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HP 17bII+ Test Yourself



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In this module we give you the opportunity to work problems with your 17bII+ that cover various subject areas. We have jumbled time-value-of-money problems with discounted cash flow, with loan amortization, with solving equations, with many of the applications that were explained in the other modules. We hope this will give you the practice you need to gain - or increase! - your confidence in the use of your hp 17bII+. Each problem is accompanied by an explanation of its solution along with all the keystrokes that are required. Good luck!

1. What is the present value of \$75,000. to be received in ten years, if discounted at an annual rate of 12%?

Solution: This is a time-value-of-money problem in which you use the five financial registers. Go to the TVM menu from the main menu with 'FIN' and 'TVM.'

Reason out what goes where in the financial registers you see in this menu: "N," "I%YR," "PV," "PMT," and "FV." The \$75,000. is money to be received in the future, right? Put it into "FV." The timeframe is 10 years. That goes into "N." Our annual discount rate is 12%. Put it into "I%YR." There is no role for payment. So, we will leave that at "0," which it will be if you first cleared your registers after getting into this menu with 'SK' (shift key) and 'CLR DATA.' Solve for what that money is presently worth. Press the 'PV' key.

And, remember what else you should do. This is annual discounting. You should have set your calculator to one payment per year by pressing 'OTHER' in the TVM menu, then '1' and 'P/YR.' Exit, then, back to the TVM menu.

Keystrokes

```
FIN
TVM
SK
CLR DATA
OTHER
1
P/YR
EXIT
75000
FV
10
N
12
I%YR
PV    Answer: 24,147.99
```

hp calculators

HP 17bII+ Test Yourself

2. What is the present value of \$20,000. per year to be received over each of the next five years if discounted annually at 6%?

Solution: Pretty much the same as the problem above, except that the money to be received is in a series of payments, not a single sum. What register to use for this series? Right. The payment register. If you are in the TVM menu, you have cleared with 'SK' and 'CLR DATA,' and you have set your calculator to one payment per year with 'OTHER,' '1,' 'P/YR,' and then exit back to the TVM menu with 'EXIT,' you would use the following keystrokes to solve this problem:

Keystrokes

20000
PMT
5
N
6
I%
PV Answer: 84,247.28

3. The following cash flows have been projected for an income-producing property:

Estimated cash flow for end of year #1: \$40,000.
 year #2: \$45,000.
 years #3 through #6: \$60,000. per year
 year #7: (\$10,000.)
 year #8: \$800,000.

Discount rate: 15%

What is the present value?

Solution: This is another discounting problem. But with a difference from the first two problems, isn't there? This problem has an income stream that varies in most years from the other years. So, we must use the discounted cash flow menu. From the main menu hit 'FIN' and 'CFLO.' That puts you in the cash flow menu. Clear it with 'SK' and 'CLR DATA' and 'YES.' Then plug in your cash flows. From there go to the calculation menu, put in the discount rate and press 'NPV.' The keystrokes below take you from the main menu to the answer.

Keystrokes

FIN
CFLO
SK
CLR DATA
YES
0
INPUT

hp calculators

HP 17bII+ Test Yourself

The two keystrokes above keep cash flow (0) at '0' and move you to the first cash flow.

```
40000
INPUT
INPUT
```

These keystrokes insert the \$40,000. into the first cash flow and then tell the calculator you want that flow only one time. If your times function is turned off you would not need the second input. But you will need the times function on for this problem because we have equal, consecutive cash flows coming up. See our module on discounted cash flow analysis for more on the times function.

```
45000
INPUT
INPUT
60000
INPUT
4
INPUT
10000
+/-
INPUT
INPUT
800000
INPUT
EXIT
CALC
15
I%
NPV      Answer: 456,097.55
```

4. In problem #3, what is the net present value if the purchase price of the property is \$450,000.?

Solution: You need to add something to the cash flows, namely a value for cash flow (0). So, from the calculation menu, press 'EXIT' and scroll up using the arrow up key until you get to cash flow (0). You can do that in one operation by pressing 'SK' and the arrow up button. Insert the purchase price as a negative (money flowing away), go back to the calculation menu, and figure your net present value by pressing the 'NPV' key. The following keystrokes take you from the end of problem #3:

hp calculators

HP 17bII+ Test Yourself

Keystrokes

EXIT
SK
Arrow up
450000
+/-
INPUT
EXIT
CALC
NPV Answer: 6,097.55

5. What is the internal rate of return for problem #4?

Solution: Although the internal rate of return is a complex variable that is laborious to calculate manually, it is simply a matter of pressing the right key with your HP 17bII+. From the completion of problem #4 you would press:

Keystroke

IRR% Answer: 15.26

You may recall from our module on discounted cash flow that it is not necessary to put in a discount rate or to calculate present value in order to come up with the internal rate of return. This rate is a return that the cash flows represent, expressed as an average periodic percentage rate of the purchase price. It is independent of what discount rate you might use and what present value that would generate.

6. What is the monthly payment that would fully amortize a loan of \$400,000. over 30 years at an annual interest rate of 9%?

Solution: Another time-value-of-money problem. What are you solving for here? Sure, payment. You can figure that the borrower is presently getting \$400,000. and that this should go into present value, as a positive from the borrower's point of view but negative if you are doing it from the lender's vantage point. Let's do it as the borrower sees it.

Make sure you have your calculator set for 12 payments per year. And set your display to two places to the right of the decimal. The keystrokes below are starting after you have gotten yourself into the TVM menu and you have properly cleared the calculator with 'SK' (shift key) and 'CLR DATA.'

Keystrokes

OTHER
12
P/YR
EXIT

hp calculators

HP 17bII+ Test Yourself

That sets your calculator to monthly payments and gets you back to the TVM menu.

DSP
FIX
2
INPUT

Now you have the display with two places to the right of the decimal.

400000
PV
30
SK
N
9
I%YR
PMT Answer: -3,218.49

7. In problem #6, how much interest and how much principal will be paid on this loan over the first two years of payments?

Solution: After you have calculated the monthly payment you need to get to the amortization menu by pressing 'OTHER' and then 'AMRT.' Tell the calculator over what period you want to amortize. This must be in language the calculator understands - months, not years. Go ahead and put 24 months into #P. The keystrokes after calculating the payment are below.

Keystrokes

OTHER
AMRT
24
#P
INT Answer: -71,521.83
PRIN Answer: -5,721.93

The negative signs indicate the borrower is paying out these monies (money is flowing away from the borrower).

8. What would be the balance of the loan after the 24 payments are made in problem #7?

Solution: Two ways to do this. First, let's pick up from the keystrokes shown in problem #7. Just one key to hit:

Keystroke

BAL Answer: 394,278.07

hp calculators

HP 17bII+ Test Yourself

The second way to do this would be to use the TVM registers only. Go back to the TVM menu from the amortization menu by pressing 'EXIT' twice. You are going to calculate a future value of this loan after two years (24 months) of payments. Once you are back in the TVM menu where you have the loan information in the registers, this is what you do:

Keystrokes

2
SK
N
FV Answer: 394,278.07

Now, this won't get you interest and principal paid for this period. You have to use the keystrokes in problem #7 to get those numbers. But, if you are looking for balance only, calculate the loan payment as we did in problem #6, then put in the 'N' register when you want to calculate the balance (we inserted '24' into the 'N' register above by pressing '2,' 'SK,' and 'N') and ask the calculator for the future value (balance) of the loan after that number of payments by pressing 'FV.'

9. Create an equation for calculating value of an income-producing asset by capitalizing the net operating income.

Solution: The formula for this is: $V = I \div R$

V = value
I = net operating income
R = capitalization rate

From the main menu press 'SOLVE' and then 'NEW.' You will spell out the equation from the letter groups and then the individual letters. The keystrokes go like this:

Keystrokes

SOLVE
NEW
RSTUV
V
=
FGHI
I
÷
RSTUV
R
EXIT

This 'EXIT' puts you into the edit menu, where you could change the formula if you wanted to.

EXIT

hp calculators

HP 17bII+ Test Yourself

This second 'EXIT' allows you to save the equation. So you press:

YES

10. Use the equation you created in #9 to estimate the value of an asset that produces \$100,000. of net operating income every year if it is capitalized with a rate of 6%.

Solution: Press 'CALC' in the SOLVE menu. Did you see that momentarily your display showed "VERIFYING EQUATION . . ."? Your calculator is making sure this is a valid equation that can be solved. Your display should then show each of the variables. Plug in your known variables and solve for the one you don't know.

From the SOLVE menu once you have created your equation:

Keystrokes

```
CALC
100000
I
.06
R
V      Answer: 1,666,666.67
```

11. Calculate an overall capitalization rate for a lender that is loaning money at an annual interest rate of 10%, for 15 years, with monthly amortization and a loan-to-value ratio of 75%.

Solution: The lender's overall rate is the sum of its return "on" - the interest rate of 10% - and its return "of," which is the return of its loan, the principal dollars. We know the return "on" and so our task is to calculate the return "of." We will do this by figuring a rate per dollar that the bank needs to get back over the 15 years. Set your calculator to four places to the right of the decimal, since capitalization rates in decimal form are usually expressed to this number of places. Use these keystrokes:

Keystrokes

```
DSP
FIX
4
INPUT
```


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HP 17bII+ Test Yourself

That sets the calculator to four places. Then, in the TVM menu after you have cleared with 'SK' (shift key) and 'CLR DATA' press in:

1
FV
10
I%YR
15
SK
N
PMT Answer: 0.0024

This is monthly amortization and so the answer is the monthly recapture or recovery of the principal dollars. Capitalization rates are typically expressed annually. So, we should annualize this monthly recapture by multiplying it by 12:

ALG

x
12
= Answer: 0.0290

RPN

12
x Answer: 0.0290

The lender's overall rate is:

$$R(d) = R(on) + R(of)$$

R(d) = debt capitalization rate, the lender's capitalization rate

R(on) = return "on"

R(of) = return "of"

$$= .1000 + .0290$$

$$= .1290 = 12.90\%$$

12. What is the overall capitalization rate to value a subject property if the debt capitalization rate is what we found in problem #11 and the equity capitalization rate, which is the rate the equity investor wants as a return on equity, is 15%?

hp calculators

HP 17bII+ Test Yourself

Solution: This is asking us to use the band-of-investment technique for calculating an overall capitalization. Its formula is:

$$R(o) = [LTVR \times R(d)] + [ETVR \times R(e)]$$

R(o) = overall capitalization rate that will be applied to the subject property's net operating income in order to value the subject

LTVR = the loan-to-value ratio, the percentage of the value that the lender is willing to make as a loan property

R(d) = the capitalization rate for the debt, which means it is the rate of return the lender wants on the money it is loaning

ETVR = the equity-to-value ratio, the remaining percentage of the purchase price not covered by the mortgage loan that the investor must put into the property as equity or down payment to complete the purchase.

R(e) = the capitalization rate for the equity, the rate of return the investor wants on the invested equity in money earned by the property.

$$\begin{aligned} R(o) &= (.75 \times .1290) + (.25 \times .15) \\ &= .0968 + .0375 \\ &= .1343 = 13.43\% \end{aligned}$$

Keystrokes

Alg

.75
x
.129
+
(
.25
x
.15
)
=

Answer: .1343

RPN

.75
ENTER
.129
x

hp calculators

HP 17bII+ Test Yourself

.25
ENTER
.15
x
+ Answer: .1343

13. What is the weekly deposit required in a savings account paying an annual interest rate of 4% and compounded weekly to have \$10,000. in the account after seven years?

Solution: This is another time-value-of-money problem involving those five variables: 'N,' 'I%YR,' 'PV,' 'PMT,' and 'FV.' Which variables are given in the information and for what are you asked to solve?

This problem has given us the interest rate, 4%, the time involved, seven years, and what we will have in the future, \$10,000. So, we have the values for 'I%YR,' 'N,' and 'FV,' don't we? 'PV' is not going to play a role in this problem, but 'PMT' will, because we are being asked for a recurring deposit amount. Plug in the knowns and solve for the unknown.

Just before we do, however, we have to make sure we have our time right. Our calculator doesn't know anything about this problem until we tell it and here we will have to inform it that we have weekly compounding, interest being paid 52 times a year. In the TVM menu, therefore, press 'OTHER' and in the resulting menu hit '52' and 'P/YR.' That sets your calculator to 52 payments per year. Hit 'EXIT' and you are back in the TVM menu.

Clear with 'SK' and 'CLR DATA' and then solve for the required weekly deposit with these keystrokes:

Keystrokes

4
I%YR
10000
FV
7
SK
N

Do you see the "N=364" in your display. Your calculator multiplied the seven years by 52 weeks per year when you hit '7,' 'SK,' and 'N.'

PMT Answer: -23.82

The answer is negative to show that the saver must pay into the account (money flowing away) this amount every week to have at the end of the seven years the \$10,000., which we inserted as a positive to indicate this money would be flowing to the saver after the seven years.

hp calculators

HP 17bII+ Test Yourself

14. What interest rate must an account pay for a saver to double an initial deposit of \$25,000. in five years if the account is compounded quarterly?

Solution: Another time-value-of-money problem. As you did in problem #13, identify what information you have and what you are being asked. Also consider the time element. This is quarterly compounding. Four times a year, right? Your keystrokes from the TVM menu:

Keystrokes

OTHER
4
P/YR
EXIT

That sets the calculator to four payments a year and bring us back to the TVM menu. Clear the menu with 'SK' and 'CLR DATA.' Then:

25000
+/-
PV

The \$25,000. is now in the account from the saver's point of view.

50,000.
FV

The \$50,000. is inserted as a positive. That money will go to the saver.

5
SK
N
I%YR Answer: 14.11

The account must pay an annual rate of 14.11%.

15. What is the term of a \$130,000. loan at an annual interest rate of 8% if the monthly payment to fully amortize the loan is \$1,003.36?

Solution: Another TVM menu problem. Do you see the point we are trying to make with problems #13, #14, and now this one? Sure. You can solve what are seemingly difficult problems by just identifying in the language of the five variables in the TVM menu what information has been given you and for what you are being asked to solve.

The starting loan amount goes into 'PV,' doesn't it. The rate into 'I%YR,' and the loan payment as a negative (from the borrower's point of view) into 'PMT.' 'FV' doesn't figure in this problem. For what are we solving? The time, right? The 'N' variable.

Set your calculator to 12 payments a year. And, this is a good time to emphasize again that it is always a good idea to clear your registers in a menu before doing the problem. From the TVM menu:

hp calculators

HP 17bII+ Test Yourself

Keystrokes

OTHER
12
P/YR
EXIT
SK
CLR DATA

You have set your payments for 12 a year and you went back to the TVM menu and cleared all the variables. Now put in the information you do know and solve for what you need:

130000
PV
8
I%YR
1003.36
+/-
PMT

The payment goes in as a negative because the loan was inserted as a positive. These two amounts flow in different directions. In this case we did it from the borrower's point of view. From the lender's viewpoint, the loan would be negative and the payment positive.

Let's solve for:

N Answer: 300

300 what? Well, we set our calculator to 12 payments per year, didn't we? So, this must be months showing up in the display. This is a 300-month term or, dividing by 12 months per year, a 25-year loan.