Future Value with Compound Interest – Annotated Examples

Liberal Arts Mathematics

# Introduction

There is a lot going on in the compound interest formula. It looks complicated and has several steps. Once you learn to focus on working one step at a time, it becomes more manageable. Here are two examples shown step-by-step with the corresponding calculator steps.

# Examples

The following example is Example 6.41 from *Contemporary Mathematics* by Donna Kirk.

The main tip I suggest to students is to keep your work in your calculator. It is easy to get round-off errors in these problems. I am showing how I type the calculations in the Microsoft Windows calculator. Almost all scientific calculators are similar.

## Example

In the following, compute the future value of the investment with the given conditions.

1. Principal is $5,000, annual interest rate is 3.8%, compounded monthly, for 5 years.
2. Principal is $18,500, annual interest rate is 6.25%, compounded quarterly, for 17 years.

## Solution 1

| Step | Calculator | Work |
| --- | --- | --- |
| Start with the formula$$A=P\left(1+\frac{r}{n}\right)^{n⋅t}$$Substitute the known values |  | A screenshot of a whiteboard with numbers and symbols  Bottom line: A = 5000 (1 + 0.038 / 12) ^ (12*5) |
| The first operations are division inside the parentheses and multiplication in the exponent. | A screenshot of a calculator  Operation is 0.038 / 12 | A screenshot of a whiteboard with numbers and symbols  Bottom line: A = 5000 (1+0.00317) ^ 60 |
| The second operation is addition inside the parentheses | A screenshot of a calculator  Operation is last result + 1 | A screenshot of a whiteboard with numbers and symbols  Bottom line: A = 5000 (1.00317)^60 |
| The third operation is the exponent.This is where round-off errors start to matter. | A screenshot of a calculator  Operation is last result ^ 60 | A screenshot of a whiteboard with numbers and symbols  Bottom line: A = 5000 * 1.20889 |
| The fourth and final operation is multiplication.The future value is $6,044.43 | A screenshot of a calculator  Operation is last result * 5000 | A screenshot of a whiteboard with numbers and symbols  Bottom line: A = 6044.43318 |

## Solution 2

| Step | Calculator | Work |
| --- | --- | --- |
| Start with the formula$$A=P\left(1+\frac{r}{n}\right)^{n⋅t}$$Substitute the known values |  | A screenshot of a whiteboard with numbers and symbols  Bottom line: A = 18500 (1 + 0.0625 / 4) ^ (4*17) |
| The first operations are division inside the parentheses and multiplication in the exponent. | A screenshot of a calculator  Operation is 0.0625 / 4 | A screenshot of a whiteboard with numbers and symbols  Bottom line: A = 18500 (1 + 0.01563) ^ 68 |
| The second operation is addition inside the parentheses | A screenshot of a calculator  Operation is last result + 1 | A screenshot of a whiteboard with numbers and symbols  Bottom line: A = 18500 (1.01563) ^ 68 |
| The third operation is the exponent.This is where round-off errors start to matter. | A screenshot of a calculator  Operation is last result ^ 68 | A screenshot of a whiteboard with numbers and symbols  Bottom line: A = 18500 * 2.86993 |
| The fourth and final operation is multiplication.The future value is $53,093.55 | A screenshot of a calculator  Operation is last result * 18500 | A screenshot of a whiteboard with numbers and symbols  Bottom line: A = 53093.54812 |