

## TVM (Time-Value of Money) Solver on the Graphing Calculator (TI-83 Plus or TI-84 Plus)

How to access:

Press



```
N=0
I%=0
PV=0
PMT=0
FV=0
P/Y=1
C/Y=1
PMT:END BEGIN
```

**N:** Total number of payment periods over the investment or loan.  
(number of payments per year)  $\times$  (number of years)

Ex: For 30-year investment with monthly compounding,  
 $N=30 \cdot 12=360$

**I%:** Annual interest rate (APR as *percent*, not as a decimal).

Ex: Enter 9.5 instead of .095 for 9.5%

**PV:** Present value. Your present value (principal, deposit) of your investment or the current mortgage balance.

**PMT:** The payment amount of the loan or the amount you are contributing to the investment.

**FV:** Future value. Your balance of the investment or loan after **N** payment periods. (Acts like the variable *A* in interest formulas)

**P/Y:** number of payment periods per year.

*For the problems we will do for class, P/Y and C/Y will be the same.*

**C/Y:** number of compounding periods per year.

**PMT:** Always keep **END** highlighted.

### IMPORTANT NOTES:

- You will enter values for every variable but one, and then you will solve for the remaining variable by using   on the row that you are trying to calculate.


- There must be a number in each field. If you press “CLEAR,” you will not be able to leave that field until you enter another number in that field.
- For investments, FV and PV will have opposite signs – if one is negative, the other must be positive.



- The TVM Solver should NOT be used for simple interest calculations!!

## TVM Solver Examples

### 1. Lump-Sum Investment (find the Future Value)

You deposit \$1000 in an account that bears 6.5% interest compounded daily for 20 years. How much will this investment be worth at the end of the 20 years?

A "deposit" is something you "pay" into, so it's negative. 

```



N=7300      Enter 365*20
I%=6.5
PV=-1000
PMT=0
FV=3668.872009
P/Y=365
C/Y=365
PMT: [ ] [ ] BEGIN
                    
```

The investment will be worth **\$3668.87** in 20 years.

### 2. Lump-Sum Investment (find the Present Value)

You want to accumulate \$7500 over the next 15 years by making a single deposit into a savings account now. How much deposit do you need to invest in order to reach your goal if you find a savings account with 4.5% interest compounded continuously?

**Note:** for continuous compounding, use a VERY large number for compoundings, such as 1,000,000,000.

```

N=1.5E10    Enter 1000000000 * 15
I%=4.5
PV=-3818.673155
PMT=0
FV=7500
P/Y=1000000000
C/Y=1000000000
PMT: [ ] [ ] BEGIN
                    
```

You need to deposit **\$3818.67** in order to meet your goal.



### 3. Find the annual percentage rate (APR) – with finance charge

Find the annual percentage rate for \$4700 financed, with a finance charge of \$1002, and a loan term of 36 months.

This is a little bit more work. First, we need to calculate the *monthly payment* (PMT):

$$\frac{\text{Amount Financed} + \text{Finance Charge}}{\text{Total months of the Loan}}$$

So, in this example, for the **PMT=** line, you would type  $-(4700+1002)/36$

```

N=36
I%=13.01206508
PV=4700
PMT=-158.38888...
FV=0
P/Y=12
C/Y=12
PMT: [ ] [ ] BEGIN
                    
```

Payments are made monthly.

The APR for this loan (rounded to the nearest half-percent), would be **13%**.

### 4. Find the APR (annual percentage rate) – with add-on interest rate

Find the annual percentage rate (true annual interest rate), to the nearest half-percent, for a loan with purchase price of \$4220, down payment of \$380, add-on interest rate 5%, with 12 monthly payments.

$$\begin{aligned} \text{Amount financed} &= \text{Purchase Price} - \text{Down Payment} \\ &= 4220 - 380 = \$3840 \text{ (PV)} \end{aligned}$$

Again, this is a bit more work. **Add-on interest rate** allows you to determine the *finance charge*. Use the Simple Interest Formula ( $I = P r t$ ) to get the finance charge (remember  $t$  is in years, not months):

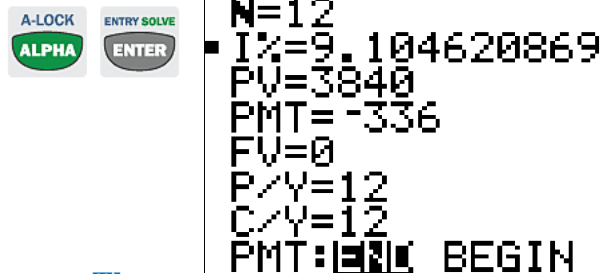
$$\text{Finance charge} = 3840 \times .05 \times 1 = \$192$$

## TVM Solver Examples

### 4. Find the APR (annual percentage rate) – with add-on interest rate (cont'd)

So monthly payment (**PMT**) would be:  
$$\frac{\text{Amount Financed} + \text{Finance Charge}}{\text{Total months of the Loan}}$$

So for the **PMT**= line, you would type  
-(3840+192)/12



The **APR for this loan, rounded to the nearest half-percent, is 9%.**

### 5. Find the Finance Charge and APR for a loan

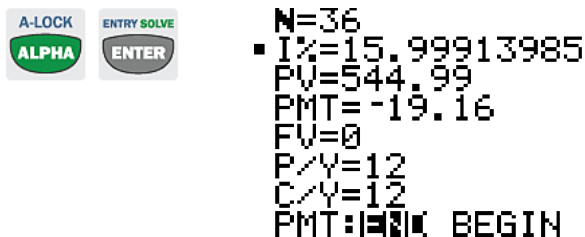
The cash price for a fitness system is \$659.99.  
The customer paid \$115 as a down payment.  
The remainder will be paid in 36 monthly installments of \$19.16 each. Find the amount of the finance charge and the APR for the loan.

To get the finance charge, you do not need to use TVM Solver yet.

Purchase Price – Down Payment = Amount Financed  
 $659.99 - 115 = \$544.99 = \text{Amount Financed (PV)}$

Monthly Payment  $\times$  Number of Payments = Total Paid Back  
 $19.16 \times 36 = \$689.76 = \text{Total Paid Back}$

Total Paid Back – Amount Financed = Finance Charge  
 $689.76 - 544.99 = \mathbf{\$144.77 = \text{Finance Charge}}$



The **APR on this loan is about 16%.**