

 TARGET CAT 2025 



MBA FASTRACK

QUANT : Arithmetic

Interest

Lecture No.- 03

By- VINIT KAKRIYA SIR



Recap of Previous Lecture :

→ Ratio
→ Percentage

A is 20% ↑ more than B

$$A = (120)\% \text{ of } B$$

A is ~~20%~~ ↓ than B

~~$$A = 80\% \text{ of } B$$~~

TOPICS *to be covered*



- 1) Concept & Numerical based on 'Simple Interest'
- 2) Concept & Numerical based on 'Compound Interest'
- 3) Problems for Practice & CAT PYQs



Simple & Compound Interest :

$P \rightarrow$ Principle



$$r = 20\% \cdot P \cdot \sigma$$

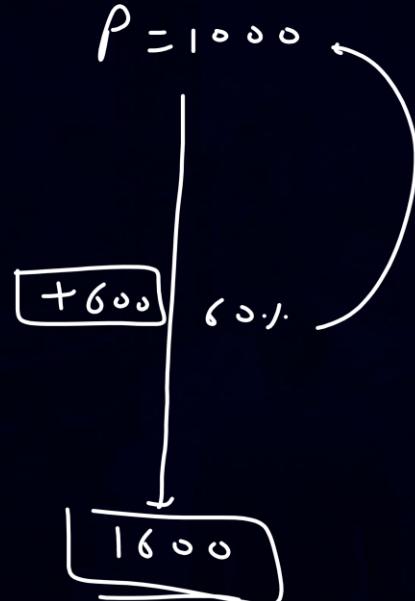
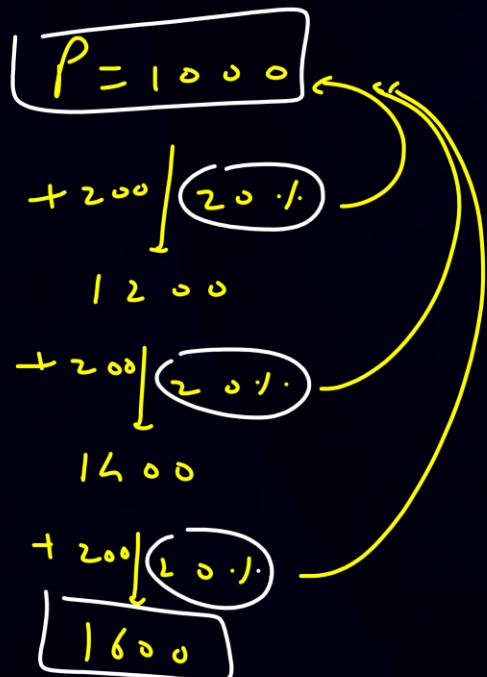
$$\begin{array}{l} \text{SI} \\ \boxed{P = 1000} \\ +200 \quad | \quad 20\% \\ A_1 = 1200 \\ +200 \quad | \quad 20\% \\ A_2 = 1400 \\ +200 \quad | \quad 20\% \\ A_3 = 1600 \end{array}$$

$$A = P + I$$

$$\begin{array}{l} CI \\ \boxed{P = 1000} \\ +200 \quad | \quad 20\% \\ A_1 = 1200 \\ +240 \quad | \quad 20\% \\ A_2 = 1440 \\ | \quad 20\% \end{array}$$

Simple Interest:

$P \rightarrow$ Principle
 $r \rightarrow$ Rate of Int./yr
 $t \rightarrow$ Period in yrs



$$\begin{aligned}
 SI &= (r \cdot P) \cdot t \\
 SI &= \frac{P \cdot r \cdot t}{100} \\
 &= \frac{1000 \times 20 \times 3}{100} \\
 SI &= 600 \\
 A &= P + SI \\
 A &= 1000 + 600 \\
 A &= 1600
 \end{aligned}$$



Simple Interest:

$$A = P + SI$$

$$= P + \frac{P \cdot r \cdot t}{100}$$

$$A = P \left(1 + \frac{r \cdot t}{100} \right)$$

$$P = 1000$$

$$r = 20\%$$

$$t = 3$$

$$A = ?$$

$$P = 5000$$

$$r = 12\% \text{ p.a.}$$

$$t = 5 \text{ yrs}$$

(I)

$$SI = \frac{5000 \times 12 \times 5}{100}$$

$$SI = 3000$$

$$A = P + SI$$

$$= 5000 + 3000 \\ = 8000$$

(II)

$$A = P \left(1 + \frac{r \cdot t}{100} \right)$$

$$= 5000 \left(1 + \frac{60}{100} \right)$$

$$= 5000 (1.6)$$

$$A = 8000$$

(III)

$$\begin{aligned} \text{T. Int Rate} \\ &= r \cdot t \\ &= 60\% \end{aligned}$$

$$\begin{aligned} A &= P + SI \\ &= 100\% + 60\% \\ A &= 160\% \end{aligned}$$

$$\begin{aligned} A &= \frac{160}{100} \cdot P \\ &= \frac{160}{100} \times 5000 = 8000 \end{aligned}$$

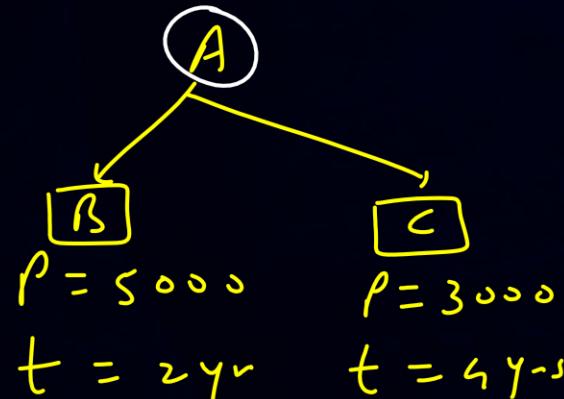
QUESTION- 1

$$SI = \frac{P \times t}{100}$$



#Q. A lent Rs. 5000 to B for 2 years and Rs. 3000 to C for 4 years on simple interest at the same rate of interest and received Rs. 2200 in all from both of them as interest.

The rate of interest per annum is:



\downarrow
 \downarrow
 \rightarrow Rate of Int.

$$T \cdot I \approx t = 2200$$

$$SI_B + SI_C = 2200$$

$$\frac{5000 \times r \times 2}{100} + \frac{3000 \times r \times 4}{100} = 2200$$

$$100r + 120r = 2200$$

$$220r = 2200$$

$$r = 10 \%$$

- A 5 %
- B 7 %
- C 8 %
- D 10 %

QUESTION- 2

$$175 \times 125 = 175 \times \frac{1000}{8} = \frac{175000}{8} = 21875$$

#Q. In 2020, Eli places Rs. 20,000 in a 5-year deposit (Deposit A) that earns simple interest of 15% per annum. In 2023, she wants to place a 2-year deposit (Deposit B) that will provide the same amount at the end of 2025 as Deposit A. If Deposit B earns simple interest at 30% per annum, what is the principal (in Rs.) required for Deposit B?

SI

A [2020]

$$P = 20000$$

$$t = 5 \text{ yrs}$$

$$r = 15\% \text{ p.a.}$$

$$T \cdot I_{\text{Int}} = 15\% \times 5$$

$$= 75\%$$

$$A = \underline{\underline{100}} + \underline{\underline{75}} = \underline{\underline{175\%}}$$

B [2023] ^(SI)

$$P = ?$$

$$t = 2 \text{ yrs}$$

$$r = 30\% \text{ p.a.}$$

$$T \cdot I_{\text{Int}} = 30\% \times 2$$

$$= 60\%$$

$$A = 100 + 60 = 160\%$$

$$[A_{\text{Int}}]_A = [A_{\text{Int}}]_B$$

$$\frac{175}{100} \times 20000 = \frac{160}{100} P$$

$$\frac{175}{160} \times 20000 P = P$$

$$21875 = P$$

$$20000 \left(1 + \frac{75}{100}\right) = P \left(1 + \frac{60}{100}\right)$$

$$20000 (1.75) = P (1.6)$$

Compound Interest:

$$r^p = \frac{20}{2} = (10\%) P \cdot n \cdot y$$

$$P = 1000$$

$$+100 \quad | \quad 10\% \\ \downarrow$$

$$A_1 = 1100$$

$$+110 \quad | \quad 10\% \\ \downarrow$$

$$A_2 = 1210$$

$$+121 \quad | \quad 10\% \\ \downarrow$$

$$A_3 = 1331$$

$$r^p = 20\% \text{ p.a. yearly}$$

$$P = 1000$$

$$+200 \quad | \quad 20\% \\ \downarrow$$

$$A_1 = 1200 \rightarrow 1^{\text{st}} \text{ yrs}$$

$$r^p = 20\% \text{ p.a.}$$

$$P = 1000$$

$$+100 \quad | \quad 10\% \\ \downarrow$$

$$A = 1100$$

$$+110 \quad | \quad 10\% \\ \downarrow$$

$$A_1 = 1210$$

Half yearly

(II)

6 months

12 months



Compound Interest:

$$\begin{aligned} P + CI &= A \\ CI &= A - P \end{aligned}$$

① Formula

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

→ yearly

$$CI = P \left(1 + \frac{r}{100}\right)^t - P$$

$$CI = P \left[\left(1 + \frac{r}{100}\right)^t - 1\right]$$

$$A = P \left(1 + \frac{r/2}{100}\right)^{2t}$$

→ Half yearly

$$CI = P \left[\left(1 + \frac{r/2}{100}\right)^{2t} - 1\right]$$

$$A = P \left(1 + \frac{r/4}{100}\right)^{4t}$$

→ Quarterly

$$CI = P \left[\left(1 + \frac{r/4}{100}\right)^{4t} - 1\right]$$

Compound Interest:

2 Successive I. :

yearly

$$P = 5000$$

$$r = 20\% \text{ p.a.}$$

$$t = 2 \text{ yrs}$$

$$A \leftarrow ?$$

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

$$= 5000 \left(1 + \frac{20}{100}\right)^2$$

$$= 5000 \times 1.44$$

$$= 7200$$

$$CI = A - P = 7200 - 5000 = 2200$$

E.g. $P = 5000$

I \rightarrow 10% ↑

II \rightarrow 20% ↑

III \rightarrow 30% ↑

$$5000 \times \frac{110}{100} \times \frac{120}{100} \times \frac{130}{100} = A$$

$$60 \times 143 = A$$

$$8580 = A$$

$$\begin{aligned} CI &= A - P \\ &= 8580 - 5000 \\ &= 3580 \end{aligned}$$

Successive I.

$$5000 \times \frac{120}{100} \times \frac{120}{100} = A$$

$$5 \times 144 = A$$

$$7200 = A$$

$$\begin{aligned} CI &= A - P = 7200 - 5000 \\ &= 2200 \end{aligned}$$

E.g. $(P = 10000)$, $r = 20\% \text{ p.a.}$, $t = 2 \text{ yrs}$
 (Half yearly)

$$r = \frac{20}{2} = 10\% \text{ p.HY}$$

$$10000 \times \frac{110}{100} \times \frac{110}{100} \times \frac{110}{100} \times \frac{110}{100} = A$$

$$14641 = A$$

Compound Interest:

③ Equivalent Int. Rate [T. Int Rate]

$$\begin{aligned}
 & \boxed{\text{SI}} \\
 & r = 20\% \text{ pa} \\
 & t = 2 \text{ yrs} \\
 & \text{T. Int Rate} = 20\% \times 2 \\
 & = \boxed{40\%}
 \end{aligned}$$

$$\left|
 \begin{array}{l}
 \boxed{CI} \\
 r = \boxed{20\% \text{ pa}} \\
 t = 2 \text{ yrs} \\
 \text{T. Int Rate} = a + b + \frac{ab}{100} \\
 = 20 + 20 + \frac{400}{100} \\
 = \boxed{44\%}
 \end{array}
 \right|$$

e.g.

$$P = 5000$$

$$\begin{cases} I = 20\% \text{ (a)} \\ II = 30\% \text{ (b)} \end{cases}$$

$$\text{CI} = ?$$

~~$\cancel{A = ?}$~~

$$\begin{aligned}
 \text{T. Int. Rate} &= a + b + \frac{ab}{100} \\
 &= 20 + 30 + \frac{600}{100}
 \end{aligned}$$

$$= 56\%$$

$$\begin{aligned}
 \text{CI} &= 56\% \text{ of } P = \frac{56}{100} \times 5000 \\
 &= 2800
 \end{aligned}$$

$$\begin{aligned}
 A &= P + CI = 5000 + \underline{\underline{2800}} = \underline{\underline{7800}}
 \end{aligned}$$



Compound Interest:



$$\begin{array}{l} \text{I} = 20\text{ J} \\ \text{II} = 30\text{ J} \\ \text{III} = 40\text{ J} \end{array}$$

~~20 · 1 ·
(a)~~ ~~30 · 1 ·
(b)~~

$$a+b+\frac{ab}{100}$$

$$20 + 30 + \underline{600}$$

56-1. (a)

$$56 + 40 = \frac{56 \times 40}{100} = 224$$

$$96 + \frac{112}{5}$$

$$96 + \frac{112}{5}$$

50-1.

$$\boxed{H. \text{ years}} \\ t = 2 \text{ yrs}$$

$$V = \frac{2^{\circ}}{2} = 1^{\circ} \text{ J. P. HY}$$

$$\begin{array}{c} \diagup \quad \diagdown \\ 10 \cdot j \cdot \quad \quad \quad 10 \cdot j \cdot \\ \diagdown \quad \diagup \end{array}$$

10 J. 10 J.

$$10 + 10 + \frac{100}{18}$$

21.). (a)

21-1. (b)

$$21 + 21 + \frac{441}{100} = \boxed{46.41\%}$$

QUESTION- 3

$$A = P + CI$$

$$\left(a + b + \frac{ab}{100} \right)$$



#Q. A certain amount is invested at 30% annual CI for 2.5 years and interest accrued at the end of 2.5 years is Rs. 11322, then what is that certain invested amount?

$$1.9435P - P = 11322$$

$$P(1.9435 - 1) = 11322$$

years

$$r = 30\% \quad \underline{\underline{P=}}$$

$$t = 2.5 \text{ yr}$$

$$CI = 11322$$

$$\underline{\underline{P = ?}}$$

$$\begin{array}{c} 30\% \\ (a) \end{array} \times \begin{array}{c} 30\% \\ (b) \end{array}$$

$$30 + 30 + \frac{900}{100}$$

$$69\% \quad (a)$$

$$\begin{array}{c} 15\% \\ (b) \end{array}$$

$$69 + 15 + \frac{1035}{100}$$

$$94.35\%$$

A Rs. 16000

B Rs. 12000

C Rs. 20000

D Rs. 24000

$$\begin{array}{c} 30\% \uparrow \\ 30\% \uparrow \\ 15\% \uparrow \end{array}$$

$$P \times \frac{130}{100} \times \frac{130}{100} \times \frac{115}{100} = A$$

$$P \times (1.3)(1.3)(1.15) = P + 11322$$

$$P(1.9435) = P + 11322$$

$$0.9435 P = 11322$$

$$P = \frac{11322}{0.9435} = 12000$$

$$94.35\% \rightarrow \text{Rs. } 11322$$

$$100 \% \rightarrow n$$

$$94.35 \times = 1132200$$

$$n = \frac{1132200}{94.35} = 12000$$

QUESTION- 4

#Q. A private bank offers two types of investment schemes: Scheme A with a simple interest rate of 12% per annum, and Scheme B with a compound interest rate of 10% per annum compounded annually. If a person invests $\text{Rs. } 10,000$ in each scheme for 2 years, how much more interest will he earn from Scheme A than Scheme B at the end of the period?

- A Rs. 160
- B Rs. 120
- C Rs. 200
- D Rs. 300

(SI)

A

$$r = 12\% \text{ p.a.}$$

$$P = 10000$$

$$t = 2$$

$$\text{T. Int rate} = 12 + 2$$

$$= 24\%$$

$$\text{Int} = 2400$$

(CI)

B

$$r = 10\% \text{ p.a.}$$

$$P = 10000$$

$$t = 2$$

$$(a) \quad (b)$$

$$\text{T. Int Rate} = 10 + 10 + \frac{100}{100}$$

$$= 21\%$$

$$\text{Int} = 2100$$

$$\text{Diff} = 2400 - 2100$$

$$= 300$$



Problems for Practice [CAT PYQs] :

QUESTION- 5

$$SI = \frac{P \cdot t}{100}$$



#Q. An amount of Rs 10000 is deposited in bank A for a certain number of years at a simple interest of 5% per annum. On maturity, the total amount received is deposited in bank B for another 5 years at a simple interest of 6% per annum. If the interests received from bank A and bank B are in the ratio 10 : 13, then the investment period, in years, in bank A is

A 4

B 3

C 6

D 5

(SI)

<p>A</p> <p>$P = 10000$</p> <p>$t \rightarrow P_{\text{period}}$</p> <p>$r = 5\%$</p> <p>$SI_A = \frac{10000 \times 5 \times t}{100}$</p> <p>$SI_A = 500t$</p> <p>$A = P + SI$</p> <p>$A = 10000 + 500t$</p>	<p>B</p> <p>$Principle = (10000 + 500t)$</p> <p>$P_{\text{period}} = 5$</p> <p>$r = 6\%$</p> <p>$SI_B = \frac{(10000 + 500t) \times 6}{100}$</p> <p>$SI_B = 300 + 150t$</p>
--	---

[CAT 2024 : Slot 1]

$$\frac{(SI)_A}{(SI)_B} = \frac{10}{13}$$

$$\frac{500t}{(3000 + 150t)} \times \frac{10}{13}$$

$$6500t = 30000 + 1500t$$

$$5000t = 30000$$

$t = 6$

QUESTION- 6

$$t = 1$$

#Q. Nitu has an initial capital of Rs. 20000. Out of this, she invests Rs. 8000 at 5.5% in bank A, Rs. 5000 at 5.6% in bank B and the remaining amount $x\%$ in bank C, each rate being simple interest per annum. [Her combined annual interest income from these investments is equal to 5% of the initial capital. If she had invested her entire initial capital in bank C alone, then her annual interest income, in rupees, would have been

- A 900
- B 700
- C 1000
- D 800

Initial Capital = 20000 SI

A: $\underline{8000} \text{ @ } 5.5\%$

B: $\underline{5000} \text{ @ } 5.6\%$

C: $\underline{7000} \text{ @ } x\%$

$T \cdot I \approx t = 1000$

$SI_A + SI_B + SI_C = 1000$

$\frac{8000 \times 5.5 \times 1}{100} + \frac{5000 \times 5.6 \times 1}{100} + \frac{7000 \times x \times 1}{100} = 1000$

$440 + 280 + 70x = 1000$

$70x = 280$

$x = 4$

[CAT 2022 : Slot 3]

$$\begin{aligned} T \cdot I \approx t &= 5\% \text{ of } 20000 \\ &= \underline{1000} \end{aligned}$$

C

$P = 20000$

$r = 4\%$

$t = 1$

$SI = \frac{20000 \times 4 \times 1}{100} = 800$

QUESTION- 7

$$A = P + SI = 100 + 10 = 110 \text{ J}$$

$$\frac{\sigma^m}{\sigma^n} = \sigma^{m-n}$$



#Q. Anil invests Rs. 22000 for 6 years in a certain scheme with 4% interest per annum, compounded half-yearly. Sunil invests in the same scheme for 5 years, and then reinvests the entire amount received at the end of 5 years for one year at 10% simple interest. If the amounts received by both at the end of 6 years are same, then the initial investment made by Sunil, in rupees, is

[CAT 2023 : Slot 1]

[CAT 2023]

$$(Amt)_{Anil} = (Amt)_{Sunil}$$

Anil H. yearly

$$P = 22000$$

$$t = 6 \text{ yrs}$$

$$r = 4\%$$

$$A = P \left(1 + \frac{r/2}{100}\right)^{2t}$$

$$= 22000 \left(1 + \frac{2}{100}\right)^{12}$$

$$\checkmark A = 22000 (1.02)^{12}$$

Sunil H. yearly

$$P = ?$$

$$t = 5 \text{ yrs}$$

$$r = 4\%$$

Amt for 5 yrs

$$= P \left(1 + \frac{2}{100}\right)^{10}$$

$$= P (1.02)^{10}$$

SJ

$$t = 1 \text{ yr.}$$

$$r = 10\%$$

$$Prin = P (1.02)^{10}$$

$$A = \frac{110}{100} \times P (1.02)^{10}$$

$$= 1.1 P (1.02)^{10}$$

$$22000 (1.02)^{12} = 1.1 P (1.02)^{10}$$

$$\frac{22000 (1.02)^{12}}{1.1 \times (1.02)^{10}} = P$$

$$\frac{22000 (1.02)^2}{1.1} = P$$

$$20808 = P$$

QUESTION- 8
 $T \cdot \text{Period} = 3 \text{ yr}$

#Q. Anil borrows Rs 2 lakhs at an interest rate of 8% per annum, compounded half-yearly. He repays Rs 10320 at the end of the first year and closes the loan by paying the outstanding amount at the end of the third year. Then, the total interest, in rupees, paid over the three years is nearest to

[CAT 2023 : Slot 2]

A Rs. 45311

B Rs. 51311

C Rs. 33130

D Rs. 40991

CI
Half yearly

$$P = 200000$$

$$r = 8\% \text{ p.a.}$$

Amnt after 1st yr $t=1$

$$= P \left(1 + \frac{r/2}{100}\right)^{2t}$$

$$= 200000 \left(1 + \frac{4}{100}\right)^2$$

$$= 200000 (1.04)^2$$

$$A_1 = 216320$$

10320 → Repay

CI (HY)

$$P = 206000$$

$$t = 2 \text{ yr}$$

$$r = 8\% \text{ p.a.}$$

$$A = 206000 \left(1 + \frac{4}{100}\right)^4$$

$$= 206000 (1.04)^4$$

$$A = 240991$$

$$\text{Loan} = 200000$$

$$\text{Paid} = 240991 + 10320$$

$$= 251311$$

$$\begin{aligned} & T \cdot \text{Int Paid} \\ & = 251311 - 200000 \\ & = 51311 \end{aligned}$$

QUESTION- 9

#Q. A person invested a total amount of Rs 15 lakh. A part of it was invested in a fixed deposit earning 6% annual interest, and the remaining amount was invested in two other deposits in the ratio 2 : 1, earning annual interest at the rates of 4% and 3%, respectively. If the total annual interest income is Rs 76000 then the amount (in Rs lakh) invested in the fixed deposit was [TITA] [CAT 2019 : Slot 1]

TRY
(Next class)

QUESTION- 10

#Q. A person invested a certain amount of money at 10% annual interest, compounded half-yearly. After one and a half years, the interest and principal together became Rs. 18522. The amount, in rupees, that the person had invested is

[CAT 2020 : Slot 3]

(TRI)
(Next class)



2 Mins Summary

- 1) Concept & Numerical based on 'Simple Interest'
- 2) Concept & Numerical based on 'Compound Interest'
- 3) Problems for Practice & CAT PYQs



Thank
You