Real Estate Investment Analyst™

For the Hewlett Packard HP 12C and HP 10BII

A self-study workbook

The Core Course
(800) 648-8475
thecorecourse.com
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How To Use This Workbook

This workbook is designed to help you understand and execute the important skills needed to use your calculator.

The workbook will focus on the basic settings and keys on the calculator, how core concepts of financial calculation are executed on the calculator, and specific real estate applications with the calculator.

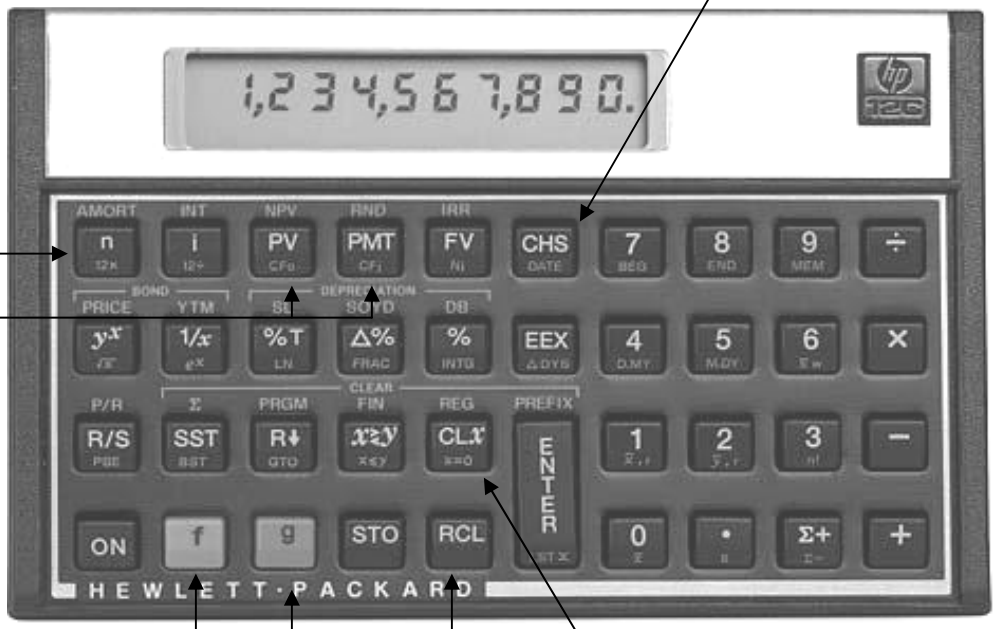
For other capabilities of the calculator, consult the manual or User's Guide that was provided when it was purchased.

This workbook is broken into two sections:

Section 1: The HP 12C

Section 2: The HP 10BII

Module 1: HP 12C
Significant Keys for the Calculator



Time value of money keys.
n, i, PV, PMT, FV

CHS key. Press to change the "sign convention" (i.e. make a positive a negative).

Cash flow keys.
CFo and CFj.

Gold "f" key. After pressed, the next key will perform the operation in gold (i.e f AMORT is achieved by pressing "f" then "n").

Recall

Clearing key. Press once to clear the previous number entered.
Press "f CLX" to clear all registers.

Blue "g" key. After pressed will perform the operation in blue. (i.e g CFo is achieved by pressing "g" then "PV").

Module 2: HP 12C
Default Settings for the Calculator

There are 3 defaults you need to use on the calculator:

- set the beginning of year (BOY) or end of year (EOY) modes
- clear the registers
- set the number of digits displayed for calculation (significant places)

BOY and EOY Settings
The HP 12C has the ability to make calculations contemplating receiving and making payments at the beginning of the period or at the end of the period. In this workbook we will assume that the investor receives the benefits of all cash flows for the entire period. This is called the "end of year" setting (EOY). If you see the word "BEGIN" in your display, it needs to be turned off, or set to end of year. If you do not see the word "BEGIN" in the display, the calculator is set on end of year (EOY).

keystrokes	description
g end	press the blue "g" key, then the number "8" key, notated as "end" in blue lettering below it.

Clearing the Registers
The HP 12C allows you to save information in some registers while it is cleared in others. In this workbook we will look at 2 of the clearing functions.

- clearing the last entry (most recent) entry
- clearing all registers

Clearing the Last Entry

keystrokes	description
CLX	clears the last entry

Clearing All Registers

keystrokes	description
f CLX	press the gold "f" key, then the "CLX" key--clears all registers

Set the Number of Digits Displayed for Calculation
In the HP-12C calculator, changing the number of digits will not affect the internal iteration of the calculator. The calculator will always performs tasks and store digits up to 12 significant places (a "significant place" is a number to the right of the decimal point). EXCEPTION: when performing mortgage loan calculations (discussed later), the calculator will round to the number of places you have pre-set in the calculator.

keystrokes	description
f # desired digits	press the gold "f" key, then the number representing the desired number of desired digits to be displayed to the right of the decimal point.

For example, to display 4 significant places, press the gold "f" key then the number 4. You will see 0.0000

Module 3: HP 12C
Basics Concepts in Financial Calculation

Time Value of Money--The Top Row
There are 5 fundamental "time value of money" keys on the top row of the HP12C calculator. They are:

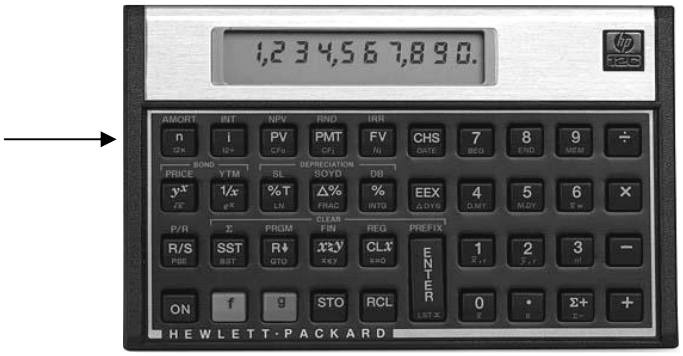
n The number of time "periods". Note: this is not always the number of years, rather the number of "periods" (i.e 12 periods in a year, 4 periods in a quarter).

i The "rate", "interest rate", or "yield".

PV Present Value is the "worth" today of money received or paid.

FV Future Value is the "worth" in the future of money received or paid.

PMT The payment. Investors receive (or pay) a series of payments throughout the holding cycle of an investment. Payments can be positive or negative. The notation used to make a number "negative" is referred to as "sign convention". NOTE: In this workbook, a negative sign convention will be denoted by "< >" or "-".



The Relationship of "i" and "n"
To balance the time value of money calculations, you will need to make a conversion for the "n' and "i" based on the number or payments per year. If you are dealing with 12 payments per year (as you will in most normal real estate situations), this is entered into the HP 12C by first entering the number of years, then pressing the blue "g" key then pressing the "n" key. For example, if you are dealing with monthly payments over 15 years, enter is this way: 15 **g n**.

A similar conversion needs to be made for the interest rate, or "i" value. To make the interest rate conversion for a situation with monthly payments, enter this into the HP 12C by first entering the annual interest rate, then pressing the blue "g" key then pressing the "i" key.
For example, let's say you are dealing with an annual interest rate of 10% and monthly payments, enter is this way: 10 **g i**.

Whenever you press the glue "g" key first, the next key you press will perform the operation in blue. Pressing **g n** will multiply by 12. Pressing **g i** will divide by 12.

Example 3-1: Adjusting "n" and "i"
Assume you want to borrow $100,000. You will be paying an interest rate of 6% per year amortized over 30 years. Payments will be made once per year. The keystrokes would be as follows:

f CLX	0.00
100000	**PV**
6	**i**
30	**n**
PMT	-7,264.89 solve for annual payment

Now assume the payments are made monthly. The keystrokes would be as follows:

f CLX	0.00
100000	**PV**
6	**g i**
30	**g n**
PMT	-599.55 solve for monthly payment

Module 4: HP 12C
Compounding and Discounting

Compounding and discounting are fundamental calculations for evaluating investments. Solving for compounding and discounting functions assumes that you know three variables, and are solving for the fourth.

When performing a "discounting" problem, you are determining the amount that should be paid for an investment at the time of purchase. When performing a "compounding" problem, you are determining what something should be worth in the future.

Example 4-1: Compounding
How much will $10,000 invested today in an investment that pays 10% monthly be worth in 20 years?

Example 4-1: Solution

keystrokes	register	description
f CLX	0.00	clears registers
10,000 **CHS PV**	-10,000.00	enters 10,000 as PV
10 **g i**	0.83	converts to monthly interest
20 **g n**	240.00	converts to monthly periods
FV	73,280.74	solution

Example 4-2: Compounding
Without clearing your calculator, what would the future value of this investment be if compounding were annual instead of monthly?

Example 4-2: Solution

keystrokes	register	description
20 **n**	20.00	"overwrites" periods to annual
10 **i**	10.00	"overwrites" interest to annual
FV	67,275.00	solution

Working Problem 4-3: Compounding
Assume you have choice to make.

Investment #1
Invest $350 in monthly income, compounded at 15% monthly over 10 years.

Investment #2
Receive $100,000 and invest it at 18.5% compounded monthly over 8 years, but receive no monthly income.

QUESTION: Which would you choose assuming you wanted the most money at the end of the term and you were indifferent about the amount of time the money was invested?

NOTE: The solution for this problem is in the Solution Set at the end of this section.

Example 4-4: Discounting
If you knew you needed $175,000 in 10 years and you were offered an investment knowing it would grow at 12.5% compounded monthly, what would you pay for it today? Note: preset for 2 significant places by pressing **f** 2.

Example 4-4: Solution

keystrokes	register	description
f CLX	0.00	clears registers
175,000 **FV**	175,000.00	enters future value
12.5 **g i**	1.04	changes to monthly interest
10 **g n**	120.00	changes to monthly periods
PV	-50,463.56	solution

Working Problem 4-5: Discounting
A client asks you to evaluate two investment options.

Option #1
Buy a piece of vacant land. The land can be purchased for $275,000 today and he believes it can be sold in 10 years for $500,000.
Option #2
Buy a group of stocks that the investor believes will be worth $500,000 in 10 years. The stocks have a historical rate of return of 10% annually.

QUESTION: What is the rate of return on the land assuming annual compounding?
QUESTION: What should the investor pay for the stocks today given his parameters?

NOTE: The solution for this problem is in the Solution Set at the end of this book.

Module 5: HP 12C
Mortgage Amortization

Amortizing a loan is a key tool for the real estate practitioner in determining 3 things:

- the amount of annual interest paid on the promissory note,
- the amount of loan balance remaining when the loan is due,
- the amount of annual principal paid on the promissory note.

To perform an amortization on any loan, the first task is to input the required loan information: PV, n, and i.

Example 5-1: Amortization
Amortize the following loan from the investor's perspective:

PV	$100,000 (received by the borrower)
n	25 years monthly payments
i	9.75%

Example 5-1: Solution

keystrokes	register	description
f CLX	0.00	clears registers
100000 **PV**	100,000.00	enters loan amount received
9.75 **g i**	0.81	adjusts interest rate monthly
25 **g n**	300.00	adjusts periods monthly
PMT	-891.14	monthly payment solution

Amortize the loan for the first year (periods 1-12)

keystrokes	register	description
12 **n**	12.00	projects 12 periods (months 1-12) into the future
f AMORT	-9,706.67	amount of interest accrued
X><Y	-987.01	amount of principal accrued
RCL PV	99,012.99	principal balance remaining at the end of the 12th month.

Amortize for the second year (periods 13-24)

keystrokes	register	description
12 **n**	12.00	projects the next 12 periods (months 13-24) into the future
f AMORT	-9,606.01	amount of interest accrued
X><Y	-1,087.67	amount of principal accrued
RCL PV	97,925.32	principal balance remaining at the end of the 24th month.

Working Problem 5-2: Amortization
A client is considering selling a property on a promissory note. He has received an offer with promissory note terms specified below. The client has asked you to prepare an amortization table for him to evaluate if the offer is viable.

He indicates that the proposed promissory note from the offer would have the following terms:

PV	275,000
i	5.25% per year
n	amortized over 25 years
FV	The note will balloon in 5 years

QUESTION: Complete the amortization schedule for this note on page on the next page and answer the two questions at the bottom of the page.

Working Problem 5-2: Amortization Worksheet

Year	Interest Paid	Principal Paid	Remaining Balance EOY
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____
5	_____	_____	_____
TOTAL	_____	_____	
REMAINING BALANCE			_____

QUESTION #1: What will be the total interest received on the note over the term by the note Holder?

QUESTION #2: What will be the amount of balloon payment due by the note Maker EOY (End of Year) 5?

NOTE: The solution for this problem is in the Solution Set at the end of this book.

Module 6: HP 12C
The "Cash Flow T"

The "Cash-Asset-Cash" Model
Any investment can be measured in a "lifecycle". When we analyze the cash flows from an investment, a simple and effective tool is available to the investment professional. We call it the "Cash-Asset-Cash" Model.

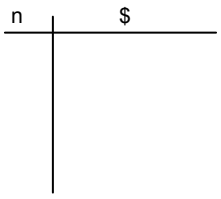
The Cash-Asset-Cash Model assumes that every investment has a "lifecycle". It has a beginning (Cash), a middle (Asset), and an end (Cash).

Cash Out: The initial cash paid by the investor to control the asset. Typically this is the sum of the down payment plus the other costs of acquisition.

Cash Flows: Cash flows from operations of the holding term of the investment. Can be both positive and negative.

Cash In: The cash received by the investor at the sale of the asset. Cash flows in this portion of the investment lifecycles are composed of two parts-- cash flows from operations in the year of sale plus the proceeds from the sale.

Graphically, we depict the Cash-Asset-Cash Model with a simple "T" account.



WHERE:

"n" represents time expressed in time periods

"$" represents money paid or received at the corresponding time period

An example of the Cash-Asset-Cash Model from the investor's point of view might be:

Down payment:	-100,000	Cash
Cash flows from operations year 1:	25,000	Asset
Cash flows from operations year 2:	14,000	Asset
Cash flows from operations year 3:	-8,000	Asset
Cash flows from the sale in year 3:	450,000	Cash

Placing this investment in the Cash-Asset-Cash Model would make it appear as follows:

n	$
0	<100,000>
1	25,000
2	14,000
3	<8,0000> + 450,000 = 442,000

Inputting Uneven Cash Flows
The HP-12C allows us to input regular and irregular cash flows in order to analyze them. This is especially helpful when analyzing the possibilities of Internal Rate of Return (IRR) and Net Present Value (NPV). Assume an investment with the following cash flows:

Time Period	Amount	Tier	Symbol
0	-100,000	Cash	CF0
1	12,000	Asset	CFj
2	12,000	Asset	CFj
3	13,500	Asset	CFj
4	-18,000	Asset	CFj
5	15,000	Asset	CFj
6	19,000 + 75,700	Cash	CFj

Example 6-1: Inputting Uneven Cash Flows
Load the cash flows from the Cash-Asset-Cash Model on the previous page into your calculator.

Example 6-1: Solution

keystrokes	register	description
f CLX	0.00	clear registers
100000 **CHS g CFo**	-100,000.00	enters cash flow "0" into time period ”0"
12000 **g CFj**	12,000.00	enters the first 12,000 cash flow
12000 **g CFj**	12,000.00	enters the next 12,000 cash flow
13500 **g CFj**	13,500.00	enters the 13,500 cash flow
18000 **CHS g CFj**	-18,000.00	enters the -18,500 cash flow
15000 **g CFj**	15,000.00	enters the 15,000 cash flow
19000 **ENTER**	19,000.00	stacks 19,000.00
75700 **+**	94,700.00	adds 19,000 to 75,700
g CFj		enters the product of 19,000.00 and 75,500 into the CFj register*

DO NOT CLEAR YOUR CALCULATOR

*Note: in the last year, cash flows from operations must be added to the cash flows at the sale because the investor receives them in the same year. If you don’t add them together, your model will assume an additional period which is not valid.

Internal Rate of Return
The Internal Rate of Return (IRR) is defined as:

The interest rate received for an investment consisting of positive and negative cash flows that occur at regular periods.

Once you've mastered inputting cash flows into the calculator, solving for IRR us relatively easy.

Example 7-1: IRR
QUESTION: Calculate the IRR for the cash flows in Example 6-1.

Example 7-1: Solution

keystrokes	register	description
f IRR	“running”	calculator is doing the work
	5.34	solution 5.34%

DO NOT CLEAR THE CALCULATOR

Net Present Value
A simple definition of the Net Present Value (NPV) of an investment is:

The amount more or less than the initial investment the investor can afford to pay at time period zero to achieve the desired rate of return

The calculator calculates NPV by discounting each future cash flow to its present value, then adding those discounted flows to the initial investment at time period zero. To perform an NPV calculation, you need to use a pre-determined desired "yield" or "discount" rate.

Example 7-2: NPV
For an investment with cash flows from Example 6-1, an investor has indicated a desire to purchase, but requires a 15% yield on investment.

QUESTION: What should he pay for the benefit of these cash flows?

Example 7-2: Solution

keystrokes	register	description
	5.34	IRR from In Class Example 7-1
15 i	15.00	enters 15% as the discount rate
f NPV	-33,507.51	solution

The answer is negative. Therefore, to achieve the desired 15% rate of return on the given cash flows, the investor needs to pay $33,507.01 less than the $100,000 initial investment assumed in the cash flows. Put another way, his initial investment can't exceed $66,492.49 (100,000.00 – 33,507.51) in order to receive his 15% desired rate of return on the cash flows.

Note: NPV and IRR calculations are independent of each other.

The HP-12C Calculator Workbook
Selected Workbook Solutions

Working Problem 4-3

Investment 1:

Keystroke	Display
f CLX	0.00
350 **CHS PMT**	-350.00
15 **g i**	1.25
10 **g n**	120.00
FV	96,325.97

Investment 2:

Keystroke	Display
f CLX	0.00
100000 **CHS PV**	-100,000.00
18.5 **g i**	1.54
8 **g n**	96.00
FV	434,361.77

You should choose investment #2 because it provides you with more.

Working Problem 4-5

Option #1: Vacant Land Investment

Keystroke	Display
f CLX	0.00
275000 **CHS PV**	-275,000.00
10 **n**	10.00
500000 **FV**	500,000.00
i	6.16

The client will receive a 6.16% rate of return on the land.

Option #2: Stocks

Keystroke	Display
f CLX	0.00
500000 **FV**	500,000.00
10 **i**	10.00
10 **n**	10.00
PV	-192,771.64

He should pay $192,771.64 for the stocks.

Working Problem 5-2

Term	Interest Paid	Principal Paid	Remaining Balance End of Year (EOY)
Year 1	-14,307.17	-5,467.99	269,532.01
Year 2	-14,013.09	-5,762.07	263,769.94
Year 3	-13,703.18	-6,071.98	257,697.96
Year 4	-13,376.63	-6,398.53	251,299.43
Year 5	-13,032.52	-6,742.64	244,556.79

REMAINING BALANCE **244,556.79**

Module 1: HP 10BII
Significant Keys for the Calculator

Time value of money keys. N, I/YR, PV, PMT and FV.

BEG/END key. Changes beginning or end of year.

IRR/YR: Internal rate of Return.
NPV: Net Present Value

Gold Key ■

Clear or Clear All.

DISP. Used to change the significant places displayed.

Module 2: HP 10BII
Default Settings for the Calculator

There are 3 defaults you need to use on the calculator:

- set the beginning of year (BOY) or end of year (EOY) modes
- clear the registers
- set the number of digits displayed for calculation (significant places)

BOY and EOY Settings
The HP 10BII has the ability to make calculations contemplating receiving and making payments at the beginning of the period or at the end of the period. In this workbook we will assume that the investor receives the benefits of all cash flows for the entire period. This is called the "end of year" setting (EOY). If you see the word "BEGIN" in your display, it needs to be turned off, or set to end of year. If you do not see the word "BEGIN" in the display, the calculator is set on end of year (EOY).

keystrokes	description
gold END	press the "GOLD" key, then the BEG/END Key

Clearing the Registers
The HP 10BII allows you to save information in some registers while it is cleared in others.

- making corrections before a number is entered
- clearing the last entry
- clearing all registers

Making Corrections Before a Number is Entered

keystrokes	description
←	← clears the last digit in the display otherwise it cancels the current calculation

Clearing the Last Entry

keystrokes	description
C	clears the last entry

Clearing all Registers

keystrokes	description
gold C ALL	clears all memory functions

Set the Number of Digits Displayed for Calculation
On the HP 10BII calculator, changing the number of digits shown to the right of the decimal point will not affect the internal iteration of the calculator. The calculator will always performs tasks and store digits up to 12 places. EXCEPTION: when performing mortgage loan calculations (discussed later), the calculator will round to the number of places you have pre-set in the calculator.

keystrokes	description
gold DISP	press the GOLD key, then the "="key, then the number of digits desired to be displayed to the right of the decimal point.

For example, to display 4 significant places, press **gold DISP** 4. You will see 0.0000

Module 3
Basics Concepts in Financial Calculation

Time Value of Money--The Top Row
There are 5 fundamental "time value of money" keys on the top row of the HP10BII calculator. They are:

N The number of time "periods". Note: this is not always the number of years, rather the number of "periods" (i.e 12 periods in a year, 4 periods in a quarter).

I/YR The "rate", "interest rate", or "yield".

PV Present Value is the "worth" today of money received or paid.

FV Future Value is the "worth" in the future of money received or paid.

PMT The payment. Investors receive (or pay) a series of payments throughout the holding cycle of an investment. Payments can be positive or negative. The notation used to make a number "negative" is referred to as "sign convention". NOTE: In this workbook, a negative sign convention will be denoted by "< >" or "-".

The Relationship of "I/YR" and "N"
When performing time value of money calculations, you will need to preset the calculator for the correct number or payments per year to make the conversions required for I/YR and N.

Setting the Number of Periods Per Year

keystrokes	description
enter number of periods (i.e. 12)	
■ **P/YR**	press the GOLD key, then press the P/YR (PMT) key, NOT the xP/YR (N).

NOTE: to check the number or periods currently set, press ■ and hold down the **C ALL** key.

Example 3-1: Adjusting "N" and "I/YR"
Assume you want to borrow $100,000. You will be paying an interest rate of 9% per year, amortized over 30 years, with payments made monthly. The keystrokes would be as follows:

keystrokes	register	description
12 ■ **P/YR**	12.00	sets payments per year to 12
■ **C ALL**	12 P_Yr	clears registers, verifies 12 payments per year
100000 **PV**	100,000.00	enters 100,000 as the PV
30 ■ **N**	360.00	multiplies the 30 times the number of periods preset per year (12)
9 **I/YR**	9.00	internally divides the 9% annual interest rate by the number of periods per year
PMT	-804.62	solve for monthly payment

Now assume you want to make payments annually instead of monthly. They keystrokes would be as follows:

keystrokes	register	description
1 ■ **P/YR**	1.00	sets payments per year to 1
■ **C ALL**	1 P_Yr	clears registers, verifies 1 payments per year
100000 **PV**	100,000.00	enters 100,000 as the PV
30 ■ **N**	30.00	multiplies the 30 times the number of periods preset per year (1)
9 **I/YR**	9.00	internally divides the 9% annual interest rate by the number of periods per year
PMT	-9,733.64	solve for annual payment

Module 4: HP 10BII
Compounding and Discounting

Compounding and discounting are fundamental calculations for the investment professional. Solving for compounding and discounting functions assumes that you know three variables, and are solving for the fourth.

When performing a "discounting" problem, you are determining the amount that should be paid for an investment at the time of purchase. When performing a "compounding" problem, you are determining what something should be worth in the future.

Example 4-1: Compounding
How much will $10,000 invested today in an investment that pays 10% monthly be worth in 20 years?

Example 4-1: Solution

keystrokes	register	description
12 ■ **P/YR**	12.00	sets payments per year to 12
■ **C ALL**	12 P_Yr	clears registers, verifies 12 payments per year
10000 **+/- PV**	-10,000.00	enters -10,000 as the PV
20 ■ **N**	240.00	multiplies the 20 times the number of periods preset per year (12)
10 **I/YR**	10.00	internally divides the 10% annual interest rate by the number of periods per year
FV	73,280.74	solution

Example 4-2: Compounding
Without clearing your calculator, what would the future value of this investment be if compounding were annual instead of monthly?

4-2: Solution

keystrokes	register	description
1 ■ **P/YR**	1.00	resets calculator for 1 payment per year
20 ■ **N**	20.00	resets calculator for annual periods
FV	67,275.00	solution

Working Problem 4-3: Compounding
Assume you have choice to make.

Investment #1
Invest $350 in monthly income, compounded at 15% monthly over 10 years.
Investment #2
Receive $100,000 and invest it at 18.5% compounded monthly over 8 years, but receive no monthly income.

QUESTION: Which would you choose assuming you wanted the most money at the end of the term and you were indifferent about the amount of time the money was invested? *NOTE: The solution for this problem is in the Solution Set at the end of this book.*

Example 4-4: Discounting
If you knew you needed $175,000 in 10 years and you were offered an investment knowing it would grow at 12.5% compounded monthly, what would you pay for it today?

keystrokes	register	description
12 ■ **P/YR**	12 P_Yr	sets payments per year to 12
■ **C ALL**	12 P_Yr	clears registers, verifies 12 payments per year
175000 **FV**	175,000.00	enters 175,000 as the FV
10 ■ **N**	120.00	number of periods
12.5 **I/YR**	12.50	interest
PV	-50,463.56	PV solution

Working Problem 4-5: Discounting
A client asks you to evaluate two investment alternatives for him.

Option #1
Buy a piece of vacant land. The land can be purchased for $275,000 today and he believes it can be sold in 10 years for $500,000.

Option #2
Buy a group of stocks that the investor believes will be worth $500,000 in 10 years. The stocks have a historical rate of return of 10% annually.

QUESTION: What is the rate of return on the land assuming annual compounding?
QUESTION: What should the investor pay for the stocks today given his parameters?

NOTE: The solution for this problem is in the Solution Set at the end of this book.

Module 5: HP 10BII
Mortgage Amortization

Amortizing a loan is a key tool for the real estate practitioner in determining 3 things:

- the amount of annual interest and principal paid on the promissory note,
- the amount of loan balance remaining when the loan is due, and
- the amount of annual debt service.

To perform an amortization on any loan, the first task is to input the required loan information: PV, I/YR and N.

Example 5-1: Amortization
Amortize the following loan from the investor's perspective:

PV	$100,000 (received by the borrower)
N	25 years monthly payments
I/YR	9.75%

Example 5-1: Solution

keystrokes	register	description
12 ■ **P/YR**	12.00	sets payments per year to 12
■ **C ALL**	12 P_Yr	clears registers, verifies 12 payments per year
100000 **PV**	100,000.00	enters 100,000 as the PV
25 ■ **N**	300.00	number of periods
9.75 **I/YR**	9.75	interest
PMT	-891.14	payment solution

Amortize
On the HP 10BII, you'll cycle through a set of 12 periods (months) each time you press ■ **AMORT** keys. When performing amortization, you can continually cycle through 4 results by pressing the "**=**" key until you press ■**AMORT** again. Each time "**=**" is pressed, a word prefix appears prior to the number displayed. "**AMORT**" is the FV key. The word prefix indicates what the corresponding number represents:

- "PER" for the number of periods
- "INT" for interest amount in that set of periods
- "BAL" for the remaining balance
- "PRIN" for principal amount in that set of periods

Amortize the loan for 1 year (periods 1-12)

keystrokes	register		description
■ **AMORT**	PER 1-12		notation of periods amortized
=	PRIN	-987.01	cumulative principal paid for periods 1-12
=	INT	-9,706.67	cumulative interest paid for periods 1-12
=	BAL	99,012.99	remaining loan balance EOY 1 (at the end of the 12th period)

Amortize for the second year (periods 13-24)

keystrokes	register		description
■ **AMORT**	PER 13-24		notation of periods amortized
=	PRIN	-1,087.67	cumulative principal paid for periods 1-12
=	INT	-9,606.01	cumulative interest paid for periods 1-12
=	BAL	97,925.32	remaining loan balance EOY 2 (at the end of the 24th period)

Working Problem 5-2: Amortization
A client is considering selling a property on a promissory note. He has received an offer with promissory note terms specified below. The client has asked you to prepare an amortization table for him to evaluate if the offer is viable.

He indicates that the proposed promissory note from the offer would have the following terms:

PV	275,000
i	5.25% per year
n	amortized over 25 years
FV	The note will balloon in 5 years

QUESTION: Complete the amortization schedule for this note on page on the next page and answer the two questions at the bottom of the page.

Working Problem 5-2: Amortization Worksheet

Year	Interest Paid	Principal Paid	Remaining Balance EOY
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____
5	_____	_____	_____
TOTAL	_____	_____	
REMAINING BALANCE			_____

QUESTION #1: What will be the total interest received on the note over the term by the note Holder?

QUESTION #2: What will be the amount of balloon payment due by the note Maker EOY (End of Year) 5?

NOTE: The solution for this problem is in the Solution Set at the end of this book.

Module 6: HP 10BII
The "Cash Flow T"

The "Cash-Asset-Cash" Model
Any investment can be measured in a "lifecycle". When we analyze the cash flows from an investment, a simple and effective tool is available to the investment professional. We call it the "Cash-Asset-Cash" Model.

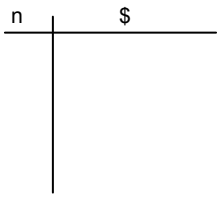
The Cash-Asset-Cash Model assumes that every investment has a "lifecycle". It has a beginning (Cash), a middle (Asset), and an end (Cash).

Cash Out: The initial cash paid by the investor to control the asset. Typically this is the sum of the down payment plus the other costs of acquisition.

Cash Flows: Cash flows from operations of the holding term of the investment. Can be both positive and negative.

Cash In: The cash received by the investor at the sale of the asset. Cash flows in this portion of the investment lifecycles are composed of two parts-- cash flows from operations in the year of sale plus the proceeds from the sale.

Graphically, we depict the Cash-Asset-Cash Model with a simple "T" account.



WHERE:

"n" represents time expressed in time periods

"$" represents money paid or received at the corresponding time period

An example of the Cash-Asset-Cash Model from the investor's point of view might be:

Down payment:	-100,000	Cash
Cash flows from operations year 1:	25,000	Asset
Cash flows from operations year 2:	14,000	Asset
Cash flows from operations year 3:	-8,000	Asset
Cash flows from the sale in year 3:	450,000	Cash

Placing this investment in the Cash-Asset-Cash Model would make it appear as follows:

n	$
0	<100,000>
1	25,000
2	14,000
3	<8,0000> + 450,000 = 442,000

Inputting Uneven Cash Flows
The HP-10BII allows us to input regular and irregular cash flows in order to analyze them. This is especially helpful when analyzing the possibilities of Internal Rate of Return (IRR) and Net Present Value (NPV). Assume an investment with the following cash flows:

Time Period	Amount	Tier	Symbol
0	-100,000	Cash	CF0
1	12,000	Asset	CFj
2	12,000	Asset	CFj
3	13,500	Asset	CFj
4	-18,000	Asset	CFj
5	15,000	Asset	CFj
6	19,000 + 75,700	Cash	CFj

Example 6-1: Inputting Uneven Cash Flows
Load the cash flows from the Cash-Asset-Cash Model on the previous page into your calculator.

Example 6-1: Solution

keystrokes	register	description
1 ■ **P/YR**	1.00	Presets for 1 payment per year
■ **C ALL**	1 P_Yr	Verifies 1 payment per year preset
100000 **+/- CFj**	-100,000.00	enters cash flow at time period "0" of -100,000 as time period ”0"
12000 **CFj**	12,000.00	enters the first 12,000 cash flow as “time period 1”
12000 **CFj**	12,000.00	enters the next 12,000 cash flow as “time period 2”
13500 **CFj**	13,500.00	enters the 13,500 cash flow as “time period 3”
18000 +/- **CFj**	-18,000.00	enters the -18,000 cash flow as “time period 4”
15000 **CFj**	15,000.00	enters the 15,000 cash flow as “time period 6”
19000 + 75700 **= CFj**	94,700.00	adds 19,000 to 75,700 as “time period 6”

DO NOT CLEAR YOUR CALCULATOR

*Note: in the last year, cash flows from operations must be added to the cash flows at the sale because the investor receives them in the same year. If you don’t add them together, your model will assume an additional period which is not valid.

Internal Rate of Return
The internal rate of return is defined as:

The interest rate received for an investment consisting of
positive and negative cash flows that occur at regular periods.

Once you've mastered inputting cash flows into the calculator, the steps are relatively easy.

Example 7-1: IRR
QUESTION: Calculate the IRR for the following cash flows. In Example 6-1.

keystrokes	register	description
■ **IRR/YR**	5.34	IRR solution = 5.34%

DO NOT CLEAR THE CALCULATOR

Net Present Value
A simple definition of the Net Present Value (NPV) of an investment is:

The amount more or less than the initial investment the investor can afford
to pay at time period zero to achieve the desired rate of return

The calculator calculates NPV by discounting each future cash flow to its present value, then adding those discounted flows to the initial investment at time period zero. To perform an NPV calculation, you need to use a pre-determined desired "yield" or "discount" rate. To perform an NPV calculation, you need to use a pre-determined desired "yield" or "discount" rate.

Example 7-2: NPV
For an investment with cash flows from Example 6-1, an investor has indicated a desire to purchase, but requires a 15% yield on investment.
QUESTION: What should he pay for the benefit of these cash flows?

Example 7-2: Solution

keystrokes	register	description
	5.34	IRR from Example 7-1
15 **I/YR**	15.00	enters 15% as the discount rate
■ **NPV**	-33,507.51	

The answer is negative. Therefore, to achieve the desired 15% rate of return on the given cash flows, the investor needs to pay $33,507.01 less than the $100,000 initial investment assumed in the cash flows. Put another way, his initial investment can't exceed $66,492.49 (100,000.00 – 33,507.51) in order to receive his 15% desired rate of return on the cash flows.

Note: NPV and IRR calculations are independent of each other.

The HP-10BII Calculator Workbook
Selected Workbook Solutions

Working Problem 4-3

Investment 1:

Keystroke	Display
12 ■ **P/YR**	12.00
■ **C ALL**	12 P_Yr
350 **+/- PMT**	-350.00
15 **I/YR**	15.00
10 ■ **N**	120.00
FV	96,325.97

Investment 2:

Keystroke	Display
12 ■ **P/YR**	12.00
■ **C ALL**	12 P_Yr
18.5 **I/YR**	18.50
8 ■ **N**	96.00
100000 **+/- PV**	-100,000.00
FV	434,361.77

You should choose investment #2 because it provides you with more.

Working Problem 4-5

Option #1: Vacant Land Investment

Keystroke	Display
1 ■ **P/YR**	1.00
■ **C ALL**	1 P_Yr
275000 **+/- PV**	-275,000.00
10 ■ **N**	10.00
500000 **FV**	500,000.00
I/YR	6.16

The client will receive a 6.16% rate of return on the land.

Option #2: Stocks

Keystroke	Display
1 ■ **P/YR**	1.00
■ **C ALL**	1 P_Yr
10 ■ **N**	10.00
10 **I/YR**	10.00
500000 **FV**	500,000.00
PV	-192,771.64

He should pay $192,771.64 for the stocks.

Working Problem 5-2

Term	Interest Paid	Principal Paid	Remaining Balance End of Year (EOY)
Year 1	-14,307.17	-5,467.99	269,532.01
Year 2	-14,013.09	-5,762.07	263,769.94
Year 3	-13,703.18	-6,071.98	257,697.96
Year 4	-13,376.63	-6,398.53	251,299.43
Year 5	-13,032.52	-6,742.64	244,556.79

REMAINING BALANCE **244,556.79**