* CHP-4: TIME VALUE OF MONEY

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Questions Sub-question No.

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Q. * Imp. Notes.

* **Simple Interest** :- (SI)
↳ (use only when it is mentioned in question)

(1) $I = \frac{PRN}{100}$

i.e. $SI = P \cdot i \cdot n$

where

P = Principal Amount (sum)

$i = \frac{R}{100}$ = interest rate

N = n = no. of years

(2) Total Amount (A)

$A = P + S.I$

$= P + P \cdot i \cdot n$

$A = P(1 + i \cdot n)$

$P = \frac{A}{1 + i \cdot n}$, $i = \frac{A/P - 1}{n}$, $n = \frac{A/P - 1}{i}$

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* **Compound Interest** :- C.I.
↳ (If nothing is mentioned then it is compound int.)

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

$A = P(1+i)^n$ [Formula of Appreciation]

(2) $CI = A - P$

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

$CI = P[(1+i)^n - 1]$

(3) For 1st year,

$CI = SI$

→ For 2 years,

$CI - SI = Pi^2$

→ For 3 years,

$CI - SI = Pi^2(i+3)$

(4) In Compound Interest,

→ if interest is calculated half yearly (semi-annually)

then $i = \frac{i}{2}$, $n = n \times 2$

→ if interest is calculated quarterly

then $i = \frac{i}{4}$, $n = n \times 4$

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→ If interest is calculated monthly,
then $i = \frac{i}{12}$, $n = n \times 12$

(5) In the example of Depreciation:

$s = c(1-i)^n$, [Depreciation Formula]
where
c = cost of machine,
s = scrap value,
n = no. of years, i = Rate of Depreciation.

* **Effective Rate of Interest** : (I.E.)

(1) → $I.E. = \left(1 + \frac{i}{m}\right)^m - 1$,

where
I.E. = Effective Rate of Interest
i = nominal interest rate
$m = 2$ for half yearly
$m = 4$ for quarterly
$m = 12$ for monthly.

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Annuity :-

(1) Future value of Annuity (Sinking Fund)

(i) Regular / ordinary Annuity (At the End)

$$F.V. = P\left[\frac{(1+i)^n - 1}{i}\right]$$

(ii) Due / Immediate Annuity (At the Beginning)

$$F.V. = P\left[\frac{(1+i)^n - 1}{i}\right](1+i)$$

NOTE → If nothing given in question, then by default (regular annuity) (at the end)

→ Now, Today, Beginning → Immediate Annuity.

(2) Present value of an Annuity (Loan & Installments)

(i) Regular / ordinary Annuity (At the End)

$$P.V. = P\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$$

(ii) Due / Immediate Annuity (At the Beginning)

$$P.V. = P\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right](1+i)$$