

SSC & Railways Exams

SI & CI Short Tricks PDF

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Quantitative Notes on Simple Interest

Simple Interest (SI) = $\frac{P \times R \times T}{100}$ Amount: Amount is total sum of Principal and simple Interest.

R(%) = rate of interest per annum,() T = time period (in years) So, P = $\frac{SI \times 100}{R \times T}$; R = $\frac{SI \times 100}{P \times T}$; T = $\frac{SI \times 100}{P \times R}$

Example 1: What will be the rate of interest if the principal is Rs. 2500 and simple interest for 3 years is Rs 375?

Solution: Given, Principal = 2500, T= 3yrs, SI = 375 So, R = $\frac{SI \times 100}{P \times T}$ R = $\frac{375 \times 100}{2500 \times 3}$ = 5% Without formula: Simple interest for 3 years is 375

Without formula: Simple interest for 3 years is 375, Interest for 1 year is Rs. 125 Now we can calculate rate of interest = $\frac{Interst for 1 year}{Principal} \times 100$

 $= \frac{125}{2500} \times 100 = 5\%$

Example 2: If the principal is 100 Rs. The difference of Simple Interest for 4yrs and 6yrs is Rs 8. Calculate the rate of simple interest.

Solution: In simple interest questions, interest always remains same for a year if the principal, rate of interest is constant for the same.

Let Interest for 4 yrs is I then interest for 6 yrs is (I+8) interest for 2 yrs is Rs. 8 interest for 1 yr = 4 rate of interest = $(4/100) \times 100 = 4\%$

Example 3: If the amount is (10/9) times of Principal and rate of interest and time both are numerically equal. Then, what is the rate of interest per annum?

Solution: Let Principal is P. Given, numerically R = TInterest = Amount – principal I = (10/9)P – P I = P/9 (Interest is in the multiples of Principal) Now, I =[(P×R×T)/100] P/9 = (P× R× T)/100 R² = 100/9 (using, R=T)

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R = (10/3)%

We can also say the time period is (10/3) years.

Short approach: Whenever Interest is in multiple of Principal and Rate of Interest and Time period is equal.

Then, R = T = $\sqrt{100 \times multiple of P}$ R = T = $\sqrt{100 \times (1/9)}$ = 10/3

Annual Instalments for Simple Interest:

Let's discuss a real example to understand instalments concept:

A person deposit Rs.140 to the bank every year up to 5 years . The bank gives him 5% rate of interest simple annually. And at the end of 5 years he get total amount of Rs.770

So, 140 is the instalment, time is 5 years rate of interest is 5% and the amount or debt is Rs.770 This Instalment is also known as the annual payment. Debt is total amount, so don't confuse between these two terms.

Installment = $\frac{100A}{100t+rt(t-1)}$ where A = debt, r = rate of interest and t = time period

Example 4: What annual payment will discharge a debt of Rs.848 in 4yrs at 4% per annum simple interest?

Solution: Given, A = 848, r = 4% and t = 4yrs Using formula: Annual payment = $\frac{100 \times 848}{100 \times 4+4 \times 4^{\frac{(4-1)}{2}}}$

Annual payment = $\frac{100 \times 848}{400+24}$ = 200

In case if you forget formula then how to approach this question. Let installment is X. There are 4 installments and rate of interest is also 4% Debt (A) = four installments + (r%) × installments × (0+1+2+... (t-1)) So, 848 = 4X + (4%)(X)(0+1+2+3) 848 = 4X+ 848 = 4X+ 848 = 424X/100 X = 200

Some Important examples based on Simple Interest.

Example 5: A sum amounts to Rs. 702 in 2 years and Rs. 783 in 3 years. Calculate the sum, rate of interest and the amount after 5 years?

Solution:

Amount for 2 years(A_2) = 702 Amount for 3 years (A_3) = 783 Interest for 1 year (I) = 783-702 = 81 So Sum = $A_2 - 2I = 702 - 2 \times 81 = 702-162 = 540$ rate of interest = (81/540)×100 = 15%

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Amount after 5 years = Sum+5I = $540+5 \times 81$ = 945

Example 6: A sum of money doubles itself in 3 yrs at a simple interest. In how many yrs will it amount to 8 times itself?

Solution: Doubles in 3 yrs 3 times in $3 \times 2 = 6$ yrs 4 times in $3 \times 3 = 9$ yrs 8 times in $3 \times 7 = 21$ yrs

Example 7: Atul and Vijay are friends. Atul borrowed a sum of Rs.400 at 5% per annum simple interest from Vijay. He returns the amount with interest after 2 yrs. Vijay returns to Atul 2% of the total amount returned. How much did Atul receive?

Solution: After 2 yrs, amount returned to Vijay = 400+(400*5*2)/100 = Rs 440Amount returned to Atul = 2% of 440 = 8.8

Example 8: Rs.4000 is divided into two parts such that if one part be invested at 3% and the other at 5%, the annual interest from both the investments is Rs. 144. Find each part.

Solution: Let the amount lent at 3% rate be Rs. X, then amount lent at 5% rate is 4000-X

So, 3% of X + 5% of (4000-X) = 144

5% of 4000 - 2% of X = 144 200 - 2% of X = 144 2% of X = 56 X = $(56/2) \times 100$ X = 2800 and 4000 -X = 1200.

How to solve this Question by Alligation Method:

First, we will calculate the net rate of interest for Rs. 144 on 4000 So, net rate = $(144/4000) \times 100 = 3.6\%$

Apply allegation:



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Quantitative Notes 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 $1^{st} yr = (1000 \times 10 \times 1)/100 = 100$, SI for $2^{nd} yr = 100$ (In SI it will be the same as $1^{st} yr$) SI for $3^{rd} yr = 100$

Compound Interest:

CI for 1^{st} yr = 100 CI for 2^{nd} yr will not be same as 1^{st} yr because principal for 2^{nd} yr is the amount of 1^{st} yr. So, CI $(2^{nd}$ yr) = $(1100 \times 10 \times 1)/100 = 110$ CI for 3^{rd} yr will also not be the same as 1^{st} yr and 2^{nd} yr because principal for 3^{rd} yr is the amount of 2^{nd} yr. principal $(3^{rd}$ yr) = Amount $(2^{nd}$ yr) = Principal $(2^{nd}$ yr) + Interest $(2^{nd}$ yr) = 1100+110 = 1210CI $(3^{rd}$ yr) = $(1210 \times 10 \times 1)/100 = 121$ Hence total CI for 3yrs = 100+110+121 = 331Amount after 3 yrs = 1331

Interest is always calculated on the Principal. But in case of CI, Principal is get changed every year. **If we calculate it by net rate concept then the Principal will remain same.**

Concept 1 : 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 = $2\times1+(1^2/100) = 2.01\%$ If rate is 3%, net CI rate for 2yrs = $2\times3+(3^2/100) = 6.09\%$ If rate is 14%, net CI rate for 2yrs = $2\times14+(14^2/100) = 29.96\%$ We suggest you to 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% |

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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 = $3 \times 3+3(9/100)+1(27/10000)$ = 9+.27+.0027 = 9.2727If rate is 12% p.a., net CI rate for 3 yrs = $3 \times 12+3(144/100)+1(1728/10000)$ = 36+4.32+.1728= 40.4928Representation 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% |

Concept 3 : If the r% p.a. is in fraction:

Example: if the rate is 16(2/3) % and the 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

 $216 \times (1/6) = 36$, Now multiply 36 by 2 = 72 $36 \times (1/6) = 6$, multiply 6 by 1 = 6 Add both the above value = 72+6 = 78 CI for 2yrs = 78 For 3 years $216 \times (1/6) = 36$, Now multiply 36 by 3 = 108 $36 \times (1/6) = 6$, multiply 6 by 3 = 18 $6 \times (1/6) = 1$, multiply 1 by 1 = 1 Add all the above values = (108+18+1)=127CI for 3yrs = 127

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| 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 | $(1/4) \times r\% = (r/4) \%$ | 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 |

Concept 4 : When r% is given p.a. and CI has to be calculated half-yearly or quarterly basis.

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 $2 \times 2 = 4$ Now we have to calculate CI for 4yrs @ 5% We know 5% = (1/20) So, $5000 \times (1/20) = 250$, multiply 250 by 4 = 1000 $250 \times (1/20) = 12.5$, multiply 12.5 by 6 = 75 $12.5 \times (1/20) = 0.625$, multiply 0.625 by 4 = 2.5 $0.625 \times (1/20) = .03125$ multiply .03125 by 1 = .03125 Add all the above values (1000+75+2.5+0.03125) = 1077.53125

Concept 5 : 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 = $4+6+(4\times6)/100$ = 10.24%

Now CI = 1000×10.24% = Rs. 102.4

Concept 6: 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 the 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% = $(10/1000) \times 100 = 1\%$ 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%.

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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 for 2 years 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

Concept 7 : Calculation of Instalment

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

then, Instalment× $\frac{b}{a+b}$ × $\frac{b+a+b}{a+b}$ = 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)

Instalment $\times \frac{10}{11} \times \frac{10+11}{11} = 8400$ X $\times \frac{10}{11} \times \frac{21}{11} = 8400$ X = 4840 Rs. For 3 yrs: If r% p.a. is given, convert it into fraction(a/b)

Instalment× $\frac{b}{a+b}\left[\frac{b^2+(a+b)^2+b(a+b)}{(a+b)^2}\right]$ = 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)
Instalment×
$$\frac{5}{5+1} \left[\frac{5^2 + (1+5)^2 + 5(1+5)}{(1+5)^2} \right] = 1820$$

X× $\frac{5}{6}$ × $\frac{5^2 + 6^2 + 5 \times 6}{6^2} = 8400$
X× $\frac{5}{6}$ × $\frac{91}{36} = 8400$
X = 864

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Formulas: Amount = P $(1+\frac{r}{100})^n$ Difference between CI and SI for 2 yrs = P× $(\frac{r}{100})^2$ Difference between CI and SI for 3 yrs = P× $(\frac{r}{100})^2$ × $(\frac{300+r}{100})$ Where P = Principal, r = rate of interest and n = no. of yrs

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