The Power of Compounding

Simple vs. Compound Interest
Simple Interest is paid only on the principal amount.

Compound Interest is paid on the principal and the interest added to
the principal.

EX 1: Calculating Compound Interest on $1000 at 10% interest
compounded annually.

<table>
<thead>
<tr>
<th>After n years</th>
<th>Interest</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$1000 \times 0.1 = 100$</td>
<td>$1000 + 100 = \boxed{1100} = 1000 \times (1.1)^1$</td>
</tr>
<tr>
<td>2</td>
<td>$1100 \times 0.1 = 110$</td>
<td>$1100 + 110 = \boxed{1210} = 1000 \times (1.1)^2$</td>
</tr>
<tr>
<td>3</td>
<td>$1210 \times 0.1 = 121$</td>
<td>$1210 + 121 = \boxed{1331} = 1000 \times (1.1)^3$</td>
</tr>
<tr>
<td>4</td>
<td>$1331 \times 0.1 = 133.1$</td>
<td>$1331 + 133.1 = \boxed{1464.1} = 1000 \times (1.1)^4$</td>
</tr>
<tr>
<td>5</td>
<td>$1464.1 \times 0.1 = 146.41$</td>
<td>$1464.1 + 146.41 = \boxed{1610.51} = 1000 \times (1.1)^5$</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td></td>
<td>$1000 \times (1.1)^n$</td>
</tr>
</tbody>
</table>

**EX 20**

$$A = 1000 \times (1.1)^{20} \approx 6727.50$$
Compound Interest Formula (when compounding only once per year)

\[ A = P(1+APR)^Y \]

- \( A \) = Account balance after \( Y \) years
- \( P \) = Principal amount invested
- \( APR \) = annual percentage rate (as a decimal)
- \( Y \) = number of years

EX 1: Find the balance if you invest $3000 at an APR of 4% for 12 years.

\[ P = 3000, \quad APR = 0.04, \quad Y = 12 \text{ yrs.} \]

\[ A = 3000(1+0.04)^{12} \]

\[ = 3000(1.04)^{12} \approx 4803.10 \]
Compound Interest Formula (when compounding more than once a year)

\[ A = P \left(1 + \frac{APR}{n}\right)^{nY} \]

- \( A \) = Amount after \( Y \) years
- \( P \) = Principal amount
- \( APR \) = Annual interest rate as a decimal
- \( n \) = number of times compounded each year
- \( Y \) = number of years of compounding

EX 2: Find the balance if you invest $3000 for 12 years at 4%, in an account which compounds daily.

\[
P = \$3000, \quad APR = 0.04, \quad Y = 12 \text{ yrs}, \quad n = 365
\]

\[
A = 3000 \left(1 + \frac{0.04}{365}\right)^{365(12)}
\]

\[
= 3000 \left(1.000109589\right)^{4380}
\]

\[
\approx 3000 \times 1.484810
\]

\[
\approx \$4848.10
\]

(Compare with \$4803.10 from compounding only once per year)