B.Com 4th Semester (CBCS)

Sub: Business Mathematics

Topic: Useful Shortcuts and Tricks for Simple Interest & Compound Interest

Simple Interest:

Formula:
1) SI = P x R x T/100

2) Principal = Simple Interest ×100/ R × T
3) Rate of Interest = Simple Interest ×100 / P × T
4) Time = Simple Interest ×100 / P × R
5) If the rate of Simple interest differs from year to year, then

Simple Interest = Principal × (R1+R2+ R3…..)/100

The four variables in the above formula are: SI=Simple Interest P=Principal Amount (This the amount invested) T=Number of years R=Rate of interest (per year) in percentage

1). A sum of money is divided into n parts in such a way that the interest on the first part at r_1% for t_1 years, on the second part at r_2% for t_2 years, on the third part at r_3% for $t_3$years, and so on, are equal. Then the ratio in which the sum is divided in n part is:
$1/r_1 \times t_1 : 1/r_2 \times t_2 : 1/r_3 \times t_3$

Example:
A sum of Rs 7700 is lent out in two parts in such a way that the interest on one part at 20% for 5 yr is equal to that on another part at 9% for 6 yr. Find the two sums.

Solution:
Here, R1 = 20% R2 = 9%

T1 = 5 yr T2 = 6 yr

By using formula, ratio of two sums = 1/100 : 1/54 = 27 : 50

Therefore, first part = [27/(27+50)]*7700 = Rs 2700

Second part = [50/(27+50)]*7700 = Rs 5000

2). Amount = Principal + S.I = p + [(p x r x t)/100]

Example:
What Principal will amount to **Rs. 16000** in 6 years at 10% simple interest?

Solution:

Let the principal be Rs. p, given rate of interest is 10% and time = 6 years.
Amount received at the end of 6 years = 16000 Rs.
=> 16000 = p + (p x 10 x 6)/100 = p + 6p/10 = 16p/10 => P = 16000 x (10/16) = 1000 x 10 = 10000 Rs.The principal should be **Rs. 10000**

3). If sum becomes n times in T yr at simple interest, then the formula for calculating the rate of interest

R =100(n-1) /T %

4). A sum of money becomes 4 times in 20 yr at SI. Find the rate of interest?

R =100(4-1)/20
=100*3 / 20 =5*3 =15

5). If A sum becomes n times in a certain rate of interest .then the time taken in which the same amount will be n times at the same rate of interest:
= (n-1)/2 × T (n = number of times)

6). If A sum becomes 3 times in a certain rate of interest in 5years .find the time taken in the same amount will be 8 times at the same rate of interest:
=(8-1)/2*5
= 7/2 * 5
=17.5years

Useful Shortcuts and Tricks for Simple Interest & Compound Interest

Compound Interest

The difference between the amount and the money borrowed is called the compound interest for a given period of time
1) Let principal =P; time =n years; and rate = r% per annum and let A be the total amount at the end of n years, then

$A = P*[1+ (r/100)]^n$;
$CI = \{P*[1+ (r/100)]^n -1\}$

2) When compound interest reckoned half-yearly, then r% become r/2% and time n becomes 2n;

$A= P*[1+ (r/2*100)]^{2n}$

3) For the quarterly

$A= P*[1+ (r/4*100)]^{4n}$

4) The difference between compound interest and simple interest over two years is given by

$Pr^2/100^2$or P(r/100)2

5) The difference between compound interest and simple interest over three years is given by

$P(r/100)^2*\{(r/100)+3\}$

6) When Rates are different for different years, say R1%, R2%, R3% for 1st, 2nd and 3rd year respectively, Then the total amount is given by

$P ((1 + R^1)/100) ((1 + R^2)/100) ((1 + R^2)/100)$

7) Present worth of Rs. x due n years hence is given by

x/(1+R/100)

Useful Shortcuts and Tricks for Simple Interest & Compound Interest

Example Problems

1). Interest is compounded half-yearly, therefore,

Example:

Find the compound interest on Rs. 20,000 in 2 years at 4 % per annum, the interest is compounded half-yearly.

Solution:
Principal = Rs. 20000, Rate = 2 % per half-year, Time = 2 years = 4 half- years
Amount=Rs.21648.64

Compound Interest = Total amount – Principal

= 21648.64 – 20000

= Rs. 1648.64

2). If interest is compounded annually,

Example:

Find the compound interest on Rs. 8500 at 4 % per annum for 2 years, compounded annually.

Solution:
We are given:

Principal = Rs. 8500, Rate = 4 % per annum, Time = 2 years

= Rs. 9193.6Compound Interest = Total amount – Principal= 9193.6 – 8500

= 693.6Compound Interest = Rs. 693.6
3). When Rates are different for different years, say R1%, R2%, R3% for 1st, 2nd and 3rd year respectively. Then, Amount (= Principal + Compound interest) = P(1 + R1/100)(1 + R2/100)(1 + R3/100).
Example:

Find the compound interest on a principal amount of Rs.5000 after 2 years, if the rate of interest for the 1st year is 2% and for the 2nd year is 4%.

Solution:

Here R1 = 2% R2 = 4% and p = Rs.5000, we have to find CI (compound interest).
CI = 5000(1 + 2/100)(1 + 4/100) – 5000
= 5000 x (102/100)(104/100) – 5000
= 5000 x (51/50) x (52/50) – 5000
= 5000 x (51 x 52/2500) – 5000
= 5000 x (2652 / 2500) – 5000
= 5304 – 5000 = 304Hence the required compound interest is Rs.304.
4). When compound interest is reckoned half-yearly.

If the annual rate is r% per annum and is to be calculated for n years, then, in this case, rate = (n/2%) half-yearly and time = (2n) half-yearly.
Example:

Sam investment Rs.15,000 @ 10% per annum for one year. If the interest is compounded half-yearly, then the amount received by Sam at the end of the year will be.

Solution:

P = Rs. 15000; R = 10% p.a = 5% half-year, T = 1 year = 2 half year

Amount = Rs.16537.50
If the simple interest for a certain sum for 2yrs at the annual rate of interest R% is SI. Then,

Compound interest (CI) = SI (1+r/200) (no. of years =2)

5). If the simple interest for a certain sum for 2 yr at 5%pa is 200, then what will be the compound interest for the same sum for the same period and the same rate of interest?

Solution:

SI =200 r=5%
CI =200(1+5/200) =200*(205/200) =205

If a certain sum at compound interest becomes x times n_1^yr and y times n_2^yr then,
$\mathbf{X^{1/N1} = Y^{1/N2}}$

Useful Shortcuts and Tricks for Simple Interest & Compound Interest

6). If an amount at compound interest becomes twice in 5yr, then in how many years, it will be 16 times at the same rate of interest?

$2^{1/5} = 16^{1/x2}$
$=2^{4*1/x2}$
$1/5 = 4/x_2$
$X_2 = 5*4 =20$yrs

If a certain sum at compound interest amounts to A_1 in n yrs and A_2 in (n+1) yrs, then

Rate of compound interest $=(A_2 – A_1)/A_1 *100\%$
Sum = $A_1 (A_1 /A_2)^n$

7). A sum of money invested at compound interest amounts to 800 in 2yr and 840 in 3yrs. Find the rate of interest and the sum.

A_1 =800 ; A_2 =840,
Rate of interest = (840-800)/800 *100% =40/8 =5%
Sum = 800 $*(800/840)^2$ =320000/441 = Rs.725.62

If the populations of a city P and increases with the rate of R% per annum, then

- **Populations after n yr = $p(1+R/100)^n$**
- **Populations n yr ago = $p / (1+R/100)^n$**

8). The population of city A is 5000. It increases by 10% in 1st year. It decreases by 20% in the 2nd yr because of some reason. In the 3rd yr, the population increases by 30%. What will be the [population of area A at the end of 3yrs?

=5000(1+10/100)(1-20/100)(1+30/100)
= 500*(11/10)*(4/5)*(13/10) = 5720

Difference between ci and si 2yr =pr^2 /100^2

9). The difference between c.i and s.i for 2yr at the rate of 5% per annum is 5 .then the sum
5 = p $(5/100)^2$ = Rs.2000

Rate of interest (no .of years =2)
(for only ci)
2% = 4.04%
3% = 6.09%
4% = 8. 16%
5% = 10.25%
6% = 12.36%
7% = 14.49%
8% = 16.64%
9% = 18.81%
10%= 20.00+ 1.00 =21%

10). What is the Compound interest for Rs. 1500 at 5% rate of interest for 2 years?
1500*(10.25/100) =153.75