SIMPLE INTEREST

IMPORTANT FACTS AND FORMULAE

1..**Principal**: The money borrowed or lent out for a certain period is called the **principal**or the **sum.**

2**. Interest**: Extra money paid for using other's money is called **interest.**

3. **Simple Interest (S.I.)** : If the interest on a sum borrowed for a certain period is reckoned uniformly, then it is called **simple interest.**

Let Principal = P, Rate = R% per annum (p.a.) and Time = T years. Then,

(i) S.I. = (P*R*T)/100

(ii) P=(100*S.I)/(R*T) ;R=(100*S.I)/(P*T) and T=(100*S.I)/(P*R)

SOLVED EXAMPLES

Ex. 1.Find the simple interest on Rs. 68,000 at 16 2/3% per annum for 9 months.

Sol. P = Rs.68000,R = 50/3% p.a and T = 9/12 years = 3/4years.

$\therefore$ S.I. = (P*R*T)/100 = Rs.$\left(68{,}000*(50/3)*(3/4)*(1/100)\right)$= Rs.8500

Ex. 2. Find the simple interest on Rs. 3000 at 6 1/4% per annum for the period from

4th Feb., 2005 to 18th April, 2005.

Sol. Time = (24+31+18)days = 73 days = 73/365 years = 1/5 years.

P = Rs.3000 and R = 6 ¼ %p.a = 25/4%p.a

$\therefore$ S.I. = Rs.$\left(3{,}000*(25/4)*(1/5)*(1/100)\right)$= Rs.37.50.

Remark : The day on which money is deposited is not counted while the day on which money is withdrawn is counted .

Ex. 3. A sum at simple interests at 13 ½ % per annum amounts to Rs.2502.50 after 4 years find the sum.

Sol. Let sum be Rs. x then , S.I.=Rs.$\left(x*(27/2)*4*(1/100)\right)$ = Rs.27x/50

$\therefore$ amount = $\left(\text{Rs. } x+(27x/50)\right)$ = Rs.77x/50

$\therefore$ 77x/50 = 2502.50 $\Leftrightarrow$ x = $\frac{2502.50 * 50}{77}$ = 1625

Hence , sum = Rs.1625.

Ex. 4. A sum of Rs. 800 amounts to Rs. 920 in 8 years at simple intere

interest rate is increased by 8%, it would amount to bow mucb ?

Sol.S.l. = Rs. (920 - 800) = Rs. 120; p = Rs. 800, T = 3 yrs. _

. R = $\left((100 \text{ x } 120)/(800*3)\right)$ % = 5%.

New rate = (5 + 3)% = 8%.

New S.l. = Rs. (800*8*3)/100 = Rs. 192.

: New amount = Rs.(800+192) = Rs. 992.

Ex. 5. Adam borrowed some money at the rate of 6% p.a. for the first two years , at the rate of 9% p.a. for the next three years , and at the rate of 14% p.a. for the period beyond five years. 1£ he pays a total interest of Rs. 11, 400 at the end of nine years how much money did he borrow ?

Sol. Let the sum borrowed be x. Then,

(x*2*6)/100 + (x*9*3)/100 + (x*14*4)/100 = 11400

$\Leftrightarrow$ $\left(3x/25 + 27x/100 + 14x / 25\right)$ = 11400 $\Leftrightarrow$ 95x/100 = 11400 $\Leftrightarrow$ x = (11400*100)/95 = 12000.

Hence , sum borrowed = Rs.12,000.

Ex. 6. A certain sum of money amounts to Rs. 1008 in 2 years and to Rs.1164 in 3 ½ years. Find the sum and rate of interests.

Sol.. S.I. for 1 ½ years = Rs.(1164-1008) = Rs.156.

S.l. for 2 years = Rs.(156*(2/3)*2)=Rs.208

Principal = Rs. (1008 - 208) = Rs. 800.

Now, P = 800, T = 2 and S.l. = 208.

Rate =(100* 208)/(800*2)% = 13%

Ex. 7. At what rate percent per annum will a sum of money double in 16 years.

Sol.. Let principal = P. Then, S.l. = P and T = 16 yrs.

$\therefore$ Rate = (100 x P)/(P*16)% = 6 ¼ % p.a.

Ex. 8. The simple interest on a sum of money is 4/9 of the principal .Find the rate percent and time, if both are numerically equal.

Sol. Let sum = Rs. x. Then, S.l. = Rs. 4x/9

Let rate = R% and time = R years.

Then, (x*R*R)/100=4x/9 or R^2 =400/9 or R = 20/3 = 6 2/3.

$\therefore$ Rate = 6 2/3 % and Time = 6 2/3 years = 6 years 8 months.

Ex. 9. The simple interest on a certain sum of money for 2 l/2 years at 12% per annum isRs. 40 less tban the simple interest on the same sum for 3 ½ years at 10% per annum. Find the sum.

Sol. Let the sum be Rs. *x* Then, $\left((x*10*7)/(100*2)\right) - \left((x*12*5)/(100*2)\right) = 40$

$\Leftrightarrow$ (7x/20)-(3x/10)=40

$\Leftrightarrow x = (40 * 20) = 800.$

Hence, the sum is Rs. 800.

Ex. 10. A sum was put at simple interest at a certain rate for 3 years. Had it been put at 2% higher rate, it would have fetched Rs. 360 more. Find the sum.

Sol. Let sum = P and original rate = R.

Then, $\left[\left(P*(R+2)*3\right)/100\right] - \left[\left(P*R*3\right)/100\right] = 360.$

$\Leftrightarrow$ 3PR + 6P - 3PR = 36000 $\Leftrightarrow$ 6P=36000 $\Leftrightarrow$ P=6000

Hence, sum = Rs. 6000.

Ex. 11. What annual instalment will discharge a debt of Rs. 1092 due in 3 years at 12% simple interest?

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Sol .Let each Instalment be Rs. *x*

Then, $\left(x+\left((x*12*1)/100\right)\right) + \left(x+\left((x*12*2)/100\right)\right) + x = 1092$

$\Leftrightarrow$ (*(28x/25)* + (31x/25) + *x)* = 1092 $\Leftrightarrow$ (28x+31x+25x)=(1092*25)

$\Leftrightarrow$ x= (1092*25)/84 = Rs.325.

$\therefore$ Each instalment = Rs. 325.

Ex. 12. A sum of Rs. 1550 is lent out into two parts, one at 8% and another one at 6%. If the total annual income is Rs. 106, find the money lent at each rate.

Sol. Let the sum lent at 8% be Rs. x and that at 6% be Rs. (1550 - *x).*

$\therefore \left((x*8*1)/100\right) + \left((1550-x)*6*1\right)/100=106$

$\Leftrightarrow$8x + 9300 –6x=10600 $\Leftrightarrow$ 2x = 1300 $\Leftrightarrow$ x = 650.

$\therefore$ Money lent at 8% = Rs. 650. Money lent at 6% = Rs. (1550 - 650) = Rs. 900.

COMPOUND INTEREST

Compound Interest: Sometimes it so happens that the borrower and the lender agree to fix up a certain unit of time, say *yearly* or *half-yearly* or *quarterly* to settle the previous account.

In such cases, the amount after first unit of time becomes the principal for the second unit,the amount after second unit becomes the principal for the third unit and so on.

After a specified period, *the difference between the amount and the money borrowed is calledthe* Compound *Interest (abbreviated* as *C.I.) for that period.*

IMPORTANT FACTS AND FORMULAE

Let Principal = P, Rate = R% per annum, Time = n years.

I. When interest is compound Annually:

$$\text{Amount} = P(1+R/100)^n$$

II. When interest is compounded Half-yearly:

$$\text{Amount} = P[1+(R/2)/100]^{2n}$$

III. When interest is compounded Quarterly:

$$\text{Amount} = P[1+(R/4)/100]^{4n}$$

IV. When interest is compounded AnnuaI1y but time is in fraction, say 3(2/5) years.

$$\text{Amount} = P(1+R/100)^3 \times (1+(2R/5)/100)$$

V. When Rates are different for different years, say Rl%, R2%, R3% for 1st, 2nd and 3rd year respectively.

$$\text{Then, Amount} = P(1+R_1/100)(1+R_2/100)(1+R_3/100)$$

VI. Present worth of Rs.x due *n* years hence is given by :

$$\text{Present Worth} = x/(1+(R/100))^n$$

SOLVED EXAMPLES

Ex.1. ***Find compound interest*** **on** ***Rs. 7500*** **at 4%** ***per*** **annum** ***for*** **2** ***years, compounded*** **annually.**

Sol.

Amount = Rs $[7500*(1+(4/100)^2]$ = Rs(7500 * (26/25) * (26/25)) = Rs. 8112.

therefore, C.I. = Rs. (8112 - 7500) = Rs. 612.

Ex. 2.*Find compound interest* **on** ***Rs. 8000*** **at 15%** ***per*** **annum** ***for*** **2** ***years*** **4** ***months, compounded annually.***

Sol. Time = 2 years 4 months = 2(4/12) years = 2(1/3) years.

Amount = Rs'. $[8000 \text{ X } (1+(15/100))^2 \text{ X } (1+((1/3)*15)/100)]$

=Rs. [8000 * (23/20) * (23/20) * (21/20)]

= Rs. 11109.

:. C.I. = Rs. (11109 - 8000) = Rs. 3109.

Ex. 3.*Find the compound interest* **on** ***Rs. 10,000 in*** **2** ***years*** **at 4%** ***per*** **annum,** ***the interestbeing compounded half-yearly.*** **(S.S.C. 2000)**

Sol.

Principal = Rs. 10000; Rate = 2% per half-year; Time = 2 years = 4 half-years.

Amount =

Rs $[10000 * (1+(2/100))^4]$ = Rs(10000 * (51/50) * (51/50) * (51/50) * (51/50))

= Rs. 10824.32.

:. C.I. = Rs. (10824.32 - 10000) = Rs. 824.32.

Ex. 4.*Find the compound interest* **on** ***Rs. 16,000*** **at** ***20% per*** **annum** ***for*** **9** ***months, compounded quarterly.***

Sol. Principal = Rs. 16000; Time = 9 months =3 quarters;
Rate = 20% per annum = 5% per quarter.

Amount = Rs. $[16000 \text{ x } (1+(5/100))^3]$ = Rs. 18522.

CJ. = Rs. (18522 - 16000) = Rs. 2522.

Ex. 5.*If the simple interest* **on a** ***sum*** **of** ***money*** **at 5%** ***per*** **annum** ***for*** **3** ***years is Rs. 1200, find the compound interest*** **on** ***the same sum for the*** **same** ***period at the same*** **rate.**

Sol.

Clearly, Rate = 5% p.a., Time = 3 years, S.I.=Rs. 1200. . .

So principal=RS [100*1200]/3*5=RS 8000

Amount = Rs. 8000 x [1 +5/100]^3 - = Rs. 9261.

.. C.I. = Rs. (9261 - 8000) = Rs. 1261.

Ex. 6.*In what time will Rs. 1000 become Rs.* 1331 at *10% per* annum *compounded annually?* **(S.S.C. 2004)**

Sol.
Principal = Rs. 1000; Amount = Rs. 1331; Rate = 10% p.a. Let the time be n years. Then,
$[1000 (1+ (10/100))^n] = 1331$ or $(11/10)^n = (1331/1000) = (11/10)^3$
n = 3 years.

Ex. 7.*If Rs. 600 amounts* to *Rs. 683.20 in* two years *compounded* annually, find the rate of *interest per* annum.

Sol. Principal = Rs. 500; Amount = Rs. 583.20; Time = 2 years.
Let the rate be R% per annum.. 'Then,

$[500 (1+(R/100)^2] = 583.20$ or $[1+ (R/100)]^2 = 5832/5000 = 11664/10000$

$[1+ (R/100)]^2 = (108/100)^2$ or $1 + (R/100) = 108/100$ or $R = 8$

So, rate = 8% p.a.

Ex. 8.*If the compound interest* on a *certain sum* at 16 (2/3)% *to* 3 *years is Rs.1270, find the simple interest* on *the same sum* at *the same* rate and *f or the* same period.

Sol. Let the sum be Rs. x. Then,

C.I. = $[x * (1 + ((50/(3*100))^3 - x] = ((343x / 216) - x) = 127x / 216$

$127x /216 = 1270$ or $x = (1270 * 216) / 127 = 2160.$

Thus, the sum is Rs. 2160
S.I. = Rs$(2160 * (50/3) * 3 * (1 /100)) = Rs. 1080.$

Ex. 9.*The difference* between *the compound interest* and *simple interest* on a *certain sum* at 10% *per* annum *for* 2 *years is Rs.* 631. *Find the sum.*

Sol. Let the sum be Rs. x. Then,

C.I. = $x(1 + (10 /100))^2 - x = 21x / 100 ,$

S.I. = $((x * 10 * 2) / 100) = x / 5$

(C.I) - (S.I) = $((21x / 100) - (x / 5)) = x / 100$

$(x / 100) = 632$ □ $x = 63100.$

Hence, the sum is Rs.63,100.

Ex. 10.*The difference* between *the compound interest* and *the simple* interest *accrued* on an amount *of Rs. 18,000 in* 2 *years was Rs. 405. What* was *the* rate *of interest p.c.p.a.* ? (Bank P.O. 2003)

Sol. Let the *rate* be R% p.a. then,

$[18000(1 + (R / 100)^2) - 18000] - ((18000 * R * 2) / 100) = 405$

$18000 [(100 + (R / 100)^2 / 10000) - 1 - (2R / 100)] = 405$

$18000[((100 + R)^2 - 10000 - 200R) / 10000] = 405$

$9R^2 / 5 = 405 \Rightarrow R^2 = ((405 * 5) / 9) = 225$

$R = 15.$

Rate = 15%.

Ex. 11.*Divide Rs. 1301 between A and B, so that the amount* of *A after* 7 *years is equal to the amount* of *B after* 9 *years, the interest being compounded at* 4% *per annum.*

Sol. Let the two parts be Rs. x and Rs. (1301 - *x).*

$x(1+4/100)^7 =(1301-x)(1+4/100)^9$

$x/(1301-x)=(1+4/100)^2=(26/25*26/25)$

$625x=676(1301-x)$

$1301x=676*1301$

$x=676.$

So,the parts are rs.676 and rs.(1301-676)i.e rs.676 and rs.625.

Ex.12. a certain sum amounts to rs.7350 in 2 years and to rs.8575 in 3 years.find the sum and rate percent.

S.I on rs.7350 for 1 year=rs.(8575-7350)=rs.1225.

*Rate=(100*1225/7350*1)%=16 2/3%*

Let the sum be rs.x.then,

$X(1+50/3*100)^2=7350$

$X*7/6*7/6=7350$

$X=(7350*36/49)=5400.$

Sum=rs.5400.

Ex.13.a sum of money amounts to rs.6690 after 3 years and to rs.10,035 after 6 years on compound interest.find the sum.

Sol. *Let the sum be rs.P.then*

$P(1+R/100)^3=6690…(i)$ *and* $P(1+R/100)^6=10035…(ii)$

On dividing,we get $(1+R/100)^3=10025/6690=3/2.$

Substituting this value in (i),we get:

$P*3/2=6690$ *or* $P=(6690*2/3)=4460$

Hence,the sum is rs.4460.

Ex.14. a sum of money doubles itself at compound interest in 15 years.in how many years will it beco,e eight times?

$P(1+R/100)^{15}=2P$

$(1+R/100)^{15}=2P/P=2$
$LET\ P(1+R/100)^{n}=8P$
$(1+R/100)^{n}=8=2^{3}=\{(1+R/100)^{15}\}^{3}[USING\ (I)]$
$(1+R/100)^{N}=(1+R/100)^{45}$
$n=45.$
Thus,the required time=45 years.

Ex.15.What annual payment will discharge a debt of Rs.7620 due in 3years at 16 2/3% per annum interest?

Sol. Let each installment beRs.x.

Then,(P.W. of Rs.x due 1 year hence)+(P>W of Rs.x due 2 years hence)+(P.W of Rs. X due 3 years hence)=7620.

$\therefore\ x/(1+(50/3*100))+ x/(1+(50/3*100))^{2} + x/(1+(50/3*100))^{3}=7620$

$\Leftrightarrow(6x/7)+(936x/49)+(216x/343)=7620.$

$\Leftrightarrow 294x+252x+216x=7620*343.$
$\Leftrightarrow x=(7620*343/762)=3430.$
$\therefore$ Amount of each installment=Rs.3430.