Time Value Tools

With this program, the user can solve three types of Time Value of Money problems:

- **Single Payment**
- **Series of Payments**
- **Loan Payments**

Each problem may be solved for one of the following:

- **Present Value**
- **Future Value**
- **Payment (annuity)**
- **Interest Rate**
- **Time Horizon**
- **Initial Balance**
- **Payment Level**
- **Time to Maturity**

Problem Type

- **Single Payment**: What is the future value of $*xx* deposited today? What is the present value of *xx* received in the future?
- **Series of Payments**: What is the future value of $*xx* deposited annually for *N* years? What is the present value of $*xx* received annually for *N* years?
- **Loan Payments**: What are the monthly payments if $100 is borrowed today at an interest rate *i* for *N* years?

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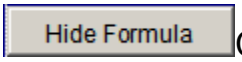
For the problems described on the previous page, the user may solve for one of the following variables:

Variable	Sample Problem
Present Value	If $500 is deposited per month in a savings account and earns 4% interest (compounded monthly) for 1½ years, how much is it worth today?
Future Value	How much will a deposit of $500 per month in an account earning 4% interest (compounded every 4 weeks) be worth in 1½ years?
Payment (annuity)	What periodic payment is needed to accumulate $10,000 in 1½ years in an account earning 4% interest (compounded every 4 weeks)? What will the monthly payment be on a one-year $100 loan with 6% interest? (Not applicable for Single Payment problem.)
Interest Rate	What annual interest rate is needed to compound a series of equal payments of $501.96 every 4 weeks for 1½ years to a total future value of $10,000?
Time Horizon	How many months will it take to accumulate $10,000 if $200 per month is deposited in an account earning 2.5% interest compounded monthly?
Initial Balance	What is the initial balance of a loan that can be paid off in one year with payments of $7.94 every 4 weeks at 6% interest?
Payment Level	What will the monthly payments be on a $100 loan for one year at 6% interest?
Time to Maturity	In how many months will payments of $7.94 paid every 4 weeks pay off a $100 loan at 6% interest?

Solution The solution for the unknown variable is found at the bottom of the screen in the cell highlighted in green.

Interpretation The program describes how input data are related to a solution.



Click on this button to either display or hide the formula used for the Time Value of Money calculations.

For each Single Payment problem, sensitivity charts graph the relationship between common variables in the problem.

Single Payment Example

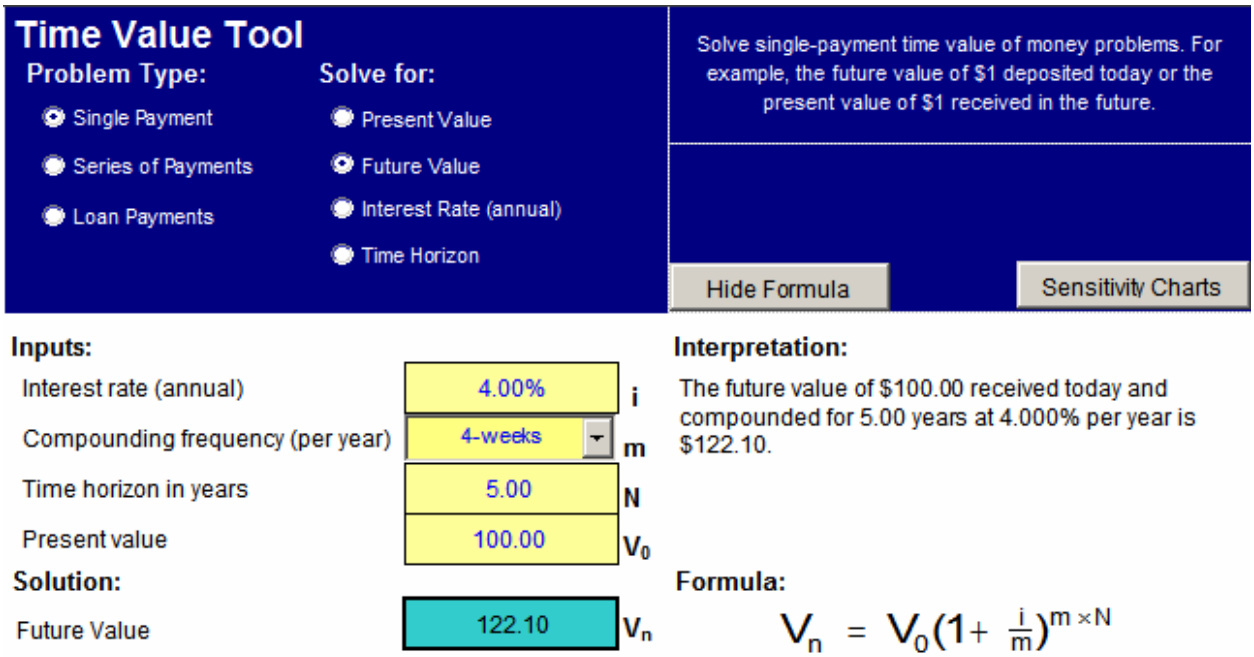
If a single payment of $100 is deposited today, how much will it be worth in 5 years with an annual interest rate of 4% compounded monthly?

This is an example of a Single Payment problem in which the Future Value is unknown. In the blue box on the next page, the **Problem Type** and **Solve for** selections have been made.

The inputs to be entered in the yellow section, and needed for this type of problem, include:

- Interest Rate (annual)- used to calculate interest costs or interest revenue
- Compounding Frequency- the frequency at which interest is compounded
- Time Horizon in Years- the length of time
- Present Value- the initial dollar amount

The interest rate is 4% and it is compounded every 4 weeks. The length of the analysis is 5 years and the present value, or amount initially deposited, is $100.



As seen in the green-highlighted box, the "Future Value" (V_n) is $122.10. An interpretation is given to the right of the inputs.

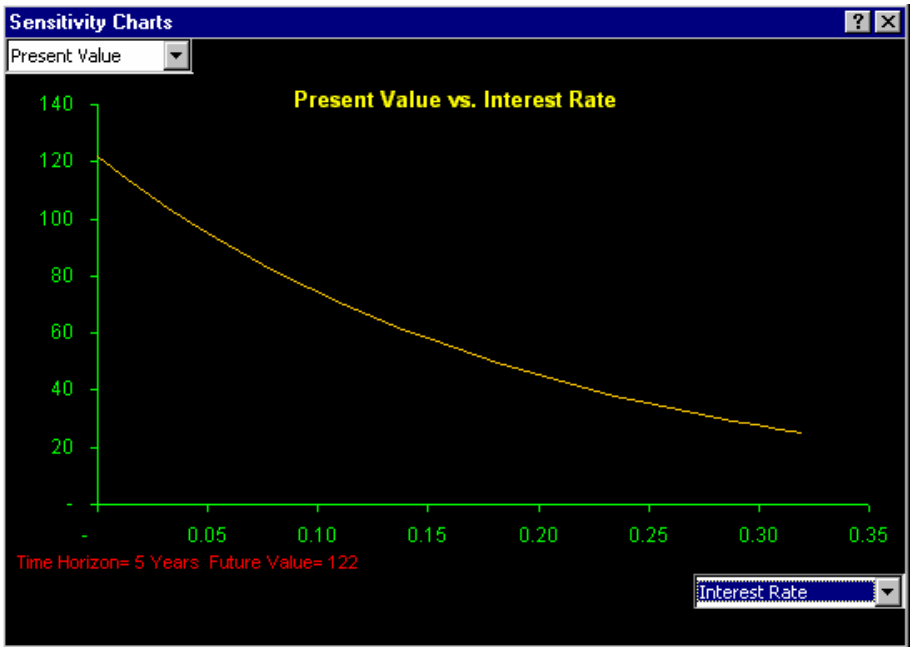
Examples

- Present Value – If I am told that I will receive $2,222.81 in 20 years, what is this money worth today?
- Future Value – If I deposit $1,000 today into my savings account (4% interest compounded every 4 weeks), how much will it be worth in 20 years?
- Interest Rate – What interest rate is needed for a $1,000 CD today to be worth $2,200 in 20 years?
- Time Horizon **–** How long will it take for a $1,000 deposit in my savings account (4% interest compounded every 4 weeks) to total to $3,000?

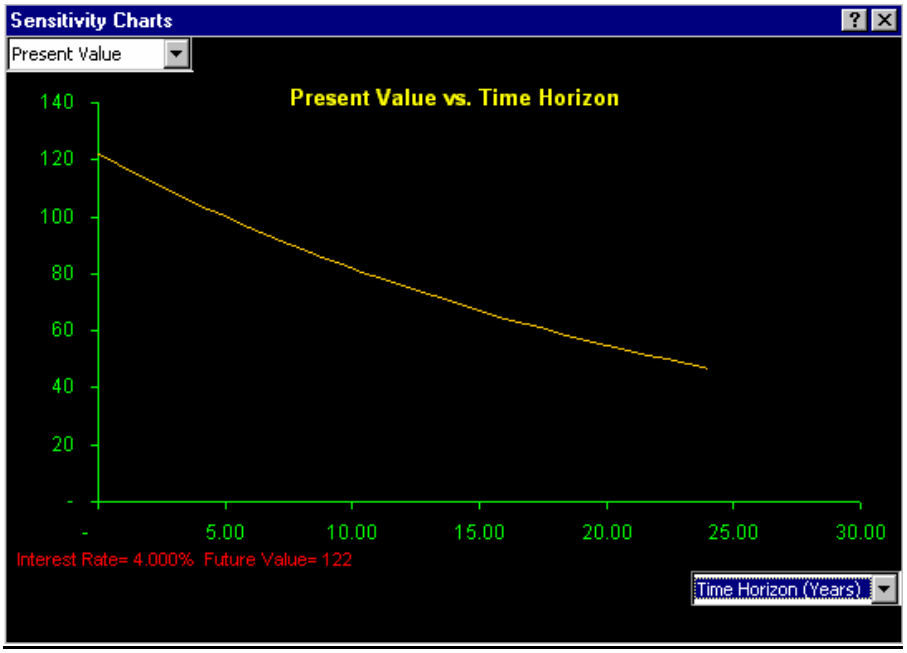
Sensitivity Charts

The charted line on the next page represents the combination of present values and interest rates that produce the same future value in a given time horizon. In this example, the "Future Value" is $122 with a 5-year "Time Horizon." This is

accomplished by depositing either $100 at an interest rate of 4% or $40 at an interest rate of 22.5%.



The charted line below represents the combination of present values and time horizons that produce the same future value at the given interest rate. In this example, the “Future Value” is $122. This is accomplished by depositing either $100 for 5 years or $82 for 10 years.



Series of Payments Example

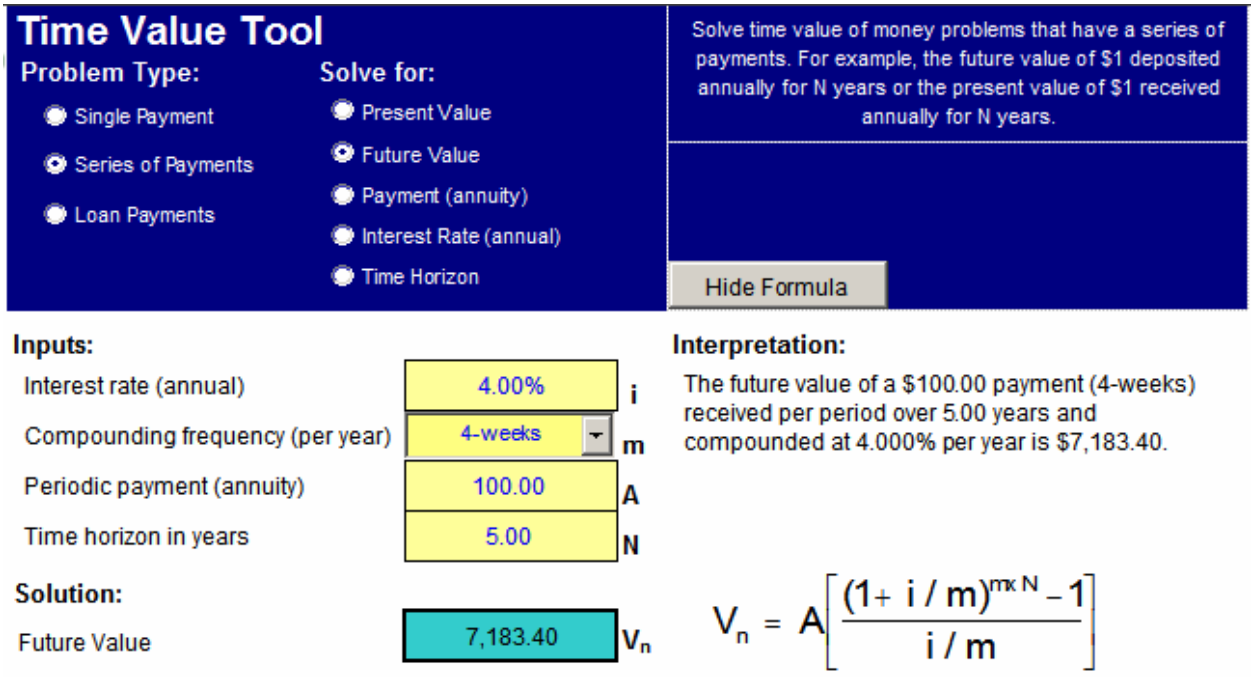
If $100 is deposited in a savings account each month, earning 4% interest every 4 weeks, how much will it be worth in 5 years?

This is an example of a Series of Payments problem in which the Future Value is unknown. In the blue box below, the **Problem Type** and **Solve for** selections have been made.

The inputs to be entered in the yellow section, and needed for this type of problem, include:

- Interest Rate (annual)- used to calculate interest costs or interest revenue
- Compounding Frequency- the frequency at which interest is compounded
- Periodic Payment (annuity)- the amount paid each period
- Time Horizon in Years- the length of time

The interest rate is 4% and it is compounded every 4 weeks. The length of the analysis is 5 years and the annuity payment, or amount deposited each day, is $100.



As seen in the green-highlighted box, the "Future Value" (V_n) is $7,183.40. An interpretation is given to the right of the inputs.

Examples

- Present Value – If I make monthly deposits of $500 in a savings account earning 4% interest (compounded every 4 weeks), how much is the final value worth in today's terms?
- Future Value – How much will my savings account be worth after 1½ years if I deposit $500 monthly at 4% interest (compounded every 4 weeks)?
- Payment (annuity) – What periodic payment will I have to make to receive $10,000 in 1½ years with a 4% interest rate compounded every 4 weeks? What amount do I owe every 4 weeks for one year if I'm charged 6% interest for a $100 loan?
- Interest Rate – What annual interest rate will compound a series of payments every 4 weeks for 1½ years to a future value of $10,000?
- Time Horizon – How long will it take me to accumulate $10,000 if I save $200 each month in an account earning 2.5% interest compounded monthly?

Loan Payments Example

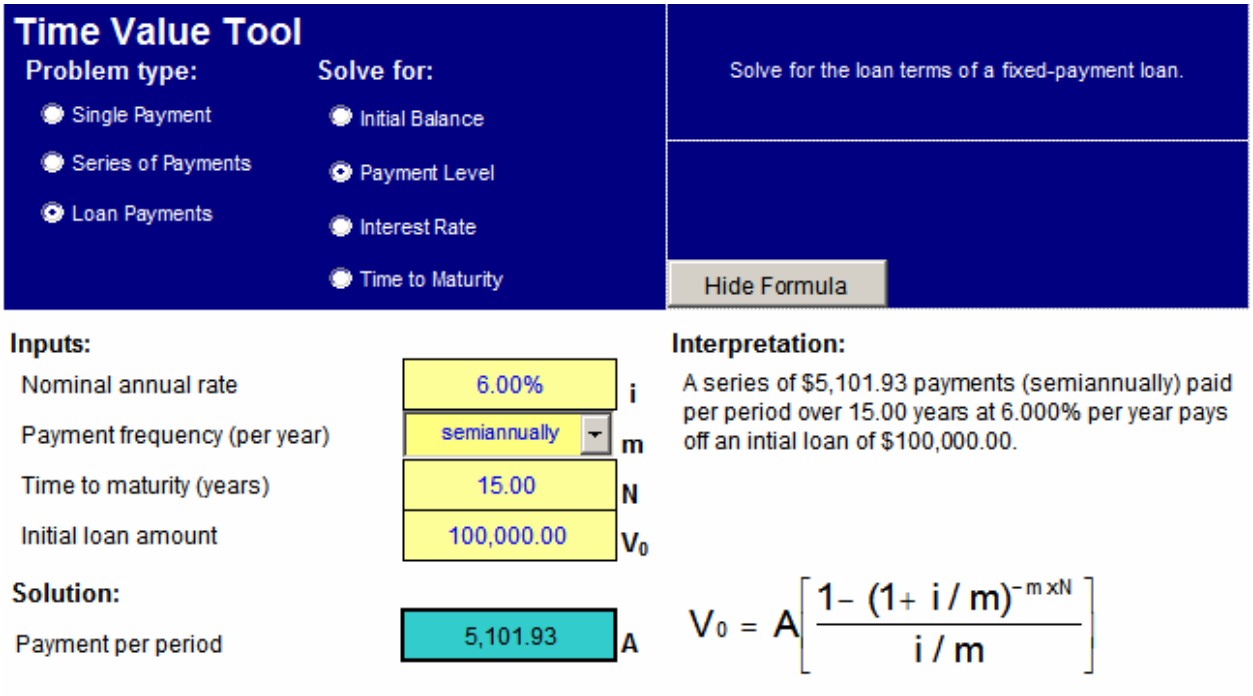
If I borrow $100,000 at a 6% interest rate for 15 years, what will the semi-annual payments be?

This is an example of a Loan Payments problem in which the Payment Level, or amount owed each period, is unknown. In the blue box on the next page, the **Problem Type** and **Solve for** selections have been made.

The inputs to be entered in the yellow cells, and needed for this type of problem, include:

- Interest Rate (annual)
- Payment Frequency (per year) – how often payments are made
- Time to Maturity (years) – the time allowed to pay back the loan without penalties
- Initial Loan Amount – the original amount of the loan

The interest rate is 6% and it is compounded semiannually. The time to maturity is 15 years and the initial loan amount is $100,000.



As seen in the green highlighted box, the "Payment Per Period" (A) is $5,101.93. An interpretation is given at the right of the "Inputs."

Examples

- Initial Balance – What is the original balance of a loan that has a 6% interest rate and payments of $7.94 every 4 weeks for one year?
- Payment Level – What will the monthly payments be, if $100 is borrowed at 6% interest for one year?
- Interest Rate – What interest rate am I being charged if I'm asked to pay $7.94 every 4 weeks for one year on a $100 loan?
- Time to Maturity – How long do I have to make $7.94 monthly payments if I'm charged 6% interest for a $100 loan?