SavingAndBorrowing.org

Tutorial – Beyond Compounding: the 5 Elements of Time Value of Money Demystified, TVM using the HP 10bII+ Financial Calculator and App

Congratulations! You have located the fastest, easiest, most-researched technique to learn about Time Value of Money (TVM), and the basics of using a financial calculator that currently exists.

The (TVM) analytical skill you are about to learn and practice will greatly enhance your understanding of saving, borrowing, and investing. This material has been adapted from college level finance courses specifically for high school personal finance and economics students and teachers. But it will benefit anyone.

We do not sell anything. No app, product, or service. Sharing this skill is our nonprofit's mission. To complete this Tutorial, you will need to **print our Problem Set** which is available at www.SavingAndBorrowing.org under menu item "For Teachers." No account is needed. You will also need a handheld HP 10bII+ Financial Calculator ($18 eBay to $40 retail), or the 10bii Financial Calculator app ($5.99) available on either app store. More details, as well as QR codes to identify the correct app are provided immediately before working the Problem Set.

SavingAndBorrowing.org

This Tutorial, Problem Set, and Answers are available at no cost, and no account needed at: www.SavingAndBorrowing.org under the menu item "For Teachers."

These resources are aligned with the *National Standards for Personal Financial Education* and Texas TEKS. Problems are also available that are aligned with the *National Economic Standards*.

What's Our Story?

SavingAndBorrowing.org's mission is to adapt the college level personal finance topic of Time Value of Money (TVM) for high school personal finance and economics students.

This new skill is easily teachable. Since 2024, 600 high school students and over 100 teachers have successfully learned to analyze and solve advanced problems dealing with TVM. Just take a look at the "Testimonials" menu item on our website.

Based on 20 years of curriculum development, two additional years of recent research has resulted in a viable pathway to teach this practical skill using classroom Chromebooks, iPads, and Windows devices. In addition, this pathway is also now available for students' personal smartphones.

Best of luck learning and using your new skill!

Dean Harris, CPA

You Can Relax, because…

All you need to do is follow along and then write the information down on your Problem Set as it is revealed on the screen. Make sure you understand why each entry was made on the Problem Set before proceeding. Doing this simple step is the <u>key</u>.

No note-taking is needed! You will learn everything from our tactile solution format.

Only very simple math!

Virtually no memorization!

Only 1 new vocabulary word!

In the unlikely event you get an incorrect answer, the full Answers are available at www.SavingAndBorrowing.org under "For Teachers."

These Problems do not take into account any effects of income taxes or inflation. No legal, accounting, financial, or other advice or services are being rendered, and all answers are approximate. Also, payments are assumed to be made at the end of the month. Payments made at the beginning of the month are calculated slightly differently.

Does this TVM skill also help with career preparedness?

You will be introduced to scenarios like those on the following exams:

1)   Certified Public Accountant (CPA); exam uses financial tables

2)   Certified Management Accountant (CMA); exam permits a handheld financial calculator

3)   Chartered Financial Analyst (CFA); exam permits a handheld financial calculator

4)   Certified Financial Planner (CFP); exam permits a handheld financial calculator

5)   Financial Risk Manager (FRM); exam permits a handheld financial calculator

3 Learning Outcomes

1. Understand the **5 elements** of the **Time Value of Money (TVM)**

2. Operate a financial calculator or approved app to **solve multiple types of real-world TVM problems**

3. If you are a teacher, we'll provide information about bringing these TVM concepts and tools into your classroom.

We hope everyone will also share this skill with their family and friends. Anyone can benefit from this.

This Tutorial is focused solely on hands-on solving TVM problems in order for you to learn this new skill as quickly and easily as possible. TVM is a foundational concept in finance and investments, however not much theory will be covered due to time constraints. Such information is easily available through a Google search, however. Nor have we included discussion questions after the problems due to the same time constraints.

Why Does Money have Value over Time?

The short answer is because of INTEREST.

1) You Receive interest on money you saved, and

2) You Pay Interest on money you have borrowed.

Interest IS Interesting!

Technology Requirements

For our **in-person sessions**, you will use the handheld HP 10bII+ Financial Calculator we provide. This and the Problem Set will be passed out in a few minutes.

For our **on-line sessions**, you may use the same HP 10bII+ Financial Calculator, or the 10bii Financial Calculator app, the latter of which may be downloaded from the App Store or Google Play Store at a cost of $5.99 each. QR codes will be provided to assist you in locating the correct app. This is the only financial calculator app we are aware of that has been approved through the Student Data Privacy review process (CoSN) for use in Texas public schools. We recommend downloading using cell data only, not wifi.

Any other financial calculator will have different keystrokes and is not compatible with this step-by-step Tutorial. We selected these specific devices for their ease of use and automatic default to monthly terms.

Now is a good time to **print the Problem Set for on-line sessions**, available at www.SavingAndBorrowing.org under "For Teachers." After printing, just set it aside for the moment.

Here is the 10bII+ Calc:

Time Value of Money Keys:
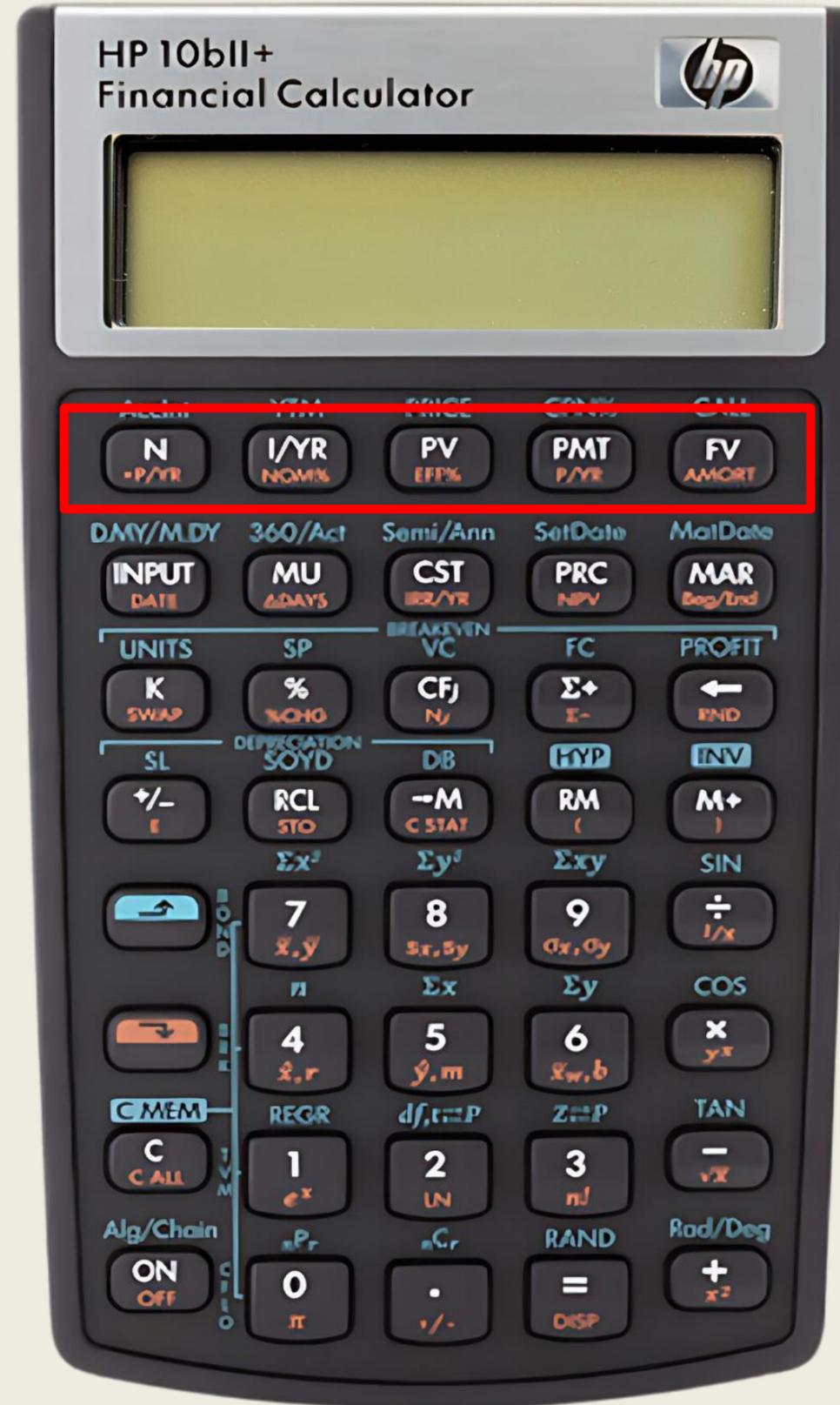
N = Total Number of Periods.

For now, think of N as the Total Number of Monthly Payments.

To calculate N, just multiply the number of years x 12.

Example: A 4-year loan is 4 x 12 = 48 N

So, a 5-year loan would be… ? N

I/YR = Percent Interest Per Year.

For 6%, simply enter as 6.

PV = Present Value.

This is Today's Purchase Price, Today's Loan Amount, or Today's Lump Sum Deposit.

For example, if you get a $15,000 car loan, the PV would be $15,000.

PMT = Payment.

Payments are the Same Amount Over and Over again, often Monthly.

These could be payments you make on a loan, payments you make into a savings account, or payments received from your retirement account, etc.

Rule: If entering a loan PMT, <u>make the PMT a negative number</u> by pressing +/- <u>after</u> entering the number on the display. This is how the calculator understands the money is going out of your pocket and into the bank. I'll show you how to do this in a moment. (There are some instances when PV must be entered as a negative number, and any such problems will mention that.)

All payments we work with will be assumed to be made at the <u>end</u> of the month. This is called an "<u>ordinary annuity</u>."

But a payment can also occur at the <u>beginning</u> of the month. This is called an "<u>annuity due</u>."
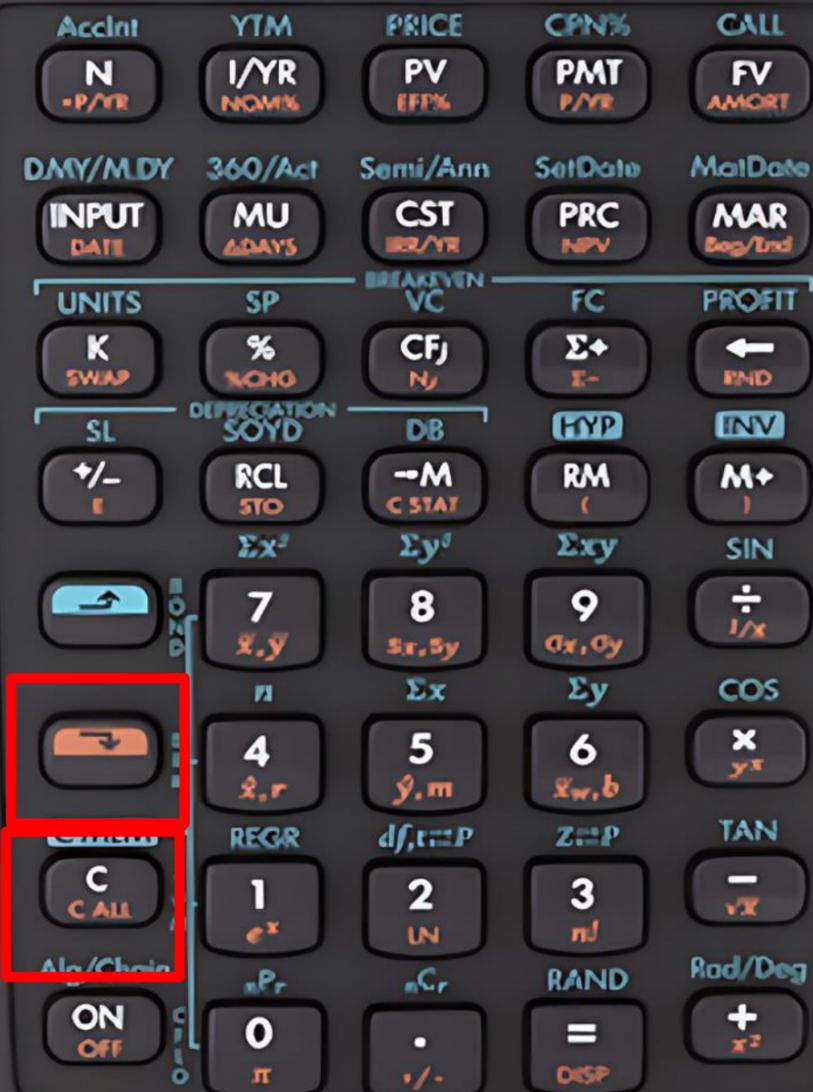
No need to memorize this, just FYI.
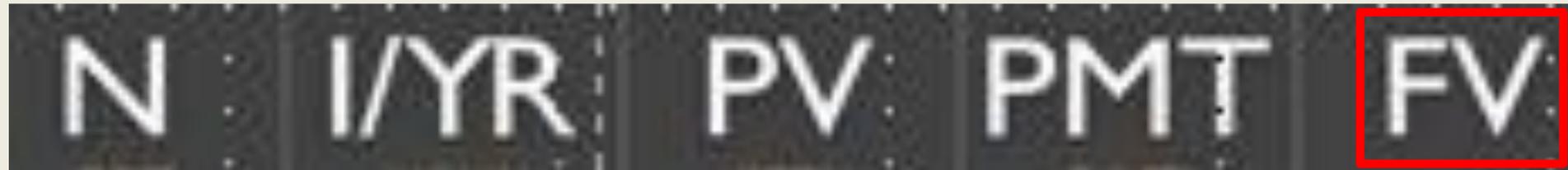
FV = Future Value.

The Amount that a Series of Savings Deposits will grow to in the Future, or the amount a Single Lump Sum Deposit will grow to in the Future.
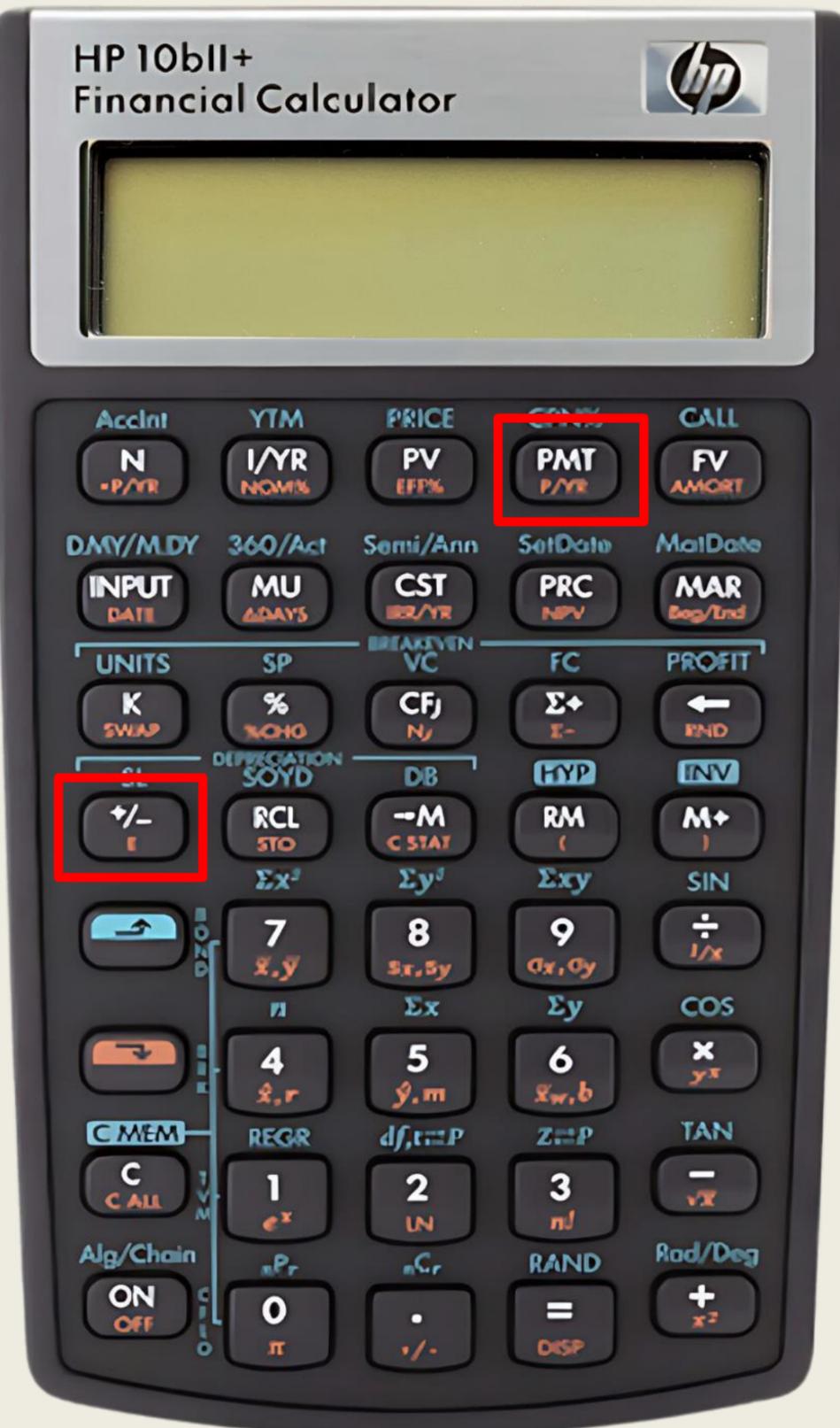
Three Operating Tips

1. Note the Orange Bar downward arrow key on the lower left side.

Before we work each new problem, we will clear any previous time value of money (TVM) entries. To do so, press the Orange Bar key, then move your finger down and press the C ALL key which is on the bottom of the C key. (Don't press them both at the same time.)

2. Payments are entered as Negative Numbers. Think of Payments as money paid out of your pocket to someone, so they are entered as negative numbers.
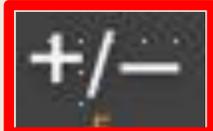
Note the "+/-" key ( ) on the left side about midway down. If entering a Payment, <u>first</u> enter the Payment amount on the display, <u>then press the +/- key</u> to make the Payment number negative. Next, you would just press the PMT key to tell the calculator what the number on the display was linked to.
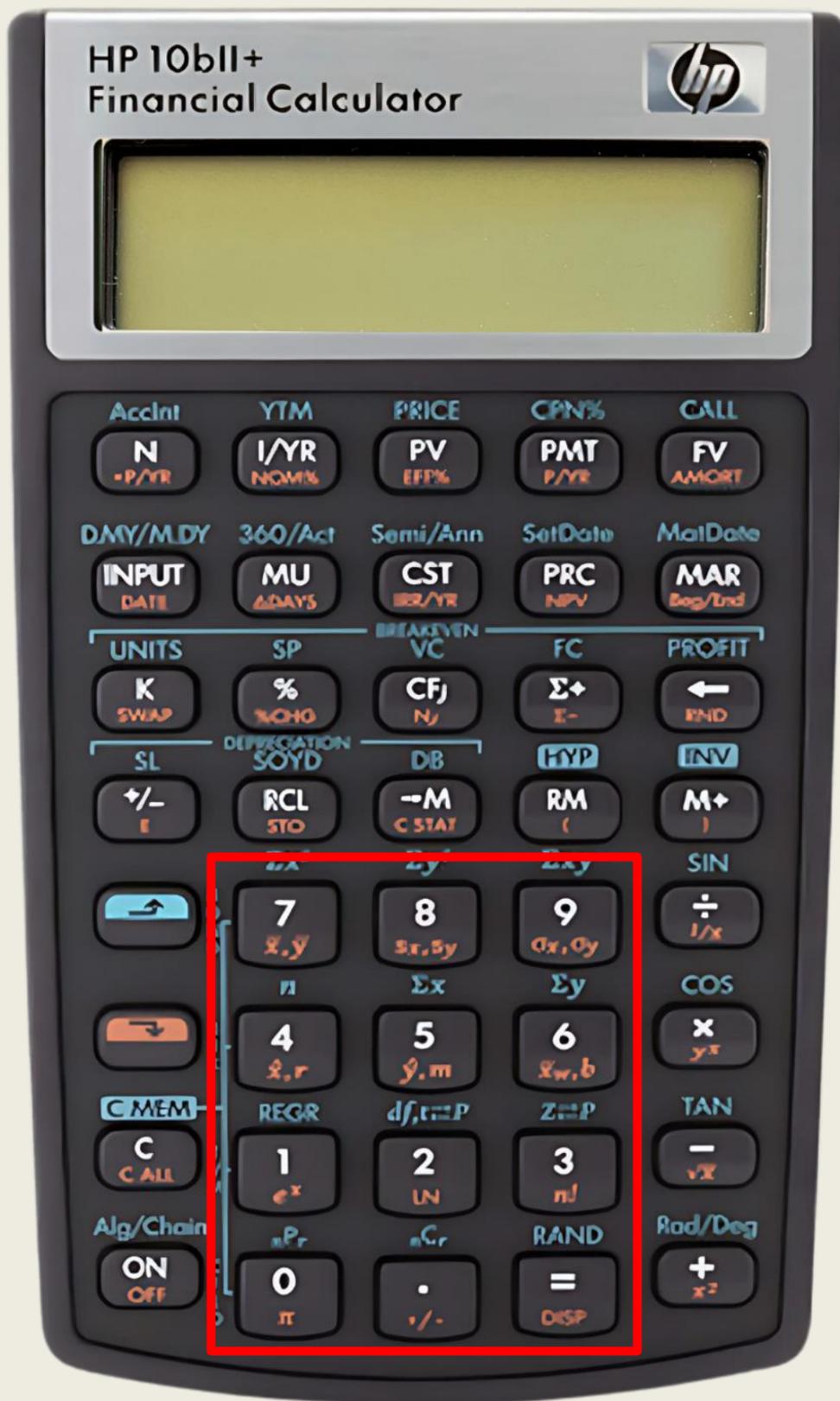
3. When entering numbers, use the keypad as outlined in red below. Once you have the number you want on the display, press the TVM key on the top row that is linked to that number.

And you can use the keypad just like any regular calculator. So, to calculate the number of months in 10 years, just enter 10 x 12 = and it will show the answer of 120 on the display.

Note: If you seem to repeatedly be getting incorrect answers on the handheld Calculator, low batteries may be the problem.

Let's get started learning this new skill!

You now need the handheld HP 10bII+ financial calculator or the 10bii Financial Calculator app and Problem Set in front of you in order to work the upcoming problems.

For the app, below are the QR codes to purchase the $5.99 app for Apple and Google devices. These are <u>not</u> subscriptions, you will <u>own</u> the app. These apps have the same keystrokes as the handheld HP calculator.

Apple Devices:

Android (Google) Devices:

If you downloaded the 10bii Financial Calculator app, here's how it looks:
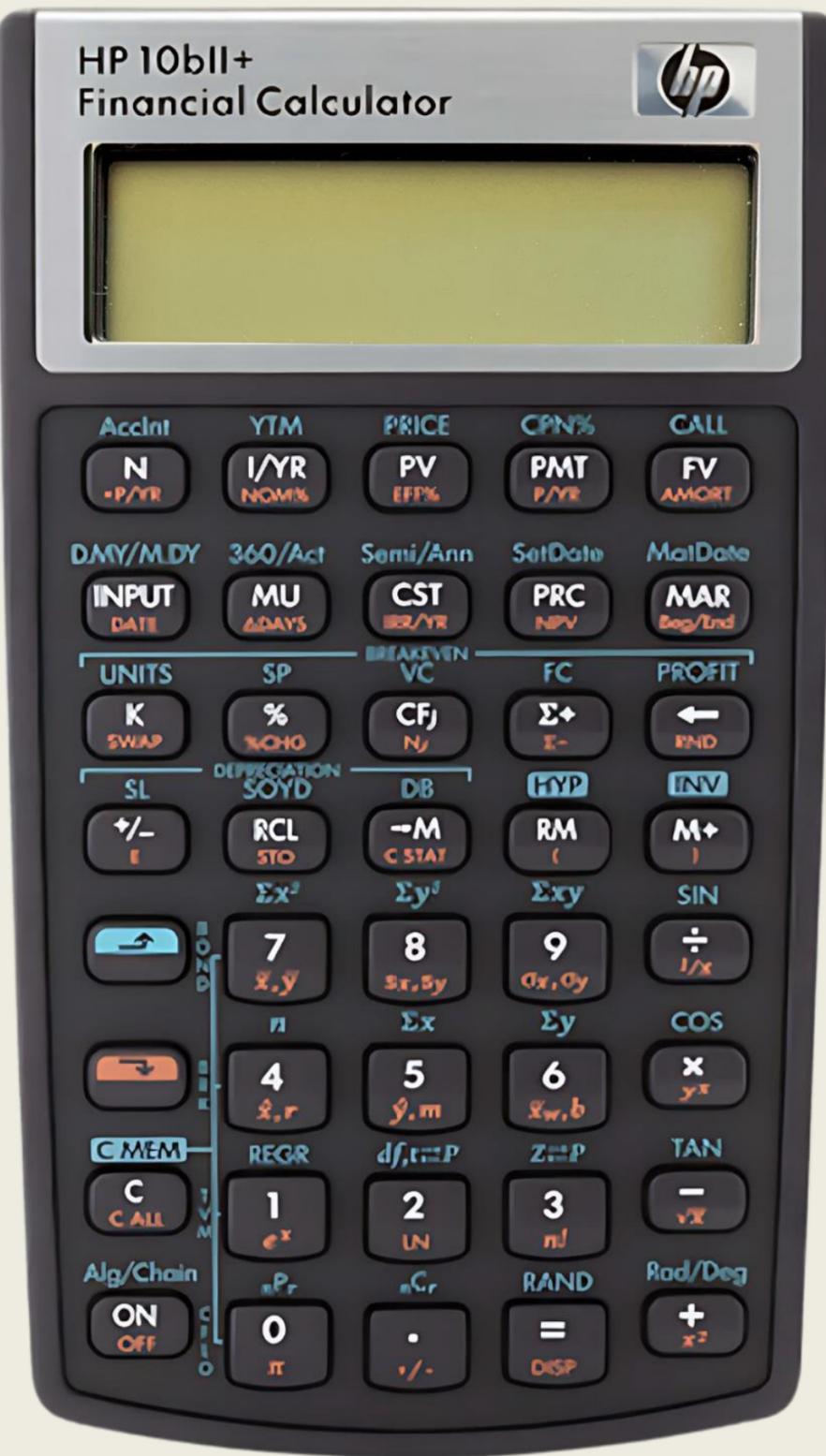
#1 How much of a loan can I get?
(Turn calculator ON by pressing key on lower left)
**First, press the Orange Bar key, then move your finger down and press the C ALL key.

How much of a car loan can you get today if you make a $300 monthly payment for 36-months at 5.74% APR?

We will work through this first problem slowly to make sure everyone has a good understanding of how entries are made. Onto the next slide...

#1 How much of a loan can I get?

How much of a car loan can you get today if you make a $300 monthly payment for 36-months at 5.74% APR?

Generally, it's easiest to simply read the problem and deal with the numbers as we run across them. First, enter 300 on the keypad.
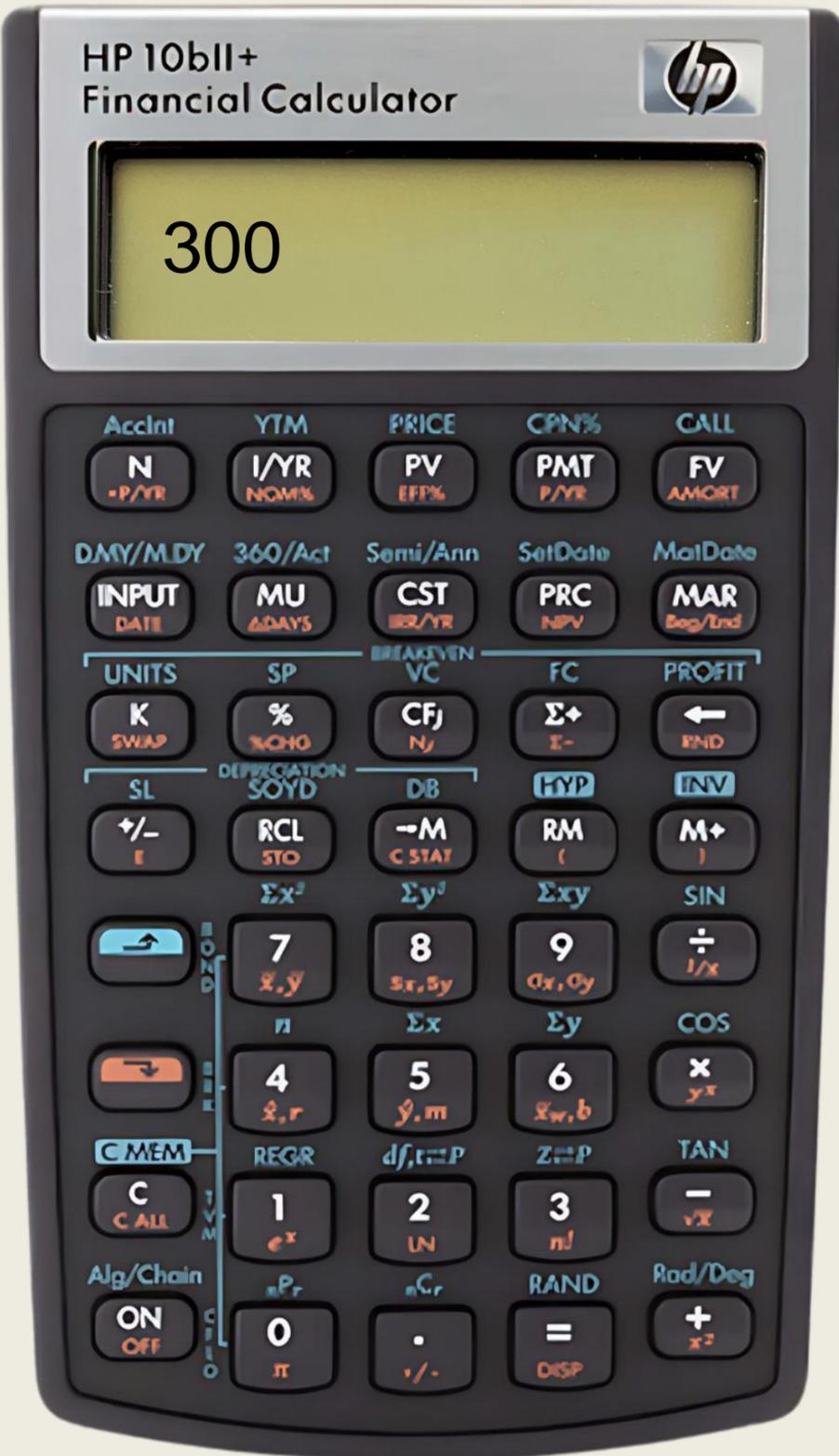
300

-300

#1 How much of a loan can I get?

How much of a car loan can you get today if you make a $300 monthly payment for 36-months at 5.74% APR?

Now, press "+/-" and your display will show -300.
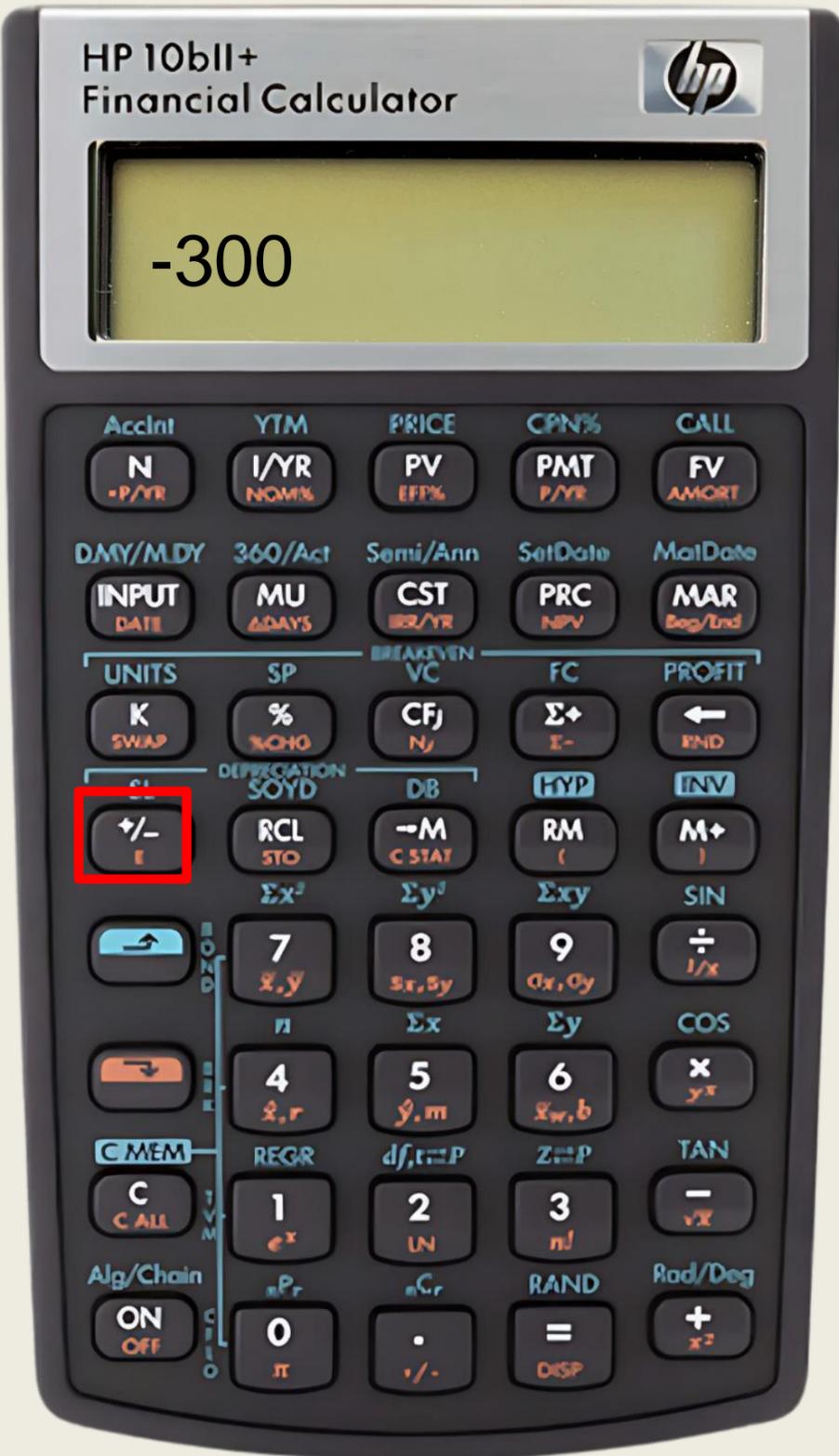
- 300 ☐

_____

_____ ☐

☐

_____

☐ _____

#1 How much of a loan can I get?

How much of a car loan can you get today if you make a $300 monthly payment for 36-months at 5.74% APR?

Now, press the "PMT" key to tell the calculator what the number on the display is linked to.
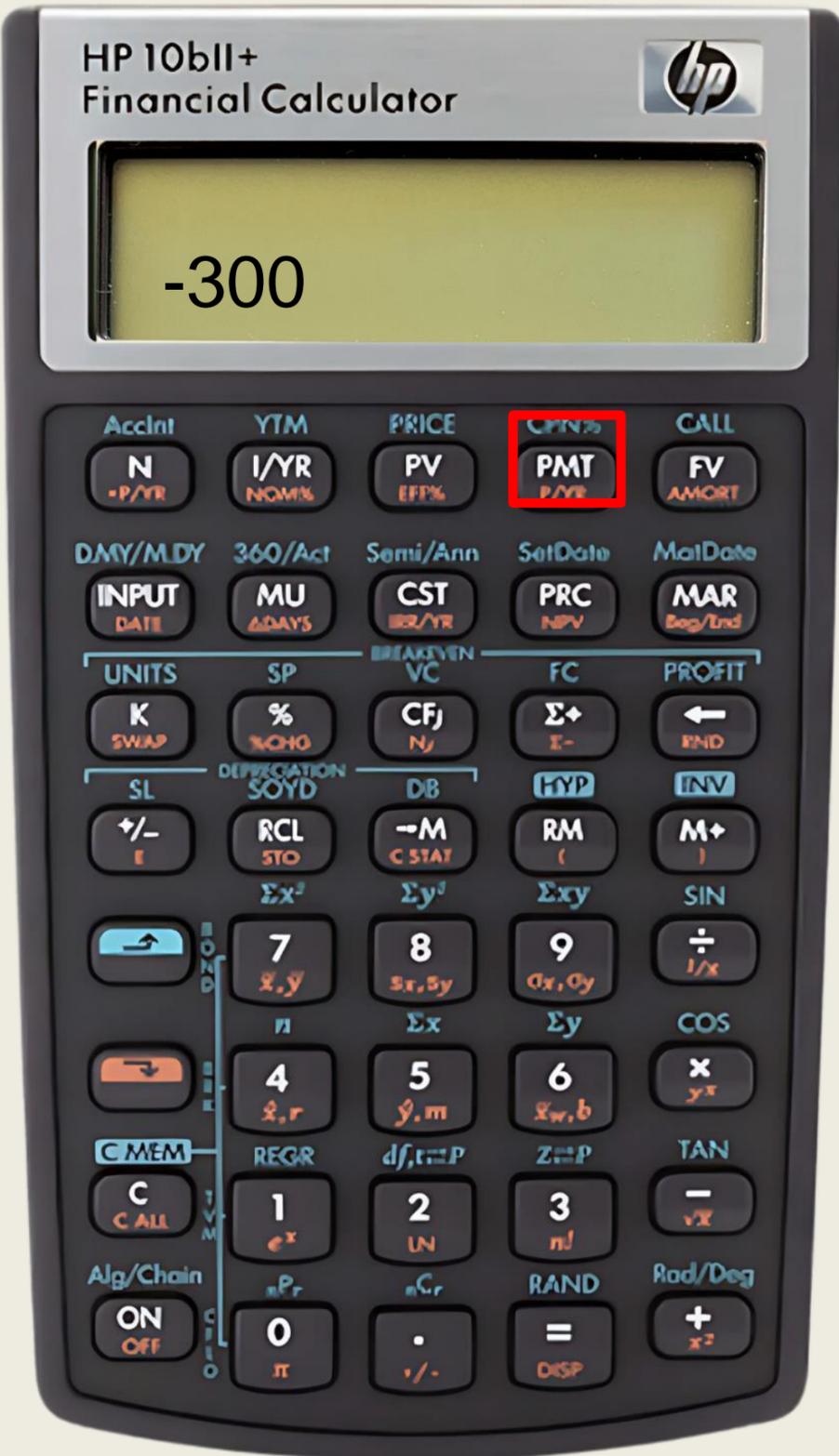
- 300   PMT

#1 How much of a loan can I get?

How much of a car loan can you get today if you make a $300 monthly payment for 36-months at 5.74% APR?

Now, enter 36 followed by pressing the "N" key.
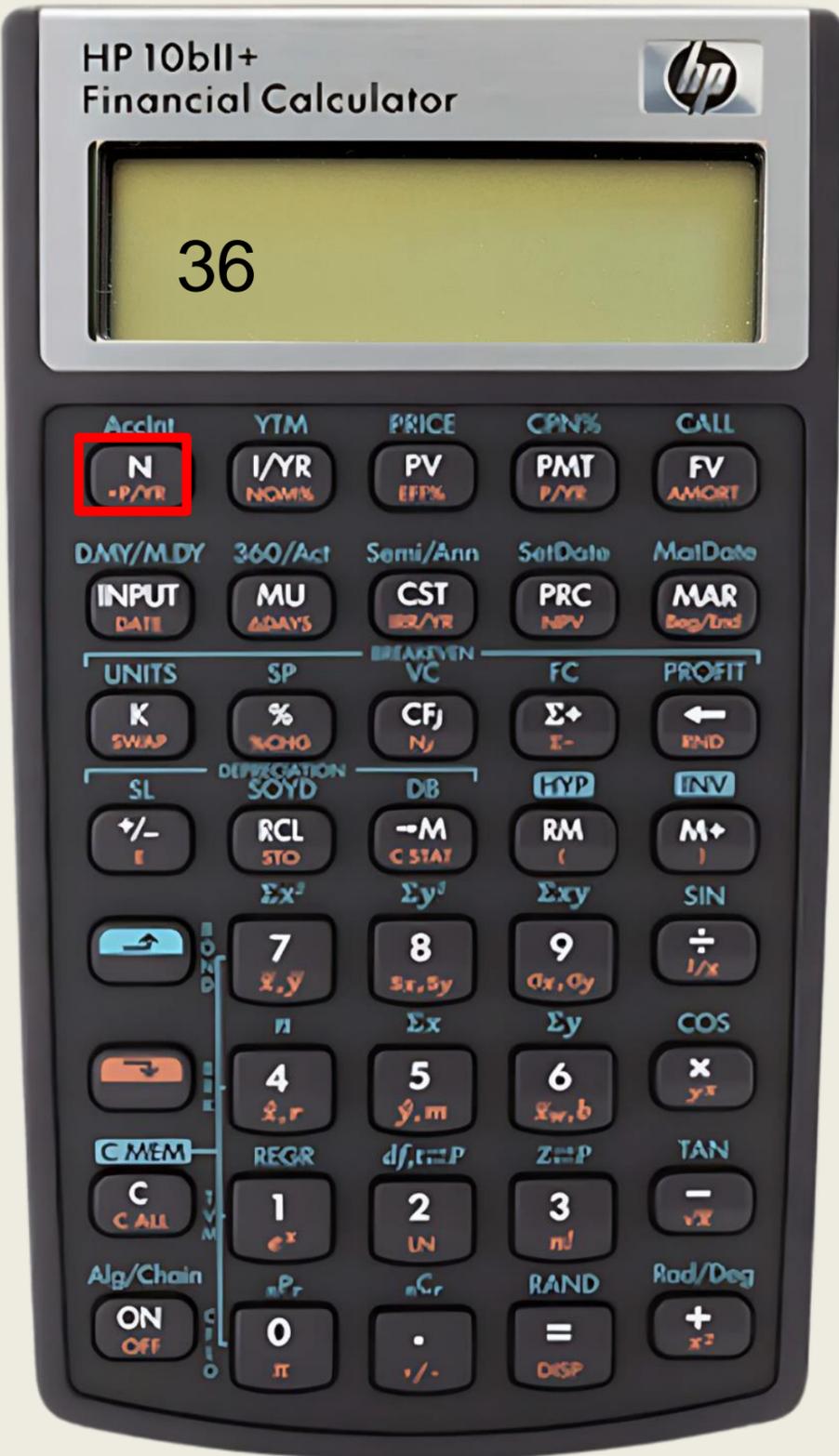
- 300   PMT

36   N

#1 How much of a loan can I get?

How much of a car loan can you get today if you make a $300 monthly payment for 36-months at 5.74% APR?

Now, enter 5.74 followed by pressing the "I/YR" key.
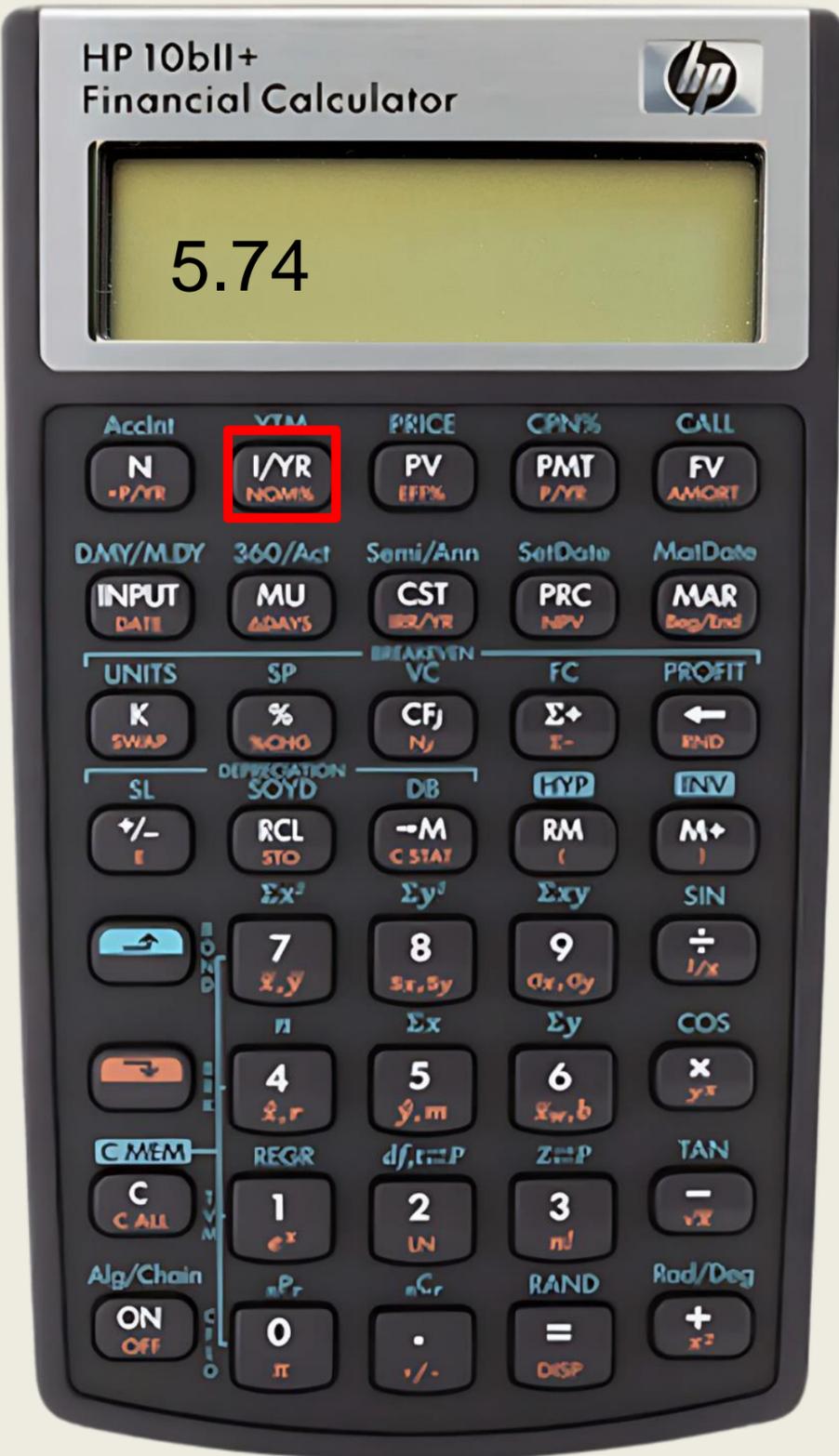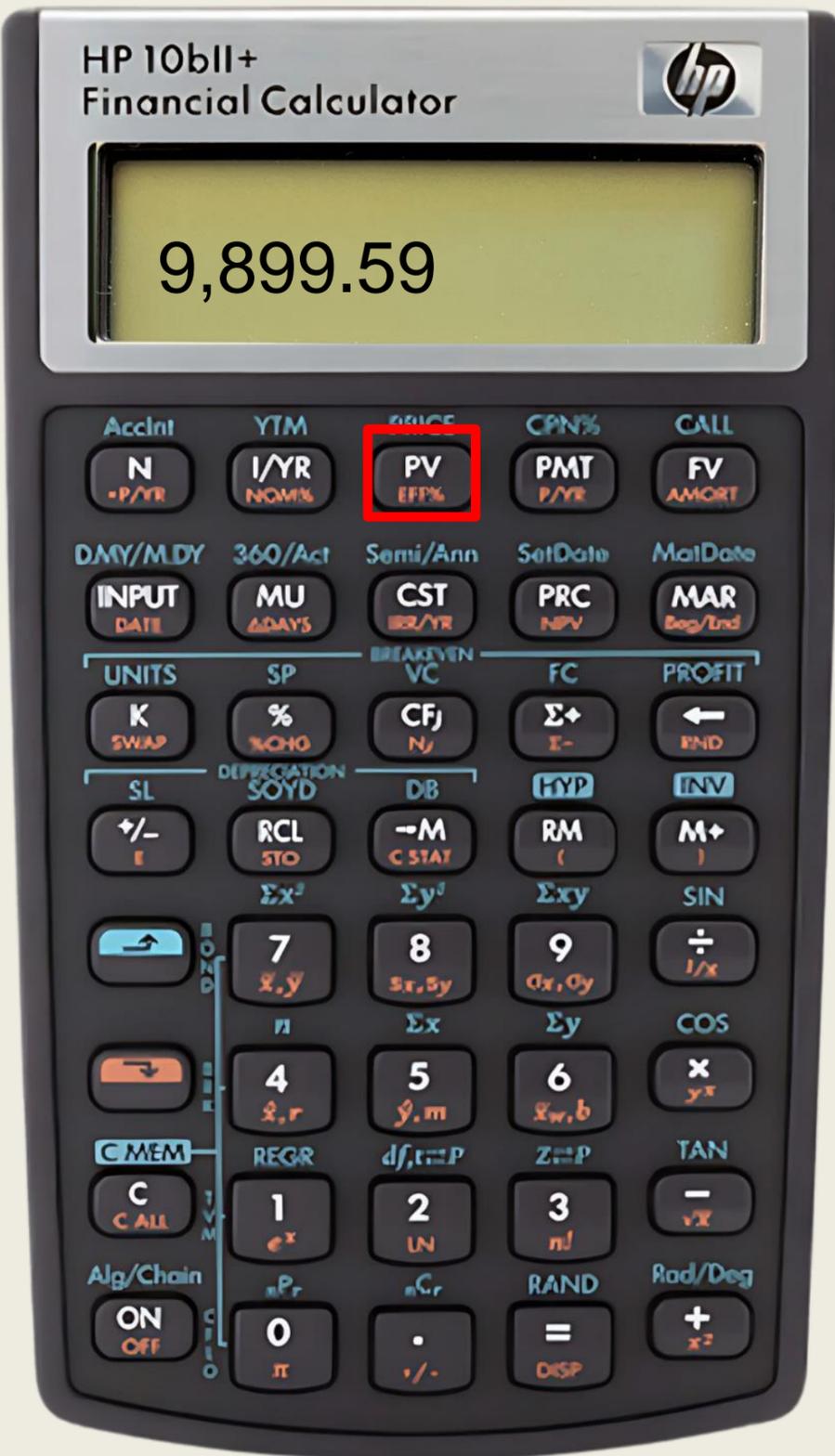
- 300   PMT

36   N

5.74   I/YR

#1 How much of a loan can I get?

How much of a car loan can you get today if you make a $300 monthly payment for 36-months at 5.74% APR?

Now to solve, simply press the "PV" key, and the answer will appear on the display.

- 300	PMT		5.74	I/YR

36	N		PV	9,899.59
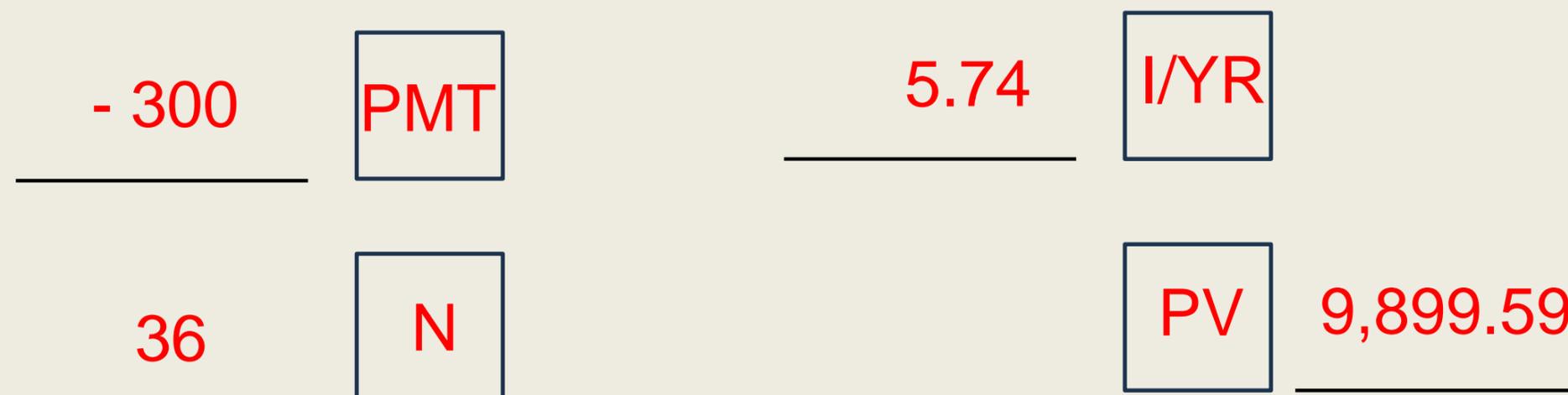
Just like in the format shown above, the full answers to all 12 problems are available on SavingAndBorrowing.org under the menu item "For Teachers."

#2) Savings PMT: Saving to become a millionaire
First, press the Orange Bar key, then move your finger down and press the C ALL key.

How much of a payment do you have to save per month if you want to have $1,000,000 in the future if you start saving at age 18 and save until you are 60, while investing in a stock index fund that averages a 10% annual return?

#2) Savings PMT: Saving to become a millionaire

How much of a payment do you have to save per month if you want to have $1,000,000 in the future if you start saving at age 18 and save until you are 60, while investing in a stock index fund that averages a 10% annual return?

1,000,000 FV

_____   _____

_____

#2) Savings PMT: Saving to become a millionaire

How much of a payment do you have to save per month if you want to have $1,000,000 in the future if you start saving at age 18 and save until you are 60, while investing in a stock index fund that averages a 10% annual return?

1,000,000 | FV
_____

60-18= 42
42x12=504 | N
_____

#2) Savings PMT: Saving to become a millionaire

How much of a payment do you have to save per month if you want to have $1,000,000 in the future if you start saving at age 18 and save until you are 60, while investing in a stock index fund that averages a 10% annual return?

1,000,000 | FV

10 | I/YR

60-18= 42
42x12=504 | N

#2) Savings PMT: Saving to become a millionaire

How much of a payment do you have to save per month if you want to have $1,000,000 in the future if you start saving at age 18 and save until you are 60, while investing in a stock index fund that averages a 10% annual return?

1,000,000   FV

10   I/YR

60-18= 42
42x12=504   N

PMT   -129.13

#3) Compute I/YR: What Annual Interest Rate is being charged by a Rent-to-Own store?

First, press the Orange Bar key, then move your finger down and press the C ALL key.

Suppose you walk into Yuddy's Rent-to-Own store in Round Rock and see an HP refurbished laptop you want. Today's cash price is $1,299.99. If you don't have the cash today, they do advertise a financing plan. The Number of payments you will make is 18, in the amount of $107.99 per Payment.

Question: What annual interest rate are you paying?

Beware! Rent-to-Own stores, Payday Loan offices and the like are classified as "Alternative Financial Services."

#3) Compute I/YR: What Annual Interest Rate is being charged by a Rent-to-Own store?

Suppose you walk into Yuddy's Rent-to-Own store in Round Rock and see an HP refurbished laptop you want. Today's cash price is $1,299.99. If you don't have the cash today, they do advertise a financing plan. The Number of payments you will make is 18, in the amount of $107.99 per Payment.

Question: What annual interest rate are you paying?

1299.99   PV

YUDDY'S HOME FURNISHINGS

COMPUTERS   Stock Number 960004862   Serial Number 5CD241CVK1
LAPTOP
HP refurb 15.6" touch laptop - Peacock Teal
HP15DY5008DS

Add it up! YUDDY'S is Better!

$107.99
18.0 Months
Cash Price TODAY $1,299.99

78 Weeks Total Cost	Cost of Lease Services
$2,105.22	$805.23

18.0 Months Total Cost	Cost of Lease Services
$1,943.82	$643.83

3 WAYS TO $AVE Ask How!
Own It Faster   Pay Monthly   Perfect Pay

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Question: What annual interest rate are you paying?

1299.99   PV

18   N

YUDDY'S
HOME FURNISHINGS

COMPUTERS
LAPTOP
HP refurb 15.6" touch laptop - Peacock Teal
HP15DY5008DS

Stock Number 960004862
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$1,943.82	$643.83

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Suppose you walk into Yuddy's Rent-to-Own store in Round Rock and see an HP refurbished laptop you want. Today's cash price is $1,299.99. If you don't have the cash today, they do advertise a financing plan. The Number of payments you will make is 18, in the amount of $107.99 per Payment. (Remember to enter the payment as a negative number.)

Question: What annual interest rate are you paying?

1299.99   PV
_____

18   N
_____

-107.99   PMT
_____

_____

#3) Compute I/YR: What Annual Interest Rate is being charged by a Rent-to-Own store?

Suppose you walk into Yuddy's Rent-to-Own store in Round Rock and see an HP refurbished laptop you want. Today's cash price is $1,299.99. If you don't have the cash today, they do advertise a financing plan. The Number of payments you will make is 18, in the amount of $107.99 per Payment.

Question: What annual interest rate are you paying?

1299.99   PV
_____

18   N
_____

-107.99   PMT
_____

I/YR   55.52%
_____

COMPUTERS   Stock Number 960004862
Serial Number 5CD241CVK1

LAPTOP
HP refurb 15.6" touch laptop - Peacock Teal
HP15DY5008DS

YUDDY'S is Better!

$107.99
18.0 Months
Cash Price TODAY $1,299.99

78 Weeks Total Cost	Cost of Lease Services
$2,105.22	$805.23

18.0 Months Total Cost	Cost of Lease Services
$1,943.82	$643.83

3 WAYS TO $AVE   Ask How!   Own It Faster   Pay Monthly   Perfect Pay

#4) PV of a Series of Payments: What is the Retirement Nest Egg Amount?
First, press the Orange Bar key, then move your finger down and press the C ALL key.

What amount will you need in the bank when you retire in order to make withdrawals of $2,000 monthly (hint: payments) for 20 years if interest rates are 4% APR?

#4) PV of a Series of Payments: What is the Retirement Nest Egg Amount?

What amount will you need in the bank when you retire in order to make withdrawals of $2,000 monthly (hint: payments) for 20 years if interest rates are 4% APR?
(don't forget to enter the negative sign)

-2000   PMT

#4) PV of a Series of Payments: What is the Retirement Nest Egg Amount?

What amount will you need in the bank when you retire in order to make withdrawals of $2,000 monthly for 20 years if interest rates are 4% APR?

-2000   PMT   _____

_____

20X12=240   N

_____

#4) PV of a Series of Payments: What is the Retirement Nest Egg Amount?

What amount will you need in the bank when you retire in order to make withdrawals of $2,000 monthly for 20 years if interest rates are 4% APR?

-2000 | PMT

4 | I/YR

20X12=240 | N

#4) PV of a Series of Payments: What is the Retirement Nest Egg Amount?

What amount will you need in the bank when you retire in order to make withdrawals of $2,000 monthly for 20 years if interest rates are 4% APR?

-2000   PMT

20X12=240   N

4   I/YR

PV   330,043.72

Before you press the Orange Bar key, then C ALL for the next problem, suppose you invest differently and will earn a 10% annual return instead? What amount will you need in the bank when you retire?
To solve, simply enter 10, press I/YR and then press PV. Answer: 207,249.24

#5) PV of a Series of Equal Payments: How much is your Lump Sum Offer Today?

First, press the Orange Bar key, then move your finger down and press the C ALL.

Your doorbell rings, and your Ring App shows the famous Steve Harvey standing there. Oh my word, The Publishers Clearinghouse Sweepstakes has just knocked on your door, and you've won the $10,800,000 Sweepstakes! They give you the choice of $30,000 per month (hint: payments) for 30 years, or a lump sum cash payout today.

If annual interest rates are 4.3871134%, how much will they offer you today (PV) as a lump sum payout? (This is the amount they need in the bank today to fund the payments to you.)

_____ ☐   _____ ☐

_____ ☐   _____ ☐

#5) PV of a Series of Equal Payments: How much is your Lump Sum Offer Today?

Your doorbell rings, and your Ring App shows the famous Steve Harvey standing there. Oh my word, The Publishers Clearinghouse Sweepstakes has just knocked on your door, and you've won the $10,800,000 Sweepstakes! They give you the choice of $30,000 per month (hint: payments) for 30 years, or a lump sum cash payout today.

If annual interest rates are 4.3871134%, how much will they offer you today (PV) as a lump sum payout? (This is the amount they need in the bank today to fund the payments to you.)

-30,000   PMT

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If annual interest rates are 4.3871134%, how much will they offer you today (PV) as a lump sum payout? (This is the amount they need in the bank today to fund the payments to you.)

-30,000 | PMT |

30X12=360 | N |

#5) PV of a Series of Equal Payments: How much is your Lump Sum Offer Today?

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If annual interest rates are 4.3871134%, how much will they offer you today (PV) as a lump sum payout? (This is the amount they need in the bank today to fund the payments to you.)

-30,000   PMT   4.3871134   I/YR
_____   _____

30X12=360   N
_____   _____

#5) PV of a Series of Equal Payments: How much is your Lump Sum Offer Today?

Your doorbell rings, and your Ring App shows the famous Steve Harvey standing there. Oh my word, The Publishers Clearinghouse Sweepstakes has just knocked on your door, and you've won the $10,800,000 Sweepstakes! They give you the choice of $30,000 per month (hint: payments) for 30 years, or a lump sum cash payout today.

If annual interest rates are 4.3871134%, how much will they offer you today (PV) as a lump sum payout? (This is the amount they need in the bank today to fund the payments to you.)

-30,000   PMT

4.3871134   I/YR

30X12=360   N

PV   6,000,000.10

#6) Savings PMT: Start Saving at Different Ages
First, press the Orange Bar key, then move your finger down and press the C ALL key.
But don't press these keys again before you start working on b)

How much would your monthly savings payments be to reach $1,000,000 in the future at age 65, with a mutual fund earning an average of 10% annual return, if you begin saving at the following ages?

a) Age 21   b) Age 51

a) 65-21=44
    44x12=

b)

#6) Savings PMT: Start Saving at Different Ages

How much would your monthly savings payments be to reach $1,000,000 in the future at age 65, with a mutual fund earning an average of 10% annual return, if you begin saving at the following ages?

a) Age 21   b) Age 51

a) 65-21=44
   44x12=528 N _____ ☐ _____ ☐ _____ ☐ _____

b) _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____

#6) Savings PMT: Start Saving at Different Ages

How much would your monthly savings payments be to reach $1,000,000 in the future at age 65, with a mutual fund earning an average of 10% annual return, if you begin saving at the following ages?

a) Age 21   b) Age 51

a) 65-21=44   N   1,000,000 FV
    44x12=528 _____   _____   _____   _____   _____

b) _____   _____   _____   _____   _____   _____

#6) Savings PMT: Start Saving at Different Ages

How much would your monthly savings payments be to reach $1,000,000 in the future at age 65, with a mutual fund earning an average of 10% annual return, if you begin saving at the following ages?

a) Age 21   b) Age 51

a)
65-21=44
44x12=528   N   1,000,000   FV   10   I/YR

b)

#6) Savings PMT: Start Saving at Different Ages

How much would your monthly savings payments be to reach $1,000,000 in the future at age 65, with a mutual fund earning an average of 10% annual return, if you begin saving at the following ages?

a) Age 21   b) Age 51 (don't press the Orange Bar key, and C ALL key.)

a) 65-21=44
    44x12=528 | N | 1,000,000 | FV | 10 | I/YR | | PMT | -$105.51

b) | | | | | | | |

#6) Savings PMT: Start Saving at Different Ages

How much would your monthly savings payments be to reach $1,000,000 in the future at age 65, with a mutual fund earning an average of 10% annual return, if you begin saving at the following ages?

a) Age 21   b) Age 51 (<u>don't press</u> the Orange Bar key, and C ALL key.)

a) 65-21=44 | N | 1,000,000 | FV | 10 | I/YR | | PMT | -105.51
    44x12=528 ____   _____   _____   _____

b) 65-51=14 | N | | | | | | |
    14x12=168 ____   _____   _____   _____

#6) Savings PMT: Start Saving at Different Ages

How much would your monthly savings payments be to reach $1,000,000 in the future at age 65, with a mutual fund earning an average of 10% annual return, if you begin saving at the following ages?

a) Age 21   b) Age 51

a) 65-21=44
   44x12=528 | N | 1,000,000 | FV | 10 | I/YR | | PMT | -105.51

b) 65-51=14
   14x12=168 | N | _____ | ☐ | ____ | ☐ | | PMT | -2,748.69

#7) Extreme TVM: Retirement Monthly Savings

First, press the Orange Bar key, then move your finger down and press the C ALL key.

Mythological figures like Thor, Yoda, Princess Celestia, and Gandalf had lifespans of 950 years or more. Let's use 950 years in this example. Suppose that these figures each want to have $10,000,000 in the bank when they retire in the future. They are going to start saving monthly for retirement at age 100, and retire at age 700. Interest rates are 2.42% APR. How much of a payment do they each have to save per month?

_____ ▢

_____ ▢

_____ ▢

▢ _____

#7) Extreme TVM: Retirement Monthly Savings

Mythological figures like Thor, Yoda, Princess Celestia, and Gandalf had lifespans of 950 years or more. Let's use 950 years in this example. Suppose that these figures each want to have $10,000,000 in the bank when they retire in the future. They are going to start saving monthly for retirement at age 100, and retire at age 700. Interest rates are 2.42% APR. How much of a payment do they each have to save per month?

10,000,000   FV

_____

#7) Extreme TVM: Retirement Monthly Savings

Mythological figures like Thor, Yoda, Princess Celestia, and Gandalf had lifespans of 950 years or more. Let's use 950 years in this example. Suppose that these figures each want to have $10,000,000 in the bank when they retire in the future. They are going to start saving monthly for retirement at age 100, and retire at age 700. Interest rates are 2.42% APR. How much of a payment do they each have to save per month?

10,000,000 | FV |
_____

700-100= 600
600x12= 7200 | N |
_____

#7) Extreme TVM: Retirement Monthly Savings

Mythological figures like Thor, Yoda, Princess Celestia, and Gandalf had lifespans of 950 years or more. Let's use 950 years in this example. Suppose that these figures each want to have $10,000,000 in the bank when they retire in the future. They are going to start saving monthly for retirement at age 100, and retire at age 700. Interest rates are 2.42% APR. How much of a payment do they each have to save per month?

10,000,000 | FV |

2.42 | I/YR |

700-100= 600
600x12= 7200 | N |

#7) Extreme TVM: Retirement Monthly Savings

Mythological figures like Thor, Yoda, Princess Celestia, and Gandalf had lifespans of 950 years or more. Let's use 950 years in this example. Suppose that these figures each want to have $10,000,000 in the bank when they retire in the future. They are going to start saving monthly for retirement at age 100, and retire at age 700. Interest rates are 2.42% APR. How much of a payment do they each have to save per month?

10,000,000 | FV |

                                2.42 | I/YR |

700-100= 600
600x12= 7200 | N |

| PMT | -.01

#8) Extreme TVM: Lump Sum Deposit
First, press the Orange Bar key, then move your finger down and press the C ALL key.

What if instead of saving monthly, the mythological figures each wanted to make a single lump sum deposit in the bank (think Present Value) at age 100 and just let it grow to $10,000,000 over 600 years, with interest remaining at 2.42% APR. How much would that deposit need to be in year 100?

_____ ⬜

_____ ⬜

⬜ _____

⬜ _____

#8) Extreme TVM: Lump Sum Deposit

What if instead of saving monthly, the mythological figures each wanted to make a single lump sum deposit in the bank (think Present Value) at age 100 and just let it grow to $10,000,000 over 600 years, with interest remaining at 2.42% APR. How much would that deposit need to be in year 100?

10,000,000 _____ | FV |

_____ | |

_____ | |

| | _____

#8) Extreme TVM: Lump Sum Deposit

What if instead of saving monthly, the mythological figures each wanted to make a single lump sum deposit in the bank (think Present Value) at age 100 and just let it grow to $10,000,000 over 600 years, with interest remaining at 2.42% APR. How much would that deposit need to be in year 100?

10,000,000   FV
_____

700-100= 600
600x12= 7200   N
_____

_____ ☐

☐ _____

#8) Extreme TVM: Lump Sum Deposit

What if instead of saving monthly, the mythological figures each wanted to make a single lump sum deposit in the bank (think Present Value) at age 100 and just let it grow to $10,000,000 over 600 years, with interest remaining at 2.42% APR. How much would that deposit need to be in year 100?

10,000,000 | FV |
_____

700-100= 600
600x12= 7200 | N |
_____

2.42 | I/YR |
_____

| | _____

#8) Extreme TVM: Lump Sum Deposit

What if instead of saving monthly, the mythological figures each wanted to make a single lump sum deposit in the bank (think Present Value) at age 100 and just let it grow to $10,000,000 over 600 years, with interest remaining at 2.42% APR. How much would that deposit need to be in year 100?

10,000,000 | FV |

2.42 | I/YR |

700-100= 600
600x12= 7200 | N |

| PV | -5.02

#9) Monthly PMT: Compute a Car Payment, and after doing so we will add a "what if" scenario.

First, press the Orange Bar key, then move your finger down and press the C ALL.

What would the payments be on a $15,000 car loan for 48 months at 7.42% APR? -

#9) Monthly PMT: Compute a Car Payment, and after doing so we will add a "what if" scenario.

What would the payments be on a $15,000 car loan for 48 months at 7.42% APR? -

15,000   PV

_____   _____   _____

_____   _____   _____

#9) Monthly PMT: Compute a Car Payment, and after doing so we will add a "what if" scenario.

What would the payments be on a $15,000 car loan for 48 months at 7.42% APR? -

15,000 [PV]

48 [N]

#9) Monthly PMT: Compute a Car Payment, and after doing so we will add a "what if" scenario.

What would the payments be on a $15,000 car loan for 48 months at 7.42% APR? -

15,000   PV

48   N

7.42   I/YR

#9) Monthly PMT: Compute a Car Payment, and after doing so we will add a "what if" scenario.

What would the payments be on a $15,000 car loan for 48 months at 7.42% APR?

15,000 **PV**   7.42 **I/YR**

48 **N**   **PMT** -362.12

But **"what if"** you could only afford $300 per month. What is the number of months the loan would be for?

#9) Monthly PMT: Compute a Car Payment, and after doing so we will add a "what if" scenario.

-What would the payments be on a $15,000 car loan for 48 months at 7.42% APR? -
-But if you could only afford $300 per month, what is the number of months the loan would be for?

15,000   PV   7.42   I/YR
_____   _____

48   N   PMT   -362.12
_____   _____

But **"what if"** you could only afford $300 per month. What is the number of months the loan would be for?

-300   PMT   _____

_____   _____

#9) Monthly PMT: Compute a Car Payment, and after doing so we will add a "what if" scenario.

What would the payments be on a $15,000 car loan for 48 months at 7.42% APR? -
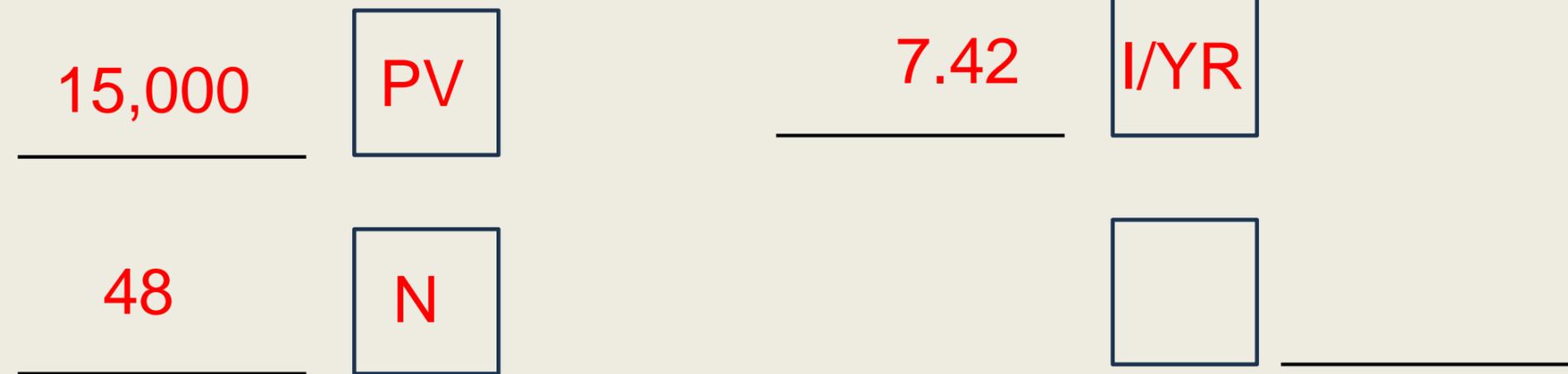
15,000   PV   7.42   I/YR

48   N   PMT   - 362.12

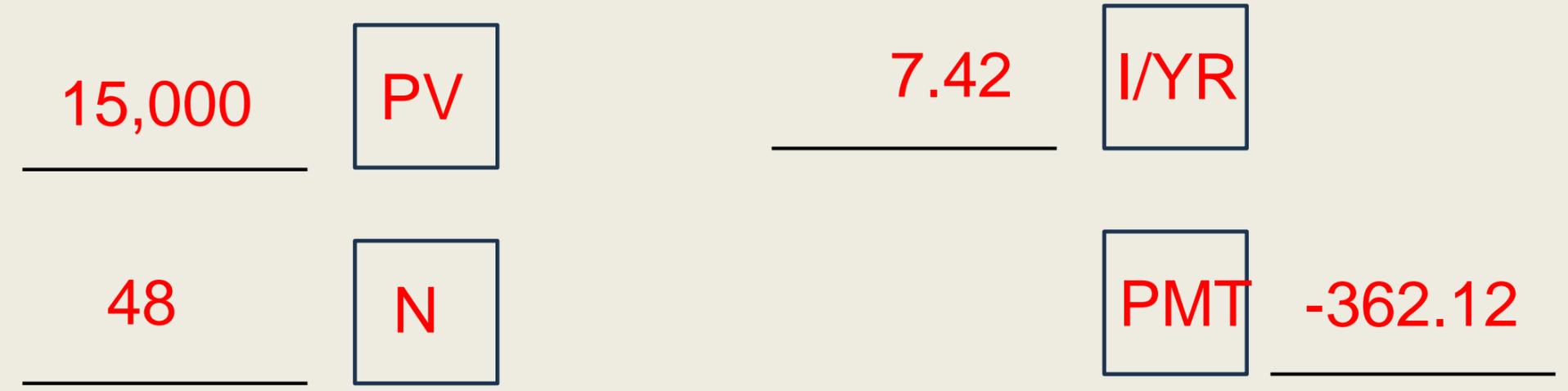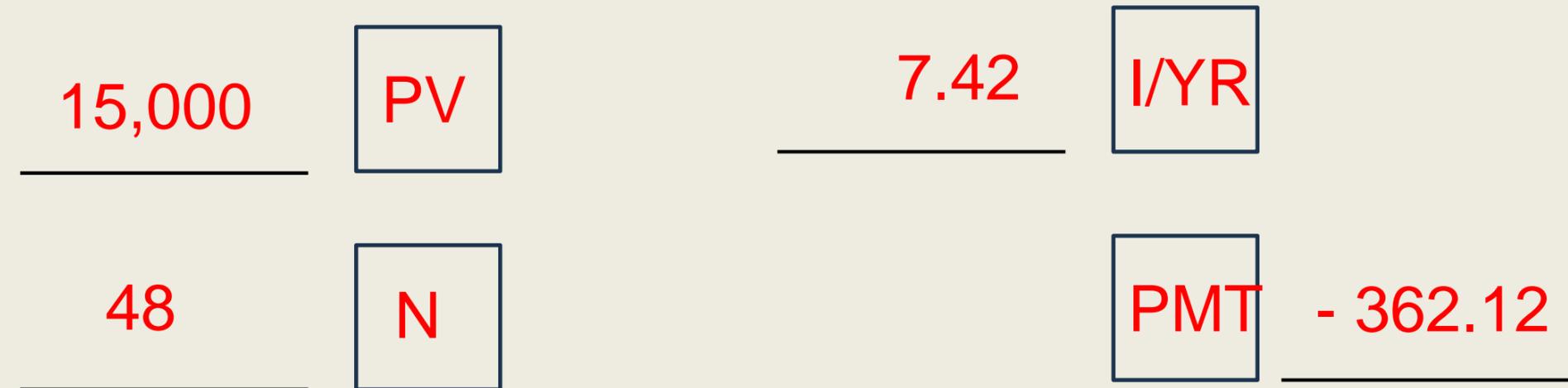But **"what if"** if you could only afford $300 per month? What is the number of months the loan would be for?

-300   PMT

N   60

#10) Compute I/YR: Calculate the Return Rate used in a Dave Ramsey Video

First, press the Orange Bar key, then move your finger down and press the C ALL key.

The Dave Ramsey High School Curriculum has a video that begins with saying "Anyone can become a millionaire"… "If you invest just $100 bucks a month, starting at age 16, you will be a millionaire ($1,000,000 in the Future) by the time you are 55." What annual return rate (I/YR) was he using?

___ ☐   ___ ☐   ___ ☐   ☐☐ _____

#10) Compute I/YR: Calculate the Return Rate used in a Dave Ramsey Video

The Dave Ramsey High School Curriculum has a video that begins with saying "Anyone can become a millionaire"… "If you invest just $100 bucks a month, starting at age 16, you will be a millionaire ($1,000,000 in the Future) by the time you are 55." What annual return rate (I/YR) was he using?

-100   PMT

____   ____   ____   _____

5

#10) Compute I/YR: Calculate the Return Rate used in a Dave Ramsey Video

The Dave Ramsey High School Curriculum has a video that begins with saying "Anyone can become a millionaire"… "If you invest just $100 bucks a month, starting at age 16, you will be a millionaire ($1,000,000 in the Future) by the time you are 55." What annual return rate (I/YR) was he using?

-100 PMT

55-16=39
39x12= 468 N

____ ☐

☐ _____

5

#10) Compute I/YR: Calculate the Return Rate used in a Dave Ramsey Video

The Dave Ramsey High School Curriculum has a video that begins with saying "Anyone can become a millionaire"… "If you invest just $100 bucks a month, starting at age 16, you will be a millionaire ($1,000,000 in the Future) by the time you are 55." What annual return rate (I/YR) was he using?

100 PMT   55-16=39   N   1,000,000 FV
              39x12=468

5

#10) Compute I/YR: Calculate the Return Rate used in a Dave Ramsey Video

The Dave Ramsey High School Curriculum has a video that begins with saying "Anyone can become a millionaire"… "If you invest just $100 bucks a month, starting at age 16, you will be a millionaire ($1,000,000 in the Future) by the time you are 55." What annual return rate (I/YR) was he using?

100 PMT   55-16=39
             39x12=468   N   1,000,000 FV   I/YR   11.86%

5
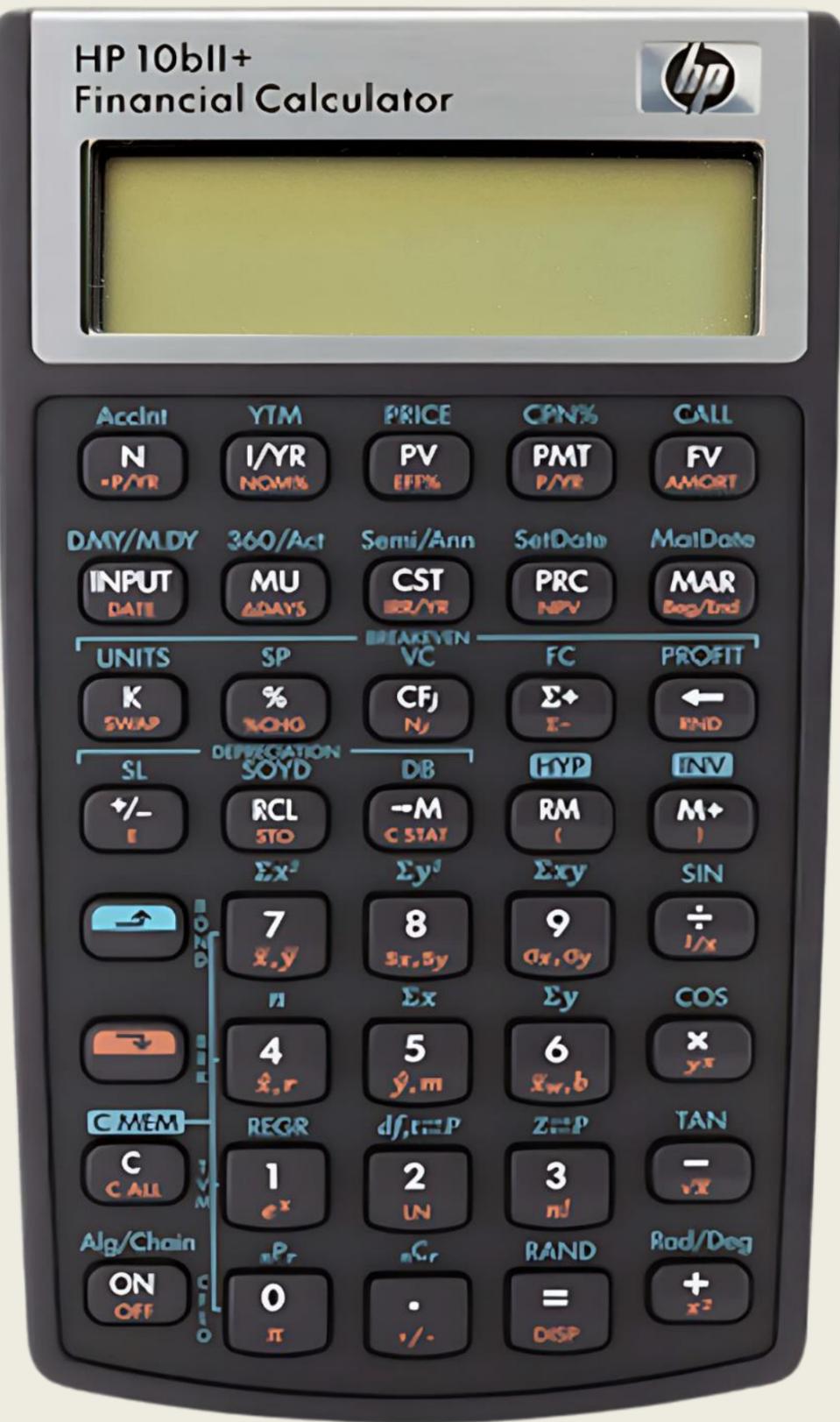
#11) Compute I/YR: Round Rock "Stock Market Game" Rock Stars.
First, press the Orange Bar key, then move your finger down and press the C ALL key.

On September 20, 2023 a student in RRISD invested $100,000 in an online simulation called The Stock Market Game. As of March 20, 2024 the value of the portfolio was $211,266.34. What was the 6-month return (I/YR) on this investment? **(In this problem, since $100,000 of the student's money was taken out of their account and put into the stock market, the $100,000 will be entered as a negative number.)**

#11) Compute I/YR: Round Rock "Stock Market Game"

On September 20, 2023 a student in RRISD invested $100,000 in an online simulation called The Stock Market Game. As of March 20, 2024 the value of the portfolio was $211,266.34. What was the 6-month return (I/YR) on this investment?

-100,000   PV

#11) Compute I/YR: Round Rock "Stock Market Game"

On September 20, 2023 a student in RRISD invested $100,000 in an online simulation called The Stock Market Game. As of March 20, 2024 the value of the portfolio was $211,266.34. What was the 6-month return (I/YR) on this investment?

-100,000   PV

211,266.34   FV

#11) Compute I/YR: Round Rock "Stock Market Game"

On September 20, 2023 a student in RRISD invested $100,000 in an online simulation called The Stock Market Game. As of March 20, 2024 the value of the portfolio was $211,266.34. What was the 6-month return (I/YR) on this investment?

-100,000   PV   6   N

211,266.34   FV

1

#11) Compute I/YR: Round Rock "Stock Market Game"

On September 20, 2023 a student in RRISD invested $100,000 in an online simulation called The Stock Market Game. As of March 20, 2024 the value of the portfolio was $211,266.34. What was the 6-month return (I/YR) on this investment?

-100,000   PV   6   N

211,266.34   FV   I/YR   159.31%

1

#12) PV: Accept the Lump Sum or Take a Monthly Payout

First, press the Orange Bar key, then move your finger down and press the C ALL key.

Suppose a relative who has worked a long time for a large company is retiring. As part of their retirement benefits, the employer offers them the choice between the following two retirement options:

A. $600,000 lump sum paid <u>today</u>. (So, $600,000 is the PV for this Option A.)

B. Payments of $3,000 per month guaranteed for 25 years. Interest rates are 4% annually. (Calculate the PV of this option.)

For simplicity, assume everything else is the same. Based strictly on the PV you calculated, which option has the higher PV and is therefore the better option to take?

_____ ☐   _____ ☐

_____ ☐   ☐ _____

#12) PV: Accept the Lump Sum or Take a Monthly Payout

Suppose a relative who has worked a long time for a large company is retiring. As part of their retirement benefits, the employer offers them the choice between the following retirement options:

A. $600,000 lump sum paid <u>today</u>. (So, $600,000 is the PV for this Option A.)
B. Payments of $3,000 per month guaranteed for 25 years. Interest rates are 4% annually. (Calculate the PV of this option.)

For simplicity, assume everything else is the same. Based strictly on the PV you calculated, which option has the higher PV and is therefore the better option to take?

-3,000   PMT

#12) PV: Accept the Lump Sum or Take a Monthly Payout

Suppose a relative who has worked a long time for a large company is retiring. As part of their retirement benefits, the employer offers them the choice between the following retirement options:

A. $600,000 lump sum paid today. (So, $600,000 is the PV for this Option A.)
B. Payments of $3,000 per month guaranteed for 25 years. Interest rates are 4% annually. (Calculate the PV of this option.)

For simplicity, assume everything else is the same. Based strictly on the PV you calculated, which option has the higher PV and is therefore the better option to take?

-3,000 | PMT

25x12= 300 | N

#12) PV: Accept the Lump Sum or Take a Monthly Payout

Suppose a relative who has worked a long time for a large company is retiring. As part of their retirement benefits, the employer offers them the choice between the following retirement options:

A. $600,000 lump sum paid <u>today</u>. (So, $600,000 is the PV for this Option A.)
B. Payments of $3,000 per month guaranteed for 25 years. Interest rates are 4% annually. (Calculate the PV of this option.)

For simplicity, assume everything else is the same. Based strictly on the PV you calculated, which option has the higher PV and is therefore the better option to take?

-3,000 PMT

4 I/YR

25x12= 300 N

#12) PV: Accept the Lump Sum or Take a Monthly Payout

Suppose a relative who has worked a long time for a large company is retiring. As part of their retirement benefits, the employer offers them the choice between the following retirement options:

A. $600,000 lump sum paid <u>today</u>. (So, $600,000 is the PV for this Option A.)
B. Payments of $3,000 per month guaranteed for 25 years. Interest rates are 4% annually. (Calculate the PV of this option.)

For simplicity, assume everything else is the same. Based strictly on the PV you calculated, which option has the higher PV ($600,000 or $568,357.45), and is therefore the better option to take?

-3,000   PMT

4   I/YR

25x12= 300   N

PV   568,357.45

Finish Line!

To bring these TVM concepts, Financial Calculators, and tools into your classroom:

Contact us at Dean@SavingAndBorrowing.org if you would like more information about teaching this curriculum using your classroom Chromebooks, iPads, and Windows devices. The financial calculator app we recommend is the only one we are aware of that has been approved through the Student Data Privacy review process (CoSN) for use in Texas public schools. And we have a limited number of **no-paperwork grants** available to cover this cost.

We also have a separate program to make the approved app available for students' smartphones.

The next page shows what the 10bii Financial Calculator app looks like Chromebooks, iPads, and Windows computers. (Guess what- it looks just like it does on smartphones.)

Bonus Problem: Buying an Oil Well, or the PV of a Series of Payments:
First, press the Orange Bar key, then move your finger down and press the C ALL key.

Suppose you want to buy an oil well that is projected to provide you with payments of $10,000 per month for five years. If you require a 25% annual return due to the riskiness of the oil business, how much would you pay for the oil well today?

That's All, Folks!