



Time Value of Money Math

“Take Charge of Your Finances” Advanced Level

Simple Interest vs. Compound Interest



Simple Interest

- Interest earned on the principal investment

Compound Interest

- Earning interest on interest

Principal is the original amount of money invested or saved



Simple Interest Equation: Step 1



$$\begin{array}{c} P \\ \text{(Principal)} \end{array} \times \begin{array}{c} r \\ \text{(Interest Rate)} \end{array} \times \begin{array}{c} t \\ \text{(Time Period)} \end{array} = \begin{array}{c} I \\ \text{(Interest Earned)} \end{array}$$

\$1,000 invested at 7% interest rate for 5 years



$$1,000 \times .07 \times 5 = 350.00$$



Simple Interest Equation: Step 2



$$\begin{array}{c} P \\ \text{(Principal)} \end{array} + \begin{array}{c} I \\ \text{(Interest} \\ \text{Earned)} \end{array} = \begin{array}{c} A \\ \text{(Amount} \\ \text{Investment} \\ \text{is Worth)} \end{array}$$

\$1,000 invested at 7% interest rate for 5 years



$$1,000 + 350 = \$1,350.00$$



Compound Interest Equations

There are two methods for calculating compound interest

1. Single sum of money
 - Money invested only once at the beginning of an investment
2. Equal number of investments spread over time
 - Equal amounts of money are invested multiple times (once a month, once a year, etc.)





Compound Interest Equation – Single Sum

$$P (1 + r)^n = A$$



Principal $(1 + \text{Interest Rate})^{\text{Time Periods}}$ = $\frac{\text{Amount}}{\text{Investment is Worth}}$



\$1,000 invested at 7% interest rate
compounded yearly for 5 years

$$1,000 (1 + .07)^5 = \$1403.00$$



Compound Interest Equation - Multiple Investments in Equal Amounts

$$\text{PMT} \times \frac{(1+r)^n - 1}{r} = A$$



$$\text{Payment} \times \frac{(1+\text{Interest Rate})^{\text{Time Period}_1} - 1}{\text{Interest Rate}} = \text{Amount Investment is Worth}$$

\$1,000 invested every year at 7% annual interest rate for 5 years

$$1,000 \times \frac{(1+.07)^5 - 1}{.07} = \$5,757.00$$





Compound vs. Simple Interest

Simple Interest =
\$1,350.00

Compound Interest
for a Single Sum =
\$1,403.00



Why?

By reinvesting the interest earned,
the interest payment keeps growing
as interest is compounded on
interest



Single Sum vs. Investments Over Time



Compound Interest
for a Single Sum =
\$1,403.00

Compound Interest for
Investments Over Time =
\$5,757.00



***To make the most of your money,
utilize compound interest and
continue to invest!***





Compound Interest

- Number of times interest is compounded has effect on return
- Interest compounding frequently will yield higher returns



\$1,000 invested at 7% for 5 years	
Compounding Method	Amount Investment is Worth
Daily	\$1,419.02
Monthly	\$1,417.63
Quarterly	\$1,414.78
Semi-Annually	\$1,410.60
Annually	\$1,402.55

Smart Investing



Which would you choose?



An investment
earning
compound
interest

OR

An investment
earning
simple
interest

Largest
return



Smart Investing



? Which would you choose? ?



An investment
earning an
interest rate
of 2%

OR

An investment
earning an
interest rate
of 2.1%

Largest
return



Smart Investing



Which would you choose?



An investment
with an
interest rate
compounded
monthly

OR

An investment
with an
interest rate
compounded
yearly

Largest
return



Time Value of Money Math

Practice #1



Sara deposited \$600.00 into a savings account one year ago. She has been earning 1.2% in annual simple interest. Complete the following calculations to determine how much Sara's money is now worth.

Step One:

$$600.00 \times .012 \times 1 = 7.20$$

Step Two:

$$600.00 + 7.20 = 607.20$$

Time Value of Money Math Practice #1



How much is Sara's investment worth
after one year?

\$607.20

Time Value of Money Math Practice #2



Tim's grandparents have given him \$1500.00 to invest while he is in college to begin his retirement fund. He will earn 2.3% interest, compounded annually. What will his investment be worth at the end of four years?

What is the equation?

$$\$1,500 (1 + .023)^4$$

Time Value of Money Math

Practice #2



Step One:

$$1 + .023 = 1.023$$

Step Two:

$$1.023^4 = 1.095$$

Step Three:

$$1.095 \times 1500 = 1642.50$$

Time Value of Money Math Practice #2



What will Tim's investment be worth at the end of four years?

\$1642.50

Time Value of Money Math

Practice #3



Nicole put \$2000.00 into an account that pays 2% interest and compounds annually. She invests \$2000.00 every year for five years. What will her investment be worth after five years?

What is the equation?

$$\$2,000 \times \frac{(1+.02)^5-1}{.02}$$

Time Value of Money Math

Practice #3



Step One:

$$1 + .02 = 1.02$$

Step Two:

$$1.02^5 = 1.104$$

Step Three:

$$1.104 - 1 = .104$$

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Practice #3

Step Four:

$$.104 \div .02 = 5.2$$

Step Five:

$$5.2 \times 2000 = 10,400.00$$

What will Nicole's investment be worth at the end of five years?

\$10,400.00

