductions, 2nd yr.		[R/S]	4463.06†

†These values are printed if the PC-100A is connected.

APPENDIX A: PROGRAM REFERENCE DATA

Program Number	Title	No. of Steps	Data Reg. Used	Flags Used	SBR Levels	Paren. Levels	Calls Pgm.	Special Functions Used	x ≷ t	Abs Address	Fix Decimal Format	Program Number
01	Diagnostic	114	1-6, 9, 27, 28		1	4	9	N/A	X			01
02	Annuities	600	1-14	0-5	3	3	4		X	X	2, 4, 9	02
03	Remaining Balance	123	1-17	0-5	4	3	2		X		2	03
04	Compound Interest	199	1-4, 8, 9, 12	5	2	3			X	X	2, 4, 9	04
05	Straight Line Dep.	171	1-5		2	3			X	X	2	05
06	Declining Bal. Dep.	227	1-5, 7		3	3	5		X	X	2	06
07	SOYD Dep.	297	1-7		3	3	5		X	X	2	07
08	Component Dep.	312	1-19, 20→		5	3	5, 6, 7		X	X	2	08
09	Excess Dep. Recapture	444	1-28		4	3	5, 7		X	X	2	09
10	Curve Fits	370	1-7, 14-17	1-3, 7	2	3		Op 12-15	X	X		10
11	Auto Curve Choice	351	1-29	1-4	2	3	10	Op 12-15	X	X		11
12	Int. Rate of Return	264	1-12, 20→		0	3			X	X	4	12
13	Cash Flow Anal.	891	0-59	0-5, 7	5	3	2, 3, 5-7		X	X	2	13
14	Yearly Amor. Sched.	89	1-15, 17-19	0-5	4	2	2		X	X	2	14
15	Investment Feas. Anal.	215	1-5		0	2			X	X	0, 4, 5	15
16	Residential Par. Anal.	209	1-19, 23-25	0-5	3	3	2, 3		X		2	16
	Pointers & Counters	124										

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