

## 2.7 Financial Calculator

The Financial Calculator program provides 16 financial functions (plus a yield conversion calculator) in an easy to use, plain English format. Functions are selected from the menubar's **Calculation** entry. Each selected function calculator appears in its own, small window. You may have more than one function window open at one time. If you minimize a function window the function calculator will retain the values you had entered. (Note: If you click on the Windows "x" button in the upper-right corner of a function window that window will be "minimized" not closed.) To close all open function windows (which clears all entered values) use the **File, Close** menubar selection.

Unless otherwise noted, annual yields and interest rates are annualized simple interest rates for the compounding interval. This conforms to handheld calculator usage and banking practices. For example, if a monthly payment loan has a monthly interest rate of 1.0%, then the annual interest rate is 12.0%. Also, for savings and investment calculations if deposits, for example, are made to a savings account monthly, then the monthly interest used by the program is the annual rate divided by 12. Keep in mind that with monthly compounding an investment with a monthly interest rate of 1.0%, has a compounded annual yield of 12.68%.

Though interest rates are entered as annual rates you can perform calculations based on rates for other periods. For example, if you are using monthly interest rates make sure you enter 12 periods per year for the compounding interval then enter 12 times the monthly interest rate as the annual rate. For quarterly rates enter 4 periods per year then enter 4 times the quarterly interest rate as the annual rate.

You may use the Yield Conversion calculator function to convert between interval and continuous compounding annual rates. You access this function with the last listed selection under the menubar's Calculation entry.

### Financial Functions

- |  |   |
|--|---|
| 1) Future Value of a Deposit               | 2) Time to Compound                                       |
| 3) Internal Rate of Return, Single Deposit | 4) Future Value of Variable Deposits                      |
| 5) Future Value of Level Deposits          | 6) Periodic Deposit                                       |
| 7) Payments to Amortize a Loan             | 8) Loan Payment   |
| 9) Remaining Loan Balance                  | 10) Loan Amount   |
| 11) IRR, Level Payments                    | 12) Present Value of Level Payments                       |
| 13) IRR, Variable Payments                 | 14) Present Value of Variable Payments                    |
| 15) Present Value of a Future Amount       | 16) Financial Manager's Rate of Return,<br>Level Payments |

Yield Conversion (interval/continuous compounding)

## Future Value of a Deposit

Future Value of a Deposit

Amount \$

Number of Periods

Periods per Year

Annual Interest Rate  %

☐ Continuous Compounding

\$

Calculate

### Amount

Deposit amount. Maximum of \$9,999,999,999.99.

### Number of Periods

Total compounding periods. Maximum of 10,950.

### Periods per Year

Compounding periods per year. Maximum of 365.

### Annual Interest Rate

Maximum of 125.000%.

### Continuous Compounding

Check this box to override interval compounding and use continuous compounding for the term defined by the number of periods and periods per year.

## Examples, Future Value of a Deposit

Assume a 5-year certificate of deposit with a nominal annual interest rate of 6.25% and monthly compounding. What will be the value at maturity of a \$50,000 CD?

Amount: 50,000

Number of Periods: 60

\$68,286.50

Periods per Year: 12

Annual Interest Rate: 6.250

Instead of monthly compounding, assume continuous compounding. What will be the value at maturity of the above-described, 5-year CD?

Check Continuous Compounding

\$68,341.90

An investment will earn 2% per quarter. If you invest \$30,000 and reinvest the quarterly earnings in the same investment, how much will you have at the end of the three-year period (12 quarters)?

Amount: 30,000

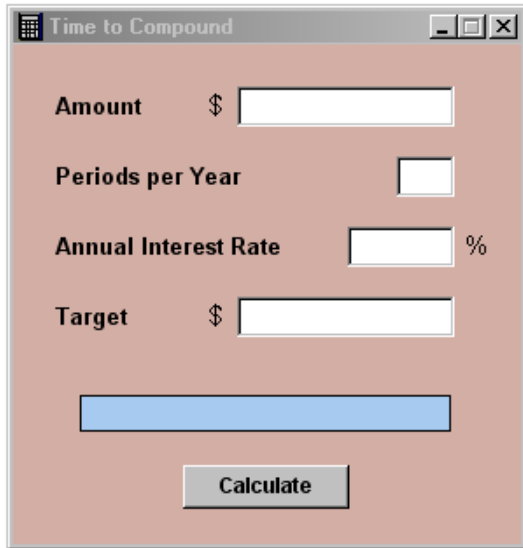
Number of Periods: 12

\$38,047.25

Periods per Year: 4

Annual Interest Rate: 8.000

## Time to Compound



The screenshot shows a window titled "Time to Compound". It contains four input fields: "Amount" with a dollar sign, "Periods per Year", "Annual Interest Rate" with a percent sign, and "Target" with a dollar sign. Below these fields is a blue rectangular button labeled "Calculate".

### Amount

Investment/deposit amount.  
Maximum of 9,999,999,999.99.

### Periods per Year

Compounding periods per year.  
Maximum of 365.

### Annual Interest Rate

Maximum of 125.000%.

### Target

Target future value of the investment amount. Maximum of \$9,999,999,999.99.

## Example, Time to Compound

Assume a \$15,000 certificate of deposit with a nominal annual interest rate of 7.5% and monthly compounding. How long will it take for the CD balance to double (future value of \$30,000)?

Amount: 15,000

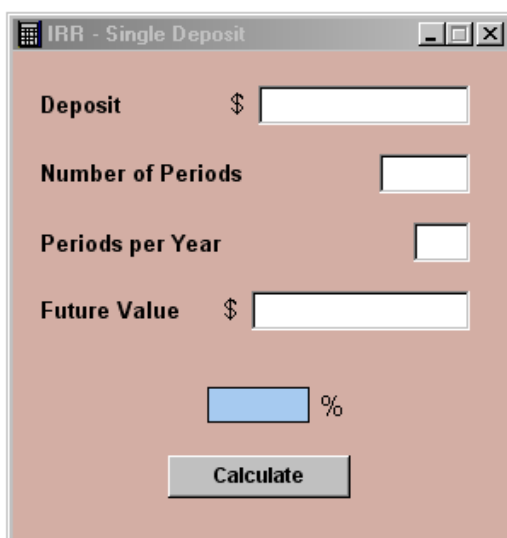
Periods per Year: 12

Annual Interest Rate: 7.500

Target: 30,000

112 periods: 9 years, 4 months

## IRR - Single Deposit



The screenshot shows a window titled "IRR - Single Deposit". It contains four input fields: "Deposit" with a dollar sign, "Number of Periods", "Periods per Year", and "Future Value" with a dollar sign. Below these fields is a blue rectangular button labeled "Calculate".

### Deposit

Investment/deposit amount.  
Maximum of \$9,999,999,999.99.

### Number of Periods

Total number of compounding periods. Maximum of 10,950.

### Periods per Year

Compounding periods per year.  
Maximum of 365.

### Future Value

Required future value of the investment amount. Maximum of \$99,999,999,999.99.

### Example, IRR – Single Deposit

Assume that an investment today of \$100,000 will be worth \$137,000 four years from now. What's the internal rate of return under quarterly compounding?

Deposit: 100,000

Number of Periods: 16

Periods per Year: 4

Future Value: 137,000

7.948%

### **Future Value of Variable Deposits**

**Annual Interest Rate**  %

**Deposits per Year**

Deposits	@	Amount
<input type="text"/>	\$	<input type="text"/>
<input type="text"/>		<input type="text"/>
<input type="text"/>		<input type="text"/>
<input type="text"/>		<input type="text"/>
<input type="text"/>		<input type="text"/>
<input type="text"/>		<input type="text"/>
<input type="text"/>		<input type="text"/>

\$

**Calculate**

#### **Annual Interest Rate**

Annual internal rate of return (IRR) on the deposits or investments. Maximum of 99.999%.

#### **Deposits per Year**

The number of deposits made each year. Maximum of 365.

#### **Deposits @ Amount**

This is the deposit schedule;  $n$  number of deposits each in the amount of  $p$ . The top edit boxes of the schedule are for the first deposit stream. The maximum number of deposits in each stream is 9,999. The maximum deposit amount for each stream is \$9,999,999.99.

### Example, Future Value of Variable Deposits

For the next 3 years you plan to contribute \$200 per month to your IRA. For the following 3 years you plan to contribute \$275 per month and for the 4 years after that you plan to contribute \$325 per month. At the end of 10 years what will be the value of your IRA assuming a 7% annual return, monthly compounding?

Annual Interest Rate: 100,000

Deposits per Year: 12

36 @ 200, 36 @ 275, 48 @ 325

\$45,742.63

## Future Value of Level Deposits

The screenshot shows a window titled "FV of Level Deposits" with a light blue background. It contains four input fields: "Deposit Amount" with a dollar sign prefix, "Total Number of Deposits", "Deposits per Year", and "Annual Interest Rate" with a percent sign suffix. Below these is a blue rectangular output field with a dollar sign prefix. At the bottom is a "Calculate" button.

### Deposit Amount

Periodic, recurring investment or deposit amount. Maximum of \$9,999,999.99.

### Total Number of Deposits

Maximum of 99,999.

### Deposits per Year

Number of deposits made each year. Maximum of 365.

### Annual Interest Rate

Annual internal rate of return on the deposits. Maximum of 125.000%.

## Example, Future Value of Level Deposits

A whole-life insurance policy has an annual rate-of-return of 2.5%. Monthly premiums are \$325. What will be the policy's cash surrender value after 20 years?

Deposit Amount: 325

Total Number of Deposits: 240

Periods per Year: 12

Annual Interest Rate: 3.500

\$101,277.34

## Periodic Deposit

The screenshot shows a window titled "Periodic Deposit" with a light blue background. It contains four input fields: "Target" with a dollar sign prefix, "Total Number of Deposits", "Deposits per Year" (with the value 12 entered), and "Annual Interest Rate" with a percent sign suffix. Below these is a blue rectangular output field with a dollar sign prefix. At the bottom is a "Calculate" button.

### Target

Expected or required future value of the periodic deposits. Maximum of \$999,999,999.99.

### Total Number of Deposits

Maximum of 99,999.

### Deposits per Year

Number of deposits made each year. Maximum of 365, default of 12.

### Annual Interest Rate

Annual internal rate of return on the deposits. Maximum of 125.000%.

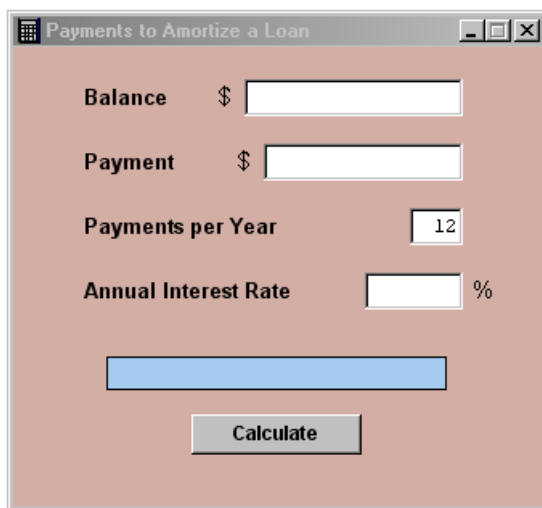
### Example, Periodic Deposit

You determine that 15 years from now, at retirement, you will need additional savings of \$185,000. How much should you save each month to attain this goal assuming an annualized 4.65% after-tax return with monthly compounding?

Target: 185,000  
Total Number of Deposits: 180  
Deposits per Year: 12  
Annual Interest Rate: 4.65

\$709.84

### **Payments to Amortize a Loan**



#### **Balance**

Current loan balance. Maximum of \$999,999,999.99.

#### **Payment**

Required loan payment amount. Maximum of \$9,999,999,999.99.

#### **Payments per Year**

Number of loan payments made each year. Maximum of 365, default of 12.

#### **Annual Interest Rate**

The loan's annualized, stated interest rate. Maximum of 125.000%.

### Examples, Payments to Amortize a Loan

You plan to payoff a revolving credit line balance of \$27,512. The current interest rate is 10.5% and the minimum monthly payment is \$591.34. How long will it take you to liquidate the outstanding balance?

Balance: 27,512  
Payment: 591.34  
Payments per Year: 12  
Annual Interest Rate: 10.500

60 payments or 5 years

How many quarterly payments of \$135,000 will a corporation have to make to liquidate a \$4,527,389 loan balance if the annualized interest rate is 9.75%?

Balance: 4,527,389  
Payment: 135,000  
Payments per Year: 4  
Annual Interest Rate: 9.750

71 payments

## Loan Payment

The screenshot shows a window titled "Loan Payment" with a light red background. It contains four input fields: "Loan Amount" with a dollar sign prefix, "Total Payments", "Payments per Year" with a value of 12, and "Annual Interest Rate" with a percent sign suffix. Below these is a blue output field with a dollar sign prefix and a "Calculate" button.

### Loan Amount

Maximum of \$999,999,999.99.

### Total Payments

Total number of payments to make in order to liquidate the debt. Maximum of 99,999.

### Payments per Year

Number of loan payments made each year. Maximum of 365, default of 12.

### Annual Interest Rate

The loan's annualized, stated interest rate. Maximum of 125.000%.

## Example, Loan Payment

What's the monthly payment on a 6-year, \$38,950 loan if the annualized interest rate is 6.54%?

Loan Amount: 38,950

Total Payments: 72

Payments per Year: 12

Annual Interest Rate: 6.540

\$655.49

## Remaining Loan Balance

The screenshot shows a window titled "Remaining Loan Balance" with a light red background. It contains five input fields: "Current Balance" with a dollar sign prefix, "Payment" with a dollar sign prefix, "Payments per Year" with a value of 12, "Annual Interest Rate" with a percent sign suffix, and "Number of Payments". Below these is a blue output field with a dollar sign prefix and a "Calculate" button.

### Current Balance

Maximum of \$9,999,999,999.99.

### Payment

Periodic loan payment amount. Maximum of \$999,999,999.99.

### Payments per Year

Number of loan payments made each year. Maximum of 365, default of 12.

### Annual Interest Rate

The loan's annualized, stated interest rate. Maximum of 125.000%.

### Number of Payments

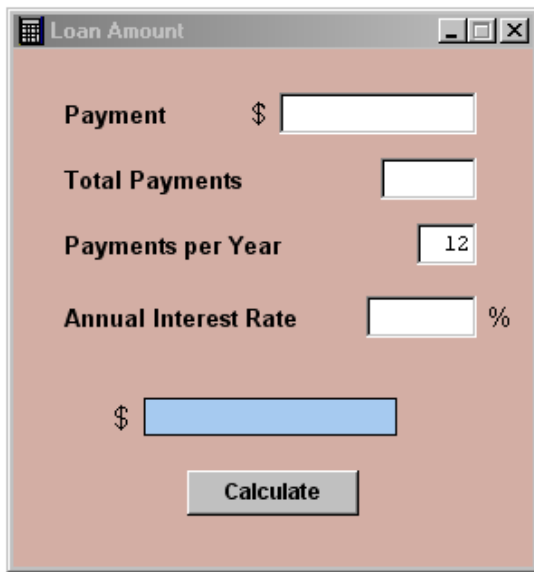
Number of payments to be made. The program calculates the loan balance after  $n$  number of payments are made. Maximum of 99,999.

### Example. Remaining Loan Balance

An 8.125% annual interest rate loan has a current balance of \$191,316.83. The note requires monthly payments of \$1,484.99. What will be the outstanding balance of the loan 5 years from now assuming all required payments are made?

Current Balance:	191,316.83	
Payment:	1,484.99	
Payments per Year:	12	\$177,338.98
Annual Interest Rate:	8.125	
Number of Payments:	60	

### **Loan Amount**



#### **Payment**

Periodic loan payment amount.  
Maximum of \$999,999,999.99.

#### **Total Payments**

Number of payments to be made over the life of the loan. Maximum of 99,999.

#### **Payments per Year**

Number of loan payments to be made each year. Maximum of 365, default of 12.

#### **Annual Interest Rate**

The loan's annualized, stated interest rate. Maximum of 125.000%.

### Examples. Loan Amount

What loan amount will a \$725 monthly payment amortize over 7 years if the annual interest rate is 6.75%?

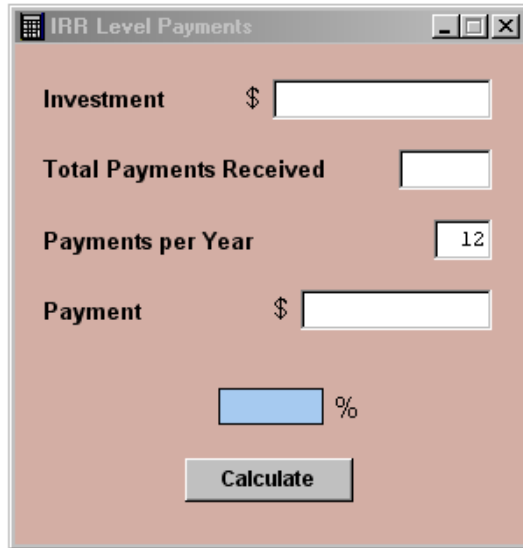
Payment:	725	
Total Payments:	84	\$48,427.72
Payments per Year:	12	
Annual Interest Rate:	6.750	

What loan amount will a \$25,000 quarterly payment amortize over 5 years if the annual interest rate is 9.50%?

Payment:	25,000	
Total Payments:	20	\$394,370.62
Payments per Year:	4	
Annual Interest Rate:	9.500	



## IRR Level Payments



The IRR Level Payments calculator interface includes the following fields and controls:

- Investment**: A text input field preceded by a dollar sign (\$).
- Total Payments Received**: A text input field.
- Payments per Year**: A text input field containing the value 12.
- Payment**: A text input field preceded by a dollar sign (\$).
- A percentage input field (represented by a blue box) followed by a percent sign (%).
- A **Calculate** button at the bottom.

### Investment

Amount of the investment made at time 0. Maximum of \$9,999,999,999.99.

### Total Payments Received

Total number of payments received over the life of the investment (number of cash flows). Maximum of 10,500.

### Payments per Year

Number of payments to be received each year. Maximum of 365, default of 12.

### Payment

Amount of the periodic payment received.. Maximum of \$999,999,999.99.

## Example, IRR Level Payments

What's the internal rate of return on a \$100,000 investment that generates \$1,350 per month over 10 years?

Investment: 100,000

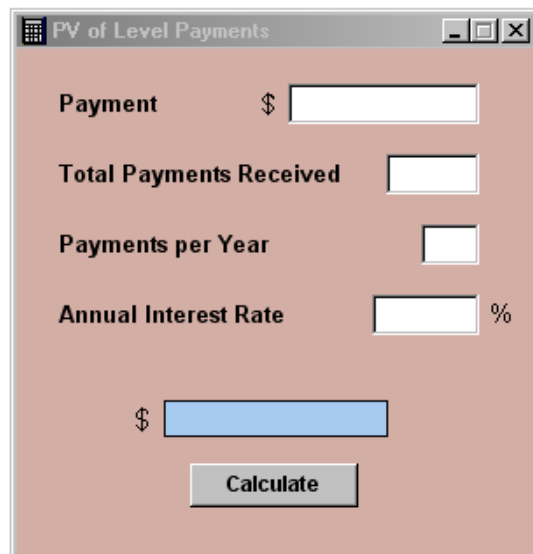
Total Payments Received: 120

Payments per Year: 12

Payment: 1,350

10.512%

## PV of Level Payments



The PV of Level Payments calculator interface includes the following fields and controls:

- Payment**: A text input field preceded by a dollar sign (\$).
- Total Payments Received**: A text input field.
- Payments per Year**: A text input field.
- Annual Interest Rate**: A text input field followed by a percent sign (%).
- A dollar sign (\$) followed by a blue text input field.
- A **Calculate** button at the bottom.

### Payment

Amount of the periodic payment received. Maximum of \$999,999,999.99.

### Total Payments Received

Total number of payments received over the life of the investment (number of cash flows). Maximum of 99,999.

### Payments per Year

Number of payments to be received each year. Maximum of 365, default of 12.

### Annual Interest Rate

Annualized internal rate of return. Maximum of 125.000%.

### Example, PV Level Payments

What's the present value of \$2,350 received each month over 15 years assuming a 5.6% internal rate of rate?

Payment: 2,350

Total Payments Received: 180

Payments per Year: 12

Annual Interest Rate: 5.600

\$285,749.15

### **IRR Variable Payments**

The screenshot shows a software window titled "IRR Variable Payments". It contains several input fields: "Investment" with a dollar sign and a text box; "Payments per Year" with a text box; a section for "Payments @ Amount" with two columns of text boxes (one with a dollar sign); and an interest rate field with a percentage sign. A "Calculate" button is at the bottom.

#### **Investment**

Amount of the investment made at time 0. Maximum of \$9,999,999,999.99.

#### **Payments per Year**

Number of payments to be received each year. Maximum of 365.

#### **Payments @ Amount**

This is the cashflow schedule;  $n$  number of payments received each in the amount of  $p$ . The top edit boxes of the schedule are for the first cashflow stream. The maximum number of payments in each stream is 999. The maximum payment amount for each stream is \$9,999,999.99.

### Example, IRR Variable Payments

A \$150,000 investment generates a cash flow of \$2,500 a month for the next 3 years and \$3,500 a month for the following 4 years. What's the internal rate of return?

Investment: 150,000

Payments per Year: 12

36 @ 2,500, 48 @ 3500

15.526%

## Present Value of Variable Payments

**PV of Variable Payments**

Annual Interest Rate  %

Payments per Year

Payments	@	Amount
<input type="text"/>	\$	<input type="text"/>
<input type="text"/>		<input type="text"/>
<input type="text"/>		<input type="text"/>
<input type="text"/>		<input type="text"/>
<input type="text"/>		<input type="text"/>
<input type="text"/>		<input type="text"/>
<input type="text"/>		<input type="text"/>

\$

**Calculate**

### Annual Interest Rate

Annualized internal rate of return.  
Maximum of 125.000%.

### Payments per Year

Number of payments to be received each year. Maximum of 365, default of 12.

### Payments @ Amount

This is the cashflow schedule;  $n$  number of payments received each in the amount of  $p$ . The top edit boxes of the schedule are for the first cashflow stream. The maximum number of payments in each stream is 999. The maximum payment amount for each stream is \$9,999,999.99.

## Examples, Present Value of Variable Payments

An investment will generate a cash flow of \$2,500 a month for the next 3 years and \$3,500 a month for the following 4 years. What's the present value given an internal rate of return of 15.500%?

Annual Interest Rate: 15.500

Payments per Year: 12

36 @ 2,500

48 @ 3500

\$150,124.40

Given an annual rate of return of 12.75%, what's the present value of an investment with the following quarterly cash flows: \$8,500 for 2 years, \$10,500 for 3 years, \$11,500 for 3 years, and \$5,500 for 2 years?

Annual Interest Rate: 12.750

Payments per Year: 4

8 @ 8,500

12 @ 10,500

12 @ 11,500

8 @ 5,500

\$214,082.07

## Present Value of a Future Amount

**PV of Future Amount**

Future Amount \$

Number of Periods

Periods per Year

Annual Interest Rate  %

\$

**Calculate**

### Future Amount

Maximum of \$99,999,999,999.99.

### Number of Periods

Periods from today when the future amount will be received. Maximum of 99,999.

### Periods per Year

The compounding interval. Maximum of 365, default of 12.

### Annual Interest Rate

Annualized internal rate of return. Maximum of 125.000%.

## Examples, Present Value of a Future Amount

What's the value today of a lump-sum annuity benefit of \$150,000 to be received 15 years from now? Assume a 6% yield with semiannual compounding.

Future Amount: 150,000  
Number of Periods: 30  
Periods per Year: 2  
Annual Interest Rate: 6.000

\$61,798.01

What's the present value of \$500,000 to be received 20 years from now? Assume a 5.75% yield with monthly compounding.

Future Amount: 500,000  
Number of Periods: 240  
Periods per Year: 12  
Annual Interest Rate: 5.750

\$158,753.79

Assume that you can make a \$15,000 investment today will likely double in value 5 years from now. Assume further that because of the risk in this type of investment you require a 15% rate of return, annual compounding. Should you make the investment?

No. The present value of the future amount is less than \$15,000.

Future Amount: 30,000  
Number of Periods: 5  
Periods per Year: 1  
Annual Interest Rate: 15.000

\$14,915.30

## Financial Manager's Rate of Return, Level Payments

Investment \$

Periodic Payments Received

Payments per Year

Payment \$

Principal at Maturity \$

Annual Reinvestment Yield  %

%

### Investment

Cost of the investment (outflow).  
Maximum of \$9,999,999,999.99.

### Periodic Payments Received

The number of regular, periodic inflows. Maximum of 10,950.

### Payments per Year

The number of periodic inflows received in a year. Maximum of 365, default of 12.

### Payment

Amount of the periodic payment received. Maximum of \$999,999,999.00.

### Principal at Maturity

Additional inflow, if any, received at the time of the last periodic inflow. Maximum of \$999,999,999.99.

### Annual Reinvestment Yield

Annualized yield at which the periodic payments can be invested. Compounding interval is the same as Payments per Year. Maximum of 125.000%.

## Examples, Financial Manager's Rate of Return, Level Payments

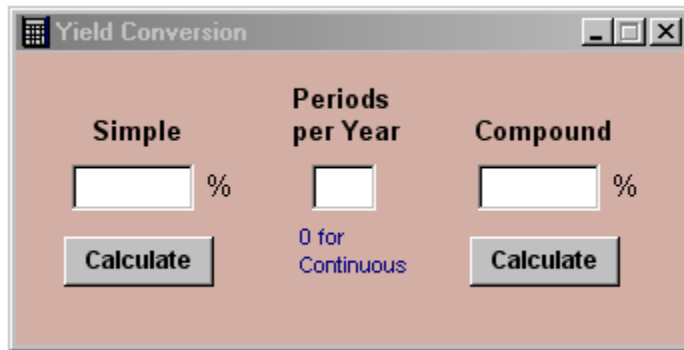
You plan to invest \$10,000 in a 10 year, 6.5% bond with semiannual interest payments. The purchase price is at par. What's the FMRR of this investment if you reinvest the interest received at 5%, semiannual compounding?

Investment: 10,000  
Periodic Payments Received: 20 6.137%  
Payments per Year: 2  
Payment: 325  
Principal at Maturity: 10,000  
Annual Reinvestment Yield: 5.000

For the above described investment, what's the FMRR if you reinvest the interest received at 5.75%, semiannual compounding?

Investment: 10,000  
Periodic Payments Received: 20 6.316%  
Payments per Year: 2  
Payment: 325  
Principal at Maturity: 10,000  
Annual Reinvestment Yield: 5.750

## Yield Conversion



The image shows a software window titled "Yield Conversion". It contains three input fields and two buttons. The first column is labeled "Simple" and has a text box followed by a "%" symbol and a "Calculate" button below it. The second column is labeled "Periods per Year" and has a text box, with the text "0 for Continuous" in blue below it. The third column is labeled "Compound" and has a text box followed by a "%" symbol and a "Calculate" button below it.

### Simple

Enter the annualized, periodic interest rate. For example, 12.0% is the simple, annualized rate for a monthly interest rate of 1.0%. Maximum of 99.9999%.

### Periods per Year

Enter the number of compounding intervals in a calendar year. Maximum of 365. For continuous compounding enter 0.

### Compound

Enter the effective interest rate for the year after compounding. This is the equivalent of a stated APY for retail savings instruments. year. Maximum of 99.999%.

To obtain the simple interest rate given a compounded yield:

Enter the compounded yield in the "Compound" edit box and the number of annual compounding intervals in the "Periods per Year" edit box. Press the "Calculate" button under the "Simple" edit box.

To obtain the compounded yield given a simple interest rate:

Enter the simple interest rate in the "Simple" edit box and the number of annual compounding intervals in the "Periods per Year" edit box. Press the "Calculate" button under the "Compound" edit box.

### Examples, Yield Conversion

What's the effective compounded yield for an annual simple interest rate of 8% with continuous compounding?

Simple: 8.0000

Periods per Year: 0

Compound: 8.3287%

What's the simple, quarterly compounded interest rate that produces a compounded yield (APY) of 5.3543%?

Simple: 5.2500

Periods per Year: 4

Compound: 5.3543%

## Printing

You may print the active calculator function window by selecting **File, Print Active Window** from the menubar. The printout shows the window with all entered values and the calculated results.

Note: The active window is the window with the colored caption bar. Under the default Windows color scheme the active window caption bar has a dark blue background color. Inactive window caption bars are colored gray.