

Compound Interest

So far we have looked at Simple interest, which we simply calculated using:

$$I = P \times R \times T \quad \text{and} \quad A = P + I.$$

However, simple interest is rarely used in the real world. The financial world depends on compound interest to make it's money.

Example 1: Consider a savings account with \$100 in it, earning 10% interest each year. So far if we wanted to know how much money would be in the account in 3 years, we would do the following calculation:

$$I = P \times R \times T$$

$$I =$$

$$I =$$

This tells us that over 3 years, you earn \$_____ in interest, or \$_____ each year.

BUT, with **Compound Interest** the interest is not only calculated at the end of the three years. In fact, it is calculated AT LEAST once a year, depending on the investment.

Therefore the calculation should really be:

Year 1

$$P = \$100$$

$$I = PRT$$

$$A = P + I =$$

$$=$$

$$= \$$$

Year 2

$$P =$$

$$I = PRT$$

$$A = P + I =$$

$$=$$

$$=$$

Year 3

$$P =$$

$$I = PRT$$

$$A = P + I =$$

$$=$$

$$=$$

As you can see, we would really have \$_____ in the bank after 3 years.

This may not seem like much difference, but what if it was \$10000 instead of \$100, or 20% interest instead of 10%? The difference would be much larger.

We do not want to have to do a calculation for every year. This would be very time consuming for long term investments. Fortunately, there is a single equation that we can use to do compound interest:

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

Where: A = the amount (in dollars)
P = the principal (amount invested, in dollars)
n = the number of compounding periods
i = the interest rate (as a decimal)

Remember, investments can have different **Compound Intervals** (number of times the interest is calculated) per year:

- Annual = _____ time per year
- Semi-annual (half-yearly) = _____ times per year
- Quarterly = _____ times per year
- Monthly = _____ times per year
- Weekly = _____ times per year
- Daily = _____ times per year

To start, we are going to use an online tool to help us do calculations:

<https://www.thecalculatorsite.com/finance/calculators/compoundinterestcalculator.php>

The image shows a screenshot of an online compound interest calculator. The interface has a dark orange background with white text. At the top, there are two tabs: "REGULAR DEPOSIT / WITHDRAWAL" (which is selected) and "STANDARD CALCULATOR". Below the tabs, there are several input fields and dropdown menus:

- CURRENCY:** A dropdown menu showing "Dollar (\$)".
- PRINCIPAL AMOUNT:** A text input field containing "\$ 6500".
- ANNUAL INTEREST RATE:** A text input field containing "5" followed by a "%" symbol.
- CALCULATION PERIOD:** A text input field containing "3" followed by a dropdown menu showing "years".
- COMPOUND INTERVAL: ?** A dropdown menu showing "Yearly".

At the bottom center, there is a grey button labeled "Calculate".