

When using the TI-83 Plus or TI-84 Plus calculators you access **Finance** by pressing the APPS key.

## Future Value of an Ordinary Annuity & Sinking Funds

An annuity is a payment of money over equal intervals of time. Ordinary annuities and annuities due are terms used to describe the future values of annuities. The future value of an annuity is the total value of the contract at the end of the period of time if a fixed amount is deposited at specific intervals.

*Example 1:*

A chemist deposits \$300 in a savings account that pays 4% interest compounded annually and adds \$300 at the end of each year for 4 years. How much money does she have after 5 years?

1. Press **[2nd] [FINANCE] (5A)†** and choose **1:TVM Solver** from the CALC menu. (Figure 1)
2. Input 5 for N, 4 for I%, -300 for PV, -300 for PMT (because the flow of money is from the saver to the bank), 1 for P/Y payment per year, and 1 for C/Y compounding per year.
3. Place the cursor on the FV and press **[ALPHA] [SOLVE] (10E)**. Notice that a square beside FV indicates that the problem has been solved. (Figure 2)

(Figure 1)



(Figure 2)



*Example 2:*

Grandparents of a fourth-grader decided to start a college fund so that in 8 years their grandchild will have \$40,000 saved toward college tuition. What monthly payments must they make if they find a bank paying 8% interest?

Follow steps 1-3 in *Example 1* above, using the values for this example in place of those above.

In Figure 3, notice that the PMT is negative 298.80 because this is the amount the grandparents must pay out monthly.

Note that if the payments are made at the beginning of each period, the payment would be \$296.82 and the \$40,000 would be available one month after the last payment. (Figure 4)

(Figure 3)



(Figure 4)



† Refer to the section on Key Arrangement in Chapter 1 for an explanation of the key locator codes used in this manual.

**Example 3:**

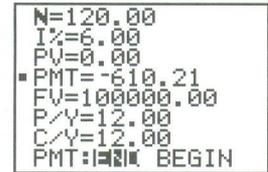
A 55 year-old man would like to have \$100,000 in his account when he retires in 10 years. What monthly payments should he make to an account that pays 6% monthly?

**Method 1: Using the TVM Solver**

1. Press **2nd** [FINANCE] (5A) and choose **1:TVM Solver** from the CALC menu.
2. Enter N = 120, I% = 6, PV = 0, FV = 100000, P/Y = 12 and C/Y = 12.
3. Move cursor to PMT, press **ALPHA** [SOLVE] (10E).

The monthly payments will be \$610.21. (Figure 5)

(Figure 5)



**Method 2: Using the tvn\_Pmt function**

1. Press **2nd** [QUIT] (2B) to return to the Home Screen.
2. Press **2nd** [FINANCE] (5A) and choose **2:tvn\_Pmt** from the CALC menu.

This will paste the **tvn\_Pmt** function on the Home Screen.

The syntax for this function is **tvn\_Pmt** (N, I%, PV, FV, P/Y, C/Y).

3. Enter **(** 120 **,** 6 **,** 0 **,** 100000 **,** 12 **,** 12 **)** **ENTER**. (Figure 6)

(Figure 6)



**Example 4:**

A mathematics teacher deposits \$1,000 in a savings and loan account at the end of each quarter for 10 years. How much money does he have at the end of 10 years if the savings and loan pays 8% interest compounded quarterly?

**Method 1: Using the TVM Solver**

1. Press **2nd** [FINANCE] (5A) and choose **1:TVM Solver** from the CALC menu.
2. Enter the values as in previous examples and press **ALPHA** [SOLVE] (10E).

The teacher will have \$60,401.98. (Figure 7)

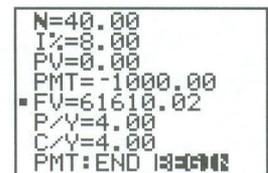
3. Change PMT: to BEGIN, move the cursor back to FV and press **ALPHA** [SOLVE] (10E).

If the teacher makes his deposits at the beginning of each compounding period, he will have \$61,610.02, a difference of \$1,208.04. (Figure 8)

(Figure 7)



(Figure 8)



**Method 2: Using the tvn\_FV function**

1. Change PMT: back to END in the **TVM Solver**.
2. Press **2nd** [QUIT] (2B) to return to the Home Screen.
3. Press **2nd** [FINANCE] (5A) and choose **6:tvn\_FV** from the CALC menu to paste the function on the Home Screen. (Figure 9)

The syntax for this function is **tvn\_FV** (N, I%, PV, PMT, P/Y, C/Y).

4. Type in **(** 40 **,** 8 **,** 0 **,** (-) 1000 **,** 4 **,** 4 **)** **ENTER**

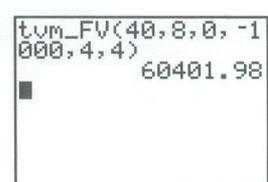
The result is \$60,401.98. (Figure 10)

This matches the answer obtained from the **TVM Solver** with the payment at the END of the period.

(Figure 9)



(Figure 10)



Example 5:

A family decides to make monthly deposits into a college education fund for a daughter so that she will have \$20,000 at the end of 8 years. They locate a bond fund that pays 12% compounded monthly. How much must the family deposit each month?

(Figure 11)

```
N=96.00
I%=12.00
PV=0.00
PMT=-125.06
FV=20000.00
P/Y=12.00
C/Y=12.00
PMT: [ ] [ ] [ ] [ ] BEGIN
```

Notice the difference of \$1.24 each month if the payments are made at the beginning of the period versus at the end of the period. (Figures 11 and 12)

(Figure 12)

```
N=96.00
I%=12.00
PV=0.00
PMT=-123.82
FV=20000.00
P/Y=12.00
C/Y=12.00
PMT: END [ ] [ ] [ ] [ ]
```

## Sinking Funds

A sinking fund is initiated if a company anticipates buying an expensive piece of equipment at some time in the future. Periodic payments are made to an account so that the company can pay for the item rather than borrow the money to pay for it (amortization). Rather than paying interest on the money they would borrow, they accumulate interest on the money that they save each time period.

Example 1:

In five years, a company wants to buy a new computer system costing \$100,000. They establish a sinking fund which pays 6% compounded semiannually. To accumulate \$100,000 in five years, what is the payment every six months?

(Figure 13)

```
N=10.00
I%=6.00
PV=0.00
PMT=-8723.05
FV=100000.00
P/Y=2.00
C/Y=2.00
PMT: [ ] [ ] [ ] [ ] BEGIN
```

The company must make ten semi-annual payments of \$8,723.05. (Figure 13)

Notice that PMT is negative because the money is flowing away from the company.

Example 2:

A company wants \$100,000 in a sinking fund after 5 years. The company is willing to make monthly payments because the investment will compound at 6% monthly. Find the amount of the payment that the company must make each month.

(Figure 14)

```
N=60.00
I%=6.00
PV=0.00
PMT=-1433.28
FV=100000.00
P/Y=12.00
C/Y=12.00
PMT: [ ] [ ] [ ] [ ] BEGIN
```

The company must make monthly payments of \$1,433.28. (Figure 14)

Example 3:

A manufacturer deposits \$1,000 each month in an account which pays 5% interest compounded monthly. He anticipates doing this for the next 5 years. How much money will be in his sinking fund to buy an updated machine to cap bottles at the end of that time period?

(Figure 15)

```
N=60.00
I%=5.00
PV=0.00
PMT=-1000.00
FV=68006.08
P/Y=12.00
C/Y=12.00
PMT: [ ] [ ] [ ] [ ] BEGIN
```

His sinking fund will accumulate \$68,006.08. (Figure 15)