Let $A =$ accumulated balance after $Y$ years
$P =$ starting principal
$APR =$ annual percentage rate (as a decimal)
$n =$ number of compounding periods per year
$Y =$ number of years (may be a fraction)
$PMT =$ regular payment (deposit) amount
$a =$ inflation rate (a decimal)
$i =$ interest rate (a decimal)

Simple Interest Formula: $A = P \cdot (1 + APR \cdot Y)$
Compound Interest Formula: $A = P(1 + \frac{APR}{n})^{nY}$

Annual Percentage Yield: APY $APY = (1 + \frac{APR}{n})^n - 1$

Continuous Compounding Formula: $A = P \cdot e^{APR \cdot Y}$

Savings Plan Formula: $A = PMT \cdot \frac{[(1 + \frac{APR}{n})^{nY} - 1]}{\frac{APR}{n}}$

Total and Annual Return:
$\text{totalreturn} = \frac{A - P}{P} \cdot (\frac{A}{P})^{(1/Y)} - 1$

Current Yield of a Bond: current yield = \frac{\text{annual interest payment}}{\text{current price of bond}}

Loan Payment Formula: $PMT = P \cdot \frac{\frac{APR}{n}}{1 - \left(1 + \frac{APR}{n}\right)^{-nY}}$

The CPI Formula $\frac{CPI_X}{CPI_Y} = \frac{\text{price}_X}{\text{price}_Y}$

The Present Value of a principal $P$, $Y$ years into the future, $r=APR$, $a=$annual inflation:
$A = P \cdot \left[\frac{1+r}{1+a}\right]^Y$

Real Growth $g$: $g = \frac{r-a}{1+a}$

Real Growth over $Y$ years: $g(Y) = \left[1 + \frac{r-a}{1+a}\right]^Y - 1$
The Tax Table:

<table>
<thead>
<tr>
<th></th>
<th>single</th>
<th>m(joint)</th>
<th>m(separate)</th>
<th>head_household</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>1 - 9,275</td>
<td>1-18,550</td>
<td>1 - 9,275</td>
<td>1-13,250</td>
</tr>
<tr>
<td>15%</td>
<td>9,276 - 37,650</td>
<td>18,551 - 75,300</td>
<td>9,276 - 37,650</td>
<td>13,251 - 50,400</td>
</tr>
<tr>
<td>25%</td>
<td>37,651 - 91,150</td>
<td>75,301 - 151,900</td>
<td>37,651 - 75,950</td>
<td>50,401 - 130,150</td>
</tr>
<tr>
<td>28%</td>
<td>91,151 - 190,150</td>
<td>151,901 - 231,450</td>
<td>75,951 - 115,725</td>
<td>130,151 - 210,800</td>
</tr>
<tr>
<td>33%</td>
<td>190,151 - 413,350</td>
<td>231,451 - 413,350</td>
<td>115,726 - 206,675</td>
<td>210,801 - 413,350</td>
</tr>
<tr>
<td>35%</td>
<td>413,351 - 415,050</td>
<td>413,351 - 466,950</td>
<td>206,676 - 233,475</td>
<td>413,351 - 441,000</td>
</tr>
<tr>
<td>39.6%</td>
<td>415,051 +</td>
<td>466,951 +</td>
<td>233,476 +</td>
<td>441,001 +</td>
</tr>
</tbody>
</table>

The mean of $x_1, x_2, \ldots, x_n$ is $\mu = \frac{x_1+x_2+\ldots+x_n}{n}$.
The variance $s^2$ of $x_1, x_2, \ldots, x_n$ is $s^2 = \frac{(x_1-\mu)^2+(x_2-\mu)^2+\ldots+(x_n-\mu)^2}{n-1}$.
The standard deviation $s$ is the square root of the variance $s^2$.

Quartiles of Normal Distributions:

$$Q_1 = \text{mean} - 0.67 * s$$
$$Q_3 = \text{mean} + 0.67 * s$$

The 68 – 95 – 99.7 Rule for normal distributions:

- 68% of the observations fall within 1 standard deviation of the mean.
- 95% of the observations fall within 2 standard deviations of the mean.
- 99.7% of the observations fall within 3 standard deviations of the mean.

Given data $(x_1, y_1), (x_2, y_2), \ldots, (x_n, y_n)$, with means $\mu_x, \mu_y$ and standard deviations $s_x, s_y$.

The correlation between variables $x$ and $y$ is

$$r = \frac{1}{(n-1)s_x s_y} \left[ (x_1 - \mu_x)(y_1 - \mu_y) + (x_2 - \mu_x)(y_2 - \mu_y) + \ldots + (x_n - \mu_x)(y_n - \mu_y) \right].$$

The least squares regression line is $y = ax + b$.

where $a = r \frac{s_y}{s_x}$ and $b = \mu_y - a \mu_x$.

For a simple random sample of size $n$,
the sample proportion of successes is $p' = \frac{\text{count of successes in the sample}}{n}$.

The mean of the sampling distribution is $p$ and the standard deviation is $\sqrt{\frac{p(1-p)}{n}}$.

The 68 – 95 – 99.7 Rule applies here as well.