Compound Interest is an important topic asked under the Arithmetic section in Mathematics. It is asked in various Defence Exams such as CDS, AFCAT, Air Force Group X & Y etc

We will discuss the basic questions that are usually asked in this topic and how you can solve them using the normal as well as Shortcut approach.

Tips & tricks on Compound Interest

Now, Let's discuss the basic difference between Simple Interest and Compound Interest.

Principal = 1000, rate of interest (r) = 10%, time = 3yrs
Simple Interest
SI for 1st yr = (1000×10×1)/100 = 100,
SI for 2nd yr = 100 (In SI it will be the same as 1st yr)
SI for 3rd yr = 100

Compound Interest:
CI for 1st yr = 100
CI for 2nd yr will not be same as 1st yr because principal for 2nd yr is the amount of 1st yr.
So, CI (2nd yr) = (1100×10×1)/100 = 110
CI for 3rd yr will also not be the same as 1st yr and 2nd yr because principal for 3rd yr is the amount of 2nd yr.
principal (3rd yr) = Amount (2nd yr) = Principal(2nd yr)+Interest(2nd yr) = 1100+110 = 1210
CI (3rd yr) = (1210×10×1)/100 = 121
Hence total CI for 3yrs = 100+110+121 = 331
Amount after 3 yrs = 1331
Interest is always calculated on the Principal. But in the case of CI, the Principal is get changed every year.

Also Check: Tips & Tricks on Simple Interest

If we calculate it by net rate concept then the Principal will remain the same.
Concept1: How to calculate net CI rate for 2 years?
Let rate is r% per annum for 2 years
Net CI rate for 2yrs can be calculated by = $2r+(r^2/100)$
If rate is 1%, net CI rate for 2yrs = $2×1+(1^2/100)$ = 2.01%
If rate is 3%, net CI rate for 2yrs = $2×3+(3^2/100)$ = 6.09%
If rate is 14%, net CI rate for 2yrs = $2×14+(14^2/100)$ = 29.96%

We suggest you learn the table given below:

% Rate per annum	Net CI rate for 2 yrs	% Rate per annum	Net CI rate for 2 yrs
2%	4.04%	9%	18.81%
3%	6.09%	10%	21%
4%	8.16%	11%	23.21%
5%	10.25%	12%	25.44%
6%	12.36%	13%	27.69%
7%	14.49%	14%	29.96%
8%	16.64%	15%	32.25%

Concept 2: How to calculate net CI rate for 3 years?

Let rate is r% per annum for 3 years

Net CI rate for 3yrs can be calculated = $3r+3(r^2/100)+1(r^3/10000)$

If rate is 3% p.a., net CI rate for 3 yrs

= **3**×3+**3**(9/100)+**1**(27/10000)

= 9+.27+.0027 = 9.2727

If rate is 12% p.a., net CI rate for 3 yrs

= 3×12+3(144/100)+1(1728/10000)

= 36+4.32+.1728

= 40.4928

Representation while calculating net rate %.

Let's calculate it for the rate 3% p.a.

write, $r/r^2/r^3$ = 3/9/27

then,$3r/3r^2/1r^3$ = 9/27/27

 = 9.2727

We suggest you learn the table given below:

% Rate per annum	Net CI rate for 3 yrs	% Rate per annum	Net CI rate for 3 yrs
1%	**3.31%**	**6%**	**19.1016%**
2%	**6.1208%**	**7%**	**22.5043%**
3%	**9.2727%**	**8%**	**25.9712%**
4%	**12.4864%**	**9%**	**29.5029%**
5%	**15.7625%**	**10%**	**33.10%**

Concept3: If the r% p.a. is in fraction:

Example: if rate is 16(2/3) % and principal is 216, then calculate CI for 2yrs and 3yrs.

Solution: We can write 16(2/3)% = 1/6 (Discussed in percentage study notes)

For 2 years

216×(1/6)= 36, Now multiply 36 by 2 = 72

36× (1/6) = 6 , multiply 6 by 1 = 6

Add both the above value = 72+6 = 78

CI for 2yrs = 78

For 3 years

216×(1/6) = 36, Now multiply 36 by 3 = 108

36× (1/6) = 6, multiply 6 by 3 = 18

6× (1/6) = 1, multiply 1 by 1 = 1

Add all the above values = (108+18+1)= 127

CI for 3yrs = 127

Concept4: When r% is given p.a. and CI has to be calculated half-yearly or quarterly basis.

Yearly	factor	r% (per annum)	Time (n yrs)
Half yearly	**6months = (6/12) =1/2**	**Factor× r% = (r/2) %**	**2n**
Quarterly	**3months= (3/12) =1/4**	**(1/4) × r% = (r/4) %**	**4n**
9 months	**9months= (9/12) = 3/4**	**(3/4) × r% = (3r/4) %**	**4n/3**
8 months	**8months= (8/12) = 2/3**	**(2/3) × r% = (2r/3) %**	**3n/2**

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Example: If r% = 10% per annum. Find the CI on 5000 for 2 years if it is compounded half-yearly.

Solution: Rate is calculated half yearly so new r% = (10/2)% = 5%

Given time is 2 yrs, acc.to half yearly, it will be 2×2 = 4

Now we have to calculate CI for 4yrs @ 5%

We know 5% = (1/20)

So, 5000×(1/20) = 250, multiply 250 by 4 = 1000

250× (1/20) = 12.5, multiply 12.5 by 6 = 75

12.5× (1/20) = 0.625, multiply 0.625 by 4 = 2.5

0.625× (1/20)= .03125 multiply .03125 by 1 = .03125

Add all the above values

(1000+75+2.5+0.03125)

= 1077.53125

Concept5: When different rates are given for 2 years.

If a% is given for 1st year and b% is given for 2nd year.

Net rate of CI for 2 yrs = (a+b+ab/100) % (discussed in percentage study notes)

Note: The net CI rate will be the same if b% is given for 1st year and a% is given for 2nd year.

Example: If principal is 1000 Rs and r(1st yr) = 4% and r(2nd yr) = 6%. Calculate the CI after 2yrs.

Solution:
Net CI rate = 4+6+(4×6)/100
= 10.24%
Now CI = 1000×10.24% = 102.4 Rs

Concept6: When difference between CI and SI is given.
We know, net CI for 2yrs = 2r+(r^2/100) %,
net SI for 2 yrs = 2r%
So, difference = (r^2/100)%

Example: If difference between CI and SI is Rs.10 and the principal is Rs.1000.Calculate the rate % per annum.

Solution: difference = 10 Rs.
So difference% = (10/1000)×100 = 1%
We know that, if rate of interest is 10%
then, net CI rate (2yrs) = 21%
net SI rate (2yrs) = 20%
difference = 1%
Definitely we can say r% per annum is 10%.

Example: Calculate the difference between CI and SI for 3 yrs if Principal = 8000 and r = 6% p.a.

Solution: Net rate CI(3yrs) = 19.1016%
Net rate SI (3yrs) = 18%
Difference = 1.1016%
So, difference = 1.1016% of 8000 = 88.128

Example: If difference between CI and SI is Rs.64 and r = 8% p.a.. Calculate the Principal and Amount?

Solution: If r = 8% p.a.
then, net rate CI (2yrs) – net rate SI (2yrs)
= 16.64% -16% = 0.64%
Given, difference is Rs. 64
So, 0.64% = 64
100% = 10000
Hence, Principal is 10000 Rs.
Amount = principal× (116.64%) = 10000× 116.64% = Rs.11664

Concept7: Calculation of Instalment

For 2 yrs: If r% is given, convert it into fraction (a/b)

then, $\text{Instalment} \times \dfrac{b}{a+b} \times \dfrac{b+a+b}{a+b} = \textbf{Principal}$

Example: A man borrowed Rs.8,400 at 10% p.a. CI. He pays equal annual repayment of X rs and clear off his debts in 2 yrs. What is the value of X?

Solution: Given r=10% = (1/10)

$$\text{Instalment} \times \frac{10}{11} \times \frac{10+11}{11} = 8400$$

$$X \times \frac{10}{11} \times \frac{21}{11} = 8400$$

$$X = 4840 \text{ Rs.}$$

For 3 yrs: If r% p.a. is given, convert it into fraction(a/b)

$$\text{Instalment} \times \frac{b}{a+b} \left[\frac{b^2+(a+b)^2+b(a+b)}{(a+b)^2} \right] = \text{Principal}$$

Example: A man borrowed Rs.1820 at 20% p.a. CI. He pays equal annual repayment of X rs and clear off his debts in 3 yrs. What is the value of X?

Solution: Given $r = 20\% = (1/5)$

$$\text{Instalment} \times \frac{5}{5+1}\left[\frac{5^2+(1+5)^2+5(1+5)}{(1+5)^2}\right] = 1820$$

$$X \times \frac{5}{6} \times \frac{5^2+6^2+5\times6}{6^2} = 8400$$

$$X \times \frac{5}{6} \times \frac{91}{36} = 8400$$

$$X = 864$$

Formulas:

Amount $= P\left(1+\dfrac{r}{100}\right)^n$

Difference between CI and SI for 2 yrs $= P \times \left(\dfrac{r}{100}\right)^2$

Difference between CI and SI for 3 yrs $= P \times \left(\dfrac{r}{100}\right)^2 \times \left(\dfrac{300+r}{100}\right)$

Where P = Principal, r = rate of interest and n = no. of yrs