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MATHEMATICS OF FINANCE

Methods of Interest Calculations

Simple Interest

Interest for each year is same

Interest is charged on principal value

$$\boxed{SI = P \times r \times t}$$

$$\boxed{A = P + SI}$$

$$\boxed{A = P(1 + rt)}$$

Compound Interest

Interest on each year is not same

Interest is charged on principal and interest on interest is also calculated

$$\boxed{CI = P[1 + r]^t}$$

$$\boxed{A = P + CI.}$$

SI = Simple Interest
CI = Compound Interest
r = rate of interest
t = time
P = principal

Calculator Tricks:-

• $(x)^n = ?$ $(2)^5$

$2 \times = = = =$ 32

$\boxed{\times}$ 1 (time) $\boxed{=}$ (n-1) times

$$\boxed{\text{Rate of interest} = \frac{\text{Int. of 1 yr}}{\text{Principal}}}$$

For double principle in SI $\boxed{t = \frac{1}{r}}$ $\boxed{r = \frac{1}{t}}$

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For triple principal in SI $\boxed{t = \frac{2}{r}}$ $\boxed{r = \frac{2}{t}}$

For four times of principal in SI $\boxed{T = \frac{3}{r}}$ $\boxed{r = \frac{3}{t}}$

$$\boxed{A = P\left[1 + \frac{r}{m}\right]^{t \times m}}$$

(12m) Annually $m=1$
(6m) semiannually $m=2$
(3m) quarterly $m=4$
(1mon) monthly $m=12$

Calculator Tricks :-

- $(x^5) \Rightarrow x \times = = = =$
  $(5^5) \Rightarrow 5 \times = = = = 3125$
- $x^{-1} \Rightarrow x \div =$
- $x^{-n} \Rightarrow x \times (n-1)$ times $\div 1 \div =$
  $2^{-1} \Rightarrow 2 \div =$
  $2^{-5} \Rightarrow 2 \times = = = = \div 1 \div = 0.03125$
- $(1.03)^{10 \times 4} \Rightarrow 1.03 \times = (4$ times$) \times = (3$ times$)$ $\boxed{}$
- $(x)^{1/n} \Rightarrow \sqrt{}$ 12 times $-1 \div (n) + 1$ $\boxed{x =}$ 12 times
  $(20)^{1/3} \Rightarrow 20 \sqrt{}$ 12 times $-1 \div 3 + 1$ $\boxed{x =}$ 12 times $\boxed{2.7150}$.
- $(30)^{2.7} \Rightarrow 30 \sqrt{}$ 12 times $-1 \times 2.7 + 1$ $\boxed{x =}$ 12 times $\boxed{9669.76}$
- $(x)^{1/2} \Rightarrow \sqrt{} / (x)^{1/4} \Rightarrow \sqrt{}\sqrt{} / (x)^{1/8} \Rightarrow \sqrt{}\sqrt{}\sqrt{}$
- log of any number
  → $\sqrt{}$ 19 times -1×227695
  $\log(30) = 30 \sqrt{}$ (19 times) $-1 \times 227695 = 1.4771$
  $\sqrt{}$ 13 times -1×3558

7 yrs . 0.87 yrs
$0.87 \times 12 = 10.44$ months
years → months

→ $\boxed{0.44 \times 30 = 13.2 \text{ days}}$

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For 2 years

$CI - SI = Pr^2$

For 3 years

$CI - SI = Pr^2 (r+3)$

Value of asset (Scrap value) $= \text{cost} \left[1 - r\%\right]^t$

Population :

$A = P(1+r)^t$

Effective Rate $= \boxed{re = \left(1 + \frac{r}{m}\right)^m - 1}$

re or E

↓

Annually Rate

Nominal rate (r)

↓

monthly / quarterly / semi annually / daily

$CI \rightarrow P$

$CI = P(1+r)^n - 1$

$A = P\left(1 + \frac{r}{m}\right)^{tm}$

$PV = \frac{FV}{\left(1+\frac{r}{m}\right)^{tm}}$

$FV = PV \left(1 + \frac{r}{m}\right)^{tm}$

Types of Annuity

Ordinary Annuity (Regular)

end of the period

$FV = R\left[\frac{(1+i)^n - 1}{i}\right]$

$i = \frac{r}{m}$, $n = t \times m$

Immediate Annuity (Annuity due)

Beginning of the period

$FV = R\left[\frac{(1+i)^n - 1}{i}\right](1+i)$

$i = \frac{r}{m}$, $n = t \times m$

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$$PV = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

Regular Annuity

$$PV = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

Immediate Annuity

Trick :-

1.06 ÷ = = = then press

GT × 100000 $\boxed{267301}$

FV = Investment

PV = loan

$\boxed{\text{cost of Asset > PV of all Rent}}$

lessee's favourable

(user of the asset)

$\boxed{\text{cost of Asset < PV of all Rent}}$

Favourable for owner of the asset (lessor)

$$\boxed{NPV = PV \text{ of all inflow} - PV \text{ of outflow}}$$

$$\text{value of Bond} = \left[\underset{\text{(Annuity)}}{\text{PV of all interest}}\right] + \left[\text{PV of maturity amount}\right]$$

Perpetuity

Regular

$$PV = \frac{R}{i}$$

Immediate

$$PV = \frac{R}{i}(1+i)$$

growing perpetuity

$$PV = \frac{R}{i+g}$$

g = growth

CAGR

$$r = \left(\frac{A}{P}\right)^{1/t} - 1$$

$$\left(\frac{\text{Current Y}}{\text{Base Y}}\right)^{1/\text{time}} - 1 = \text{Rate}$$

$$\text{Real Rate} = \text{Nominal Rate} - \text{Inflation}$$

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"If you don't sacrifice what you want, what you want becomes the sacrifice."