

Certified Foreclosure Analyst™

For the Hewlett Packard HP 12C and HP 10BII

A self-study workbook



The Core Course
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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

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

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

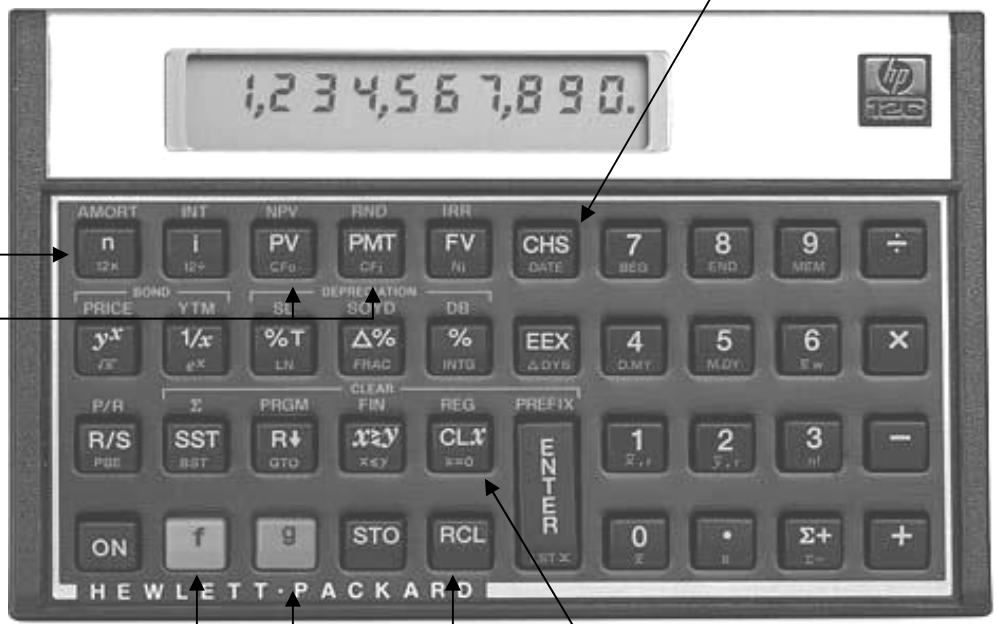
Cash flow keys.
CFo and CFj.

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

g end

description

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

CLX

description

clears the last entry

Clearing All Registers

keystrokes

f CLX

description

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 perform 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

f # desired digits

description

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

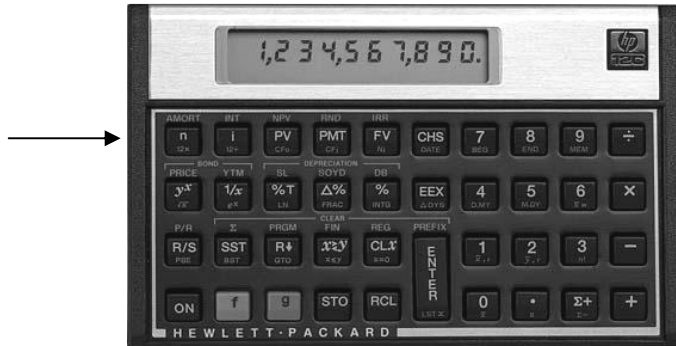
Module 3: HP 12C

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 blue "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

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|------------------------------|
| 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

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|---------------------------------|
| 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

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|-----------------------------|
| 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

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

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

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

Amortize for the second year (periods 13-24)

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

| <u>Year</u> | <u>Interest Paid</u> | <u>Principal Paid</u> | <u>Remaining Balance EOY</u> |
|--------------------------|----------------------|-----------------------|------------------------------|
| 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.

| n | \$ |
|---|----|
| | |

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 <u>operations</u> year 1: | 25,000 | Asset |
| Cash flows from <u>operations</u> year 2: | 14,000 | Asset |
| Cash flows from <u>operations</u> year 3: | -8,000 | Asset |
| Cash flows from the <u>sale</u> 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:

| <u>Time Period</u> | <u>Amount</u> | <u>Tier</u> | <u>Symbol</u> |
|--------------------|-----------------|-------------|---------------|
| 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

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|---|
| 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 is relatively easy.

Example 7-1: IRR

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

Example 7-1: Solution

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-------------------|--|
| f IRR | "running" 5.34 | calculator is doing the work 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

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|--|
| 15 i | 5.34 15.00 | IRR from In Class Example 7-1 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 |

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 |

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

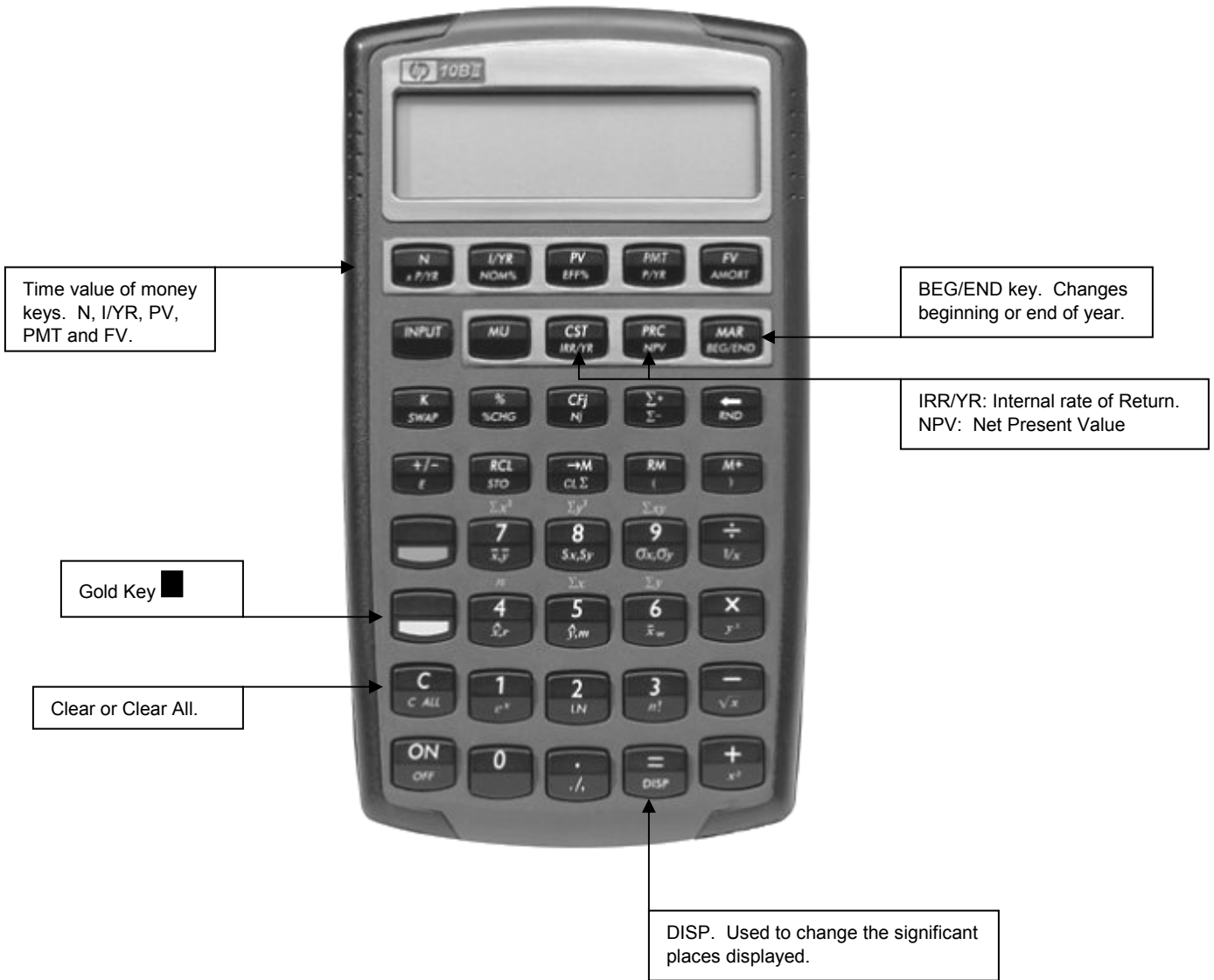
He should pay \$192,771.64 for the stocks.

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



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).

| <u>keystrokes</u> | <u>description</u> |
|-------------------|--|
| ■ 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

| <u>keystrokes</u> | <u>description</u> |
|-------------------|---|
| ← | ← clears the last digit in the display otherwise it cancels the current calculation |

Clearing the Last Entry

| <u>keystrokes</u> | <u>description</u> |
|-------------------|-----------------------|
| C | clears the last entry |

Clearing all Registers

| <u>keystrokes</u> | <u>description</u> |
|-------------------|-----------------------------|
| ■ 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.

| <u>keystrokes</u> | <u>description</u> |
|-------------------|---|
| ■ 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 **■** 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:

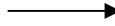
N The number of time "periods". Note: this is not always the number of years, rather the number of "periods" (i.e. 12 periods in a year, 4 periods in a quarter).

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:

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|--|
| 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 <u>monthly</u> payment |

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

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|--|
| 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 <u>annual</u> 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

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|---|
| 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

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|--|
| 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?

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|---|
| 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

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|---|
| 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)

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

Amortize for the second year (periods 13-24)

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

| <u>Year</u> | <u>Interest Paid</u> | <u>Principal Paid</u> | <u>Remaining Balance EOY</u> |
|--------------------------|----------------------|-----------------------|------------------------------|
| 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.

| n | \$ |
|---|----|
| | |

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 <u>operations</u> year 1: | 25,000 | Asset |
| Cash flows from <u>operations</u> year 2: | 14,000 | Asset |
| Cash flows from <u>operations</u> year 3: | -8,000 | Asset |
| Cash flows from the <u>sale</u> 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:

| <u>Time Period</u> | <u>Amount</u> | <u>Tier</u> | <u>Symbol</u> |
|--------------------|-----------------|-------------|-----------------|
| 0 | -100,000 | Cash | CF ₀ |
| 1 | 12,000 | Asset | CF _j |
| 2 | 12,000 | Asset | CF _j |
| 3 | 13,500 | Asset | CF _j |
| 4 | -18,000 | Asset | CF _j |
| 5 | 15,000 | Asset | CF _j |
| 6 | 19,000 + 75,700 | Cash | CF _j |

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

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|---------------------|-----------------|--|
| 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.

| <u>keystrokes</u> | <u>register</u> | <u>description</u> |
|-------------------|-----------------|----------------------|
| ■ 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

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

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 <input type="checkbox"/> P/YR | 12.00 |
| <input type="checkbox"/> C ALL | 12 P_Yr |
| 350 +/- PMT | -350.00 |
| 15 I/YR | 15.00 |
| 10 <input type="checkbox"/> N | 120.00 |
| FV | 96,325.97 |

Investment 2:

| Keystroke | Display |
|----------------------------------|-------------|
| 12 <input type="checkbox"/> P/YR | 12.00 |
| <input type="checkbox"/> C ALL | 12 P_Yr |
| 18.5 I/YR | 18.50 |
| 8 <input type="checkbox"/> 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 <input type="checkbox"/> P/YR | 1.00 |
| <input type="checkbox"/> C ALL | 1 P_Yr |
| 275000 +/- PV | -275,000.00 |
| 10 <input type="checkbox"/> N | 10.00 |
| 500000 FV | 500,000.00 |
| I/YR | 6.16 |

Option #2: Stocks

| Keystroke | Display |
|---------------------------------|-------------|
| 1 <input type="checkbox"/> P/YR | 1.00 |
| <input type="checkbox"/> C ALL | 1 P_Yr |
| 10 <input type="checkbox"/> N | 10.00 |
| 10 I/YR | 10.00 |
| 500000 FV | 500,000.00 |
| PV | -192,771.64 |

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

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 |