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.

Example from *Contemporary Mathematics* by Donna Kirk. Access for free at https://openstax.org/books/contemporary-mathematics/pages/1-introduction

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Step	Calculator	Work
Start with the formula		জনতে লু এ এ টা ই ই ২ × • • • • • • • • • • • • • • • • • •
$A = P\left(1+rac{r}{n} ight)^{n \cdot t}$ Substitute the known values		$P = 5000 \qquad A = P(1 + \frac{r}{n})^{n \cdot t}$ $P = 0.038 \qquad A = 5000 \left(1 + \frac{0.038}{12}\right)^{n \cdot t}$ $P = 12 \qquad A = 5000 \left(1 + \frac{0.038}{12}\right)^{n \cdot t}$
The first operations are division inside the parentheses and multiplication in the exponent.	$\begin{tabular}{ c c c } \hline calculator & - & - & - & X \\ \hline \hline $ Scientific & & & & & \\ 0.038 + 12 = & & & \\ 0.038 + 12 = & & & \\ 0.038 + 12 = & & & \\ 0.038 + 12 = & & & \\ 0.038 + 12 = & & & \\ 0.038 + 12 = & & & \\ 0.038 + 12 = & & & \\ \hline \hline $ M & M & M & M & MS & M^- \\ \hline \hline $ M & MR & M & M & MS & M^- \\ \hline $ M & MR & M & M & MS & M^- \\ \hline $ M & MR & M & M & MS & M^- \\ \hline $ M & MR & M & M & MS & M^- \\ \hline $ M & MR & M & M & MS & M^- \\ \hline $ M & MR & M & M & MS & M^- \\ \hline $ M & MR & M & M & MS & M^- \\ \hline $ M & MR & M & M^- & MS & M^- \\ \hline $ M & MR & M & M^- & MS & M^- \\ \hline $ M & MR & M & M^- & MS & M^- \\ \hline $ M & MR & M & M^- & MS & M^- \\ \hline $ M & MR & M & M^- & MS & M^- \\ \hline $ M & M & M & M^- & MS & M^- \\ \hline $ M & M & M & M^- & MS & M^- \\ \hline $ M & M & M^- & MS & M^- \\ \hline $ M & M & M^- & MS & M^- \\ \hline $ M & M & M^- & MS & M^- \\ \hline $ M & M & M^- & MS & M^- \\ \hline $ M & M & M^- & MS & M^- \\ \hline $ M & M & M^- & MS & M^- \\ \hline $ M & M & M^- & MS & M^- \\ \hline $ M & M & M^- & MS & M^- \\ \hline $ M & M & M^- & MS & M^- \\ \hline $ M & M & M^- & MS & M^- \\ \hline $ M & M^- & M & M^- & MS & M^- \\ \hline $ M & M^- & M & M^- & MS & M^- \\ \hline $ M & M^- & M & M^- & MS & M^- \\ \hline $ M & M^- & M & M^- & MS & M^- \\ \hline $ M & M^- & M & M^- & MS & M^- \\ \hline $ M & M^- & M & M^- & MS & M^- \\ \hline $ M & M^- & M & M^- & MS & M^- \\ \hline $ M & M^- & M & M^- & MS & M^- \\ \hline $ M & M^- & M & M^- & MS & M^- \\ \hline $ M & M^- & M & M^- & MS & M^- \\ \hline $ M & M^- & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M & M^- \\ \hline $ M & M & M^- & M \\ \hline$	$A = 5000(1 + 0.00317)^{60}$
The second operation is addition inside the parentheses	$\begin{tabular}{ c c c } \hline catoleter & - & C & X \\ \hline \hline catoleter & & & & \\ \hline \hline catoleter & & & & \\ \hline \hline catoleter & & & \\ \hline catoleter & &$	$A = 5000 (1 + 0.00317)^{60}$ $A = 5000 (1.00317)^{60}$
The third operation is the	Calculator − □ × Scientific ③	
exponent. This is where round-off errors start to matter.	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	A = 5000 (1.00317) ⁶⁰ A = 5000 · 1.20889
The fourth and final	Calculator – – ×	 । । । । । । । । । । । । । । । । ! ! ! !
operation is multiplication.	SCIENTIFIC SO COB8866357193278776540582857817 × 5000 = G,044.4331785966393882702914289084 DEG F-E Mic MiR M+ M- MS M//	A = 5000 · 1.20889
The future value is \$6,044.43		A = 6044.43318

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Step	Calculator	Work
Start with the formula		× 「アマレム」 ************************************
$A = P\left(1 + \frac{r}{n}\right)^{n \cdot t}$		$P = [8500 A = P(1 + f)^{n \cdot t}]$
Substitute the known		r = 0.0625 $r = 1(1 n)$
values		1 = 0.00x3 9 - 4
		$h = \frac{1}{2}$ $h = \frac{18500}{10000000000000000000000000000000000$
		t = 1/(A - 10500(1 + - 4))
The first successions are	Galculator – 🗆 🗙	··· 2
division incide the	\equiv Scientific \textcircled{O}	
aivision inside the	0.0625+4= 0.015625	0.0025
parentileses and	DEG F-E MC MR M+ M- MS M~	$A = 8500 + \frac{0.0000}{4}$
exponent	\varDelta Trigonometry \lor f Function \lor	
exponent.	2^{-1} π e CE \otimes x^2 $\frac{1}{2}x$ $ x $ exp mod	$A = 12722 \left(1 + 1217 \right)^{-1}$
	$\sqrt[3]{x}$ () $n!$ \div x^y 7 8 9 \times	A = 8500 (+0.0156)
	10° 4 5 6 -	
	in */- 0 . =	
The second operation is	Galculator − □ × Scientific ③	
addition inside the	0.015625 + 1 = 1.015625	68
parentheses	DEG F-E	A = 18500(1+0.01563)
	MC MR M+ M− MS M∨ ⊿ Trigonometry ∨ f Function ∨	168
	2 ¹⁴ π e CE 🗵	10500(1015(3))
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	A = [8500(1.0156J)]
	x^{y} 7 8 9 × 10 ^x 4 5 6 -	
	log 1 2 3 +	
The third operation is the	Calculator — — X	
exponent.	≡ Scientific 1.015625 ^ 68 =	Reducedaes Supervised at 2014 1 1 1 1 1 1 1
•	2.8699215199877242898516510162927	1 10500 (101563)
This is where round-off	MC MR M+ M- MS M~	A = [8300](1.01383)
errors start to matter.	\bigtriangleup Trigonometry \checkmark f Function \checkmark 2 nd π e CE \textcircled{B}	
	x^2 y_x $ x $ exp mod $\sqrt[3]{x}$ () $u!$ \div	1 - 19500.2993
	x^y 7 8 9 ×	A= 18500 2.86115
	10° 4 5 6 -	
The fourth and final	in ⁴ ∕- 0 . = ☐ Calculator – □ ×	
operation is	\equiv Scientific \Im	Bitle Marchang, Supplementer 18, 2034 1.83 PN
multiplication	\$ 3699215199877242896516510162927 × 18500 = 53,093.548119772899362255543801415	1 - 18500.7993
	DEG F-E MC MR M+ M- MS M~	M-10300 2.00113
The future value is	\triangle Trigonometry \vee f Function \vee	
\$53.093.55	x^2 y_x $ x $ exp mod	A = 53073.54812
+	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
	10° 4 5 6 -	
	In ⁺ /- 0 . =	

Solution 2

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