

The
Home Buyer Income
Qualification Manual

1991 Supplement

Includes
Comprehensive
HP 17BII and HP 19BII
Routines

Also for use with
HP 17B and HP 19B

By John A. Tirone, J.D.

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By John A. Tirone, J.D.
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INTRODUCTION

This supplement covers the effect of the **Revenue Reconciliation Act of 1990** on the after-tax payment cost routines first published in the 1989 edition of "The Home Buyer Income Qualification Manual". In addition, four new buyer qualification routines are added which make extensive use of the LET and GET (L/G) function of the calculators.

The next series of changes reduce the number of characters in the original **PMT/INCOME** and **INCOME** algorithms. The amended versions of these routines save the user valuable storage memory. Examples, however, are not given of the routines in operation since they are identical in function and menu-label layout to the original routines which they amend. (These algorithms can be found after their tax-counterpart **MAXIMUM INCOME** routines for Parts I, II, and III.)

Finally, three combined routines are added which join the tax-counterpart **PMT/INCOME** and **ATAX** routines into separate tax-specific **PMT/INCOME/ATAX** routines. This enables the user to calculate the monthly payment for PITI (or PITI plus "other" expenses), annual income needed to qualify, and the average monthly after-tax payment cost, all in one routine. Examples are not given of these routines in operation since their functioning is identical to that of the **PMT/INCOME** and **ATAX** routines, though their menu-labels do not appear in the identical sequence. (These algorithms follow their amended tax-counterpart **PMT/INCOME** and **INCOME** routines.)

Impact of the Revenue Reconciliation Act of 1990

The after-tax payment cost routines in "The Home Buyer Income Qualification Manual" (copyright 1989) are affected by the addition of new section 68 of the Internal Revenue Code (IRC), added by the **Revenue Reconciliation Act of 1990**. Basically, IRC section 68 reduces itemized deductions for "high income" taxpayers. Since the major thrust of this IRC section is aimed at mortgage interest and real estate taxes, their deductibility will be somewhat limited for "high income" home buyers, thus increasing the buyer's monthly after-tax payment cost of owning a home.

The change became effective for tax years beginning with 1991. Consequently, an individual whose adjusted gross income (AGI) exceeds the "threshold amount" (\$100,000) will be required to reduce the amount of otherwise allowable itemized deductions by three percent of the "excess" income over \$100,000. For example, if a taxpayer has AGI of \$125,000 in 1991, his itemized deductions (which include mortgage interest and real estate taxes) must be reduced by three percent (3%) of \$25,000 ($.03 \times (\$125,000 - \$100,000)$). Therefore, his effective after-tax monthly housing cost will be somewhat higher (approximately 1% to 3%) due to the loss of a portion of the otherwise allowable deduction for mortgage interest and real estate taxes.

In no event, however, may the deduction-loss be more than eighty percent of the allowable deductions without counting the deductions for medical expenses, investment interest, casualty and theft losses, and allowable wagering losses. What this means is that no matter how high the buyer's income, the itemized deduction loss cannot exceed eighty percent of the allowable deductions. Said differently, no matter how high your income, IRC section 68 "caps" your itemized deduction losses at eighty

percent, thereby allowing you to use twenty percent of your otherwise allowable deductions.

In effect, the above limitation kicks-in when three percent (3%) of the buyer's income over \$100,000 is **greater** than twenty percent (20%) of the allowable deductions. In this case, the overriding **eighty percent limitation** controls and the buyer is permitted to deduct twenty percent of allowable itemized deductions.

TESTING FOR THE EIGHTY PERCENT LIMITATION CASE

This supplement includes three tax-specific sets of after-tax payment cost routines (TAX/YR; ASSESSMENT RATIO; and TAX AS A PERCENT OF PRICE) which follow the general format used in the main volume of this book. Also covered are four LET and GET (L/G)-based routines which use the ASSESSMENT RATIO method and TAX AS A PERCENTAGE OF PRICE. These routines do not use "conditional tests" (see your HP Owner's Manual for more on "conditional tests") addressed to the issue of the maximum buyer income which will trigger the **eighty percent rule**.

In the interest of keeping the size and complexity of the primary income qualification routines at a minimum, separate routines are given for estimating the maximum income which triggers the **rule**. This gives the user the option of dealing with the **eighty percent rule** or bypassing it altogether.

Short of testing every case, how do you determine when to limit the buyer's income in the after-tax payment cost routines to the maximum which triggers the **rule**? A suggested short-cut is simply to multiply the amount of the mortgage times 1.25. If the buyer's income is greater than this amount, test for **the** maximum income. If the computed maximum income is less than the buyer's actual (or projected) income, use the **computed maximum income** for the income

[\$INC] input into the after-tax adjusted routine you are working with. This procedure is not foolproof and should be used guardedly.

Caution: Your safest and most accurate course of action on this issue is to always test for the maximum income which triggers the **eighty percent rule**, and then use the computed amount if it is less than the buyer's actual (or projected) income.

DESIGN AND LIMITATION OF MAXIMUM INCOME ROUTINE

When working with a "high income" buyer who may have itemized deductions over and above mortgage interest, real estate taxes, and the (current) items not subject to the reach of IRC section 68, we simply cannot expect the buyer to launch-into an in-depth presentation of his overall tax-picture in order to facilitate the computation of an extremely accurate after-tax payment cost of the sale.

Clearly, the mathematical-side of the buyer income qualification process must stop someplace. Practically speaking, it must stop at the income tax deduction inquiry-level. Therefore, in some cases, this limitation will have an impact upon the accuracy of the after-tax payments computed with the routines covered in this supplement.

The **MAXIMUM INCOME routines** covered in this supplement are not designed to take into consideration itemized deductions over and above real estate taxes and mortgage interest. Practically speaking, it has to be that way. Therefore, it is suggested when making a presentation of the after-tax payment cost to a buyer whose itemized deduction losses may be capped by the **eighty percent rule**, the buyer should be informed that the computation's accuracy is based upon the assumption that there are no itemized deductions over and above real estate taxes, mortgage interest and the excluded items under IRC section 68

(medical expenses, investment interest, casualty and theft losses, and allowable wagering losses).

The LET and GET-Based Routines

Four new LET and GET-based routines enable the user to cover additional buyer qualification issues over and above those possible with the separate routines first published in the main volume of this book.

The first of the new routines--designated as the **INCOME.QUAL/ATAX routine**--enables the user to estimate (1) the buyer's monthly payment for PITI, (2) annual income needed to qualify, and (3) the projected average monthly after-tax payment cost of the purchase to the buyer. Coverage of this routine starts on page 31.

The second routine--designated the **MAX/PRICE routine**--was primarily designed to enable the user to estimate the maximum purchase price supported by the buyer's income. However, due to the power built into your calculator's equation SOLVER, you can estimate a number of additional financial variables, such as (1) the required down payment or (2) the income needed to qualify the buyer. This routine treats the down payment as a percentage of the purchase price; its coverage starts on page 46.

The third routine--designated the **MAX/PRICE1 routine**--performs the same kinds of computations as the MAX/PRICE routine, except it accepts the down payment as a fixed amount, rather than as a percentage of the purchase price. Its coverage starts on page 62.

The fourth routine--designated the **MAX/PRICE2 routine**--also solves for the maximum purchase price supported by the buyer's income. However, inputs for the down payment are accepted as a percentage of the purchase price and as a fixed amount. In this

respect, the routine duplicates the maximum price results obtained from the MAX/PRICE and the MAX/PRICE1 routines, **except** it does it all in a single computation. Coverage of this routine starts on page 76.

The four new routines accept inputs for real estate taxes using either of two methods: Taxes expressed as a percentage of the purchase price, or taxes produced by applying an assessment ratio and rate per \$1,000 of assessed value.

Hazard insurance (Home Owner's Insurance) is not treated as an annual amount in the new routines. Rather, it is **estimated as a percentage of price**. This change places the insurance expense financial issue on the same footing with the real estate tax issue.

Now, both real estate taxes and insurance expense will increase or decrease with the price of the property. Said differently, real estate taxes and insurance expense will **track** the price of the property, thus assuring a much greater degree of accuracy when estimating the maximum affordable home price supported by the buyer's income.

The new LET and GET-based routines were clearly designed to expand the level of computations possible with the routines originally published in the main volume of this book. However, the new routines do not in any manner supersede those originally published, nor are they intended to take the place of or supersede the new combined PMT/INCOME/ATAX routines. You should study each of the routines carefully in order to determine which is best for your purposes.

Caution: You should not go beyond the scope and level of the examples given in this supplement.

PART I

Revised AFTER-TAX PAYMENT COST ROUTINE

$$\begin{aligned} \text{ATAX} = & \%ITAX \times \#PMTS \times 0 + \text{PMT} - ((\text{PRICE} \\ & - \text{DOWN}) \times ((\text{USPV}(\text{I}\%YR \div 12:N - \#PMTS) + \\ & \#PMTS) \div \text{USPV}(\text{I}\%YR \div 12:N) - 1) \div \#PMTS \\ & + (\text{TAX/YR} - (\$INC - 100000) \times \text{RATE} \div \\ & 100) \div 12) \times \%ITAX \div 100 \end{aligned}$$

Your calculator will display the ATAX equation's menu-variables as follows:

[ATAX][%ITAX][#PMT][PMT][PRICE][MORE]

Pressing [MORE] brings up:

[DOWN][I%YR][N][TAX/Y][\\$INC][MORE]

Pressing [MORE] again brings up:

[RATE]

[MORE]

Revised Problem 3, Page 34

1. MONTHLY PAYMENT FOR PITI	\$1,809.49
2. PRICE OF HOME	\$175,000
3. DOWN PAYMENT	\$35,000
4. ANNUAL INTEREST RATE	10.75%
5. LOAN TERM (MONTHS)	360
6. ANNUAL REAL ESTATE TAX	\$5,564.13
7. BUYER'S INCOME TAX BRACKET	32%
8. HOLDING PERIOD (MONTHS)	1; 60; 360;
9. BUYER'S INCOME	\$125,000
10. RATE OF DEDUCTION LOSS FOR INCOME OVER \$100,000	3%

Compute the buyer's monthly after-tax payment cost both with and without taking into consideration the income over \$100,000.

<u>KEYSTROKES</u>	<u>DISPLAY</u>
[GOLD][INPUT]	0.00
1,809.49 [PMT]	PMT = 1,809.49
175,000 [PRICE]	PRICE = 175,000.00
[MORE]	
35,000 [DOWN]	DOWN = 35,000.00
10.75 [I%YR]	I%YR = 10.75
360 [N]	N = 360.00
5,564.13 [TAX/Y]	TAX/YR = 5,564.13
[MORE][MORE]	
1 [#PMT]	#PMTS = 1.00
32 [%ITAX]	%ITAX = 32.00
[ATAX]	ATAX = 1,259.78 *
60 [#PMT]	#PMTS = 60.00
[ATAX]	ATAX = 1,265.12 *
360 [#PMT]	#PMTS = 360.00
[ATAX]	ATAX = 1,367.36 *
[MORE]	
125,000 [\$INC]	\$INC = 125,000.00
[MORE]	
3 [RATE]	RATE = 3.00
[MORE]	
1 [#PMT]	#PMTS = 1.00
[ATAX]	ATAX = 1,279.78 *
60 [#PMT]	#PMTS = 60.00
[ATAX]	ATAX = 1,285.12 *
360 [#PMT]	#PMTS = 360.00
[ATAX]	ATAX = 1,387.36 *

* Emphasis added to starred answers.

PART I

Revised COMBINED PAYMENT ESTIMATOR & AFTER-TAX PAYMENT COST ROUTINE

PMT/ATAX: IF(S(PMT): (PRICE - DOWN) ÷
L(U:USPV(I%YR ÷ 12:N)) + (TAX/YR +
INS.YR + OTHER/YR) ÷ 12 - PMT: - ATAX
+ PMT - ((PRICE - DOWN) × ((USPV(I%YR
÷ 12:N - #PMTS) + #PMTS) ÷ G(U) - 1) ÷
#PMTS + (TAX/YR + %ITAX × 0 - (\$INC -
100000) × RATE ÷ 100) ÷ 12) × %ITAX ÷
100)

Your calculator will display the PMT/ATAX equation's
menu-variables as follows:

[PRICE][DOWN][I%YR][N][TAX/Y][MORE]

Pressing [MORE] brings up:

[INS.Y][OTHER][PMT][ATAX][#PMT][MORE]

Pressing [MORE] again brings up:

[%ITAX][\$INC][RATE] [MORE]

Revised Problem 4, Page 36

1. PRICE OF HOME	\$100,000
2. DOWN PAYMENT	\$20,000
3. ANNUAL INTEREST RATE	10%
4. LOAN TERM (MONTHS)	360
5. ANNUAL REAL ESTATE TAX	\$2,000
6. ANNUAL INSURANCE EXPENSE	\$225
7. "OTHER" EXPENSES	\$1,500
8. HOLDING PERIOD (MONTHS)	120
9. BUYER'S INCOME TAX BRACKET	33%
10. BUYER'S INCOME	\$125,000

11. RATE OF DEDUCTION LOSS FOR INCOME OVER \$100,000

Compute the monthly payment for PITI (plus OTHER expenses) and the average monthly after-tax payment cost. Next, compute the monthly after-tax payment cost considering the buyer's income.

<u>KEYSTROKES</u>	<u>DISPLAY</u>
[GOLD][INPUT]	0.00
100,000 [PRICE]	PRICE = 100,000.00
20,000 [DOWN]	DOWN = 20,000.00
10 [I%YR]	I%YR = 10.00
360 [N]	N = 360.00
2,000 [TAX/Y]	TAX/YR = 2,000.00
[MORE]	
225 [INS.Y]	INS.YR = 225.00
1,500 [OTHER]	OTHER/YR = 1,500.00
[PMT]	PMT = 1,012.47 *
[MORE]	
33 [%ITAX]	%ITAX = 33.00
[MORE][MORE]	
120 [#PMT]	#PMTS = 120.00
[ATAX]	ATAX = 745.73 *
[MORE]	
125,000 [\$INC]	\$INC = 125,000.00
3 [RATE]	RATE = 3.00
[MORE][MORE]	
[ATAX]	ATAX = 766.36 *

* Emphasis added to starred answers.

MAXIMUM INCOME ROUTINE
(Subject to the **eighty percent rule**)

$$\begin{aligned} \text{MAX/INC} = & 20 \div 3 \times ((\text{PRICE} - \text{DOWN}) \times \\ & ((\text{USPV}(\text{I\%YR} \div 12:\text{N} - \text{\#PMTS}) + \text{\#PMTS}) \\ & \div \text{USPV}(\text{I\%YR} \div 12:\text{N}) - 1) \div \text{\#PMTS} \times 12 \\ & + \text{TAX/YR}) + 100000 \end{aligned}$$

Your calculator will display the MAX/INC equation's menu-variables as follows:

[MAX/][PRICE][DOWN][I%YR][N][MORE]

Pressing [MORE] brings up:

[#PMT][TAX/Y] [MORE]

Problem

1. PRICE OF HOME	\$150,000
2. DOWN PAYMENT	\$45,000
3. ANNUAL INTEREST RATE	10%
4. TERM (MONTHS)	360
5. ANNUAL REAL ESTATE TAX	\$3,000
6. HOLDING PERIOD (MONTHS)	60
7. BUYER'S INCOME	\$200,000

Note: Insurance and OTHER expenses are not necessary for this computation.

Compute the maximum income subject to the three (3%) percent deduction loss for income over \$100,000.

Remember: This is an estimate and, if used, will understate the true maximum income if the buyer has deductions over and above real estate taxes, mortgage interest, medical expenses, investment interest, casualty and theft losses, and allowable wagering losses.

KEYSTROKESDISPLAY

[GOLD][INPUT]	0.00
150,000 [PRICE]	PRICE = 150,000.00
45,000 [DOWN]	DOWN = 45,000.00
10 [I%YR]	I%YR = 10.00
360 [N]	N = 360.00
[MORE]	
60 [#PMT]	#PMTS = 60.00
3,000 [TAX/Y]	TAX/YR = 3,000.00
[MORE]	
[MAX/]	MAX/INC = 188,920.06

Interpretation

Since the computed maximum income subject to the three (3%) percent itemized deduction loss under IRC section 68 is less than the buyer's actual income (\$200,000), you would use the **computed** income (\$188,920.06) in the after-tax payment cost equation [\$INC] you might be working with. The effect is to lower the amount of itemized deductions lost to IRC section 68, thereby effectively allowing more itemized deductions, and thus lowering the computed after-tax payment cost to the buyer.

PART I

Revised COMBINED PAYMENT ESTIMATOR & HOME OWNER'S INCOME-QUALIFICATION ROUTINE

The **PMT/INCOME** algorithm given on page 27 of the main volume of this book is amended as follows:

```
PMT/INCOME: IF(S(PMT): (PRICE - DOWN) ÷  
USPV(I%YR ÷ 12:N) + (TAX/YR + INS.YR +  
OTHER/YR) ÷ 12 - PMT: - INCOME + INV(  
%INC.RATIO ÷ 1200) × (PMT + DEBT/MO))
```

The menu-labels display as follows:

```
[PRICE][DOWN][I%YR][ N ][TAX/Y][MORE]
```

Pressing [MORE] brings up:

```
[INS.Y][OTHER][PMT][INCO][%INC.][MORE]
```

Pressing [MORE] again brings up:

```
[DEBT/] [MORE]
```

The **INCOME** algorithm given on page 38 of the book is amended as follows:

```
INCOME = ((PRICE - DOWN) ÷ USPV(I%YR ÷  
12: N) + (TAX/YR + INS.YR + OTHER/YR)  
÷ 12 + DEBT/MO) ÷ (%INC.RATIO ÷ 1200)
```

The menu-labels will display as follows:

```
[INCO][PRICE][DOWN][I%YR][ N ][MORE]
```

Pressing [MORE] brings up:

```
[TAX/Y][INS.Y][OTHER][DEBT/][%INC.][MORE]
```

PART I

COMBINED PAYMENT ESTIMATOR, HOME OWNER'S INCOME QUALIFICATION, AND AFTER-TAX PAYMENT COST ROUTINE

```
PMT/INCOME/ATAX: IF(S(PMT): L(P: PRICE -  
DOWN) ÷ L(U:USPV(I%YR ÷ 12:N)) + (TAX/YR  
+ INS.YR + OTHER/YR) ÷ 12 - PMT: IF(S(  
INCOME): - INCOME + INV(%INC.RATIO ÷ 1200) ×  
(PMT + DEBT/MO): - ATAX + PMT - ((G(P) × ((  
USPV(I%YR ÷ 12:N - #PMTS) + #PMTS) ÷ G(U) - 1) ÷  
#PMTS + (TAX/YR + %ITAX × 0 - ($INC - 100000)  
× RATE ÷ 100) ÷ 12) × %ITAX ÷ 100)))
```

The menu-labels will display as follows:

[PRICE][DOWN][I%YR][N][TAX/Y][MORE]

Pressing [MORE] brings up:

[INS.Y][OTHER][PMT][INCO][%INC.][MORE]

Pressing [MORE] again brings up:

[DEBT/][ATAX][#PMT][%ITAX][\$INC][MORE]

Pressing [MORE] again brings up:

[RATE]

[MORE]

Instructions: The equation works exactly like the PMT/INCOME and ATAX routines, except the three functions represented by the two separate routines are combined together into one new routine.

This routine accepts data inputs in the same manner as the PMT/INCOME and ATAX routines. However, you are restricted to solving for: **PITI**, or PITI plus "other" expenses; annual income needed to qualify (**INCO**); and the average monthly after-tax payment cost (**ATAX**) to the buyer. Do not try to solve for any other variable with this routine.

PART II

Revised AFTER-TAX PAYMENT COST ROUTINE

$$\begin{aligned} \text{ATAX} = & \% \text{ITAX} \times \# \text{PMTS} \times 0 + \text{PMT} - ((\text{PRICE} \\ & - \text{DOWN}) \times ((\text{USPV}(\text{I}\% \text{YR} \div 12 : \text{N} - \# \text{PMTS}) + \\ & \# \text{PMTS}) \div \text{USPV}(\text{I}\% \text{YR} \div 12 : \text{N}) - 1) \div \# \text{PMTS} \\ & + (\text{PRICE} \div 1\text{E}5 \times \text{A}\% / \text{PRICE} \times \text{TAX} / \$1000 - \\ & (\$ \text{INC} - 100000) \times \text{RATE} \div 100) \div 12) \\ & \times \% \text{ITAX} \div 100 \end{aligned}$$

Your calculator will display the ATAX equation's menu-variables as follows:

[ATAX][%ITAX][#PMT][PMT][PRICE][MORE]

Pressing [MORE] brings up:

[DOWN][I%YR][N][A%/PR][TAX/][MORE]

Pressing [MORE] again brings up:

[\$INC][RATE] [MORE]

Revised Problem 3, Page 49

1. MONTHLY PAYMENT FOR PITI	\$2,120.60
2. PRICE OF HOME	\$250,000
3. DOWN PAYMENT	\$50,000
4. ANNUAL INTEREST RATE	9.75%
5. LOAN TERM (MONTHS)	360
6. TAX ASSESSMENT RATIO	90%
7. TAX RATE/\$1,000 ASSESSED VALUE	\$15.90
8. HOLDING PERIOD (MONTHS)	180
9. BUYER'S INCOME TAX BRACKET	33%
10. BUYER'S INCOME	\$150,000
11. RATE OF DEDUCTION LOSS FOR INCOME OVER \$100,000	3%

Compute the buyer's monthly after-tax payment cost both with and without taking into consideration the income over \$100,000.

<u>KEYSTROKES</u>	<u>DISPLAY</u>
[GOLD][INPUT]	0.00
2,120.60 [PMT]	PMT = 2,120.60
250,000 [PRICE]	PRICE = 250,000.00
[MORE]	
50,000 [DOWN]	DOWN = 50,000.00
9.75 [I%YR]	I%YR = 9.75
360 [N]	N = 360.00
90 [A%/PR]	A%/PRICE = 90.00
15.90 [TAX/]	TAX/\$1000 = 15.90
[MORE][MORE]	
180 [#PMT]	#PMTS = 180.00
33 [%ITAX]	%ITAX = 33.00
[ATAX]	ATAX = 1,524.47 *
[MORE][MORE]	
150,000 [\$INC]	\$INC = 150,000.00
3 [RATE]	RATE = 3.00
[MORE]	
[ATAX]	ATAX = 1,565.72 *

* Emphasis added to starred answers.

PART II

Revised COMBINED PAYMENT ESTIMATOR & AFTER-TAX PAYMENT COST ROUTINE

PMT/ATAX: IF(S(PMT): (PRICE - DOWN) ÷
L(U:USPV(I%YR ÷ 12:N)) + (L(T:PRICE ÷
1E5 × A%/PRICE × TAX/\$1000) + INS.YR +
OTHER/YR) ÷ 12 - PMT: - ATAX + PMT -
((PRICE - DOWN) × ((USPV(I%YR ÷ 12: N
- #PMTS) + #PMTS) ÷ G(U) - 1) ÷ #PMTS +
(G(T) + %ITAX × 0 - (\$INC - 100000) ×
RATE ÷ 100) ÷ 12) × %ITAX ÷ 100)

Your calculator will display the PMT/ATAX equation's
menu-variables as follows:

[PRICE][DOWN][I%YR][N][A%/PR][MORE]

Pressing [MORE] brings up:

[TAX/][INS.Y][OTHER][PMT][ATAX][MORE]

Pressing [MORE] again brings up:

[#PMT][%ITAX][\$INC][RATE] [MORE]

Revised Problem 4, Page 51

1. PRICE OF HOME	\$125,000
2. DOWN PAYMENT	\$25,000
3. ANNUAL INTEREST RATE	9 7/8%
4. LOAN TERM (MONTHS)	360
5. ASSESSMENT RATIO	50%
6. TAX RATE/\$1,000 ASSESSED VALUE	\$31.95
7. ANNUAL INSURANCE EXPENSE	\$275
8. "OTHER" EXPENSES	\$1,400
9. HOLDING PERIOD (MONTHS)	120
10. BUYER'S INCOME TAX BRACKET	33%

11. BUYER'S INCOME	\$125,000
12. RATE OF DEDUCTION LOSS FOR INCOME OVER \$100,000	3%

Compute the monthly payment for PITI (plus OTHER expenses) and the average monthly after-tax payment cost. Next, compute the monthly after-tax payment cost considering the buyer's income.

KEYSTROKES

DISPLAY

[GOLD][INPUT]	0.00
125,000 [PRICE]	PRICE = 125,000.00
25,000 [DOWN]	DOWN = 25,000.00
9.875 [I%YR]	I%YR = 9.88
360 [N]	N = 360.00
50 [A%/PR]	A%/PRICE = 50.00
[MORE]	
31.95 [TAX/]	TAX/\$1000 = 31.95
275 [INS.Y]	INS.YR = 275.00
1,400 [OTHER]	OTHER/YR = 1,400.00
[PMT]	PMT = 1,174.34 *
[MORE]	
120 [#PMT]	#PMTS = 120.00
33 [%ITAX]	%ITAX = 33.00
[MORE][MORE]	
[ATAX]	ATAX = 858.28 *
[MORE]	
125,000 [\$INC]	\$INC = 125,000.00
3 [RATE]	RATE = 3.00
[MORE][MORE]	
[ATAX]	ATAX = 878.90 *

* Emphasis added to starred answers.

MAXIMUM INCOME ROUTINE
(Subject to the **eighty percent rule**)

$$\begin{aligned} \text{MAX/INC} = & 20 \div 3 \times ((\text{PRICE} - \text{DOWN}) \times \\ & ((\text{USPV}(\text{I\%YR} \div 12:\text{N} - \text{\#PMTS}) + \text{\#PMTS}) \\ & \div \text{USPV}(\text{I\%YR} \div 12:\text{N}) - 1) \div \text{\#PMTS} \times 12 \\ & + \text{PRICE} \div 1\text{E}5 \times \text{A\%/PRICE} \times \text{TAX}/\$1000) \\ & + 100000 \end{aligned}$$

Your calculator will display the MAX/INC equation's menu-variables as follows:

[MAX/][PRICE][DOWN][I%YR][N][MORE]

Pressing [MORE] brings up:

[#PMT][A%/PR][TAX/] [MORE]

Problem

1. PRICE OF HOME	\$450,000
2. DOWN PAYMENT	\$150,000
3. ANNUAL INTEREST RATE	9.5%
4. TERM (MONTHS)	240
5. TAX ASSESSMENT RATIO	40%
6. TAX RATE/\$1,000 ASSESSED VALUE	\$31.25
7. HOLDING PERIOD (MONTHS)	60
8. BUYER'S INCOME	\$375,000

Note: Insurance and OTHER expenses are not necessary for this computation.

Compute the maximum income subject to the three (3%) percent deduction loss for income over \$100,000.
Remember: This is an estimate and, if used, will understate the true maximum income if the buyer has deductions over and above real estate taxes, mortgage interest, medical expenses, investment

interest, casualty and theft losses, and allowable wagering losses.

KEYSTROKES

DISPLAY

[GOLD][INPUT]	0.00
450,000 [PRICE]	PRICE = 450,000.00
150,000 [DOWN]	DOWN = 150,000.00
9.5 [I%YR]	I%YR = 9.50
240 [N]	N = 240.00
[MORE]	
60 [#PMT]	#PMTS = 60.00
40 [A%/PR]	A%/PRICE = 40.00
31.25 [TAX/]	TAX/\$1000 = 31.25
[MORE]	
[MAX/]	MAX/INC = 318,273.03

Interpretation

Since the computed maximum income subject to the three (3%) percent itemized deduction loss under IRC section 68 is less than the buyer's actual income (\$375,000), you would use the **computed income** (\$318,273.03) in the after-tax payment cost equation [\$INC] you might be working with. The effect is to lower the amount of itemized deductions lost to IRC section 68, thereby effectively allowing more itemized deductions, and thus lowering the computed after-tax payment cost to the buyer.

PART II

Revised COMBINED PAYMENT ESTIMATOR & HOME OWNER'S INCOME-QUALIFICATION ROUTINE

The **PMT/INCOME** algorithm given on page 42 of the main volume of this book is amended as follows:

PMT/INCOME: IF(S(PMT): (PRICE - DOWN) ÷
USPV(I%YR ÷ 12:N) + (PRICE ÷ 1E5 ×
A%/PRICE × TAX/\$1000 + INS.YR + OTHER/
YR) ÷ 12 - PMT: %INC.RATIO × 0 - INCOME
+ (PMT + DEBT/MO) ÷ (%INC.RATIO ÷ 1200))

The menu-labels display as follows:

[PRICE][DOWN][I%YR][N][A%/PR][MORE]

Pressing [MORE] brings up:

[TAX/][INS.Y][OTHER][PMT][%INC.][MORE]

Pressing [MORE] again brings up:

[INCO][DEBT/] [MORE]

The new **INCOME** algorithm for page 53 follows:

INCOME = ((PRICE - DOWN) ÷ USPV(I%YR ÷
12: N) + (A%/PRICE × TAX/\$1000 × PRICE ÷
1E5 + INS.YR + OTHER/YR) ÷ 12 + DEBT/MO)
÷ (%INC.RATIO ÷ 1200)

The menu-labels will display as follows:

[INCO][PRICE][DOWN][I%YR][N][MORE]

Pressing [MORE] brings up:

[A%/PR][TAX/][INS.Y][OTHER][DEBT/][MORE]

Pressing [MORE] brings up:

[%INC.] [MORE]

PART II

COMBINED PAYMENT ESTIMATOR, HOME OWNER'S INCOME QUALIFICATION, AND AFTER-TAX PAYMENT COST ROUTINE

```
PMT/INCOME/ATAX: IF(S(PMT): L(P: PRICE -  
DOWN) ÷ L(U:USPV(I%YR ÷ 12:N)) + (L(T:  
PRICE ÷ 1E5 × A%/PRICE × TAX/$1000) + INS.YR  
+ OTHER/YR) ÷ 12 - PMT: IF(S(INCOME): (PMT  
+ DEBT/MO) ÷ (%INC.RATIO ÷ 1200) - INCOME:  
- ATAX + PMT - ((G(P) × ((USPV(I%YR ÷ 12:N -  
#PMTS) + #PMTS) ÷ G(U) - 1) ÷ #PMTS + (G(T)  
+ %ITAX × 0 - ($INC - 100000) × RATE ÷ 100)  
÷ 12) × %ITAX ÷ 100)))
```

The menu-labels will display as follows:

[PRICE][DOWN][I%YR][N][A%/PR][MORE]

Pressing [MORE] brings up:

[TAX/][INS.Y][OTHER][PMT][DEBT/][MORE]

Pressing [MORE] again brings up:

[%INC.][INCO][ATAX][#PMT][%ITAX][MORE]

Pressing [MORE] again brings up:

[\$INC][RATE] [MORE]

Instructions: The equation works exactly like the PMT/INCOME and ATAX routines, except the three functions represented by the two separate routines are combined together into one new routine.

This routine accepts data inputs in the same manner as the PMT/INCOME and ATAX routines. However, you are restricted to solving for: **PITI**, or PITI plus "other" expenses; annual income needed to qualify (**INCO**); and the average monthly after-tax payment cost (**ATAX**) to the buyer. Do not try to go solve for any other variable with this routine.

PART III

Revised AFTER-TAX PAYMENT COST ROUTINE

$$\begin{aligned} \text{ATAX} = & \%ITAX \times \#PMTS \times 0 + \text{PMT} - ((\text{PRICE} \\ & - \text{DOWN}) \times ((\text{USPV}(\%YR \div 12:N - \#PMTS) + \\ & \#PMTS) \div \text{USPV}(\%YR \div 12:N) - 1) \div \#PMTS \\ & + (\text{PRICE} \times \text{TAX\%/PRICE} \div 100 - (\$INC - \\ & 100000) \times \text{RATE} \div 100) \div 12) \times \%ITAX \div 100 \end{aligned}$$

Your calculator will display the ATAX equation's menu-variables as follows:

[ATAX][%ITAX][#PMT][PMT][PRICE][MORE]

Pressing [MORE] brings up:

[DOWN][%YR][N][TAX%/][\$INC][MORE]

Pressing [MORE] again brings up:

[RATE]

[MORE]

Revised Problem 3, Page 64

1. MONTHLY PAYMENT FOR PITI	\$1,809.49
2. PRICE OF HOME	\$175,000
3. DOWN PAYMENT	\$35,000
4. ANNUAL INTEREST RATE	10.75
5. LOAN TERM (MONTHS)	360
6. TAX RATIO	3.1795%
7. BUYER'S INCOME TAX BRACKET	32%
8. HOLDING PERIOD (MONTHS)	1; 60; 360.
9. BUYER'S INCOME	\$125,000
10. RATE OF DEDUCTION LOSS FOR INCOME OVER \$100,000	3%

Compute the buyer's monthly after-tax payment cost both with and without taking into consideration the income over \$100,000.

<u>KEYSTROKES</u>	<u>DISPLAY</u>
[GOLD][INPUT]	0.00
1,809.49 [PMT]	PMT = 1,809.49
175,000 [PRICE]	PRICE = 175,000.00
[MORE]	
35,000 [DOWN]	DOWN = 35,000.00
10.75 [I%YR]	I%YR = 10.75
360 [N]	N = 360.00
3.1795 [TAX%/]	TAX%/PRICE = 3.18
[MORE][MORE]	
1 [#PMT]	#PMTS = 1.00
32 [%ITAX]	%ITAX = 32.00
[ATAX]	ATAX = 1,259.78 *
60 [#PMT]	#PMTS = 60.00
[ATAX]	ATAX = 1,265.12 *
360 [#PMT]	#PMTS = 360.00
[ATAX]	ATAX = 1,367.36 *
[MORE]	
125,000 [\$INC]	\$INC = 125,000.00
[MORE]	
3 [RATE]	RATE = 3.00
[MORE]	
1 [#PMT]	#PMTS = 1.00
[ATAX]	ATAX = 1,279.78 *
60 [#PMT]	#PMTS = 60.00
[ATAX]	ATAX = 1,285.12 *
360 [#PMT]	#PMTS = 360.00
[ATAX]	ATAX = 1,387.36 *

* Emphasis added to starred answers.

PART III

Revised COMBINED PAYMENT ESTIMATOR & AFTER-TAX PAYMENT COST ROUTINE

PMT/ATAX: IF(S(PMT): (PRICE - DOWN) ÷
L(U:USPV(I%YR ÷ 12: N)) + (L(T:PRICE ×
TAX%/PRICE ÷ 100) + INS.YR + OTHER/YR)
÷ 12 - PMT: - ATAX + PMT - ((PRICE -
DOWN) × ((USPV(I%YR ÷ 12:N - #PMTS) +
#PMTS) ÷ G(U) - 1) ÷ #PMTS + (G(T) +
%ITAX × 0 - (\$INC - 100000) × RATE ÷
100) ÷ 12) × %ITAX ÷ 100)

Your calculator will display the PMT/ATAX equation's
menu-variables as follows:

[PRICE][DOWN][I%YR][N][TAX%/][MORE]

Pressing [MORE] brings up:

[INS.Y][OTHER][PMT][ATAX][#PMT][MORE]

Pressing [MORE] again brings up:

[%ITAX][\$INC][RATE] [MORE]

Revised Problem 4, Page 66

1. PRICE OF HOME	\$100,000
2. DOWN PAYMENT	\$20,000
3. ANNUAL INTEREST RATE	10%
4. LOAN TERM (MONTHS)	360
5. TAX RATIO	2%
6. ANNUAL INSURANCE EXPENSE	\$225
7. "OTHER" EXPENSES	\$1,500
8. HOLDING PERIOD (MONTHS)	120
9. BUYER'S INCOME TAX BRACKET	33%
10. BUYER'S INCOME	\$125,000

11. RATE OF DEDUCTION LOSS FOR 3%
INCOME OVER \$100,000.

Compute the monthly payment for PITI (plus OTHER expenses) and the average monthly after-tax payment cost. Next, compute the monthly after-tax payment cost considering the buyer's income.

<u>KEYSTROKES</u>	<u>DISPLAY</u>
[GOLD][INPUT]	0.00
100,000 [PRICE]	PRICE = 100,000.00
20,000 [DOWN]	DOWN = 20,000.00
10 [I%YR]	I%YR = 10.00
360 [N]	N = 360.00
2 [TAX%/]	TAX%/PRICE = 2.00
[MORE]	
225 [INS.Y]	INS.YR = 225.00
1,500 [OTHER]	OTHER/YR = 1,500.00
[PMT]	PMT = 1,012.47 *
120 [#PMT]	#PMTs = 120.00
[MORE]	
33 [%ITAX]	%ITAX = 33.00
[MORE][MORE]	
[ATAX]	ATAX = 745.73 *
[MORE]	
125,000 [\$INC]	\$INC = 125,000.00
3 [RATE]	RATE = 3.00
[MORE][MORE]	
[ATAX]	ATAX = 766.36 *

* Emphasis added to starred answers.

MAXIMUM INCOME ROUTINE
(Subject to the **eighty percent rule**)

$$\begin{aligned} \text{MAX/INC} = & 20 \div 3 \times ((\text{PRICE} - \text{DOWN}) \times \\ & ((\text{USPV}(\text{I\%YR} \div 12:\text{N} - \text{\#PMTS}) + \text{\#PMTS}) \\ & \div \text{USPV}(\text{I\%YR} \div 12:\text{N}) - 1) \div \text{\#PMTS} \times 12 \\ & + \text{PRICE} \times \text{TAX\%/PRICE} \div 100) + 100000 \end{aligned}$$

Your calculator will display the MAX/INC equation's menu-variables as follows:

[MAX/][PRICE][DOWN][I%YR][N][MORE]

Pressing [MORE] brings up:

[#PMT][TAX%/] [MORE]

Problem

1. PRICE OF HOME	\$200,000
2. DOWN PAYMENT	\$50,000
3. ANNUAL INTEREST RATE	9.75%
4. TERM (MONTHS)	360
5. TAX RATIO	1.25
6. HOLDING PERIOD (MONTHS)	60
7. BUYER'S INCOME	\$124,000

Note: Insurance and OTHER expenses are not necessary for this computation.

Compute the maximum income subject to the three (3%) percent deduction loss for income over \$100,000.

Remember: This is an estimate and, if used, will understate the true maximum income if the buyer has deductions over and above real estate taxes, mortgage interest, medical expenses, investment interest, casualty and theft losses, and allowable wagering losses.

KEYSTROKES

[GOLD][INPUT]
200,000 [PRICE]
50,000 [DOWN]
9.75 [I%YR]
360 [N]
[MORE]
60 [#PMT]
1.25 [TAX%/]
[MORE]
[MAX/]

DISPLAY

0.00
PRICE = 200,000.00
DOWN = 50,000.00
I%YR = 9.75
N = 360.00

#PMTS = 60.00
TAX%/PRICE = 1.25

MAX/INC = 212,587.18

Interpretation

Since the computed maximum income (\$212,587.18) subject to the three (3%) percent itemized deduction loss under IRC section 68 is greater than the buyer's actual income (\$124,000), you would use the actual income [\$INC] in the after-tax payment cost equation you might be working with.

PART III

Revised COMBINED PAYMENT ESTIMATOR & HOME OWNER'S INCOME-QUALIFICATION ROUTINE

The **PMT/INCOME** algorithm given on page 57 of the main volume of this book is amended as follows:

```
PMT/INCOME: IF(S(PMT): (PRICE - DOWN) ÷  
USPV(I%YR ÷ 12:N) + (PRICE × TAX%/PRICE  
÷ 100 + INS.YR + OTHER/YR) ÷ 12 - PMT:  
- INCOME + INV(%INC.RATIO ÷ 1200) ×  
(PMT + DEBT/MO))
```

The menu-labels display as follows:

```
[PRICE][DOWN][I%YR][ N ][TAX%/][MORE]
```

Pressing [MORE] brings up:

```
[INS.Y][OTHER][PMT][INCO][%INC.][MORE]
```

Pressing [MORE] again brings up:

```
[DEBT/] [MORE]
```

The **INCOME** algorithm given on page 68 of the book is amended as follows:

```
INCOME = ((PRICE - DOWN) ÷ USPV(I%YR ÷  
12: N) + (TAX%/PRICE ÷ 100 × PRICE +  
INS.YR + OTHER/YR) ÷ 12 + DEBT/MO) ÷  
(%INC.RATIO ÷ 1200)
```

The menu-labels will display as follows:

```
[INCO][PRICE][DOWN][I%YR][ N ][MORE]
```

Pressing [MORE] brings up:

```
[TAX%/][INS.Y][OTHER][DEBT/][%INC.][MORE]
```

PART III

COMBINED PAYMENT ESTIMATOR, HOME OWNER'S INCOME QUALIFICATION, AND AFTER-TAX PAYMENT COST ROUTINE

```
PMT/INCOME/ATAX: IF(S(PMT): L(P: PRICE -  
DOWN) ÷ L(U:USPV(I%YR ÷ 12:N)) + (L(T:  
PRICE × TAX%/PRICE ÷ 100) + INS.YR +  
OTHER/YR) ÷ 12 - PMT: IF(S(INCOME): (PMT  
+ DEBT/MO) ÷ (%INC.RATIO ÷ 1200) - INCOME:  
- ATAX + PMT - ((G(P) × ((USPV(I%YR ÷ 12:N  
- #PMTS) + #PMTS) ÷ G(U) - 1) ÷ #PMTS + (G(T)  
+ %ITAX × 0 - ($INC - 100000) × RATE ÷ 100)  
÷ 12) × %ITAX ÷ 100))
```

The menu-labels will display as follows:

[PRICE][DOWN][I%YR][N][TAX%/] [MORE]

Pressing [MORE] brings up:

[INS.Y][OTHER][PMT][DEBT/][%INC.] [MORE]

Pressing [MORE] again brings up:

[INCO][ATAX][#PMT][%ITAX][\$INC] [MORE]

Pressing [MORE] again brings up:

[RATE] [MORE]

Instructions: The equation works exactly like the PMT/INCOME and ATAX routines, except the three functions represented by the two separate routines are combined together into one new routine.

This routine accepts data inputs in the same manner as the PMT/INCOME and ATAX routines. However, you are restricted to solving for: **PITI**, or PITI plus "other" expenses; annual income needed to qualify (**INCO**); and the average monthly after-tax payment cost (**ATAX**) to the buyer. Do not try to solve for any other variable with this routine.

PART IV

ROUTINES USING TAXES EXPRESSED AS A PERCENTAGE OF SALES PRICE OR TAX ASSESSMENT RATIOS AND TAX RATES PER \$1,000 OF ASSESSED VALUATION

- A) Combined Monthly Payment Estimator, Annual
Income to Qualify, and After-Tax Payment
Cost Estimator.

Entering and Using the INCOME.QUAL/ATAX Routine:

Input the INCOME.QUAL/ATAX routine into your equation SOLVER. (Memory needed: to use 31%; save 7%.)

```
INCOME.QUAL/ATAX: L(M:L(P:L(V:PRICE ×
(1 - %DOWN ÷ 100))) ÷ USPV(I%YR ÷ 12: N))
+ (L(T:IF(TAX%/PRICE > 0:TAX%/PRICE ÷ 100
× PRICE:A%/PRICE × TAX/$1000 × PRICE ÷
1E5)) + INS%.PRICE ÷ 100 × PRICE +
OTHER/YR) ÷ 12) + 0 × L(?INCOME:IF(L(Y:
IF(BASIC = 0:0:G(M) ÷ BASIC × 1200)) > L(Z:
IF(TOTAL = 0:0:(G(M) + DEBT/MO) ÷ TOTAL ×
1200)):G(Y):G(Z))) × L(?ATAX:IF(#PMTS =
0:0:G(M) - ((G(P) × (#PMTS + USPV(I%YR ÷
12:N - #PMTS)) - G(V)) ÷ #PMTS + (G(T) -
($INC - 100000) × RATE ÷ 100) ÷ 12) ×
%ITAX ÷ 100)) × ?ATAX × ?INCOME = PMT
```

Your calculator will display the INCOME.QUAL/ATAX equation's menu-variables as follows:

[PRICE][%DOW][I%YR][N][TAX%/][MORE]

Pressing [MORE] brings up:

[A%/PR][TAX/][INS%.][OTHER][BASIC][MORE]

Pressing [MORE] again brings up:

[TOTAL][DEBT/][#PMT][\$INC][RATE][MORE]

Pressing [MORE] again brings up:

[%ITAX][?ATAX][?INC][PMT] [MORE]

Introduction

The Routine uses the LET and GET (L/G) function in conjunction with the IF function of the HP 17BII, HP 19BII, HP 17B, and HP 19B. These powerful functions enable the user to draw the maximum in versatility from the calculators.

The Routine can be used to estimate the buyer's:

a) monthly payment for principal, interest, taxes and insurance (PITI), or you can estimate PITI plus "other" expenses, such as maintenance, utilities, or renewal premiums for private mortgage insurance (PMI);

b) annual income needed to qualify using both the Basic Housing Expense Ratio and the Total Debt Ratio;

c) average monthly after-tax payment cost based upon (1) projected holding period, (2) assumed overall income tax bracket, and (3) the buyer's anticipated gross annual income; and

d) maximum sales price, or required down payment expressed as a percentage of the sales price.

The Routine covers a comprehensive array of financial variables which real estate practitioners encounter most often in the home buyer income qualification process. A thorough study of it follows.

THE MENU LABELS CREATED BY THE ALGORITHM

The menu-labels are categorized as (1) "primary" labels and (2) "subordinate" labels. We further break down the "primary" menu-labels into (a) input (I) and (b) input/output (I/O) labels. What does this mean?

The Input Labels: Labels designated as "input" are used exclusively to enter data into the routine; they cannot be used to solve for the financial variable represented by the label. For example, the monthly consumer installment debt menu-label [DEBT/] accepts inputs needed to qualify the buyer with the Total Debt Ratio. However, you cannot solve for the monthly consumer debt by pressing the "soft key" immediately under the [DEBT/] menu-label because the routine restricts this label exclusively to accepting data, and thus cannot be used for its solution.

The Input/Output Labels: An "input/output" label not only accepts data-inputs, but also can be used to solve for the financial variable represented by the menu-label. For example, the annual interest rate menu-label [I%YR] accepts data-inputs and can also be used to solve for the annual interest rate which ties-together the other financial-inputs in the income-qualification segment of the routine.

The Subordinate Labels: A key feature of using a LET/GET-based SOLVER routine is that you may create any number of "subordinate" variables, which in turn gives rise to "subordinate" menu-labels in your calculator's display window. These variables are considered subordinate because their values arise from and through the computation of an "input/output" variable, such as the [PMT] variable. Insofar as the SOLVER is concerned, they **track** the calculation of "input/output" variables, but do not influence their value since the "subordinate" variable's "defining equation" is always multiplied times zero.

Inputs into a "subordinate" menu-label--such as the [?INC] and [?ATAX] labels--have absolutely no effect on the calculation of a primary variable, such as those represented by the [I%YR] and [PMT] menu-labels. In addition, trying to solve directly for a "subordinate" variable--by pressing the "soft key" immediately under a "subordinate" menu-label--is not recommended since the calculator will display "SOLUTION NOT FOUND", even in cases where the correct result is in fact displayed.

The Menu Labels

Each label given below is categorized as an Input/Output (I/O), Input (I), or a Recall (RCL) label. The routine creates the following menu-labels in your calculator, one row at a time:

(I/O)	(I/O)	(I/O)	(I/O)	(I/O)	
[PRICE]	[ZDOW]	[I%YR]	[N]	[TAX%/]	[MORE]

(I/O)	(I/O)	(I/O)	(I/O)	(I)	
[A%/PR]	[TAX/]	[INS%.]	[OTHER]	[BASIC]	[MORE]

(I)	(I)	(I)	(I)	(I)	
[TOTAL]	[DEBT/]	[#PMT]	[\$INC]	[RATE]	[MORE]

(I)	(RCL)	(RCL)	(I/O)		
[ZITAX]	[?ATAX]	[?INC]	[PMT]		[MORE]

Note that the two "subordinate" labels ([?ATAX] and [?INC]) use a question mark (?) as the first character. This tells you that we "question"--that is, "ask"--the calculator for the result, and further tells you **never** to use these labels to make data-inputs or to attempt a direct solution.

The Menu-Variables Explained

INPUTS

When computing the buyer's monthly payment for PITI (or PITI plus "other" expenses), the routine uses the following data-inputs:

- * Price of property [PRICE]
- * Down payment expressed as a percentage of price [%DOWN]
- * Annual mortgage interest rate [I%YR]
- * Number of monthly payments [N]
- Real estate taxes:
- * Tax ratio as a percentage of sales price or market value, or [TAX%/PRICE]
- * Tax assessment ratio and tax rates per \$1,000 of assessed value [A%/PRICE]
[TAX/\$1000]
- * Annual insurance expense as a percentage of price [INS%.PRICE]
- * Annual "other" expenses (utility, maintenance, PMI renewal premiums, and so forth) [OTHER]
- * **Computes** monthly payment for PITI (or PITI plus "other" expenses) [PMT]

After calculating the estimated monthly payment for PITI-or PITI plus "other" expenses-you can immediately determine the annual income needed to qualify the buyer. However, the following additional inputs **must** have been entered into your calculator before the monthly payment for PITI (etc) is calculated.

- * Lender's guideline ratio for PITI [BASIC]
(or PITI plus "other") as a percentage of annual gross income
- * Lender's guideline ratio for PITI [TOTAL]
(etc), plus monthly consumer debt, as a percentage of annual gross income
- * Buyer's monthly consumer debt, if [DEBT/MO]
any
- * **Recalls** annual income needed [RCL]
to qualify [?INCOME]

After calculating the estimated monthly payment for PITI (etc), you can immediately determine the buyer's estimated average monthly after-tax payment cost of the purchase. To do this, the following additional inputs **must** have been entered into your calculator before the monthly payment payment for PITI (etc) is calculated.

- * Expected number of payments to be [#PMTS]
made on the mortgage loan, if any.

Note: You must input at least "1" as the number of payments to be made.

- * Buyer's overall income tax bracket [%ITAX]
- * **Recalls** projected average monthly [RCL]
after-tax payment cost of purchase [?ATAX]

If the buyer's income is estimated at over \$100,000 per year, he will be subject to the itemized deduction loss discussed earlier in this supplement. To estimate the average monthly after-tax payment cost of a purchase to a buyer whose annual income is over \$100,000, the following additional inputs **must** have

been entered into your calculator before the monthly payment for PITI (etc) is calculated.

* Buyer's estimated annual income [\$INC]

* Rate of deduction loss for income [RATE]
over \$100,000.

Note: For 1991, the rate is three percent (3%). The rate is subject to change and should be verified in subsequent years. (For 1991, you will input "3" into the [RATE] menu-label.)

* **Recalls** projected average monthly [RCL]
after-tax payment cost of the [?ATAX]
purchase, adjusted for the 3%
itemized deduction loss.

User Instructions and a Caution

PROPERTY TAXES

You will note that the routine accepts inputs for **real estate taxes** using two different methods: (1) Taxes estimated as a percentage of sales price or (2) Tax assessment ratio and tax rates per \$1,000 of assessed value. Either method can be used at any time.

However, you should note that the routine gives priority-preference-to taxes estimated using the Tax Ratio method; that is, taxes estimated as a percentage of sales price or market value. Thus, you could input a tax ratio into the [TAX%/] menu-label and have other data entered into the [A%/PR] and [TAX/] menu-labels; the routine will disregard the assessment ratio and rate per \$1,000 and will use the Tax Ratio entered into [TAX%/].

THE INCOME QUALIFICATION "CONDITIONAL TEST"

When calculating the annual income needed to qualify, the routine uses a "conditional test" before entering the computed amount into the [?INC] menu-label. This is carried out within the routine by comparing the annual income needed to qualify using both the Basic Housing Expense Ratio and the Total Debt Ratio. The routine returns the larger of the computed incomes needed to qualify. (This procedure is consistent with accepted mortgage underwriting practice.)

Caution

Note that while the routine will estimate the **maximum sales price** [PRICE] or **required down payment** [%DOW] expressed as a percentage of the price, these solutions are more-so a collateral benefit of using the LET/GET function rather than resulting from the design-intent of the routine. The routine was primarily designed to compute PITI (or PITI plus "other" expenses); Income to Qualify; and After-Tax Payment Cost as a function of holding period.

If you use the routine to estimate (1) maximum sales [PRICE] or (2) required down payment [%DOW], you must go back and determine whether the internally-evaluated income to qualify--the [?INC] menu-label--is in fact equal to the income used to estimate the monthly payment for PITI (etc) supported by the purchaser's income. This is necessary because the routine uses only the Basic Housing Expense Ratio [BASIC] when estimating--solving for--maximum price or required down payment.

It makes absolutely no difference to the functioning of the routine if the buyer has zero or one million dollars per month in consumer installment debt [DEBT/]: The same maximum price or the same required down payment will be computed. However, the routine

automatically recomputes the annual income needed to qualify [?INC] each and every time you compute the maximum price [PRICE] or the required down payment [%DOW].

You **must** redetermine the income needed to qualify [?INC] each and every time you estimate the maximum price or required down payment. This is accomplished by recalling [RCL] the annual income menu-label [?INC]. If the recalled annual income [?INC] is equal to that used in estimating the maximum PITI payment, the buyer qualifies for the purchase. Otherwise you will have to readjust your inputs or work with a different version of the routine.

For example, assume we estimate the buyer's annual income at \$77,549.51. If we use a Basic Housing Expense Ratio [BASIC] of 28%, the buyer's income will support a (maximum) monthly payment [PMT] of \$1,809.49 for PITI ($\$77,549.51 / 12 \times 28\%$). You would input the number "1,809.49" directly into the [PMT] menu-label.

Also, if we use a Total Debt Ratio [TOTAL] of 36%, the maximum payment for PITI plus monthly consumer installment debt would be \$2,326.49 ($\$77,549.51 / 12 \times 36\%$). However, you would still input the number "1,809.49" into the [PMT] menu-label because the PITI-portion of the maximum allowed total monthly obligation is still \$1,809.49. Note that this allows the buyer a maximum of \$517 per month ($\$2,326.49 - \$1,809.49$) for consumer installment debts [DEBT/].

Now, if we computed the maximum affordable price or required down payment using the above data--including mortgage financing inputs--the routine will return the same price [PRICE] or the same down payment [%DOW] whether the buyer's monthly consumer debts [DEBT/] are over or under \$517. (**Again, always** recall [RCL] the income [?INC] needed to qualify when using the routine in this manner.)

Problem 1

The following facts are given:

1. PRICE OF HOME	\$125,000
2. DOWN PAYMENT	20%
3. ANNUAL INTEREST RATE	9.875%
4. LOAN TERM (MONTHS)	360
5. TAX RATIO	2%
6. INSURANCE RATIO	0.225%
7. "OTHER" EXPENSES (ANNUAL)	\$1,500
8. BASIC HOUSING EXPENSE RATIO	28%
9. TOTAL DEBT RATIO	36%
10. MONTHLY CONSUMER DEBT	\$375
11. HOLDING PERIOD (MONTHS)	120
12. BUYER'S INCOME TAX BRACKET	33%

(a) Compute the monthly payment for PITI (plus "other" expenses), annual income needed to qualify, and the average monthly after-tax payment cost to the buyer. (You must have the INCOME.QUAL/ATAX Routine input into your equation SOLVER.)

(b) Assume the buyer has gross annual income of \$65,000. Calculate the maximum price for which the buyer income-qualifies. (Leave all inputs the same, except enter the monthly payment for PITI (plus "other") based upon 28% of the buyer's gross annual income.)

KEYSTROKES

[GOLD][INPUT]
125,000 [PRICE]
20 [%DOW]
9.875 [I%YR]
360 [N]
2 [TAX%/]
[MORE]
.225 [INS%.]
1,500 [OTHER]

DISPLAY

0.00
PRICE = 125,000.00
%DOWN = 20.00
I%YR = 9.88
N = 360.00
TAX%/PRICE = 2.00

INS%.PRICE = 0.23
OTHER/YR = 1,500.00

Solution (a)

KEYSTROKES

28 [BASIC]
 [MORE]
 36 [TOTAL]
 375 [DEBT/]
 120 [#PMT]
 [MORE]
 33 [%ITAX]
 [PMT]
 [RCL][?INC]
 [RCL][?ATAX]

DISPLAY

BASIC = 28.00
 TOTAL = 36.00
 DEBT/MO = 375.00
 #PMTS = 120.00
 %ITAX = 33.00
PMT = 1,225.12
?INCOME = 53,337.32
?ATAX = 895.22

Conclusion: The monthly payment for PITI plus "other" expenses is \$1,225.12. Annual income needed to qualify equals \$53,337.32. Average monthly after-tax payment cost is \$895.22.

Solution (b)

KEYSTROKES

65,000 × 28 % ÷ 12 [PMT]
 [MORE]
 [PRICE]
 × [RCL][%DOW] % =
 [MORE][MORE][MORE]
 [RCL][?INC]

DISPLAY

PMT = 1,516.67
PRICE = 158,126.76
31,625.35
?INCOME = 65,000.00

Conclusion: If the buyer has available \$31,625 for a down payment, he qualifies to purchase a \$158,000 home.

When performing a **maximum price** calculation in the above manner, you must verify that the buyer's income used to compute PITI (etc) is in fact

sufficient to qualify for the purchase. Thus, after computing **[PRICE]**, you must recall the "subordinate" annual income **[?INC]** menu-label. If the required income **[?INC]** is equal to the buyer's annual income, the computed maximum sales price is accurate; otherwise a larger down payment will be required.

(c) Assume the buyer seeks to purchase a home selling for \$200,000. If we eliminate the \$1,500 per year "other" expense, what down payment is needed to qualify for the purchase? Then, go back and verify that the income needed to qualify is \$65,000 per year.

Solution (c)

KEYSTROKES

DISPLAY

[MORE]

200,000 [PRICE]

PRICE = 200,000.00

[MORE]

0 [OTHER]

OTHER/YR = 0.00

[MORE] [MORE] [MORE]

[%DOW]

%DOWN = 34.02

% × [RCL] [PRICE] =

68,044.55

[MORE] [MORE] [MORE]

[RCL] [?INC]

?INCOME = 65,000.00

Conclusion: Buyer requires a \$68,000 down payment to qualify for the purchase of a \$200,000 home. The annual income is sufficient for qualification.

Problem 2:

The following information is given:

1. PRICE OF HOME	\$375,000
2. DOWN PAYMENT	30%
3. ANNUAL INTEREST RATE	9.75%
4. LOAN TERM (MONTHS)	360
5. ASSESSMENT RATIO	50%
6. TAX RATE PER \$1000 OF ASSESSED VALUE	\$31.95 *
7. INSURANCE RATIO	0.20%
8. BASIC HOUSING EXPENSE RATIO	30%
9. TOTAL DEBT RATIO	38%
10. MONTHLY CONSUMER DEBT	\$875
11. AFTER-TAX ESTIMATE HOLDING PERIOD (IN MONTHS)	12
12. BUYER'S ANNUAL INCOME	\$150,000
13. RATE OF DEDUCTION LOSS FOR INCOME OVER \$100,000	3%
14. BUYER'S INCOME TAX BRACKET	38%

(a) Compute the monthly payment for PITI, annual income needed to qualify, and the average monthly after-tax payment cost to the buyer.

(b) Calculate the maximum price supported by the buyer's income; determine the down payment needed to support the computed maximum price; and verify that the income needed to qualify is in fact equal to the buyer's gross annual income.

* The equivalent annual tax ratio is computed as follows: $\text{Tax Ratio} = \text{Assessment Ratio} \times \text{Tax Rate Per } \$1,000 \div \$1000$. Therefore: $\text{Tax Ratio} = 50\% \times \$31.95 \div \$1,000 = 1.5975\%$

Solution (a)

KEYSTROKES

[GOLD][INPUT]
 375,000 [PRICE]
 30 [%DOW]
 9.75 [I%YR]
 360 [N]
 [MORE]
 50 [A%/PR]
 31.95 [TAX/]
 .2 [INS%.]
 30 [BASIC]
 [MORE]
 38 [TOTAL]
 875 [DEBT/]
 12 [#PMT]
 150,000 [\$INC]
 3 [RATE]
 [MORE]
 38 [%ITAX]
 [PMT]
 [RCL][?INC]
 [RCL][?ATAX]

DISPLAY

0.00
 PRICE = 375,000.00
 %DOWN = 30.00
 I%YR = 9.75
 N = 360.00
 A%/PRICE = 50.00
 TAX/\$1000 = 31.95
 INS%.PRICE = 0.20
 BASIC = 30.00
 TOTAL = 38.00
 DEBT/MO = 875.00
 #PMTS = 12.00
 \$INC = 150,000.00
 RATE = 3.00
 %ITAX = 38.00
PMT = 2,817.00
?INCOME = 116,589.44
?ATAX = 1,866.46

Conclusion: The monthly payment for PITI is \$2,817; annual income needed to qualify equals \$116,589.44; and the average monthly after-tax payment cost to the buyer is \$1,866.46.

Solution (b)

KEYSTROKES

150,000 × 30 % ÷ 12 [PMT]
 [MORE]
 [PRICE]
 × [RCL][%DOW] % =
 [MORE][MORE][MORE]

DISPLAY

PMT = 3,750.00
PRICE = 499,201.44
149,760.43

KEYSTROKESDISPLAY

[RCL] [?INC]

?INCOME = 150,000.00

Conclusion: The buyer qualifies for a \$499,000 home, assuming a down payment of approximately \$150,000 can be made. By recalling the [?INC] menu-variable we verified that the price (\$499,210.44) is in fact supported by the buyer's income (\$150,000).

(c) Delete the data stored in the [A%/PR] and [TAX/] menu-labels and enter "1.5975" into the tax ratio menu-label [TAX%/]. Then, verify that the annual income needed to qualify equals \$150,000. Next, set the down payment to 25%, recompute the maximum price for which the buyer qualifies, and again verify that the annual income equals \$150,000.

Solution (c)

KEYSTROKESDISPLAY

[MORE]

1.5975 [TAX%/]

TAX%/PRICE = 1.60

[MORE]

0 [A%/PR]

A%/PRICE = 0.00

0 [TAX/]

TAX/\$1000 = 0.00

[MORE] [MORE]

[PMT]

PMT = 3,750.00

[RCL] [?INC]

?INCOME = 150,000.00

[MORE]

25 [%DOW]

%DOWN = 25.00

[PRICE]

PRICE = 472,198.54

[MORE] [MORE] [MORE]

[RCL] [?INC]

?INCOME = 150,000.00

Conclusion: The annual income required to qualify is verified at \$150,000. Also, a 25% down payment qualifies the buyer for a \$472,000 purchase, and the annual income again verifies at \$150,000.

B) MAXIMUM PRICE/Income Qualification Routine.

Entering and Using the MAX/PRICE Routine:

Input the MAX/PRICE routine into your equation SOLVER. (Memory needed: to use 24%; to save 5%.)

```
MAX/PRICE = L(MAX:IF(L(?T.PRICE:L(U:
USPV(I%YR ÷ 12: N)) ÷ L(D:1 - %DOWN
÷ 100) × (INCOME × TOTAL ÷ 1200 -
DEBT/MO + BASIC × 0 - L(O:OTHER/YR ÷
12)) ÷ ((L(T:IF(TAX%/PRICE > 0: TAX%/
PRICE: A%/PRICE × TAX/$1000 ÷ 1000))
+ L(I:INS%.PRICE)) × G(U) ÷ (1200 ×
G(D)) + 1)) > L(?B.PRICE: G(U) ÷ G(D)
× (INCOME × BASIC ÷ 1200 - G(O)) ÷
((G(T) + G(I)) × G(U) ÷ (1200 × G(D)
+ 1)): ?B.PRICE: ?T.PRICE))
```

Your calculator will display the MAX/PRICE equation's menu-variables as follows:

```
[MAX/][I%YR][ N ][%DOW][INCO][MORE]
```

Pressing [MORE] brings up:

```
[TOTAL][DEBT/][BASIC][OTHER][TAX%/][MORE]
```

Pressing [MORE] again brings up:

```
[A%/PR][TAX/][INS%.][?B.PR][?T.PR][MORE]
```

Introduction

The Routine uses the LET and GET (L/G) function in conjunction with the IF function of the HP 17BII, HP 19BII, HP 17B, and HP 19B.

The Routine can be used to estimate the buyer's:

a) **maximum affordable home price;**

b) **required down payment** expressed as a percentage of the sales price; or

c) **annual income needed to qualify** using both the Basic Housing Expense Ratio and the Total Debt Ratio.

The financial variables utilized by the routine are similar to the variables in the INCOME.QUAL/ATAX routine, except we do not concern ourselves with the after-tax payment cost issue.

The Menu Labels

Each label given below is categorized as an Input/Output (I/O), Input (I), or a Recall (RCL) label. The routine creates the following menu-labels in your calculator, one row at a time:

(I/O)	(I/O)	(I/O)	(I/O)	(I/O)	
[MAX/]	[IZYR]	[N]	[ZDOW]	[INCO]	[MORE]

(I)	(I/O)	(I)	(I/O)	(I/O)	
[TOTAL]	[DEBT/]	[BASIC]	[OTHER]	[TAXZ/]	[MORE]

(I/O)	(I/O)	(I/O)	(RCL)	(RCL)	
[AZ/PR]	[TAX/]	[INSZ.]	[?B.PR]	[?T.PR]	[MORE]

* **[?B.PR]** stands for "maximum price produced using the Basic Housing Expense Ratio". **[?T.PR]** is the "maximum price using the Total Debt Ratio".

Note that the two "subordinate" labels ([?B.PR] and [?T.PR]) use a question mark (?) as the first character. This tells the user to "question"--that is, "ask"--the calculator for the result, and further tells the user **never** to make data-inputs into these labels or attempt a direct solution.

The Menu-Variables Explained

INPUTS

The routine accepts the following inputs and produces the solutions noted:

- | | |
|------------------------------------------------------------------------------------------------------------------------|-------------|
| * Maximum price of property
~ input or solve for | [MAX/PRICE] |
| * Annual mortgage interest rate | [I%YR] |
| * Number of monthly payments | [N] |
| * Down payment expressed as a
percentage of maximum price
(or price)
~ input or solve for | [ZDOWN] |
| * Buyer's annual income
~ input or solve for | [INCOME] |
| * Lender's guideline ratio for PITI
(etc), plus monthly consumer debt,
as a percentage of annual gross
income | [TOTAL] |
| * Buyer's monthly consumer debt, if
any | [DEBT/MO] |
| * Lender's guideline ratio for PITI
(or PITI plus "other") as a per-
centage of annual gross income | [BASIC] |

- * Annual "other" expenses (utility, maintenance, PMI renewal premiums, and so forth) [OTHER]
- Real estate taxes:
- * Tax ratio as a percentage of sales price or market value, or [TAX%/PRICE]
- * Tax assessment ratio and tax rates per \$1,000 of assessed value [A%/PRICE]
[TAX/\$1000]
- * Annual insurance expense as a percentage of price [INS%.PRICE]
- * **Recalls** maximum sale price produced using the Basic Housing Expense Ratio [RCL]
[?B.PRICE]
- * **Recalls** maximum sale price produced using the Total Debt Ratio [RCL]
[?T.PRICE]

User Instructions

MAXIMUM SALES PRICE "CONDITIONAL TEST"

When calculating the **maximum sales price**, the routine uses a "conditional test" before entering the computed amount into the [MAX/] menu-label. This is carried out within the routine by comparing the maximum sales price produced using both the Total Debt Ratio [TOTAL] and the Basic Housing Expense Ratio [BASIC], with the lesser of the two amounts returned as the maximum sales price. (This procedure is consistent with accepted mortgage loan underwriting practice.)

The maximum sales price computed using the BASIC housing expense ratio is copied by the SOLVER into the [?B.PRICE] "subordinate" menu-variable, while

the maximum sales price computed using the TOTAL debt ratio is copied into the "subordinate" [?T.PRICE] menu-variable. Thus, when you solve for the **maximum sales price** [MAX/], the routine computes two distinct prices, one of which will be copied into the [MAX/] menu-label and as well will be copied into one of the two "subordinate" labels.

Remember: Since the [?B.PRICE] and [?T.PRICE] menu-variables are "subordinate" variables, you **must** compute the maximum sales price [MAX/PRICE] before you can recall an amount from either of the subordinate menu-labels.

After computing the maximum price [MAX/], you can go back and recall the [?B.PR] and [?T.PR] menu-labels in order to determine which ratio (BASIC or TOTAL) produced the **lower** price, and therefore the maximum price. This feature can provide a wealth of instant feed-back on the amount of the buyer's debt, if any, relative to his income, at least insofar as mortgage underwriting considerations go.

For example, if the buyer's financial picture includes monthly consumer debt (and most do), and if the computed **?T.PRICE** is **lower** than the computed **?B.PRICE**, this "red flags" monthly debts as the constraint--the restriction--responsible for producing a **maximum price** below the optimum otherwise possible. In this case, you can go back and quickly determine the maximum allowable monthly debt which will cause the maximum prices produced by **both** housing expense ratios to be equal. To do this, just set the [MAX/PRICE] equal to the [?B.PRICE] and solve for the monthly consumer debt [DEBT/].

DOWN PAYMENT CONSIDERATIONS

When computing the maximum sales price the user must take into consideration generally accepted mortgage underwriting guidelines for the down payment.

Typically a conventional mortgage loan (i.e. anything other than a Government-backed loan) requires a minimum down payment equal to twenty percent (20%) of the purchase price in order for the borrower to be exempted from carrying private mortgage insurance (PMI). Thus, you will generally use "20", or more, as the down payment [%DOW] expressed as a percentage of the unknown maximum sales price.

Note also that within certain price ranges, lenders may require a down payment in excess of twenty percent (20%) of the sales price. This requirement may result in the user having to compute the maximum sales price in two steps.

For example, assume the underwriting practice in your locale requires a minimum down payment of 30% of the purchase price on all single family residential sales over \$350,000. If we further assume the buyer's income supports a maximum sales price of \$360,000, using a down payment of 20%, you will have to go back and recompute the maximum price using a down payment of 30%. Of course, under this scenario the buyer will "qualify" for a higher purchase price, assuming he has available the larger down payment needed to support the higher purchase price.

PROPERTY TAXES

As is the case with the INCOME.QUAL/ATAX routine, the MAX/PRICE routine accepts inputs for real estate taxes using (1) taxes estimated as a percentage of sales price or (2) tax assessment ratios and tax rates per \$1,000 of assessed value. Either method can be used at any time.

The MAX/PRICE routine gives preference to taxes estimated using the Tax Ratio method; that is, taxes estimated as a percentage of sales price or market value. Thus, you could input a Tax Ratio into the [TAX%/] menu-label and have other data entered into

the [A%/PR] and [TAX/] menu-labels; the routine will disregard the assessment ratio and rate per \$1,000 and will use the Tax Ratio entered into the [TAX%/] menu-label.

This fact should be obvious from looking at the fifth (5th) and sixth (6th) lines of the routine. Here we are using the **LET** statement to help establish the total tax obligation against the unknown maximum price. Loosely speaking, the statement "reads":

LET taxes ("T") equal "something". **IF** it is found that the menu-variable TAX%/PRICE is greater than zero, set the tax method to TAX%/PRICE. Otherwise set the tax method to A%/PRICE times TAX/\$1000 divided by 1,000.

Since your calculator's equation SOLVER scans through a routine from left to right, it reaches the TAX%/PRICE variable in the MAX/PRICE routine before it reaches any input which might be in the A%/PRICE variable. Hence, if a number is already input into the TAX%/PRICE menu-variable, the first part of the "conditional statement" is satisfied, thus restricting the tax method to TAX%/PRICE.

On the other hand, if the TAX%/PRICE variable is set to zero--which is the same as saying it is empty--the SOLVER establishes the real estate tax method on the basis of an assessment ratio (A%/PRICE) and a rate per \$1,000 of assessed value (TAX/\$1000). It then multiplies the assessment ratio times the rate per \$1,000 and divides the result by 1,000. This is equivalent to establishing the tax method on the basis of a percentage of the unknown price.

This methodology applies to every routine in this supplement which uses a conditional statement to establish the tax assessment against a property.

Problem 1

The following facts are given:

1. BUYER'S ANNUAL INCOME	\$53,337.32
2. DOWN PAYMENT	20%
3. ANNUAL INTEREST RATE	9.875%
4. LOAN TERM (MONTHS)	360
5. TAX RATIO	2%
6. INSURANCE RATIO	0.225%
7. "OTHER" EXPENSES (ANNUAL)	\$1,500
8. BASIC HOUSING EXPENSE RATIO	28%
9. TOTAL DEBT RATIO	36%
10. MONTHLY CONSUMER DEBT	\$375

(a) Compute the maximum sales price supported by the given information. Then, determine which housing expense ratio produced the computed maximum price.

(b) Compute the maximum monthly consumer debt which will enable the buyer to afford the internally evaluated [?B.PRICE]. Then, go back and verify that the ?B.PRICE is indeed equal to the ?T.PRICE at the newly computed maximum monthly debt.

Solution (a)

KEYSTROKES

DISPLAY

[GOLD][INPUT]	0.00
9.875 [I%YR]	I%YR = 9.88
360 [N]	N = 360.00
20 [%DOW]	%DOWN = 20.00
53,337.32 [INCO]	INCOME = 53,337.32
[MORE]	
36 [TOTAL]	TOTAL = 36.00
375 [DEBT/]	DEBT/MO = 375.00
28 [BASIC]	BASIC = 28.00
1,500 [OTHER]	OTHER/YR = 1,500.00
2 [TAX%/]	TAX%/PRICE = 2.00
[MORE]	

KEYSTROKESDISPLAY

.225 [INS%.]

INS%.PRICE = 0.23

[MORE]

[MAX/]

MAX/PRICE = 125,000.01

[MORE] [MORE]

[RCL] [?T.PR]

?T.PRICE = 125,000.01

[RCL] [?B.PR]

?B.PRICE = 127,206.35

Conclusion: The buyer qualifies for a maximum sales price of \$125,000. Since the maximum price produced using the Basic Housing Expense Ratio is greater than that produced with the Total Debt Ratio, we conclude that the buyer can increase his maximum affordable price by lowering his monthly consumer debts. We calculate the break-even amount next.

Solution (b)

KEYSTROKESDISPLAY

[MORE]

[STO] [MAX/]

MAX/PRICE = 127,206.35

[MORE]

[DEBT/]

DEBT/MO = 355.58

[MORE]

[RCL] [?B.PR]

?B.PRICE = 127,206.35

[RCL] [?T.PR]

?T.PRICE = 127,206.35

Conclusion: Lowering the buyer's consumer monthly installment debt from \$375 to \$355.58 technically qualifies the buyer to purchase a home selling for approximately \$2,200 more. Of course, to qualify for the higher price the buyer must make an additional down payment of \$440 (\$2,200 x 20%).

Problem 2

The following facts are given:

1. BUYER'S ANNUAL INCOME	\$76,247.76
2. DOWN PAYMENT	20%
3. ANNUAL INTEREST RATE	10%
4. LOAN TERM (MONTHS)	360
5. ASSESSMENT RATIO	50%
6. TAX RATE PER \$1,000 OF ASSESSSED VALUE	\$40.00 *
7. INSURANCE RATIO	0.25%
8. BASIC HOUSING EXPENSE RATIO	28%
9. TOTAL DEBT RATIO	36%
10. MONTHLY CONSUMER DEBT	\$500

(a) Compute the maximum sales price supported by the given information. Next, determine which housing expense ratio produced the computed maximum purchase price.

Solution (a)

KEYSTROKES

DISPLAY

[GOLD][INPUT]	0.00
10 [I%YR]	I%YR = 10.00
360 [N]	N = 360.00
20 [%DOW]	%DOWN = 20.00
76,247.76 [INCO]	INCOME = 76,247.76
[MORE]	
36 [TOTAL]	TOTAL = 36.00
500 [DEBT/]	DEBT/MO = 500.00

* The equivalent annual tax ratio is computed as follows: $\text{Tax Ratio} = \text{Assessment Ratio} \times \text{Tax Rate Per } \$1,000 \div \$1,000$. Therefore: $\text{Tax Ratio} = 50\% \times \$40.00 \div \$1,000 = 2.00\%$.

KEYSTROKES

28 [BASIC]
[MORE]
50 [A%/PR]
40 [TAX/]
.25 [INS%.]
[MORE]
[MAX/]

[MORE] [MORE]
[RCL] [?B.PR]

[RCL] [?T.PR]

DISPLAY

BASIC = 28.00

A%/PRICE = 50.00
TAX/\$1000 = 40.00
INS%.PRICE = 0.25

MAX/PRICE = 199,999.99

?B.PRICE = 199,999.99

?T.PRICE = 200,935.10

Conclusion: The buyer qualifies for a maximum sales price of \$200,000. The maximum price was produced using the Basic Housing Expense Ratio. The difference between the maximum sales price produced by each housing expense ratio is not significant.

(b) Set the monthly consumer debt to zero (\$0.00), increase the BASIC housing expense ratio to 30%, and increase the TOTAL debt ratio to 38%. Requalify the buyer. Then, determine which housing expense ratio produced the maximum purchase price.

Solution (b)

KEYSTROKES

[MORE] [MORE]
38 [TOTAL]
0 [DEBT/]
30 [BASIC]
[MORE] [MORE]
[MAX/]
[MORE] [MORE]
[RCL] [?B.PR]

[RCL] [?T.PR]

DISPLAY

TOTAL = 38.00
DEBT/MO = 0.00
BASIC = 30.00

MAX/PRICE = 214,285.70

?B.PRICE = 214,285.70

?T.PRICE = 271,428.55

Conclusion: By increasing the housing expense ratios by two percent (2%), and reducing the consumer debt to zero, the buyer qualifies for an additional \$14,000 in purchase price.

Note the extremely large variance between the purchase prices produced using the two housing expense ratios: \$214,285.70 versus \$271,428.55.

The variance drives-home the "double protection" afforded a mortgage lender under traditional mortgage underwriting standards. Specifically, the underwriting standards just-about "presume" that a borrower will incur consumer installment debt though he may be debt-free at the time of making application for the mortgage loan.

In spite of the fact that the buyer's income will support approximately \$57,000 more home, based upon the Total Debt Ratio and assuming a 20% down payment is made, that would leave absolutely no room for consumer installment debt. Should the buyer later incur consumer debt, his overall financial obligations can be such that the lender's security in the property could be jeopardized.

In effect, restricting the maximum purchase price to, say, \$214,000-versus \$271,000-works not only in the lender's interest, but also aids the buyer who might otherwise incur sufficient debt to push him into a financially tenuous position.

Problem 3

The following facts are given:

1. BUYER'S ANNUAL INCOME	\$35,067.07
2. DOWN PAYMENT	20%
3. ANNUAL INTEREST RATE	9.75%
4. LOAN TERM (MONTHS)	360
5. ASSESSMENT RATIO	50%
6. TAX RATE PER \$1,000 OF ASSESSED VALUE	\$20.00
7. INSURANCE RATIO	0.315789% *
8. "OTHER" EXPENSES (ANNUAL)	\$700
9. BASIC HOUSING EXPENSE RATIO	30%
10. TOTAL DEBT RATIO	38%
11. MONTHLY CONSUMER DEBT	\$295

(a) Compute the maximum sales price supported by the given information. Next, determine which housing expense ratio produced the maximum sales price.

Solution (a)

KEYSTROKES

DISPLAY

[GOLD][INPUT]	0.00
9.75 [I%YR]	I%YR = 9.75
360 [N]	N = 360.00
20 [%DOW]	%DOWN = 20.00
35,067.07 [INCO]	INCOME = 35,067.07
[MORE]	
38 [TOTAL]	TOTAL = 38.00
295 [DEBT/]	DEBT/MO = 295.00
30 [BASIC]	BASIC = 30.00

* The lengthy insurance ratio is given to force the solution in this problem into close compliance with that given on page 71 of this book's main volume.

KEYSTROKESDISPLAY

700 [OTHER]

OTHER/YR = 700.00

[MORE]

50 [A%/PR]

A%/PRICE = 50.00

20 [TAX/]

TAX/\$1000 = 20.00

.315789 [INS%.]

INS%.PRICE = 0.32

[MORE]

[MAX/]

MAX/PRICE = 94,999.99

[MORE] [MORE]

[RCL] [?B.PR]

?B.PRICE = 102,681.50

[RCL] [?T.PR]

?T.PRICE = 94,999.99

Conclusion: The buyer qualifies for a maximum sales price of \$95,000. The maximum was produced using the Total Debt Ratio. This tells us that the buyer may qualify for a higher purchase price if he can lower his monthly consumer installment debts to an amount which will equate the maximum purchase prices produced by both housing expense ratios.

(b) Assume the buyer's income is \$34,500 per year. Compute the down payment needed to qualify the buyer to purchase the maximum sales price computed above.

Solution (b)

KEYSTROKESDISPLAY

[MORE]

34,500 [INCO]

INCOME = 34,500.00

[%DOW]

DOWN = 22.20

% × [RCL] [MAX/] =

21,090.10

Conclusion: Lowering the buyer's annual gross income by approximately six hundred (\$600) dollars requires the down payment to be increased by approximately two thousand (\$2,000) dollars.

(c) Set the down payment to 20%, double the buyer's annual income, and set "OTHER" to "0". Recompute the maximum purchase price and determine which housing expense ratio produced the maximum price.

Solution (c)

KEYSTROKES

DISPLAY

20 [%DOW]	%DOWN = 20.00
[RCL][INCO] × 2 [INCO]	INCOME = 69,000.00
[MORE]	
0 [OTHER]	OTHER/YR = 0.00
[MORE][MORE]	
[MAX/]	MAX/PRICE = 216,444.07
[MORE][MORE]	
[RCL][?B.PR]	?B.PRICE = 216,444.07
[RCL][?T.PR]	?T.PRICE = 237,147.42

Conclusion: The buyer qualifies for a maximum sales price of approximately \$216,000. The maximum price was produced by the Basic Housing Expense Ratio. Mathematically this tells us that lowering the buyer's monthly consumer debt will not produce an increase in the maximum purchase price.

From an underwriting perspective, since the example assumes a 20% down payment, it is unlikely that a lender would increase the Basic Housing Expense Ratio beyond 30% of the buyer's annual gross income. However, if "compensating factors" exist, such as situations where the borrower makes a proportionally greater down payment--such as 30%, or possibly more--the lender may very well increase either or both of the housing expense ratios.

Care should be taken to become familiar with not only your local mortgage underwriting practices, but as well you should become familiar with the **FNMA** and **FHLMC** mortgage underwriting standards.

For example, under the "Fannie Mae" mortgage underwriting guidelines, a lender may write and sell to FNMA a mortgage loan with higher debt-to-income ratios, such as 30% for the Basic Housing Expense Ratio and 38% for the Total Debt Ratio. To justify this, the buyer must show one or more "compensating factors", such as those setforth below.

COMPENSATING FACTORS FOR HIGHER QUALIFYING RATIOS

There are numerous underwriting considerations which may justify a lender's use of a higher BASIC housing expense ratio or a higher TOTAL debt ratio, or both. Generally speaking, to go beyond 28% for the BASIC housing expense ratio or 36% for the TOTAL debt ratio, one or more of the following conditions must exist:

- * the buyer makes a larger down payment toward the price of the property;
- * the property qualifies as an "energy-efficient" home;
- * the buyer has demonstrated the ability to save money and has a good credit history or is free of debt and appears capable of remaining debt-free;
- * the buyer has a strong potential for greater earnings and employment advancement because of his education or job training;
- * the buyer has considerable savings or net worth such that his ability to repay the mortgage loan can be considered more secure; or
- * the buyer has demonstrated the ability to apply a greater proportion of income to basic needs like housing expenses.

C) MAXIMUM PRICE1/Income Qualification Routine.

Entering and using the MAX/PRICE1 Routine:

Input the MAX/PRICE1 routine into your equation SOLVER. (Memory needed: to use 23%; to save 5%.)

```
MAX/PRICE1= L(MAX: IF(L(?T.PRICE:(INCOME
× TOTAL ÷ 1200 + DOWN ÷ L(U:USPV(I%YR ÷
12:N)) - L(O:OTHER/YR ÷ 12) - DEBT/MO) ÷
(1 ÷ G(U) + (L(T:IF(TAX%/PRICE > 0:
TAX%/PRICE: A%/PRICE × TAX/$1000 ÷ 1000))
+ L(I:INS%.PRICE)) ÷ 1200)) > L(?B.PRICE:
(INCOME × BASIC ÷ 1200 + DOWN ÷ G(U) -
G(O)) ÷ (1 ÷ G(U) + (G(T) + G(I)) ÷ 1200)):
?B.PRICE: ?T.PRICE))
```

Your calculator will display the MAX/PRICE1 equation's menu-variables as follows:

```
[MAX/][INCO][TOTAL][DOWN][I%YR][MORE]
```

Pressing [MORE] brings up:

```
[ N ][OTHER][DEBT/][TAX%/][A%/PR][MORE]
```

Pressing [MORE] again brings up:

```
[TAX/][INS%.][BASIC][?B.PR][?T.PR][MORE]
```

Introduction

The Routine uses the LET and GET (L/G) function in conjunction with the IF function of the HP 17BII, HP 19BII, HP 17B, and HP 19B.

The Routine can be used to estimate the buyer's:

a) **maximum affordable home price;**

b) **required down payment;** or

c) **annual income needed to qualify** using both housing expense ratios.

The financial variables utilized by the routine are almost identical to the variables in the MAX/PRICE routine given on page 46, except the down payment is treated as a fixed amount, rather than as a percentage of the unknown maximum price.

The Menu Labels

Each menu-label given below is categorized as an Input/Output (I/O), Input (I), or a Recall (RCL) label. The routine creates the following menu-labels in your calculator, one row at a time:

(I/O)	(I/O)	(I)	(I/O)	(I/O)	
[MAX/]	[INCO]	[TOTAL]	[DOWN]	[I%YR]	[MORE]

(I/O)	(I/O)	(I/O)	(I/O)	(I/O)	
[N]	[OTHER]	[DEBT/]	[TAX%]	[A%PR]	[MORE]

(I/O)	(I/O)	(I)	(RCL)	(RCL)	
[TAX/]	[INS%.]	[BASIC]	[?B.PR]	[?T.PR]	[MORE]

* [?B.PR] stands for "maximum price produced using the Basic Housing Expense Ratio". [?T.PR] is the "maximum price using the Total Debt Ratio".

As is the case with the two routines previously covered in Part IV, the two "subordinate" labels ([?B.PR] and [?T.PR]) in the MAX/PRICE1 routine also use a question mark (?) as the first character. Again, this tells the user to "question" the calculator for a result, and further tells the user **never** to make data-inputs into these labels or attempt a direct solution.

The Menu-Variables Explained

INPUTS

The routine accepts the following inputs and produces the solutions noted:

- * Maximum price of property [MAX/PRICE1]
~ input or solve for
- * Buyer's annual income [INCOME]
~ input or solve for
- * Lender's guideline ratio for PITI [TOTAL]
(etc), plus monthly consumer debt,
as a percentage of annual gross
income
- * Down payment [DOWN]
~ input or solve for
- * Annual mortgage interest rate [I%YR]
- * Number of monthly payments [N]
- * Annual "other" expenses (utility, [OTHER]
maintenance, PMI renewal premi-
ums, and so forth)
- * Buyer's monthly consumer debt, if [DEBT/MO]
any

Real estate taxes:

- * Tax ratio as a percentage of sales price or market value, or [TAX%/PRICE]
- * Tax assessment ratio and tax rates per \$1,000 of assessed value [A%/PRICE]
[TAX/\$1000]
- * Annual insurance expense as a percentage of price [INS%.PRICE]
- * Lender's guideline ratio for PITI (or PITI plus "other") as a percentage of annual gross income [BASIC]
- * **Recalls** maximum sale price produced using the Basic Housing Expense Ratio [RCL]
[?B.PRICE]
- * **Recalls** maximum sale price produced using the Total Debt Ratio [RCL]
[?T.PRICE]

User Instructions

MAXIMUM SALES PRICE "CONDITIONAL TEST"

Go back and read the discussion of the maximum sales price "conditional test" on pages 49 and 50.

DOWN PAYMENT CONSIDERATIONS

As is the case with the MAX/PRICE routine given on page 46, the user **must** take into consideration generally accepted mortgage loan underwriting guidelines for the down payment. This is necessary because private mortgage insurance (PMI) is required on purchases where the loan-to-value ratio (LTV) is greater than eighty percent (80%) of the sales price.

The LTV ratio issue becomes much more critical when estimating the **maximum sales price** with a routine which restricts down payment inputs to a fixed amount, rather than expressing the down payment as a percentage of the sales price. This is so because a buyer's income--in relationship to all other financial inputs--may be sufficient to push the **maximum price** high enough to cause the LTV ratio to exceed eighty percent of the unknown maximum price.

By way of comparison, the MAX/PRICE routine (given on page 46) restricts the down payment to a percentage of the unknown maximum price. If we used this routine with the down payment [%DOW] set to 20% of the price, we **assure** a loan-to-value ratio (LTV) of 80% of the maximum price, no matter what the other financial inputs may be.

Thus, with the MAX/PRICE routine, the LTV ratio remains fixed (constant), and therefore assures that the mortgage loan underwriting requirements for the down payment will normally be satisfied, assuming the buyer has available sufficient funds to meet the required down payment.

On the other hand, since the **MAX/PRICE1** routine holds the down payment **constant**, there will be cases where the computed **maximum price** is high in relationship to the down payment used in the calculation. Specifically, there will be cases where the computed **maximum price** will be **greater** than five times the down payment used in the calculation.* In these cases, if the target sales price is **less than** the computed maximum price, the procedure given on the next page should be followed.

* A purchase with a LTV ratio above 80% is equivalent to saying that the price of the property is over five times greater than the down payment.

(1) Store the target (anticipated) purchase price into the [MAX/] menu-label.

(2) Solve for the required down payment [DOWN].

(3) Determine whether the LTV ratio meets the lender's guidelines--typically 80% of the price. To do this, use the following keystrokes:

$$\begin{aligned} & [\text{RCL}] [\text{MAX/}] - [\text{RCL}] [\text{DOWN}] \\ & \div [\text{RCL}] [\text{MAX/}] \times 100 = \end{aligned}$$

(4) If the LTV ratio is greater than 80%, the buyer must make a larger down payment. (At this stage it is more practical to switch to the MAX/PRICE routine if the user is to follow the **maximum price** qualification process any further.)

In conclusion, **always** test for the LTV ratio before concluding that the buyer qualifies for the computed maximum price.

PROPERTY TAXES

As is the case with the INCOME.QUAL/ATAX and the MAX/PRICE routines, the MAX/PRICE1 routine accepts inputs for real estate taxes using (1) taxes estimated as a percentage of sales price or (2) tax assessment ratios and tax rates per \$1,000 of assessed value. Either method can be used at any time. However, the routine gives preference to taxes estimated using the Tax Ratio method.

Problem 1

The following facts are given:

1. BUYER'S ANNUAL INCOME	\$53,337.32
2. DOWN PAYMENT	\$25,000
3. ANNUAL INTEREST RATE	9.875%
4. LOAN TERM (MONTHS)	360
5. TAX RATIO	2%
6. INSURANCE RATIO	0.225%
7. "OTHER" EXPENSES (ANNUAL)	\$1,500
8. BASIC HOUSING EXPENSE RATIO	28%
9. TOTAL DEBT RATIO	36%
10. MONTHLY CONSUMER DEBT	\$375

Note: The facts in this problem are identical to those in Problem 1 on page 53, except here we express the down payment as a fixed amount (\$25,000) rather than as a percentage of the price.

(a) Compute the maximum sales price supported by the given information. Then, determine which housing expense ratio produced the maximum price.

Solution (a)

KEYSTROKES

DISPLAY

[GOLD][INPUT]	0.00
53,337.32 [INCO]	INCOME = 53,337.32
36 [TOTAL]	TOTAL = 36.00
25,000 [DOWN]	DOWN = 25,000.00
9.875 [I%YR]	I%YR = 9.88
[MORE]	
360 [N]	N = 360.00
1,500 [OTHER]	OTHER/YR = 1,500.00
375 [DEBT/]	DEBT/MO = 375.00
2 [TAX%/]	TAX%/PRICE = 2.00
[MORE]	
.225 [INS%.]	INS%.PRICE = 0.23

KEYSTROKESDISPLAY

28 [BASIC]

BASIC = 28.00

[MORE]

[MAX/]

MAX/PRICE1 = 125,000.01

[MORE] [MORE]

[RCL] [?T.PR]

?T.PRICE = 125,000.01

[RCL] [?B.PR]

?B.PRICE = 126,842.72

Conclusion: The buyer qualifies for a maximum sales price of \$125,000. Since the maximum price produced using the Basic Housing Expense Ratio is greater than that produced with the Total Debt Ratio, we conclude that the buyer can increase his maximum affordable price by lowering his monthly consumer debts. (We calculate the break-even amount in Solution (c) below.)

Comment: Review the results obtained in problem 1(a) on page 54. Note the computed Basic Housing Expense Ratio price [?B.PRICE] of \$127,206.35. However, the result obtained in the above problem for the [?B.PRICE] is \$126,842.72, which amount is \$363.63 less. Why the difference in results between the two problems?

In the above problem we used a **fixed** down payment of \$25,000, rather than a down payment expressed as twenty percent (20%) of the price. Therefore, the Basic Housing Expense Ratio price [?B.PRICE] computed above is limited (constrained) by the fixed down payment of \$25,000. However, the problem on page 53 presumes a down payment of \$25,441.27 will be made in order to support the internally-evaluated [?B.PRICE] of \$127,206.35.

We conclude that an additional down payment of \$441.27 should support an extra \$363 in purchase price in the current problem.

(b) Show that by increasing the down payment to \$25,441.27, the buyer will qualify for an additional \$363.63 in purchase price. Then, verify that the maximum prices calculated with both housing expense ratios increased by exactly \$363.63.

Solution (b)

KEYSTROKES

DISPLAY

[MORE]

25,441.27 [DOWN]

DOWN = 25,441.27

[MAX/]

MAX/PRICE1 = 125,363.64

[MORE] [MORE]

[RCL] [?B.PR]

?B.PRICE = 127,206.35

[RCL] [?T.PR]

?T.PRICE = 125,363.64

Conclusion: Increasing the down payment by \$441.27 increased the maximum price by \$363.63. Also, the maximum prices produced with both housing expense ratios increased by exactly \$363.63.

The ?T.PRICE first calculated was \$125,000.01; the second ?T.PRICE was determined to be \$125,363.64, which amount is exactly \$363.63 higher than the first price computed. As well, the ?B.PRICE first calculated was \$126,842.72; the second ?B.PRICE was determined to be \$127,206.35, which is exactly \$363.63 higher than the first price computed.

(c) Reset the down payment to \$25,000 and recalculate the maximum price of \$125,000.01. Next, set the [MAX/] menu-label to the internally-evaluated [?B.PRICE] of \$126,847.72. Then, calculate the maximum monthly debt which will allow the buyer to qualify for the \$126,847.72 price computed under the Basic Housing Expense Ratio. Next, verify that the [?B.PRICE] and [?T.PRICE] are **identical**.

Solution (c)

KEYSTROKESDISPLAY

[MORE]	
25,000 [DOWN]	DOWN = 25,000.00
[MAX/]	MAX/PRICE1 = 125,000.01
[MORE] [MORE]	
[RCL] [?B.PR]	?B.PRICE = 126,842.72
[MORE]	
[STO] [MAX/]	MAX/PRICE1 = 126,842.72
[MORE]	
[DEBT/]	DEBT/MO = 355.58
[MORE]	
[RCL] [?B.PR]	?B.PRICE = 126,842.72
[RCL] [?T.PR]	?T.PRICE = 126,842.72

Conclusion: Lowering the buyer's consumer monthly installment debt from \$375 to \$355.58 technically qualifies the buyer to purchase a home selling for approximately \$1,800 more.

Note, however, that the LTV ratio in the above problem exceeds 80% (approximately 80.29%) of the maximum price. Therefore, in order to sustain the computed maximum price of "\$126,842.72", the buyer must make a larger down payment. Technically, the down payment must be increased by "\$368.54" to \$25,368.54. (The reader should verify that 20% of \$126,842.72 equals \$25,368.54.)

Caution: Care must be exercised when using the routine to calculate the maximum allowable monthly consumer debt as we did above. This calculation can only be performed in the exact manner you see above. That is, we are limited to computing the maximum allowable monthly debt in cases where the **maximum price** was produced with the Total Debt Ratio. And, be sure to always go back and check the LTV ratio in order to determine if it exceeds 80% of the price.

Problem 2

The following facts are given:

1. BUYER'S ANNUAL INCOME	\$76,247.76
2. DOWN PAYMENT	\$40,000
3. ANNUAL INTEREST RATE	10%
4. LOAN TERM (MONTHS)	360
5. ASSESSMENT RATIO	50%
6. TAX RATE PER \$1,000 OF ASSESSSED VALUE	\$40 *
7. INSURANCE RATIO	0.25%
8. BASIC HOUSING EXPENSE RATIO	28%
9. TOTAL DEBT RATIO	36%
10. MONTHLY CONSUMER DEBT	\$500

Note: The facts in this problem are identical to those in Problem 2 on page 55, except here we express the down payment as a fixed amount (\$40,000) rather than as a percentage of the price.

(a) Compute the maximum sales price supported by the given information. Next, determine which housing expense ratio produced the computed maximum price.

Solution (a)

KEYSTROKES

DISPLAY

[GOLD][INPUT]

0.00

76,247.76 [INCO]

INCOME = 76,247.76

* The equivalent annual tax ratio is computed as follows: $\text{Tax Ratio} = \frac{\text{Assessment Ratio} \times \text{Tax Rate Per } \$1,000}{\$1,000}$. Therefore: $\text{Tax Ratio} = \frac{50\% \times \$40.00}{\$1,000} = 2\%$.

KEYSTROKES

36 [TOTAL]
40,000 [DOWN]
10 [I%YR]
[MORE]
360 [N]
500 [DEBT/]
50 [A%/PR]
[MORE]
40 [TAX/]
.25 [INS%.]
28 [BASIC]
[MORE]
[MAX/]
[MORE] [MORE]
[RCL] [?T.PR]
[RCL] [?B.PR]

DISPLAY

TOTAL = 36.00
DOWN = 40,000.00
I%YR = 10.00
N = 360.00
DEBT/MO = 500.00
A%/PRICE = 50.00
TAX/\$1000 = 40.00
INS%.PRICE = 0.25
BASIC = 28.00
MAX/PRICE1 = 199,999.99
?T.PRICE = 200,781.01
?B.PRICE = 199,999.99

Conclusion: The buyer qualifies for a maximum sales price of \$200,000. The maximum price was produced using the Basic Housing Expense Ratio. The difference between the maximum sales prices produced by each housing expense ratio is not significant.

(b) Set the monthly consumer debt to zero (\$0.00), increase the BASIC housing expense ratio to 30%, increase the TOTAL debt ratio to 38%, and set the down payment to \$42,857.14.* Requalify the buyer and determine which housing expense ratio produced the maximum purchase price.

* We are duplicating the maximum price obtained in Problem 2(b) on page 56.

Solution (b)KEYSTROKESDISPLAY

[MORE]

38 [TOTAL]

TOTAL = 38.00

42,857.14 [DOWN]

DOWN = 42,857.14

[MORE]

0 [DEBT/]

DEBT/MO = 0.00

[MORE]

30 [BASIC]

BASIC = 30.00

[MORE]

[MAX/]

MAX/PRICE1 = 214,285.70

[MORE][MORE]

[RCL][?T.PR]

?T.PRICE = 262,011.92

[RCL][?B.PR]

?B.PRICE = 214,285.70

Conclusion: By increasing the housing expense ratios by two percent (2%), reducing the consumer debt to zero, and increasing the down payment to \$42,857.14, the buyer (technically) qualifies for an additional \$14,000 in sales price. Note also that the computed maximum price in this problem is consistent with the results obtained in Problem 2(b) on page 56.

(c) Assume the buyer seeks to purchase a home selling for \$200,000 and that his annual income is \$70,000. Leave all other inputs the same. Then, solve for the required down payment and compute the loan-to-value ratio (LTV).

Solution (c)KEYSTROKESDISPLAY

[MORE]

200,000 [MAX/]

MAX/PRICE1 = 200,000.00

70,000 [INCO]

INCOME = 70,000.00

[DOWN]

DOWN = 43,317.62

KEYSTROKESDISPLAY

[RCL][MAX/] - [RCL]
[DOWN] ÷ [RCL][MAX/]
× 100 =

78.34

Conclusion: The buyer requires a down payment of \$43,300. The loan-to-value ratio (LTV) is 79%. (The LTV ratio is always rounded up to the next highest whole number.)

(d) Set the buyer's income to \$100,000 and compute the maximum price. Then, compute the LTV ratio.

Solution (d)

KEYSTROKESDISPLAY

100,000 [INCO]
[MAX/]
- [RCL][DOWN] ÷ [RCL]
[MAX/] × 100 =

INCOME = 100,000.00
MAX/PRICE1 = 270,417.80
83.98

Conclusion: The buyer's income--in relationship to the down payment--was sufficient to push the maximum price to a level where the LTV ratio exceeded 80%. At this juncture, considering the price level we are dealing with, the buyer's most realistic option is to make a larger down payment.

Insofar as pursuing the maximum price qualification issue beyond what we did above, it would be best to switch to the MAX/PRICE routine previously covered on page 46 of this supplement. This is due to the fact that the MAX/PRICE1 routine cannot 'zero-in' on an exact LTV ratio when calculating the maximum price or the required down payment.

D) MAXIMUM PRICE2/Income Qualification Routine.

Entering and using the MAX/PRICE2 Routine:

Input the MAX/PRICE2 routine into your equation SOLVER. (Memory needed: to use 35%; to save 8%.)

```
MAX/PRICE2 = L(MAX: IF(L(?T.PRICE: L(U:
USPV(I%YR ÷ 12: N)) ÷ L(D:1 - %DOWN ÷
100) × (INCOME × TOTAL ÷ 1200 - DEBT/MO
+ BASIC × 0 - L(O:OTHER/YR ÷ 12)) ÷ ((L(
T:IF(TAX%/PRICE > 0: TAX%/PRICE: A%/PRICE
× TAX/$1000 ÷ 1000)) + L(I:INS%.PRICE)) ×
G(U) ÷ (1200 × G(D)) + 1)) > L(?B.PRICE:
G(U) ÷ G(D) × (INCOME × BASIC ÷ 1200 -
G(O)) ÷ ((G(T) + G(I)) × G(U) ÷ (1200 ×
G(D)) + 1)): ?B.PRICE: ?T.PRICE)) + 0 ×
L(?MAX: IF(L(?T'PRICE: (INCOME × TOTAL ÷
1200 + DOWN ÷ G(U) - G(O) - DEBT/MO) ÷
(1 ÷ G(U) + (G(T) + G(I)) ÷ 1200)) > L(
?B'PRICE: (INCOME × BASIC ÷ 1200 + DOWN
÷ G(U) - G(O)) ÷ (1 ÷ G(U) + (G(T) +
G(I)) ÷ 1200)): ?B'PRICE: ?T'PRICE)) × ?MAX
```

Your calculator will display the MAX/PRICE2 equation's menu-variables as follows:

```
[MAX/][I%YR][ N ][%DOW][INCO][MORE]
```

Pressing [MORE] brings up:

```
[TOTAL][DEBT/][BASIC][OTHER][TAX%/][MORE]
```

Pressing [MORE] again brings up:

```
[A%/PR][TAX/][INS%.][?B.PR][?T.PR][MORE]
```

Pressing [MORE] again brings up:

[DOWN][?B'PR][?T'PR][?MAX] [MORE]

Introduction

The routine makes extensive use of the LET and GET (L/G) function in conjunction with the IF function of the HP 17BII, HP 19BII, HP 17B, and HP 19B.

The Routine can be used to estimate the buyer's:

a) **maximum affordable home price;** or

b) **annual income needed to qualify** using both housing expense ratios.

The financial variables utilized by the routine are identical to the variables in the MAX/PRICE and MAX/PRICE1 routines, except we express the BASIC housing expense ratio price and the TOTAL debt ratio price as ?B'PRICE and ?T'PRICE, respectively, when estimating these variables with the down payment expressed as a fixed amount.

The Menu Labels

Each menu-label given below is categorized as an Input/Output (I/O), Input (I), or a Recall (RCL) label. The routine creates the following menu-labels in your calculator, one row at a time:

(I/O)	(I/O)	(I/O)	(I)	(I/O)	
[MAX/]	[IZYR]	[N]	[ZDOW]	[INCO]	[MORE]

(I)	(I/O)	(I)	(I)	(I/O)	
[TOTAL]	[DEBT/]	[BASIC]	[OTHER]	[TAXZ/]	[MORE]
(I/O)	(I/O)	(I/O)	(RCL)	(RCL)	
[AZ/PR]	[TAX/]	[INS%.]	[?B.PR]	[?T.PR]	[MORE]
(I)	(RCL)	(RCL)	(RCL)		
[DOWN]	[?B'PR]	[?T'PR]	[?MAX]		[MORE]

Note the five "subordinate" labels ([?B.PR], [?T.PR], [?B'PR], [?T'PR], and [?MAX]) use a question mark (?) as the first character. This tells the user to "question" the calculator for a result, and further tells the user **never** to make data-inputs into these labels or attempt a direct solution.

The Menu-Variables Explained

INPUTS

The routine accepts the following inputs and produces the solutions noted:

- * Maximum price of property **[MAX/PRICE2]**
 (using %DOWN menu-variable)
 ~ input or solve for
- * Annual mortgage interest rate **[I%YR]**
- * Number of monthly payments **[N]**
- * Down payment as a percentage of **[%DOWN]**
 maximum price or price
- * Buyer's annual income **[INCOME]**
 ~ input or solve for

- * Lender's guideline ratio for PITI (etc), plus monthly consumer debt, as a percentage of annual gross income [TOTAL]
- * Buyer's monthly consumer debt, if any [DEBT/MO]
- * Lender's guideline ratio for PITI (or PITI plus "other") as a percentage of annual gross income [BASIC]
- * Annual "other" expenses (utility, maintenance, PMI renewal premiums, and so forth) [OTHER]

Real estate taxes:

- * Tax ratio as a percentage of sales price or market value, or [TAX%/PRICE]
- * Tax assessment ratio and tax rates per \$1,000 of assessed value [A%/PRICE]
[TAX/\$1000]
- * Annual insurance expense as a percentage of price [INS%.PRICE]
- * **Recalls** maximum sale price produced using the Basic Housing Expense Ratio and down payment as a percentage of maximum price or price [RCL]
[?B.PRICE]
- * **Recalls** maximum sale price produced using the Total Debt Ratio and down payment as a percentage of maximum price or price [RCL]
[?T.PRICE]
- * Down payment expressed as a fixed amount [DOWN]

- * **Recalls** maximum sale price produced using the Basic Housing Expense Ratio and down payment expressed as a fixed amount [RCL] [?'PRICE]
- * **Recalls** maximum sale price produced using the Total Debt Ratio and down payment expressed as a fixed amount [RCL] [?'PRICE]
- * **Recalls** the maximum sale price produced using the down payment expressed as a fixed amount [RCL] [?'MAX]

User Instructions

THE DOWN PAYMENT

The unique feature of the MAX/PRICE2 routine is that it combines **both** the MAX/PRICE and the MAX/PRICE1 routines into a single algorithm. Therefore, the down payment can be treated as a percentage of the price [%DOW] **and** as a fixed amount [DOWN] **at the same time**. This feature enables the user to compute two--usually--distinct maximum prices **at the same time**, each tracking a different method of handling the down payment.

This flexibility will make it easier for the user to estimate a maximum sales price while keeping within both the buyer's down payment-limits and the lender's requirements for the loan-to-value (LTV) ratio.

MAXIMUM SALES PRICE "CONDITIONAL TEST"

The routine calculates two maximum sales prices--assuming both the [%DOWN] and [DOWN] menu-variables are utilized--and will input them into the [MAX/]

and [?MAX] menu-labels, depending upon the down payment method used.

The maximum price produced using the down payment expressed as a percentage of the purchase price will be returned in the [MAX/] menu-label, while the "subordinate" [?MAX] menu-label returns the maximum price produced using the down payment [DOWN] treated as a fixed amount.

Each maximum price generated by the routine is subjected to its own "conditional test" before being copied into the appropriate menu-label. Specifically, the routine compares the maximum sales prices produced using both the Total Debt Ratio and the Basic Housing Expense Ratio and returns the lesser of the two amounts as the maximum sales price for the given method of handling the down payment.

When working with the down payment treated as a percentage of the price, the routine enters the maximum sales price into the [MAX/] menu-variable, copies the maximum sales price computed using the BASIC housing expense ratio into the "subordinate" [?B.PRICE] menu-variable, and copies the maximum sales price computed using the TOTAL debt ratio into the "subordinate" [?T.PRICE] menu-variable.

On the other hand, if the down payment is also treated as a fixed amount, the routine enters a **maximum sales price** (under this secondary option) into the "subordinate" [?MAX] menu-variable, copies the maximum sales price computed using the BASIC housing expense ratio into the "subordinate" [?B'PRICE] menu-variable, and copies the maximum sales price computed using the TOTAL debt ratio into the "subordinate" [?T'PRICE] menu-variable.

In order to compute a maximum sales price, you **must** first compute the maximum sales price represented by the [MAX/] menu-label. This is the primary menu-

label (primary variable) which, in effect, "pulls" all the "subordinate" maximum price menu-variables along with it. You cannot determine or solve for a "subordinate" menu-variable without first solving for the maximum price represented by the [MAX/] menu-label.

After computing the maximum sales price [MAX/], you can go back and recall the [?B.PR] and [?T.PR] menu-labels in order to determine which ratio (BASIC or TOTAL) produced the **lower** price, and therefore the maximum price.

Also, if you input a fixed down payment into [DOWN] before computing the maximum price represented by the [MAX/] menu-label, you can recall a second maximum price from the "subordinate" [?MAX] menu-label. This would be the maximum affordable price produced by treating the down payment as a fixed amount. Finally, you can recall the [?B'PR] and [?T'PR] menu-labels in order to determine which ratio (BASIC or TOTAL) produced the **lower** price, and therefore the maximum price under this down payment option.

PROPERTY TAXES

The routine accepts inputs for real estate taxes using (1) taxes estimated as a percentage of sales price or (2) tax assessment ratios and tax rates per \$1,000 of assessed value. As is case with the other routines in Part IV, you can use either tax method at any time, though the routine gives preference to taxes estimated using the Tax Ratio method.

Problem 1

The following facts are given:

1. BUYER'S ANNUAL INCOME	\$50,000
2. DOWN PAYMENT	20%
~ ALTERNATE DOWN PAYMENT	\$30,000
3. ANNUAL INTEREST RATE	9.75%
4. LOAN TERM (MONTHS)	360
5. TAX RATIO	2%
6. INSURANCE RATIO	0.25%
7. BASIC HOUSING EXPENSE RATIO	28%
8. TOTAL DEBT RATIO	36%
9. MONTHLY CONSUMER DEBT	\$450

(a) Compute both maximum sales prices supported by the given information and the down payment needed to support the [MAX/] price. Next, determine which housing expense ratio produced the computed maximum prices.

Note: We will compute two maximum sales prices. The first, being the [MAX/] menu-label, will be supported by treating the down payment as a percentage of the unknown sales price; the second will be supported by the \$30,000 fixed down payment.

Solution (a)

KEYSTROKES

DISPLAY

[GOLD][INPUT]	0.00
9.75 [I%YR]	I%YR = 9.75
360 [N]	N = 360.00
20 [%DOW]	%DOWN = 20.00
50,000 [INCO]	INCOME = 50,000.00
[MORE]	
36 [TOTAL]	TOTAL = 36.00
450 [DEBT/]	DEBT/MO = 450.00
28 [BASIC]	BASIC = 28.00

KEYSTROKES

2 [TAX%/]
 [MORE]
 .25 [INS%.]
 [MORE]
 30,000 [DOWN]
 [MORE]
 [MAX/]
 × [RCL][%DOW] % =
 [MORE][MORE]
 [RCL][?B.PR]
 [RCL][?T.PR]
 [MORE]
 [RCL][?MAX]
 [RCL][?B'PR]
 [RCL][?T'PR]

DISPLAY

TAX%/PRICE = 2.00
 INS%.PRICE = 0.25
 DOWN = 30,000.00
MAX/PRICE2 = 120,024.21
24,004.84
?B.PRICE = 133,360.23
?T.PRICE = 120,024.21
?MAX = 124,945.38
?B'PRICE = 136,092.01
?T'PRICE = 124,945.38

Conclusion: The buyer qualifies to purchase a home selling for \$120,000 if he makes a down payment of \$24,000. A down payment of \$30,000 supports a purchase price of approximately \$125,000.

The buyer's monthly consumer debt is a controlling factor since both maximum prices (MAX/ and ?MAX) were produced by the Total Debt Ratio. Thus, lowering the monthly consumer debt would increase the maximum purchase prices up to the amounts determined under the Basic Housing Expense Ratio.

(b) Set the purchase price to \$130,000 and use \$30,000 to establish the down payment as a percentage of the purchase price. Compute the income needed to qualify the buyer. Then, verify that the computed [MAX/] price is equal to the [?MAX] price.

Solution (b)

KEYSTROKES

DISPLAY

[MORE]

130,000 [MAX/]

MAX/PRICE2 = 130,000.00

30,000 ÷ 130,000 ×

100 [%DOW]

%DOWN = 23.08

[INCO]

INCOME = 51,763.48

[MORE][MORE][MORE]

[RCL][?MAX]

?MAX = 130,000.00

(c) Reset the income to \$50,000, set the down payment to 25% of the price, and set the alternate down payment to \$25,000. Compute the maximum prices supported by the data. Then, determine the down payment required to support the computed [MAX/] price, and compute the LTV ratio for the fixed down payment price [?MAX].

Solution (c)

KEYSTROKES

DISPLAY

25,000 [DOWN]

DOWN = 25,000.00

[MORE]

25 [%DOW]

%DOWN = 25.00

50,000 [INCO]

INCOME = 50,000.00

[MAX/]

MAX/PRICE2 = 126,222.28

× [RCL] [%DOW] % =

31,555.57

[MORE][MORE][MORE]

[RCL][?MAX]

?MAX = 120,841.09

– [RCL][DOWN] ÷ [RCL]

[?MAX] × 100 =

79.31

Conclusion: A down payment of \$31,600 will support a purchase price of \$126,000, while a down payment of \$25,000 supports a purchase price close to \$121,000. The LTV ratio is 80%.

Problem 2

The following facts are given:

1. BUYER'S ANNUAL INCOME	\$53,337.32
2. DOWN PAYMENT	20%
~ ALTERNATE DOWN PAYMENT	\$25,000
3. ANNUAL INTEREST RATE	9.875%
4. LOAN TERM (MONTHS)	360
5. TAX RATIO	2%
6. INSURANCE RATIO	0.225%
7. BASIC HOUSING EXPENSE RATIO	28%
8. TOTAL DEBT RATIO	36%
9. MONTHLY CONSUMER DEBT	\$375

Compute both maximum sales prices supported by the given information, and calculate the down payment needed to support the [MAX/] price. Next, determine which housing expense ratio produced the computed maximum prices, and calculate the LTV ratio of the maximum price supported by the fixed down payment option.

<u>KEYSTROKES</u>	<u>DISPLAY</u>
[GOLD][INPUT]	0.00
9.875 [I%YR]	I%YR = 9.88
360 [N]	N = 360.00
20 [%DOW]	%DOWN = 20.00
53,337.32 [INCO]	INCOME = 53,337.32
[MORE]	
36 [TOTAL]	TOTAL = 36.00
375 [DEBT/]	DEBT/MO = 375.00
28 [BASIC]	BASIC = 28.00
2 [TAX%/]	TAX%/PRICE = 2.00
[MORE]	
.225 [INS%.]	INS%.PRICE = 0.23
[MORE]	
25,000 [DOWN]	DOWN = 25,000.00

KEYSTROKESDISPLAY

[MORE]	
[MAX/]	MAX/PRICE2 = 139,203.02
× [RCL][%DOW] % =	27,840.60
[MORE][MORE]	
[RCL][?B.PR]	?B.PRICE = 141,409.35
[RCL][?T.PR]	?T.PRICE = 139,203.02
[MORE]	
[RCL][?MAX]	?MAX = 136,862.24
[RCL][?B'PR]	?B'PRICE = 138,704.95
[RCL][?T'PR]	?T'PRICE = 136,862.24
[RCL][?MAX] - [RCL]	
[DOWN] ÷ [RCL][?MAX]	
× 100 =	81.73

Conclusion: A down payment of approximately \$28,000 will support a purchase price of \$139,000. The maximum prices were both produced using the TOTAL debt ratio; therefore the buyer can increase the maximum price by lowering his monthly consumer installment debts.

Though the \$25,000 fixed down payment assumption appears to support a purchase price of "\$136,862.24", the loan-to-value ratio (LTV) in this case goes over 80% (81.73%), and thus would require private mortgage insurance (PMI) in order to satisfy customary mortgage lending underwriting guidelines.

Overall, the buyer's maximum purchase price falls within a range of (approximately) \$136,000 to \$139,000, depending upon the down payment which can be made. This conclusion assumes that the buyer will not be required to carry private mortgage insurance and that the LTV ratio will not exceed 80% of the assumed purchase price.

A CONDITIONAL STATEMENT FOR THE AFTER-TAX ROUTINES

Designing SOLVER equations involves not only a considerable amount of math, but also a large number of "judgment calls" must be made in the interest of keeping a book below 300, or more, pages. One of the judgment-calls which went into this supplement concerned the possibility of using a **conditional statement** to assist in cases in which the **three percent deduction loss rule** (Sec. 68 of the IRC) must be utilized. In this regard, we might have used a "conditional statement" to cause the term "**(\$INC - 100000)**" to be multiplied times the decimal equivalent of 3%, thus saving the user two keystrokes.

The decision was made to require the user to manually input the number "3" into the [RATE] menu-label for cases where the buyer's annual income exceeds \$100,000. However, we could eliminate the [RATE]-input step, along with the [RATE] menu-variable, by using a "conditional statement" to "read" the [\$INC] menu-variable to determine when the input-income is indeed over \$100,000.

Surveys showed that although it is considered important to adjust the after-tax payment cost for the **three percent deduction loss rule**, buyer qualification cases involving purchasers with incomes over \$100,000 are, admittedly, limited. Therefore, the "judgment call" was to design an equation which adjusts for the **rule**, though a "conditional test" was left out, thereby saving nineteen characters in the standard equations published in this supplement.

For the user who regularly qualifies buyers whose incomes exceed \$100,000, a conditional test might be beneficial, though it is strongly urged that those who use this test make sure that the deduction-loss attributed to IRC Sec 68 is in fact three percent (3%) for the calendar year in which they are making the monthly after-tax payment cost calculation.

For the needed modification we will use the equation on page 7 for this example, though only the critical components will be show below. For the sake of saving space, we detail the last two lines of the equation and **"bold"** the characters to be deleted for the conditional statement:

$$+ (\text{TAX/YR} - (\$INC - 100000) \times \text{RATE} \div 100) \div 12) \times \%ITAX \div 100$$

To amend the equation to provide for a conditional test which automatically inputs the decimal-equivalent of 3% into the routine, the following **bold** characters should be substituted for those which you see above:

$$+ (\text{TAX/YR} - (\$INC - 100000) \times \text{L(R: IF(\$INC > 100000: .03: 0))} \div 12) \times \%ITAX \div 100$$

When the SOLVER scans through an after-tax adjusted equation with the above changes, it will consider the conditional test. Basically, the "test" determines whether or not the number (if any) input into the [\$INC] menu-variable is greater than \$100,000. If it is, the "test" sets the LET function variable **"R"** to "0.03". If, however, the [\$INC] menu-variable was set to something less than-or equal-to \$100,000, the LET function variable **"R"** will be set to "0.00", thereby causing the **(\$INC - 100000)** term to equal ("go to") zero, which is where we want it if the buyer's income does not exceed \$100,000.

The user who prefers the change should input the identical **bold** changes into all equations which compute the after-tax payment cost of a purchase.

Finally, since the variable **"R"** solely defines the LET statement, it will not appear in the menu of variables. And, since [RATE] was deleted, it too will not appear in the menu of variables.

SHOULD THE CALCULATOR DISPLAY "INVALID EQUATION"

If your calculator momentarily displays "INVALID EQUATION" after you attempt to input an equation into the SOLVER, you are put on notice that the equation was typed incorrectly. After the "INVALID EQUATION" announcement disappears from your display, the cursor will blink where the calculator's programming detects the error. There is no assurance, however, that the cursor will blink over the exact location of the input-error.

To determine where the error is, you should first check the exact section of the equation where the cursor blinks, and compare it with the exact section of the equation as it appears in this supplement. If you find a discrepancy, retype the characters where the error is found.

If you determine that the error is not in the location where the cursor blinks, you must go back to the beginning of the equation and check it one character at a time. There is no other way around this process.

What you should **not** do in attempting to remedy an input-error is to **force** the SOLVER to accept an equation by typing--or deleting--any number of closed parenthesis [)] at the end of the equation. Generally speaking, your calculator will accept a large percentage of incorrectly typed equations if you followed this procedure. However, the "equation" you will wind up with will produce clearly erroneous results, though it will be accepted by the calculator's SOLVER.

Take your time when inputting an equation or when debugging an erroneously typed equation. And be sure to verify every equation after it is accepted by the SOLVER by checking it against the examples in this supplement.

EFFECTIVE UTILIZATION OF STORAGE MEMORY

Your calculator's memory storage capacity--though substantial for an inexpensive hand-held computing device--is still limited and therefore should be prudently managed. One thing that can be done to utilize the calculator's maximum storage capacity is to always clear an equation's variables after you are finished working with it.

The following procedure should be used to clear the calculator's storage memory:

To delete the variables on the **HP 17BII and HP 17B**
Press: [EXIT] [GOLD] [INPUT] [YES]

Your display will show: **DELETING...**

You will then be asked whether you want to

DELETE ALL EQUATIONS?

At this step, if you want to keep the equations in your calculator, press **[NO]**. You may now press **[EXIT]** if you want to return to the **MAIN MENU**, otherwise you can press the **Up List Pointer** (or **Down List Pointer**) to view the first 21 characters of a new equation in your display window.

To delete the variables on the **HP 19BII and HP 19B**
Press: [EXIT] [GOLD] [INPUT] [VARS]

Your display will show: **DELETING...**

Now press the **Up List Pointer** (or **Down List Pointer**) to place the first 22 characters of a new equation on the third line of the display, or press **[EXIT]** to return to the **MAIN MENU**.

REQUEST FOR FEEDBACK

In the interest of assuring that I am addressing the kinds of timely and modern problems which are of most value to those who use "The Home Buyer Income Qualification Manual", I solicit your feedback and comments.


Although the ideas for the algorithms covered in this book come from my teaching and consulting in Real Estate and Income Property Appraisal and Analysis, I almost always find a new application or interest each time I present a seminar, receive a call from a user of my books, or just talk "time value of money" with any number of Instructor-Authors who also work in this fascinating field.

In spite of the fact that the kinds of computational problems one faces in real estate are just about limitless, we likely can solve every one of them with a modern hand-held Hewlett Packard computing device.

If there are specific real estate problems or applications which you have, and for which you seek a solution, consider calling or writing me. As well, if you care to comment on the equations contained in this supplement or in the main volume of the book, or if you experience any difficulty in using them, feel free to contact me at anytime.

You can write to me at 21205 Woodmont Avenue, Harper Woods, Michigan 48225, or call on (313) 886-2004.

Thank you.



John A. Tirone.

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