Compound Interest

Compound Interest is one method of computing interest. Using this method, interest is computed from the up-to-date balance. That is, interest is earned on the interest and original balance not just on the original balance.

Five things are needed to calculate ***compound interest*:**

1) Principal (P) = the amount put into the bank or the amount borrowed from the bank
2) Rate (r) = the percent per year
3) Number of periods per year (n) = [daily (365), weekly (52), monthly (12), quarterly (4), semi-annually (2), or annually (1)].
4) Time (t) = how many years the money is in the savings account at the bank or how many years it will take you to pay back the loan.
5) Final Amount (A) = Principal + compound Interest

The formula for calculating Compounded Interest is:

$$\mathbf{A = Principal}\left(1+\frac{rate}{number\ of\ \ periods}\right)^{number\ of\ \ periods\ x\ time} \qquad \textbf{or}\ \ \mathbf{A = P}\left(1+\frac{r}{n}\right)^{nt}$$

The tricky part about calculating the number of periods in a year.

Example 1:

Ray put ***$2,000*** into a savings account. The interest on the account is ***12%*** *per year compounded quarterly.* He wants to put the money away for *7 years.*

Using the compound interest method, how much will Ray have at the end of that time period?

Principal = $2000 *Rate = 12% = 0.12* *Number of Periods = 4* *Time = 7*

$$\mathbf{A = P}\left(1+\frac{r}{n}\right)^{nt} = 2000\left(1+\frac{0.12}{4}\right)^{4\ x\ 7} = 2000\left(1.03\right)^{28} = \mathbf{\$4{,}575.86}$$

To determine how much Compound Interest was accumulated, we have to subtract the Principal from the final Amount.

Amount – Principal = Compound Interest

A – P = CI

$4,575.86 – $2000 = $2,575.86

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Compound Interest (continued)

Example 2:

An individual has $1000.00 to invest for 3 years at rate of 5% annual compound interest. How much is the investment worth at the end of 3 years?

Principal = $1000 *Rate = 5% = 0.05* *Number of Periods = 1* *Time = 3*

$$\mathbf{A} = \mathbf{P}\left(1+\frac{r}{n}\right)^{nt} = 1000\left(1+\frac{0.05}{1}\right)^{1 \times 3} = 1000(1.05)^3 = \mathbf{\$1{,}157.63}$$

To determine how much Compound Interest was accumulated, we have to subtract the Principal from the final Amount.

Amount – Principal = Compound Interest

A – P = CI

$1,157.63 – $1000 = $157.63

Example 3:

To buy a computer, Tom borrowed ***$3000*** at ***6%*** compound interest calculated quarterly. Calculate:

a. The total amount to be paid back.

b. The amount of compound interest paid over the 4 years.

a. Using compound interest method:

Principal = $3000 *Rate = 6% = 0.06* *Number of Periods = 4* *Time = 4*

$$\mathbf{A} = \mathbf{P}\left(1+\frac{r}{n}\right)^{nt} = 3000\left(1+\frac{0.06}{4}\right)^{4 \times 4} = 3000(1.015)^{16} = \mathbf{\$3{,}806.96}$$

b. To determine how much Compound Interest was accumulated, we have to subtract the Principal from the final Amount.

Amount – Principal = Compound Interest

A – P = CI

$3,806.96 – $3000 = $806.96

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