Time Value Money TI-Nspire™ CX   **Future Value of an Ordinary Annuity and Sinking Funds**

Future Value of an Ordinary Annuity and 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.

A sinking fund is initiated if a company anticipates buying an expensive piece of equipment at some time in the future.

Objectives:

- Determine the future value of an annuity or a sinking fund if a fixed amount is deposited at specific intervals.
- Determine the fixed amount of the deposit required at specific intervals to attain a desired future value of an annuity or a sinking fund.

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 5 years. How much money does she have after 5 years?

1. Press ⌂on, and select **New** to start a new document. Select **Add Calculator**.

   Note: To round computations to two decimal places, change the Display Digits setting in the Documents Settings to **Fix 2**.

2. Press **Menu > Finance**. Select **Finance Solver**.
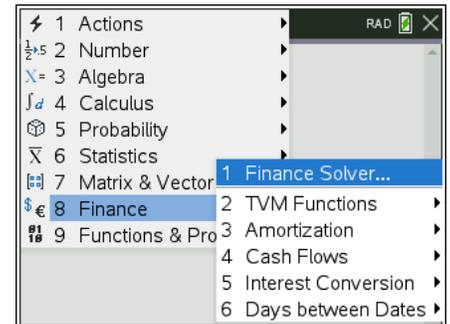
   N is the number of payment periods, **I(%)** is the annual interest rate, **PV** is the Present Value, **Pmt** is the Payment Amount, **FV** is the Future Value, **PpY** is the number of payment periods per year, and **CpY** is the number of compounding periods per year. The last row, **PmtAt**, indicates whether payments are made at the end or beginning of each payment period.

   To move from row to row in the Finance Solver, press tab.

3. Input N = 5, I(%) = 4, PV = -300, Pmt = -300 (because the flow of the money is from the saver to the bank), PpY = 1, and CpY = 1.
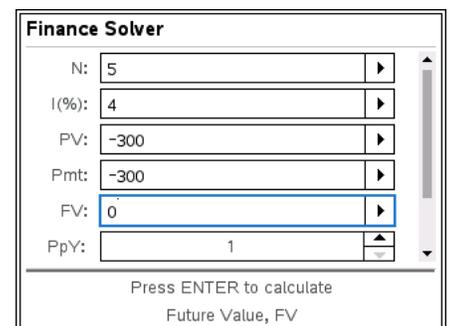
4. Place the cursor in the Future Value (FV) row. Press ⌷enter⌷ to calculate the Future Value.

    Note the presence of the rectangle around FV, which indicates that FV has been calculated for the given input values.

    Tab to another row to display the Future Value rounded to two decimal places.

The chemist has $1989.89 after 5 years.

Finance Solver

N:	5
I(%):	4
PV:	−300
Pmt:	−300
FV:	1989.89263872
PpY:	1

Finance Solver info stored into
tvm.n, tvm.i, tvm.pv, tvm.pmt, ...
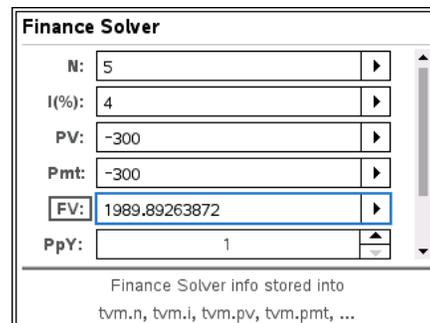
Example 2:

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 5% interest?

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

Finance Solver

N:	96
I(%):	5
PV:	0
Pmt:	0
FV:	40000
PpY:	12

Press ENTER to calculate
Number of Payments, N
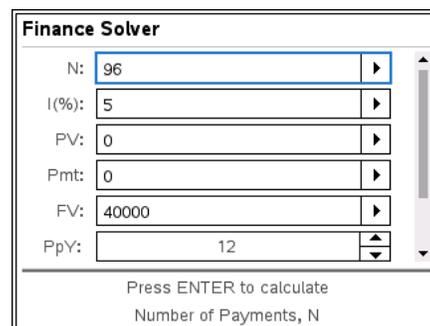
Note that Pmt is negative 339.73 because this is the amount the grandparents must pay out monthly.

Finance Solver

N:	96
I(%):	5
PV:	0
Pmt:	−339.73013381828
FV:	40000
PpY:	12

Finance Solver info stored into
tvm.n, tvm.i, tvm.pv, tvm.pmt, ...
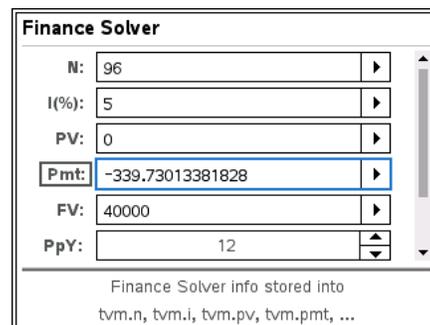
Change PmtAt: to **BEGIN**, and calculate the payment again.

Note that if the payments are made at the beginning of each period, the payment would be $338.32 and the $40,000 would be available one month after the last payment.

Finance Solver

PV:	0
Pmt:	−338.32046521323
FV:	40000
PpY:	12
CpY:	12
PmtAt:	BEGIN

Finance Solver info stored into
tvm.n, tvm.i, tvm.pv, tvm.pmt, ...
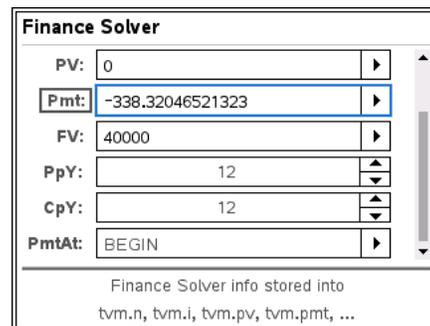
Example 3:

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 **Finance Solver**

1. Press [🏠on], and select **New** to start a new document. Select **Add Calculator**. Press **Menu > Finance**. Select **Finance Solver**.

2. Enter N = 120, I(%) = 6, PV = 0, FV = 100000, PpY = 12, and CpY = 12.

3. Place the cursor in the Payment Amount (Pmt) row, and press [enter].

The monthly payments will be $610.21.
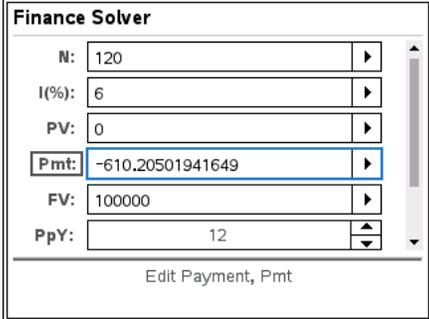
Finance Solver	
N:	120
I(%):	6
PV:	0
Pmt:	-610.20501941649
FV:	100000
PpY:	12

Edit Payment, Pmt

Method 2: Using the **tvmPmt** function

1. Press [esc] to exit the Finance Solver. On the Calculator page, press **Menu > Finance**, and select **TVM Functions**.

2. Select **Payment Amount**.

    This will paste the **tvmPmt** function on the Calculator page.

    The syntax for this function is **tvmPmt**(N, I, PV, FV, [PpY], [CpY], [PmtAt]).

    Note: Entries shown in brackets are optional and, if no value is entered, default values are used. The default value for both PpY and CpY is 1.0. The default value for PmtAt is 0.0, which indicates a PmtAt selection of END. (To change PmtAt to BEGIN, enter a value of 1.0 for PmtAt.)

3. Enter 120 [,] 6 [,] 0 [,] 100000 [,] 12 [,] 12 [enter].
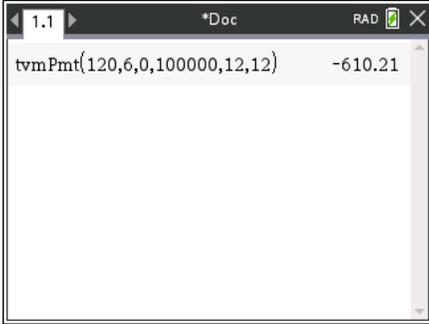
1.1	*Doc	RAD
tvmPmt(120,6,0,100000,12,12)		-610.21

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

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 4.5% interest compounded quarterly?

Method 1: Using the **Finance Solver**

1. On a Calculator page, press **Menu > Finance**. Select **Finance Solver**.

2. Enter the values as in previous examples and, with the cursor in the Future Value (FV) row, press enter .

The teacher will have $50,166.83.

3. Change PmtAt to **BEGIN**. Move the cursor back to FV, and press enter .

If the teacher makes his deposits at the beginning of each compounding period, he will have $50,731.21, a difference of $564.38.
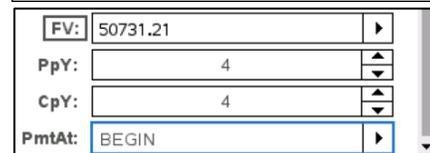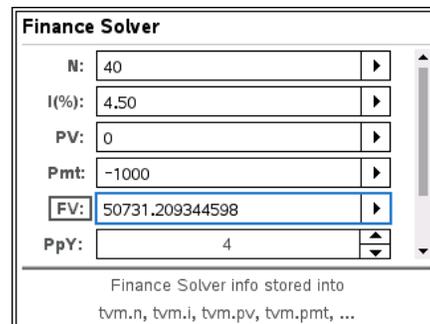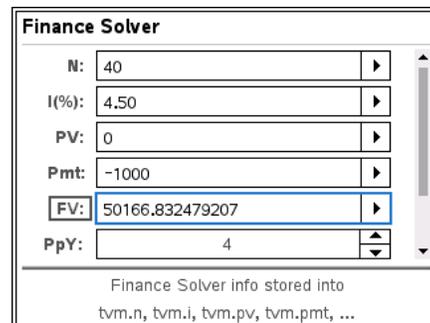
Method 2: Using the **tvmFV** function

1. Press esc to exit the Finance Solver. On the Calculator page, press **Menu > Finance > TVM Functions > Future Value**.

   The syntax for this function is **tvmFV**(N, I(%), PV, Pmt, P/Y, C/Y).

2. Enter 40 , 4.5 , 0 , (−) 1000 , 4 , 4 enter .

   The result is $50,166.83.

   This matches the answer obtained from the **Finance Solver** with the payment at the END of the period.
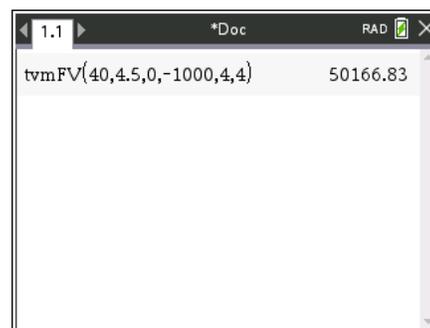
Example 5:

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 5% compounded monthly. How much must the family deposit each month?

Notice the difference of $0.71 each month if the payments are made at the beginning of the period versus at the end of the period.

Finance Solver	
PV:	0 ▸
Pmt:	−169.87 ▸
FV:	20000 ▸
PpY:	12
CpY:	12
PmtAt:	END ▸
	Set Annuity, PmtAt

Finance Solver	
PV:	0 ▸
Pmt:	−169.16 ▸
FV:	20000 ▸
PpY:	12
CpY:	12
PmtAt:	BEGIN ▸
	Set Annuity, PmtAt

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?

1. Press ⌂on, and select **New** to start a new document. Select **Add Calculator**. Press **Menu > Finance**. Select **Finance Solver**.

2. PpY and CpY are both set equal to 2.

The company must make ten semi-annual payments of $8,723.05.

Notice that Pmt is negative because the money is flowing away from the company.
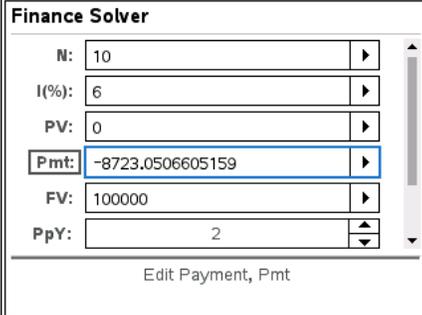
Finance Solver	
N:	10
I(%):	6
PV:	0
Pmt:	–8723.0506605159
FV:	100000
PpY:	2
Edit Payment, Pmt	

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.

The company must make monthly payments of $1,433.28.
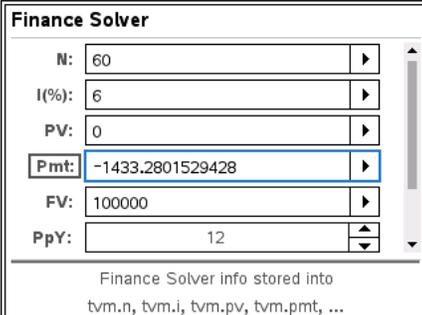
Finance Solver	
N:	60
I(%):	6
PV:	0
Pmt:	–1433.2801529428
FV:	100000
PpY:	12
Finance Solver info stored into tvm.n, tvm.i, tvm.pv, tvm.pmt, …	

Example 3:

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

Her sinking fund will accumulate $68.006.08.
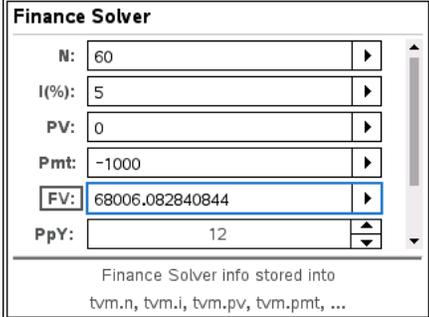
Finance Solver

N:	60 ▶
I(%):	5 ▶
PV:	0 ▶
Pmt:	−1000 ▶
FV:	68006.082840844 ▶
PpY:	12

Finance Solver info stored into
tvm.n, tvm.i, tvm.pv, tvm.pmt, ...