Compound Interest

$A = P\left(1+\frac{R}{100}\right)^T$ $\quad CI = A - P$

Chart

In SI. the interest is calculated on principal, for all years, so interest is same for all years.

In CI, the interest is calculated an amount of the previous year so interest is different for all years.

When interest is calculated QLY

$$A = P\left(1+\frac{R/4}{100}\right)^{T\times 4}$$

When interest in calculated HLY

$$A = P\left(1+\frac{R/2}{100}\right)^{T\times 2}$$

Depreciation

As the time passes the value of object depreciate is called depreciation.

$$A = P\left(1-\frac{R}{100}\right)^T$$

When Time Period is in fraction

Ex. $T = 2\frac{3}{4}$ yr.

$$A = P\left(1+\frac{R}{100}\right)^2\left(1+\frac{\frac{3}{4}\times R}{100}\right)$$

If the present population of a town is P. and it is growing at R% P.A.

Then population of town after T year is $P\left(1+\frac{R}{100}\right)^T$

Then population of town before T year in $\frac{P}{\left(1+\frac{R}{100}\right)^T}$

When Rate of interest is different for diff. year

$$A = P\left(1+\frac{R_1}{100}\right)^{T_1}\left(1+\frac{R_2}{100}\right)^{T_2}\ldots\ldots$$

Q. If CI -SI = 50 for 2 yr at R= 10% P.A. find P

Sol. $SI = \frac{PRT}{100} = \frac{P\times 10\times 2}{100} = \frac{P}{5}$

$$A = P\left(1+\frac{R}{100}\right)^T = P\left(1+\frac{10}{100}\right)^2 = P\left(\frac{11}{10}\right)^2 = \frac{121}{100}P$$

$$CI = A - P = \frac{121P}{100} - P = \frac{21P}{100}$$

$CI - SI = 50$

$$\frac{21P}{100} - \frac{P}{5} = 50$$

$$\frac{P}{100} = 50 \Rightarrow P = 5000$$

Q. If a money become double in 5 yr. In what time it will become 8 times.

Sol. $A = 2P$, $T = 5$ yr.

$$\therefore A = P\left(1+\frac{R}{100}\right)^T$$

$$2P = P\left(1+\frac{R}{100}\right)^5$$

$$\left(1+\frac{R}{100}\right) = 2^{1/5}$$

$A = 8P$, $T = ?$

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$8P = P\left(1+\frac{R}{100}\right)^T$$

$$8 = (2^{1/5})^T$$

$$2^3 = 2^{T/5} \Rightarrow 3 = \frac{T}{5} \Rightarrow T = 15\,\text{yr.}$$

Q. In what time a sum of Rs. 1000 become Rs. 1331 at 10% P.A at CI.

Sol. $A = 1331$, $P = 1000$, $R = 10\%$ P. A.

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$1331 = 1000\left(1+\frac{10}{100}\right)^T$$

$$\frac{1331}{1000} = \left(\frac{11}{10}\right)^T$$

$$\left(\frac{11}{10}\right)^3 = \left(\frac{11}{10}\right)^T \Rightarrow T = 3\,\text{yr.}$$

* SI Means : Simple Interest
CI Means : Compound Interest