एकाइ (Unit): 3

चक्रिय ब्याज (Compound Interest)

3.1 चक्रिय ब्याज (Compound Interest)

केहि महत्वपूर्ण सूत्रहरु (Some Important Formula:)

- यदि साँवा वा मूलधन = P साधारण ब्याजदर = R %
  समय = T र साधारण ब्याज = SI भए

  साधारण ब्याज (SI) = $\frac{PTR}{100}$

  If Principal = P Simple Rate of Interest = R %
  Time = T Yrs and Simple Interest = SI, then

  Simple Interest (SI) = $\frac{PTR}{100}$

- यदि साँवा वा मूलधन = P , चक्रिय ब्याजदर = R%
  (वार्षिक) समय = T बर्ष चक्रिय ब्याज = CI र चक्रिय मिश्रधन = CA भए
  If Principal = P Rate of compound Interst = R %
  (yearly), Time = T yrsCompound Interest = CI
  and Compound amount = CA

  $\therefore CA = P\left(1+\frac{R}{100}\right)^T \quad CI = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

- यदि साँवा = P, चक्रिय ब्याजदर = $\frac{R}{2}$ % (अर्धवार्षिक)

  समय = 2T बर्ष र चक्रिय ब्याज = CI र चक्रिय मिश्रधन = CA भए

  If Principle = P, Compound Interest Rate (R) = $\frac{R}{2}$ % (Semi annually)

  Time (T) = 2T yrsCompound Amount = CA and Compound Interst = CI

  $\therefore \quad CA = P\left(1+\frac{R}{200}\right)^{2T} \quad CI = P\left[\left(1+\frac{R}{200}\right)^{2T} - 1\right]$

- यदि साँवा = P चक्रिय ब्याजदर = R % (वार्षिक)
  समय = T बर्ष, m महिना मिश्रव्याज = (CI) र
  चक्रिय मिश्रधन = CA भए
  If Principle = P Compound Interest Rate (R) = R %
  Time (T) = T Yrs and m months Compound
  Interest = CI and Compound amount = CA

  $CA = P\left(1+\frac{R}{100}\right)^T\left(1+\frac{mR}{1200}\right), \quad CI = P\left[\left(1+\frac{R}{100}\right)^T\left(1+\frac{mR}{1200}\right)-1\right]$

- यदि साँवा = P, चक्रिय ब्याजदर (R) = $\frac{R}{2}$ % (अर्धवार्षिक)

  समय (T) = 2T बर्ष र m महिना, र मिश्रव्याज = (CI) र
  चक्रिय मिश्रधन = CA भए

  If Principal = P, Compound rate (R) = $\frac{R}{2}$ % (Semi – annually)

  Time = 2T yrs m months, Compound Interest = CI
  and Compound Amount = CA

$\therefore \quad CA = P\left(1+\frac{R}{200}\right)^{2T}\left(1+\frac{mR}{1200}\right),\ CI = P\left[\left(1+\frac{R}{200}\right)^{2T}\left(1+\frac{mR}{1200}\right)-1\right]$

- यदि साँवा = P, चक्रिय ब्याजदर (R) = $\frac{R}{4}$ % (त्रैमासिक)
  समय = 4T बर्ष, मिश्रव्याज = (CI) र
  चक्रिय मिश्रधन = CA भए
  If Principal = P, Compound rate (R) = $\frac{R}{4}$ % (Per quarter – yearly))
  Time (T) = 4T yrs, Compound Interst = CI
  and Compound Amount = CA
  $\therefore \quad CA = P\left(1+\frac{R}{400}\right)^{4T}\ CI = \left[\left(1+\frac{R}{400}\right)^{4T}-1\right]$
- यदि साँवा = P, चक्रिय ब्याजदर (R) = तीन महिनामा
  प्रति वर्ष R_1 %, R_2 %, R_3 % भए
  समय (T) = 3 बर्षमा
  T_1 = 1बर्ष T_2 = 1 बर्ष T_3 = 1 बर्ष
  चक्रिय ब्याज = CI र चक्रिय मिश्रधन = CA भए
  If Principal = P Rate of Interest (R) = rate being different in different years.
  R_1 % R_2 % and R_3 % are in first year, in 2nd year and 3rd year respectively. Time (T) = 3 yrs T_1 = 1 year T_2 year T_3 = 1 year
  Compound intesrt = CI and Compound amount = CA
  $CA = P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right)$
  $CI = P\left[\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right)-1\right]$
- यदि साँवा = P, चक्रिय ब्याजदर = R %, समय = T वर्षमा
  मिश्रधन = CA_1 र समय = (T + 1) वर्षमा, मिश्रधन = CA_2 भए
  If T yrs, and compound amount = CA_1, Time = (T + 1) yrs Compound amount = CA_2
  $R\ \% = \left(\frac{CA_1}{CA_2}-1\right)\times 100\ \%\ \ P = \frac{CA_1}{\left(1+\frac{R}{100}\right)^T}$
- यदि साँवा = P समय = 1 वर्षमा
  चक्रिय ब्याज = CI, र समय = 2 वर्षमा
  ब्याज = CI_2 भए
  If Principal = P Time = 1 year and
  Compound Interst = CI_1 Time – In 2 years and
  Compound Interst = CI_2
  $R\ \% = \left(\frac{CI_2}{CI_1}-1\right)\times 100\ \%\ P = \frac{CI\times 100}{R}$
- 1 वर्ष वा सो समय भन्दा कम अवधिको वार्षिक चक्रिय ब्याज र साधारण ब्याज एउटै हुन्छ ।
  The annual compound interest for 1 year or less will be same as the simple interest.
- 6 महिना वा सो भन्दा कम अवधिको अर्धवार्षिक चक्रिय ब्याज र साधारण ब्याज एउटै हुन्छ ।
  The semiannual compound interest for 6 month or less will be the same as the simple interest.

Very Short Questions

1. मूलधन Pको T वर्षमा R % प्रतिवर्ष दरले चक्रिय ब्याज र मिश्रधन क्रमश CI र CA भएP, T R र CI को वार्षिक चक्रिय रुपमा सम्बन्ध लेख्नुहोस् ।
   The compound interest and compound amount on a sum of P is T yrs at R % are CI and CA respectively, write the relation among P, T,R and CI

2. P, T, R, र CI को अर्धवार्षिक चक्रिय ब्याजको रुपमा सम्बन्ध लेख्नुहोस् ।
Write the relation among of P,T, R and CA compounding semiannually
3. मिश्रित ब्याज अनुसार मिश्रधन A , वार्षिक ब्याजदर R % समय T भए मुलधन P कति होला ।
According to compound interest, A is the compound, R is the rate percent perannum and T is the time, what will be the principal.
4. कुनै धन P को T वर्षमा R % दरले चक्रिय मिश्रधन CA हुन्छ भने P, T, R र CA को सम्वन्ध लेख्नुहोस् ।
The compound amount on a sum P in T yrs at R % perannum in CA, write down the relation among P, T, R and CA.
5. कुनै मुलधनको P को चक्रिय मिश्रधन वार्षिक ब्याजदर क्रमस R_1 %, R_2 % र R_3 % पहिलो दोश्रो र तेश्रो वर्ष भए CA को सम्बन्ध लेख्नुहोस् ।
If CA is the compound amount of a sum of P at the different rates R_1 % R_2 %, R_3 % in first first, 2nd and 3rd yea rs respectively write the relation among CA, P, R_1 % R_2 % and R_3 % (compounded annually)
6. यदि व्याज दर प्रति 2 रुपैयाको 3 पैसाको दरले प्रतिमहिना भए व्याज दर निकाल्नुहोस् ।
Find the rate of interst, if the rate compound intent is 3 Rs 2 per mounth.
7. दुई वटा लगातार आउने वर्षहरूको लामो चक्रियव्याजहरू क्रमश 300 र 330 भए 2 वर्षको व्याज कति होला?
The compound interst for two suceslive respectively Rs 300 and 330 find the compont of two yrs.
8. चक्रिय व्याजदर अनुसार A चक्रिय मिश्रधन, R अर्धवार्षिक व्याजदर र समय T भए साँवा (P) कति हुन्छ ?
According to the compound interest, A is the compound amount R is rate of percent semi annually and T is the time what wil be the principal (P).
9. यदि CA साँवा P को चक्रिय मिश्रधन T वर्ष M महिनाको वार्षिक व्याजदर R % भए P, T, M, R र CA को सम्वन्ध लेख्नुहोस् ।
The compound amount on sum P in T yrs M months at R % P is CA w rite relation among P, T, M R and CA compounding annually.
10. यदि CI साँवा P को वार्षिक व्याजदर R % र समय T वर्ष M महिनाको चक्रिय हो भने P, R, T M र C I को सम्वन्ध लेख्नुहोस् ।
If CI is the compound interst of a sum P in T yrs M months at R % P a write the relation among P, T, M, R and CI.
11. साधारण व्याज र चक्रिय व्याजको कुनै एउटा भिन्नता लेख्नुहोस् जसमा ए,च र त ले क्रमश साँवा, व्याजदर र समय जनाउछ ।
Write any one difference simple interst and compound interest. If in which P, R and T denoted principal, Rate of in terest and time repectively.
12. यदि T_1 र T_2 वर्षका लागि व्याजदर क्रमश R_1% र R_2% प्रतिवर्ष र मूलधन र P भए चक्रिय मिश्रव्याज पत्ता लगाउन सुत्रलेख्नुहोस् ।
If R_1% and R_2% rate of u\interest for T_1 and T_2 yrs respectively and P is principal thenwrite the formula of compound interest.

Short Questions

Model 1

कति प्रतिशत चक्रिय व्याजदरले 2 वर्षमा रु 700 को मिश्रधन रु 847 हुन्छ ।
At what rate percent compound interst will Rs 700 amount to Rs 847 in 2 yrs.
Solution:
Time (T) = 2 yrs
Principal (P) = Rs 700
Compound amount (CA) = Rs 847
Rate of compound interst = R%

$$CA = P\left(1+\frac{R}{100}\right)^{T}$$

or, $\text{Rs } 847 = \text{Rs } 700\left(1+\frac{R}{100}\right)^{2}$

or, $\frac{\text{Rs } 847}{\text{Rs } 700} = \left(1+\frac{R}{100}\right)^{2}$

or, $(1.1)^2 = \left(1+\frac{R}{100}\right)^{2}$

or, $(1.1-1) = \frac{R}{100}$

or, $0.1 \times 100 = R$

$\therefore$ $R = 10\ \%$

Rate of compound interest (R) = 10 %

Model 2

रु 2500 को 8 % वार्षिक चक्रिय व्याज का दरले 2 वर्षको मिश्रधन कति हुन्छ ।

Calculate the compound amount on Rs 2500 at the rate of 8 % for 2 yrs ?

Solution:

Here,

Time (T) = 2 yrs

Principal (P) = Rs 2500

Rate of compound interest (R) = 8%

Compound Amount (CA) = ?

$$CA = P\left(1+\frac{R}{100}\right)^{T}$$

or, $CA = \text{Rs } 2500\left(1+\frac{8}{100}\right)^{2}$

or, $CA = \text{Rs } 2500\ (1+0.08)^2$

or, $CA = \text{Rs } 2500\ (1.08)^2$

or, $CA = \text{Rs } 2500 \times 1.1664$

$\therefore$ $CA = \text{Rs } 2916$

Compound amount (CA) = Rs 2916

Model 3

रामले 8 % अर्धवार्षिक चक्रिय व्याज दिने वैङकमा रु 85000 जम्मा गरयो भने 1 वर्षमा कति व्याज पाउछ ?

Ram deposite Rs 85000 at Bank at the half – yerly rate of interst 8 % per 1year. How much interst will he get.

Solution:

Here,

Rate Compound Interest (R) = 8 % (half yearly)

Principal (P) = Rs 85000

Time (T) = 1 year

$$CI = P\left[\left(1+\frac{R}{200}\right)^{2T}-1\right] = \text{Rs } 85000\left[\left(1+\frac{8}{200}\right)^{2\times 1}-1\right]$$

$= \text{Rs } 855000\left[(1+0.04)^2-1\right] = \text{Rs } 85000\left[(1.04)^2-1\right] = \text{Rs } 85000\ [1.0816-1]$

$= \text{Rs } 85000 \times 0.0816 = \text{Rs } 6936$

Compound Interest (CI) = Rs 6936

Model 4

कति दिपकले वार्षिक 9% चक्रिय व्याजदरमा केहिरकम जम्मा गर्दा 2 वर्ष पछि रु 18810 व्याज पायो भने बति साँवा जम्मा गरेको रहेछ ?

Dipak got Rs. 18810 interest of some of money for 2 yrs at 9 % compound yearly, find the sum.

Solution:

Here,

Rate compound Interest (R) = 9 %

Time (T) = 2yrs

Compound interst (CI) = Rs 18810

Sum of money (P) = ?

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

or, $\text{Rs } 18810 = P\left[(1+0.09)\right]^2 - 1)$

or, $\text{Rs } 18810 = P\left[(1.09)\right]^2 - 1)$

or, $\text{Rs } 18810 = P \times (1.1881 - 1)$

or, $\text{Rs } 18810 = P \times 0.1881$

$\therefore \quad P = \frac{\text{Rs } 18810}{\text{Rs } 0.1881} = \text{Rs } 100000$

$\therefore$ Principle (P) = Rs 100,000

Model 5

रु 5000 को कति वर्षमा वार्षिक 10 % चक्रिय व्याजदरले चक्रिय मिश्रधन रु 6052 हुन्छ ।

In how many yrs the compound interest of Rs 5000 at 10 % P.a is Rs 6050.

Solution:

Here,

Principal (P) = Rs 5000

Rate of Interst (R) = 10 %

Compound amount (CA) = Rs 6050

Time (T) = ?

$$CA = P\left(1+\frac{R}{100}\right)^T$$

or, $\text{Rs } 6050 = \text{Rs } 5000\left(1+\frac{10}{100}\right)^T$

or, $\frac{\text{Rs } 6050}{\text{Rs}5000} = (1+0.1)^2$

or, $1.21 = (1.1)^T$

or, $(1.1)^2 = (1.1)^T$

$\therefore \quad T = 2\text{yrs}$

$\therefore$ Time (T) = 2yrs

Model 6

पहिलो वर्ष 8% र दोस्रो वर्ष 10% प्रतिवर्ष व्याजको दरले रु 100 को चक्रिय मिश्र ब्याज कति होला?

Find the compound Interest of Rs 7000 for 2 yrs at the rate of 8% for 1st year and 10% for 2nd year.

Solution:

Here principal (p) = Rs 7000

for 1st rate of interest (R_1) = 8%

for 2nd Rate of interest (R_2) = 10%

Then T_1 = 1 years T_2 = 1 year

$$\therefore CI = p\left[\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)-1\right]$$

$= \text{Rs } 7000\left[\left(1+\frac{8}{100}\right)\left(1+\frac{10}{100}\right)-1\right] = \text{Rs } 7000\ [(1+0.08)(1+0.1)-1]$

$= \text{Rs } 7000\ [1.08 \times 1.1 - 1] = \text{Rs } 7000 \times 0.188 = \text{Rs } 1316$

Compound Interest(C_2) = Rs 1316

Model 7

कति वर्षमा 3% प्रतिवर्ष व्याजदर चक्रिय व्याज रु 90.675 हुन्छ ? जहाँ अर्धवार्षिक व्याजहरूमा जोडिन्छ ?

In the how many yrs the compound interest of Rs 3000 at 3% per year will be Rs 90.675, where the interest is compounded semi–annually.

Solution:

Pricipal (p) = Rs 3000

Rate of interest (R) = 3%

Time (T) = ? compound interest (CI) = Rs 90.675

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

or, $\text{Rs } 90.675 = \text{Rs } 3000\left[\left(1+\frac{3}{100}\right)^T - 1\right]$

or, $\frac{\text{Rs } 90.675}{\text{Rs } 3000} = (1+0.015)^T - 1$

or, $0.030225 = (1.075)^T - 1$

or, $1 + 0.030225 = (1.015)^T$

or, $1.030225 = (1.015)^T$

or, $(1.015)^2 = (1.015)^2$

$\therefore$ T = 2 yrs $\therefore$ Time (T) = 2 yrs

Model 8

रु 10,0000 को 10% प्रतिवर्ष का दरले 1 वर्षको वार्षिक चक्रिय व्याज र साधारण व्याज पत्ता लगाउनुहोस्

Find the compound interest yraly and simple interest if. Rs 10,000 1 yrs at the rate of interest 10%.

Solution:

Here principal (p) = Rs 10,0000

Rate interest ® = 10%

Time (T) = 1 year

$CI = p\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= \text{Rs } 10{,}000\left[\left(1+\frac{10}{100}\right)^1 - 1\right] = \text{Rs } 10{,}000\ [-(1.1)-1] = \text{Rs } 100000 \times 0.1 = \text{Rs } 10{,}000$

Compound interest (CT) = Rs 10,000

$SI = \frac{PTR}{100} = \frac{\text{Rs } 10{,}0000 \times 1 \times 10}{100} = \text{Rs } 10{,}000$

Simple interest (SI) = Rs. 10,000

Model 9

रु 30,000 को 10% प्रतिवर्ष व्याजको दरले 6 अर्धवार्षिक व्याज र साधारण व्याज पत्ता लगाउनुहोस् ।

Find the semiannually compound interest and simple interest. If the Rs 3000 for 6 months at the rati of 10%. p.d.

Solution:

Here principal (p) = Rs 30,000, Time (T) = 6 months = $\frac{1}{2}$ yrs

Rate of interest (R) = 10%

$$CI = p\left[\left(1+\frac{R}{200}\right)^{2T}-1\right] = \text{Rs } 30{,}000\left[\left(1+\frac{10}{200}\right)^{2\times\frac{1}{2}}-1\right]$$

$= \text{Rs } 30{,}000\ [(1+0.05)-1] = \text{Rs. } 30{,}000\ [1.05-1] = \text{Rs. } 30{,}000 \times 0.05 = \text{Rs. } 1500$

Compound interest semiannually (CI)= 63000

$$SI = \frac{PTR}{100} = \frac{\text{Rs } 30{,}000 \times \frac{1}{2} \times 10}{100} = \text{Rs. } 1500$$

Simple interest (SI) = Rs. 1500

Model 10

कुनै मुलधनको पहिलो र दोस्रो वर्षको वार्षिक चक्रिय व्याजहरू क्रमश रु 225 र रु 240 भए व्याजदर पत्ता लगाउनुहोस् ।

The compound interest for the 1st and 2nd years of a sum of money corresponding year are Rs 225 and Rs 240 respectively. Find the rate of compound interest.

Solution:

Time (T) = 1 year — Time = 2yrs

Compound interest (CI_1) = Rs 225 — compound interest (CI_2) = Rs 240 + Rs 225 = Rs 465

$$R = \left(\frac{CI_2}{CI_1}-1\right)\times 100\% = \left(\frac{465}{225}-2\right)\times 100\ \%$$

$$= \text{Rs. } \frac{465-450}{225}\times 100\% = \frac{15\times 100\%}{4515} = \frac{100}{15}\% = \frac{20}{3}\% = 6\frac{2}{3}\%$$

Rate of compound interest (R) = $6\frac{2}{3}\%$

Practice Yourself

1. कति प्रतिशत चक्रिय व्याजले 2 वर्षमा रु 625 को मिश्रधन रु 729 हुन्छ ?
   At what rate of compound interst will be Rs 625 amount to Rs 729 in 2 yrs ? **(Ans: 8 %)**
2. कति समयमा वार्षिक चक्रिय व्याजदर 8 % ले रु 1250 को रु 1458 हुन्छ ?
   In how many yrs with the compound interest on Rs 1250 to be Rs 1450 at 8 % P.a. **(Ans: 2 yrs)**
3. केहि निश्चित रुपैयाको 10 % वार्षिक चक्रिय व्याजदर ले 2 वर्ष मा मिश्रधन रु 7260 हुन्छ भने साँवा पत्ता लगाउनुहोस् ।
   If the compound amount on certain sum of money at 10 % for 2 yrs is Rs 7260, find the sum. **(Ans: Rs 6000)**
4. दिपाले 8 % अर्धवार्षिक मिश्रधन दरमा NABIL बैङकमा Rs.85000 जम्मा गर्दा 1 वर्षमा व्याज कति हुन्छ ।
   Deepa deposists Rs 85000 at NABIL Bank at half –yearly compound interest rate of 8 % in 1 year. How many interest will she get. **(Ans : Rs 6936)**
5. प्रतिवर्ष 5 % दरले 2 वर्षमा चक्रिय मिश्रधन रु 13230 हुन्छ भने साँवा कति हुन्छ ।
   The compound amount of a sum of money for 2 yrs at 5 % is Rs 13230. What is the sum of money. **(Ans: Rs 12000)**
6. रु 50000 को 1 वर्ष 6 महिनामा चक्रिय व्याजदर अनुसार अर्धवार्षिक व्याज निकाल्नुहोस् ।
   Find the half – yearly compound interest on Rs 50,000 for 1 year 6 month at the rate of interest of 10 %. **(Ans: Rs 7881.25)**

Long Questions

Model 1

वार्षिक 21 % व्याजदरमा सीताले राधासंग रु 170,000 सापटी लिइछन भने 1 वर्ष 6 महिमाको अन्त्यमा
Sita borrowed Rs 170,000 from Radha at the rate of 21 % perannum at the and 1 year 6 months.

(i) उनले साधारण व्याज कति तिर्नुपर्ला ?
How much simple interest will she have to pay?

(ii) चक्रिय व्याज कति तिर्नुपर्ला ?
How much compound interest will the she have to pay?

Solution:

Here,
Principal (P) = Rs 170,000
Rate of interest (R) = 21 %

Time (T) = 1 year 6 month $= \left(1 + \frac{1}{2}\right)$ yrs $= \frac{3}{2}$ yrs

If simple interst = SI

$$SI = \frac{PTR}{100} = \frac{\text{Rs } 170000 \times \frac{3}{2} \times 21}{100} = \text{Rs } 53550$$

Simple interest (SI) = Rs 53550
If compound interest = CI

$$CI = P\left[\left(1 + \frac{R}{100}\right)^T \left(1 + \frac{mR}{1200}\right) - 1\right]$$

$$= \text{Rs } 170000\left[\left(1 + \frac{21}{100}\right)^1 \left(1 + \frac{6 \times 21}{1200}\right) - 1\right]$$

$= \text{Rs } 170000\ [(1 + 0.21)'(1 + 0.105) - 1 = \text{Rs } 170,000\ [1.21 \times 1.105 - 1]$
$= \text{Rs } 170,000\ [1.33705 - 1] = \text{Rs } 1,70,000 \times 0.33705 = \text{Rs } 57298.50$
Compound interest (CI) = Rs. 5729.50

Model 2

रामले 21% प्रतिवर्ष को दरले सितासँग रु 150000 साँपट लियो । 9 महिनाको अन्त्यमा अर्धवार्षिक रुपमा कति व्याज दिनुपर्छ ।
Ram borrowed Rs 150,000 from sita at the rateof 21% per year. At the and of 9 months how much compound interest should he pay compoded half yearly ?

Solution:

Here,
Rate of interest (R) = 21% principal (P) = Rs 1,50,000

Time (T) = 9 months $= \frac{1}{2}$ years 3 months (half–yearly)

compound interest = CI

$$CI = p\left[\left(1 + \frac{R}{200}\right)^{2t} \left(1 + \frac{mR}{1200}\right) - 1\right]$$

$$= \text{Rs } 150000\left[1 + \frac{21}{200}\right]^{2 \times \frac{1}{2}} \left[1 + \frac{3 \times 21}{1200} - 1\right]$$

$= \text{Rs } 150000\ [(1 + 0{,}105)'\ (1 + 0.0525) - 1] = \text{Rs } 1{,}50{,}000\ (1.105 \times 1.05525 - 1]$
$= \text{Rs } 150{,}000\ [1.1630125 - 1] = \text{Rs } 150{,}000 \times 0.1630125 = \text{Rs } 24451.875$
$\therefore$ Total compound interest 9 months (CI) = Rs 24451.875

Model 3

एक जना व्यापारीले रु 3000 दुई वर्षको लागि मुद्धति खातामा वार्षिक 10% दरले जम्मा गऱ्यो वैङ्कले अर्धवार्षिक चक्रिय व्याज दिन्छ भने 2 वर्षको अन्त्यमा मिश्रधन र मिश्रव्याज कति कति होला ?

A business man deposited Rs 3000 in the fixed deposite account of the bank for 2 years at the rate of 10% perannum. The interest is compounded semiannually How much will be amount and compound interest at the end of 2 years.

Solution:

Here, Principal (P) = Rs 3000 time (T) = 2 years

Rate of interest(R) = 10% (semiannually)

$$\therefore \text{CA} = p\left[1+\frac{R}{200}\right]^{2t} = \text{Rs } 3000\left[1+\frac{R}{200}\right]^{2\times 2}$$

$$= \text{Rs } 3000\,[1+0.05]^4 = \text{Rs } 3000 \times 1.2155062 = \text{Rs } 3646.5186$$

$$\therefore \text{CI} = p\left[\left(1+\frac{R}{200}\right)^{2T}-1\right] = \text{Rs } 3000\left[\left(1+\frac{10}{200}\right)^{2\times 2}-1\right]$$

$$= \text{Rs } 3000\,[(1+0.05)4-1] = \text{Rs } 3000\,[(1.05)4-1] = \text{Rs } 2000\,[1.2155062-1]$$

$$= \text{Rs } 3000 \times 0.2155062 = \text{Rs } 646.5186$$

$\therefore$ Compound amount (CA) = Rs 36465186

$\therefore$ Compound interest (CI) = Rs 446.52

Model 4

रु. 18000 को वार्षिक 15% ब्याजदरमा 2 वर्ष मा हुने साधारण ब्याज र वार्षिक चक्रिय ब्याज बीचको अन्तर निकाल्नुहोस् ।

Find the difference between simple interest and annual compound interest on Rs 18000 for 2 years at the rate of 15% per annum.

Solution:

Here,

Price (p) = Rs18000 rate of interst (R) = 15%

Time (T) = 2 years

Simple interest = SI

$$\text{SI} = \frac{PTR}{100} = \frac{\text{Rs } 18000\times 2\times 15}{100} = \text{Rs } 5400$$

Compound interest = CI

$$\text{CI} = P\left[\left(1+\frac{R}{100}\right)^{T}-1\right] = \text{Rs } 18000\left[\left(1+\frac{15}{100}\right)^{2}-1\right]$$

$$= \text{Rs } 18000\,[(1+0.15)^2-1] = \text{Rs } 18000\,[(1.15)^2-1]$$

$$= \text{Rs } 18000\,[1325-1] = \text{Rs } 18000 \times 0.3225 = \text{Rs } 5805$$

Difference of interest = CI – SI = Rs 5805 – Rs 5400 = Rs 405

Model 5

रु 8000 को 10% व्याजको दरले $1\frac{1}{2}$ वर्षमा हुने अर्धवार्षिक चक्रिय व्याज र साधारण ब्याजको फरक पत्ता लगाउनुहोस् ।

Find the difference between simple interest and compound interest compounded semi-annually on R 8000 at 10% p.a. in $1\frac{1}{2}$ years.

Solution:

Here, principal (P) = Rs 8000, Rate of interest (R) = 10% Time (T) = $1\frac{1}{2}$

$$= \frac{3}{2} \text{ years} = 1 \text{ years } 6 \text{ months}$$

If simple interest = SI

$$SI = \frac{PTR}{100} = \frac{Rs8000 \times \frac{3}{2} \times 10}{100} = \frac{Rs\ 8000 \times 15}{100} = Rs.\ 1200$$

$\therefore$ Simple interest (SI) = Rs 1200

Compound interest (CI) (Semianncally)

$$CI = p\left[\left(1+\frac{R}{200}\right)^{2T}\left(1+\frac{mR}{1200}\right)-1\right]$$

$$= Rs\ 8000\left[\left(1+\frac{10}{200}\right)^{2\times1}\left(1+\frac{6\times10}{1200}\right)-1\right] = Rs\ 8000\left[(1+0.05)^2\left(1+\frac{60}{1200}\right)-1\right]$$

$= Rs\ 8000\ [(1.05)^2\ (1.05) - 1] = Rs.\ 8000\ [1.1025 \times 1.05 - 1]$

$= Rs\ 8000 \times 0.157625 = Rs.\ 1261$

Compound interest (CI) = Rs. 1261

Difference of interest = CI – SI = Rs. 1261 – Rs 1200 = Rs. 61

Model 6

रु 14000 को 2 वर्षमा 12% ब्याजको दरले हुने वार्षिक चक्रिय ब्याज र अर्धवार्षिक चक्रिय ब्याजको अन्तर निकाल्नुहोस् ।

Find the difference between compound interest payable annually and half–yearly for a amount Rs. 14000 at the rate of 12% perannum for 2 years.

Solution:

Here principal (P) = Rs 14000 Rate of interest (R) = 12% time (T) = 2 years

of compound in terest = CI_A (annualy)

$$CI_A = p\left[\left(1+\frac{R}{100}\right)^{T}-1\right] = Rs\ 14000\left[\left(1+\frac{12}{100}\right)^{2}-1\right]$$

$= Rs\ 14000\ [(1 + 0.12)^2 - 1] = Rs\ 14000\ [(1.12)2 - 1] = Rs\ 14000\ [1.2533 - 1]$

$= Rs\ 14000 \times 0.2544 = Rs\ 3561.60$

Compound interest $(C.I)_A$ = Rs 3561.60

Again, compound interest CI_s (semianncally)

$$CI_s = P\left[\left(1+\frac{R}{200}\right)^{2T}-1\right] = Rs\ 14000\left[\left(1+\frac{12}{200}\right)^{2\times2}-1\right]$$

$= Rs\ 14000\ [1 + 0.06)^4 - 1] = Rs\ 14000\ [1.2624469 - 1]$

$= Rs\ 14000 \times 0.2624469 = Rs\ 3674.26$

Compound interest semiannually (CI_S) = Rs 367426

Difference of compound interest = $CI_s - CI_A$ = Rs 674.26 – 3561.60 = Rs 112.65

Model 7

वार्षिक 20% ब्याजदरले 2 वर्षमा हुने कुनै धनको मिश्रित ब्याज र साधारण ब्याजको फरक रु 400 हुन्छ भने साँवा पत्ता लगाउनुहोस् ।

Find the principal if the difference between the compound interest and the simple interest on a sum of money for 2 years at the interst rate of 20% per annun is Rs 400.

Solution:

Here Let the principal (P) be x

Rate of interest (R) = 20% Time (T) = 2 years

difference of interest = Rs 400

If simple interest = SI

$$SI = \frac{PTR}{100} = \frac{x \times 2 \times 20}{100} = 0.4\,x$$

Again, compound interest = CI

$$CI = p\left[\left(1+\frac{R}{100}\right)^{T}-1\right] = x\left[\left(1+\frac{20}{100}\right)^{2}-1\right]$$

$= x\ [(1 + 0.2)^2 - 1] = x\ [(1.2)^2 - 1] = x\ (1.44 - 1) = 0.44x$

According to the question

difference of interest = Rs 400

or, CI – SI = Rs. 4000

or, $0.44x - 0.4x = Rs.\ 400$

or, $0.04\ x = Rs\ 4000$

or, $x = \frac{Rs4000}{0.04}$

$\therefore$ $x = Rs.\ 10000$

Principal (P) = Rs. 10,000

Model 8

एक साहुले 3% प्रतिवर्ष साधारण ब्याजको दरले साँपट लिएछ र सो रकम वार्षिक 5% चक्रिय ब्याजको दरले लगानी गरेछ । यदि 3 वर्ष पछि उसले रु 1082 लाभ गरेछ भने कति रुपैया साँपट लिएको रहेछ ?

A money lender barrows a certain sum of money at 3% per annum simple interest and invest the same sum of money at 5% per annum compound interest compounded annually. If after 3 years he makes a profit of Rs 1082. What is the amount he borrowed ?

Solution:

Let the sum of money (P) be x

Rate of simple interest (R) = 3%, Time (T) = 3 years

$SI = \frac{PTR}{100}$

$= \frac{x \times 3 \times 3}{100} = \frac{9x}{100} = 0.09x$

Again, Rate compound interest (R) = 5%

Time (T) = 3 years Principal (P) = x

$CI = p\left[\left(1 + \frac{R}{100}\right)^T - 1\right] = x\left[\left(1 + \frac{5}{100}\right)^3 - 1\right]$

$= x\ [1 + 0.05)^3 - 1] = x\ [(1.05)^3 - 1] = [1.157625 - 1] = x \times 0.157625 = 0.157625x$

According to the question

Profit of interest = Rs. 1082

or, $0.157625\ x - 0.09x = Rs.\ 1082$

or, $0.067625\ x = Rs.\ 1082$

or, $x = \frac{Rs\ 1082}{0.067625}$

or, $x = Rs\ 16000$

$\therefore$ The principal (P) = Rs. 16000

Model : 9

वार्षिक 20% ब्याजदरले 2 वर्षमा कुनै धनराशीको वार्षिक चक्रिय ब्याज र अर्धवार्षिक चक्रिय ब्याजको अन्तर रु 482 भए सो धनराशी पत्ता लगाउनुहोस् ।

The difference between the annual and semiannual compound interest of a sum of money Rs 482 at the rate to 20% per annum for 2 years find the sum.

Solution:

Here, the sum of money (P) be x

Rate of interest (R) = 20%, Time (T) = 2 years if annual compound interest = CI_A

$CI_A = P\left[\left(1 + \frac{R}{100}\right)^T - 1\right] = x\left[\left(1 + \frac{2}{100}\right)^2 - 1\right]$

$= x\ [1 + 0.2)2 - 1] = x\ [(1.2)2 - 1] = x\ (1.44 - 1] = 0.44x$

Again, semiannual compound interest = CIs

$CI_s = P\left[\left(1 + \frac{R}{200}\right)^2 - 1\right]^T = x\left[\left(1 + \frac{20}{200}\right)^{2 \times 2} - 1\right]$

$= x\ [(1 + 0.1)4 - 1] = x(1.4641 - 1] = 0.4641x$

According to the questions
Difference Interest = Rs 482
or, $CIs - CI_A$ = Rs 482
or, 0.4641 x – 0.44x = Rs 482
or, 0.0241x = Rs 482
or, $x = \frac{482}{0.0041}$
∴ x = Rs 20000
The sum of money (P) = Rs 20,000

Model 10

वार्षिक 10% को दरले 3 वर्षमा अन्त्यमा साधारण ब्याज र चक्रिय ब्याजको योग रु 504.80 भए मूलधन पत्ता लगाउनुहोस् ।

The sum of simple interest and compound interest after 3 years is Rs 504.80 and the rate of interest 10% per annum. find the principal.

Solution:

Here, Let the principal (P) be x
Rate of interest (R) = 10%
Time (T) = 3 years
if simple interest = SI

$$SI = \frac{PTR}{100}$$

$$= \frac{x \times 3 \times 10}{100} = \frac{300}{100} = 0.3x$$

If compound interest = CI (annually)

$$CI = P\left[\left(1 + \frac{R}{100}\right)^T - 1\right] = x\left[\left(1 + \frac{20}{100}\right)^3 - 1\right]$$

$$= x\,[(1 + 0.1)3 - 1] = x\,[(1.1)3 - 1]$$
$$= x\,[1.331 - 1] = 0.331x$$

According to the question
Sum of interest =Rs 504.80
or, SI + CI = Rs 504.80
or, 0.3x + 0.331x = Rs 504.80
or, 0.631x = Rs 504.80
or, $x = \frac{Rs504.80}{0.631}$
Principal (P) = Rs 800.

Model : 11

ार्षिक चक्रिय ब्याज दरमा कुनै रकम 3 वर्षमा रु 13310 र 4 वर्षमा 14641 पुग्दछ भने चक्रिय ब्याजदर र मूलधन पत्ता गाउनुहोस् ।

The compound amount of a sum of money 3 years is Rs 13310 and in 4 years is Rs 14641. find the ompound rate of interest preannum and sum.

olution:

Here, Let the principal be P and Rate of compound interest be R%
Time (T) = 3 years
Compound amomt (CA) = Rs 13310

$$CA = P\left(1 + \frac{R}{100}\right)^T$$

or, $\text{Rs}13310 = P\left(1+\frac{R}{100}\right)^{3}$ .....(i)

Again, time (T) = 4 years compound amomt (CA) = Rs 14641

$CA = P\left(1+\frac{R}{100}\right)^{T}$

or, $\text{Rs } 14641 = P\left(1+\frac{R}{100}\right)^{4}$ .....(ii)

From equation (ii) $\text{Rs } 14641 = P\left(1+\frac{R}{100}\right)^{3} \times \left(1+\frac{R}{100}\right)$ .....(iii)

From equation (i) and (iii) we get

$\text{Rs } 14641 = P\left(1+\frac{R}{100}\right)^{3}\left(1+\frac{R}{100}\right)$

or, $\text{Rs } 14641 = \text{Rs } 13310 \times \left(1+\frac{R}{100}\right)$

or, $\text{Rs } 14641 = \text{Rs } 13310 \times \left(1+\frac{R}{100}\right)$

or, $\frac{14641}{\text{Rs } 13310} = \left(1+\frac{R}{100}\right)$

or, $1{:}1 = 1+\frac{R}{100}$

or, $(1.1-1) = \frac{R}{100}$

or, $0.1 \times 100 = R$

$\therefore$ $R = 10\%$

Putting the value of R in equation (i), we get

$\therefore$ $\text{Rs } 13310 = P\left(1+\frac{10}{100}\right)^{3}$

or, $\text{Rs } 13310 = P\,[1 + 0.1)3$

or, $\text{Rs } 13310 = P \times (1.1)3$

or, $\text{Rs } 13310 = P \times 1.331$

or, $P = \frac{\text{Rs } 13310}{1.331}$

$\therefore$ $P = \text{Rs } 10{,}000$

Principal (P) = Rs 10000, Rate of interest (R) = 10%

Model 12:

वार्षिक चक्रिय ब्याजदरमा कुनै धनको मिश्रधन 2 वर्षमा रु 19360 र 4 वर्षमा रु 23425.60 हुन्छ भने मिश्रित ब्याजदर र साँवा निकाल्नुहोस् ।

A sum of money amounts to Rs 19360 in 2 years and Rs 25425.60 in 4 years find the rate of compound and the sum.

Soltuion:

Here Let principal be P and Rate of interest R%

Time (T) = 2 years

Compound amount (CA) = Rs 19360

$\therefore$ $CA = P\left(1+\frac{R}{100}\right)^{T}$

or, $\text{Rs } 19360 = P\left(1+\frac{R}{100}\right)^{2}$ .....(i)

Again, Time (T) = 4 years, compound amount (CA) = RS 23425.60

$\therefore$ $CA = P\left(1 + \frac{R}{100}\right)$

or, Rs 23425.60 = $p\left(1 + \frac{R}{100}\right)^4$ .....(ii)

From equation (ii)

Rs 23425.60 = $P\left(1 + \frac{R}{100}\right)^4$

or, Rs 23425.60 = $P\left(1 + \frac{R}{100}\right)^2 \times \left(1 + \frac{R}{100}\right)^2$ .....(iii)

From equation (i) and (iii), we get

or Rs 23425.60 = Rs 19360 $\times \left(1 + \frac{R}{100}\right)^2$

or, $1.21 = \left(1 + \frac{R}{100}\right)^2$

or, $(1.1)^2 = \left(1 + \frac{R}{100}\right)^2$

or, $1.1 + 1 + \frac{R}{100}$

or, $(1.1 - 1) = \frac{R}{100}$

or, $0.1 \times 100 = R$

$\therefore$ $R = 10\%$

Putting the value of R in equation (i), We get

or, Rs 19360 = $P\left(1 + \frac{R}{100}\right)^2$

or, Rs 19360 = $P\left(1 + \frac{R}{100}\right)^2$

or, Rs 19360 = $P\,(1 + 0.1)^2$

or, Rs 19360 = $P \times (1.1)^2$

or, $19360 = P \times 1.21$

$\therefore$ $P = \frac{\text{Rs } 19360}{1.21} = \text{Rs } 16000$

Principal (P) = Rs 16000 and Rate of interest (R) = 10%

Model : 11

वार्षिक चक्रिय ब्याज दरमा कुनै रकम 3 वर्षमा रु 13310 र 4 वर्षमा 14641 पुग्दछ भने चक्रिय ब्याजदर र मूलधन पत्ता लगाउनुहोस् ।

The compound amount of a sum of money 3 years is Rs 13310 and in 4 years is Rs 14641. find the compound rate of interest preannum and sum.

Solution:

Here, Let the principal be P and Rate of compound interest be R%

Time (T) = 3 years

Compound amomt (CA) = Rs 13310

$CA = P\left(1 + \frac{R}{100}\right)^T$

or, Rs13310 = $P\left(1 + \frac{R}{100}\right)^3$ .....(i)

Again, time (T) = 4 years compound amomt (CA) = Rs 14641

$CA = P\left(1 + \frac{R}{100}\right)^T$

or, Rs 14641 = $P\left(1+\frac{\quad}{100}\right)$ .....(ii)

From equation (ii) Rs 14641 = $P\left(1+\frac{R}{100}\right)^3 \times \left(1+\frac{R}{100}\right)$ .....(iii)

From equation (i) and (iii) we get

Rs 14641 = $P\left(1+\frac{R}{100}\right)^3\left(1+\frac{R}{100}\right)$

or, Rs 14641 = Rs 13310 $\times \left(1+\frac{R}{100}\right)$

or, Rs 14641 = Rs 13310 $\times \left(1+\frac{R}{100}\right)$

or, $\frac{14641}{\text{Rs } 13310} = \left(1+\frac{R}{100}\right)$

or, $1.1 = 1+\frac{R}{100}$

or, $(1.1-1) = \frac{R}{100}$

or, $0.1 \times 100 = R$

$\therefore$ R = 10%

Putting the value of R in equation (i), we get

$\therefore$ Rs 13310 = $P\left(1+\frac{10}{100}\right)^3$

or, Rs 13310 = P [1 + 0.1)3

or, Rs 13310 = P × (1.1)3

or, Rs 13310 = P × 1.331

or, $P = \frac{\text{Rs } 13310}{1.331}$

$\therefore$ P = Rs 10,000

Principal (P) = Rs 10000, Rate of interest (R) = 10%

Model 12:

वार्षिक चक्रिय ब्याजदरमा कुनै धनको मिश्रधन 2 वर्षमा रु 19360 र 4 वर्षमा रु 23425.60 हुन्छ भने मिश्रित ब्याजदर र साँवा निकाल्नुहोस् ।

A sum of money amounts to Rs 19360 in 2 years and Rs 25425.60 in 4 years find the rate of compound and the sum.

Soltuion:

Here Let principal be P and Rate of interest R%

Time (T) = 2 years

Compound amount (CA) = Rs. 19360

$\therefore$ CA = $P\left(1+\frac{R}{100}\right)^T$

or, Rs 19360 = $P\left(1+\frac{R}{100}\right)^2$ .....(i)

Again, Time (T) = 4 years, compound amount (CA) = RS 23425.60

$\therefore$ CA = $P\left(1+\frac{R}{100}\right)^T$

or, Rs 23425.60 = $p\left(1+\frac{R}{100}\right)^4$ .....(ii)

From equation (ii)

Rs 23425.60 = P $\left(1+\frac{\quad}{100}\right)$

or, Rs. 23425.60 = P $\left(1+\frac{R}{100}\right)^2 \times \left(1+\frac{R}{100}\right)^2$ .....(iii)

From equation (i) and (iii), we get

or Rs. 23425.60 = Rs 19360 $\times \left(1+\frac{R}{100}\right)^2$

or, $1.21 = \left(1+\frac{R}{100}\right)^2$

or, $(1.1)^2 = \left(1+\frac{R}{100}\right)^2$

or, $1.1 + 1 + \frac{R}{100}$

or, $(1.1 - 1) = \frac{R}{100}$

or, $0.1 \times 100 = R$

$\therefore$ R = 10%

Putting the value of R in equation (i), We get

or, Rs. 19360 = P $\left(1+\frac{R}{100}\right)^2$

or, Rs. 19360 = P $\left(1+\frac{R}{100}\right)^2$

or, Rs. 19360 = P $(1 + 0.1)^2$

or, Rs. 19360 = P $\times (1.1)^2$

or, 19360 = P $\times$ 1.21

$\therefore$ P = $\frac{\text{Rs. } 19360}{1.21}$ = Rs. 16000

Principal (P) = Rs. 16000 and Rate of interest (R) = 10%

Model 13:

अर्धवार्षिक चक्रिय ब्याजको दरले कुनै धनको चक्रिय मिश्रधन 1 वर्षमा रु 400 र 2 वर्षमा रु 441 भए मूलधन र ब्याजदर निकाल्नुहोस् ।

The semiannual compound amount of a sum of money in 1 year is Rs 400 and in 2 years at Rs 441 find principal and the rate of interest.

Solution:

Here, Let the principal be P and

Rate of interest = R% (Semi-annually)

Time (T) = 1 years

Compound amount (CA) = Rs 400

CA = P $\left(1+\frac{R}{200}\right)^{2T}$

or, Rs 400 = P $\left(1+\frac{R}{200}\right)^{2T}$

or, Rs 400 = P $\left(1+\frac{R}{200}\right)^{2T}$ .....(i)

Rate of interest (R) = 10%

Again, Time (T) = 2 years

Compound amount(CA) = Rs 441

$\therefore$ CA = P $\left(1+\frac{R}{200}\right)^{2T}$

or, $\text{Rs } 441 = P\left(1+\frac{R}{200}\right)^{2\times 2}$

or, $\text{Rs } 441 = P\left(1+\frac{R}{200}\right)^{2} \times \left(1+\frac{R}{200}\right)^{2}$ .....(ii)

From equation (i) and (ii) we get

or, $\text{Rs } 441 = P\left(1+\frac{R}{100}\right)^{2} \times \left(1+\frac{R}{100}\right)^{2}$

or, $\text{Rs } 441 = \text{Rs } 400 \times \left(1+\frac{R}{100}\right)^{2}$

or, $\frac{\text{Rs } 441}{\text{Rs}400} = \left(1+\frac{R}{100}\right)^{2}$

or, $1.1025 = \left(1+\frac{R}{200}\right)^{2}$

or, $(1.05)^2 = \left(1+\frac{R}{200}\right)^{2}$

or, $(1.05)^2 = 1+\frac{R}{200}$

or, $(1.05-1) = \frac{R}{200} = 0.05 \times 200$

or, $0.05 \times 200 = R$

$\therefore$ $R = 10\%$

Substituting the value of R in equation (i) , we get

$\text{Rs } 400 = P\left(1+\frac{R}{200}\right)^{2}$

or, $\text{Rs } 400 = P\left(1+\frac{R}{200}\right)^{2}$

or, $\text{Rs } 400 = P \times (1+0.05)^2$

or, $\text{Rs } 400 = P \times (1.05)2$

or, $\text{Rs } 400 = P \times 1.1025$

or, $P = \frac{\text{Rs } 400}{1.1025}$

$\therefore$ $P = \text{Rs } 362.81$

Principal (P) = Rs 362.81, Rate of interest(R) = 10%

Model 14:

कुनै रकमको वार्षिक चक्रिय ब्याज अनुसार एक वर्ष र दुई वर्षको चक्रिय ब्याज क्रमश रु 1800 र रु 3816 हुन्छ भने चक्रिय ब्याजदर र मूलधन निकाल्नुहोस् ।

The yearly compound interest on a sum of money 1 and 2 years are Rs 1800 and Rs 3816 respectively calculate the rate of Compound interest and the principal.

Solution:

Here, Let the principal be P and

Rate of interest R%

Time (T) = 1 years compound interest (CI_1) = Rs 1800

$CI_1 = P\left[\left(1+\frac{R}{100}\right)^{T}-1\right]$

or, $\text{Rs } 1800 = P\left[\left(1+\frac{R}{100}\right)^{2}-1\right]$ .....(i)

Again, time (T) = 2 years, compound interest (CI_2) = Rs 3816

$$CI_2 = P\left[\left(1+\frac{R}{100}\right)-1\right]$$

or, Rs 3216 $= P\left[\left(1+\frac{R}{100}\right)^2-1\right]$ .....(ii)

To equation (ii) divided by equation (i)

$$\frac{\text{Rs } 3816}{\text{Rs } 1800} = \frac{P\left[\left(1+\frac{R}{100}\right)^2-1\right]}{P\left[\left(1+\frac{R}{100}\right)^2-1\right]}$$

or, $2.12 = \frac{\left[\left(1+\frac{R}{100}\right)+1\right]\left[\left(1+\frac{R}{100}\right)-1\right]}{\left[\left(1+\frac{R}{100}\right)-1\right]}$

or, $2.12 = \left(1+\frac{R}{100}\right)+1$

or, $2{,}12 = 2+\frac{R}{100}$

or, $2.12-2 = \frac{R}{100}$

or, $0.12 \times 100 = R$

$\therefore$ R = 12%

Substituting the value of R in equaltion (i)

Rs 1800 $= P\left[\left(1+\frac{R}{100}\right)^2-1\right]$

or, Rs 1800 $= P\left[\left(1+\frac{12}{100}\right)^2-1\right]$

or, Rs 1800 $= P\,[(1+0.12)^2-1]$

or, Rs 1800 $= P\,[(1.12)^2-1]$

or, Rs 1800 $= P\,(1.2544-1]$

or, Rs 1800 $= P \times 0.2544-1]$

or, $P = \frac{\text{Rs } 1800}{0.2544}$

$\therefore$ P = Rs 7075.47

Principal (P) = Rs 7075.47 Rate of interest (R) = 12%

Model : 15

एउटा व्यक्तिको रु 46,875 को कर्जा लिएछ । यदि प्रतिवर्ष प्रतिरुपैया चक्रिय ब्याजदरमा 4 पैसा भएकति वर्ष मा रु 5853 चक्रिय ब्याज होला ?

A person took a loan of Rs 46875. If the rate of compound interest is 4 paisa per rupee per year in how many years will be compound interest be Rs 5853.

Solution:

Here, principal (P) = Rs 46875

Rate of interest (R) = 4 paisa per years per rupee

$= \frac{4}{100} \times 100 = 4\%$

Time (T) = ?

Compound interest (CI) = Rs 5853

$\therefore$ $CI = P\left[\left(1+\frac{R}{100}\right)^T-1\right]$

or, $\text{Rs } 5853 = \text{Rs } 46875\left[\left(1+\frac{4}{100}\right)^{T}-1\right]$

or, $\frac{\text{Rs } 5853}{\text{Rs } 46875} = [(1+0.04)^{T}-1]$

or, $0.124864 = (1.04)^{t}-1$

or, $1+0.124864 = (1.040)^{t}$

or, $1.124864 = (1.04)^{t}$

or, $(1.04)^{3} = (1.04)^{t}$

∴ T = 3 years

The required time (T) = 3 years

Model 16:

रु 15625 को 1 वर्ष 6 महिनाको अर्धवार्षिक चक्रिय ब्याज रु 1951 हुन्छ भने ब्याजदर पत्ता लगाउनुहोस् ।

If the semi-annual compound interest of Rs. 15625 for 2 year 6 months in Rs. 1951, find the rate of interest.

Soltuion:

Here, Principal (P) = Rs 15625

Time (T) = 1 yeat

6 months $\left(1+\frac{6}{12}\right) = \frac{3}{2}$ years

Compound interest (CI) = Rs 1951

Rate of Interest (R) = ?

$CI = P\left[\left(1+\frac{R}{200}\right)^{2T}-1\right]$

or, $\text{Rs } 1951 = \text{Rs } 15625\left[\left(1+\frac{R}{100}\right)^{2\cdot 3/2}-1\right]$

or, $\frac{\text{Rs } 1951}{\text{Rs } 15625} = \left[\left(1+\frac{R}{100}\right)^{3}-1\right]$

or, $0.124864 = \left(1+\frac{R}{200}\right)^{3}-1$

or, $1+0.124864 = \left(1+\frac{R}{200}\right)^{3}$

or, $1.124864 = \left(1+\frac{R}{200}\right)^{3}$

or, $(1.04)3 = \left(1+\frac{R}{200}\right)^{3}$

or, $1.04 = 1+\frac{R}{200}$

or, $(1.04-1) = \frac{R}{200}$

or, $0.04 \times 200 = R$

∴ R = 8% Rate of compound interest (R) = 8%

Model 17

रु 4000 को 3 वर्षको 10% प्रतिवर्षको दरले हुन आउने वार्षिक चक्रिय ब्याज रु 4200- को 3 वर्षमा 8% को दरले हुन आउने साधारण ब्याज भन्दा कति प्रतिशतले दिइन्छ ? पत्ता लगाउनुहोस् ।

By what percent mire is the yearly compounded interest on Rs 4000 for 3 yrs at 10% p.a. than simple interest on Rs 4200 for 3 yrs at 8% p.a. find it.

Soltuion:

Here principle (p) = Rs 4000

Rate of compound interest ® = 10%

Time (T) = 3 yrs

$$CI = p\left[\left(1+\frac{R}{100}\right)^T - 1\right] = \text{Rs } 4000\left[\left(1+\frac{10}{100}\right)^3 - 1\right] = \text{Rs } 4000\ [(1+0.1)3 - 1]$$

$$= \text{Rs } 4000\ [(1.1)3 - 1) = \text{Rs } 4000 \times 0.331 = \text{Rs } 1324$$

Again principal (p) = Rs 4200 Rate of interest ® = 80%

Time (T) = 3

$$SI = \frac{PTR}{100} = \frac{4200 \times 3 \times 8}{100} = \text{Rs } 1008$$

different of interest = Rs 1324 – Rs 1008 = Rs 316

$$\text{percentage} = \frac{\text{Rs } 316 \times 100\%}{\text{Rs } 1008} = 31.34\%$$

The required more percentage than simple interest is 31.24%

Model 18

कुनै धन 3 वर्षसम्म वार्षिक 10% को दरले साधारण व्याजमा र त्यसपछिको मिश्रधन लाई सोही व्याजदरमा 2 वर्षसम्म चक्रिय व्याजमा लगानी गरियो । यदि 5 वर्षमा जम्मा मिश्रधन रु 471900 जम्मा भयो भने मूल धन कति होला?

A sum of money is placed at simple interest for 3 yrs at 10% p.a. and then the amount is interest for 2 yrs at the same rate at the compound interest. if the total amount of 5 yrs become at Rs 471900 what area the sum? Find it.

Solution:

Here, Let the sum of money (P) be x

Time (T) = 3 yrs Rate of interest (R) = 10%

$$SI = \frac{PTR}{100} = \frac{x \times 3 \times 10}{100} = \frac{3x}{10}$$

$$\text{Simple interest (SI)} = \frac{3x}{10} = \frac{13x}{10}$$

According to the question

Rate of compound interest (R) = 10%

Time (T) = 2yrs

$$\text{Now, CA} = p\left(1+\frac{R}{100}\right)^T$$

$$\text{or,} \quad \text{Rs. } 471900 = \frac{13x}{10} = \left(1+\frac{10}{100}\right)^2$$

$$\text{or,} \quad \text{Rs. } 471900 = \frac{13x}{10} = (1+0.1)2$$

$$\text{or,} \quad \text{Rs. } 471900 = \frac{13x}{10} \times (1.1)2$$

$$\text{or,} \quad \text{Rs. } 471900 = \frac{13x}{10} \times 1.21$$

$$\text{or,} \quad \text{Rs. } 471900 = \frac{15.73x}{100}$$

$$\text{or,} \quad \text{Rs. } 471900 \times 100 = 15.73x$$

$$\text{or,} \quad \text{Rs. } \frac{471900 \times 100}{15.73} = x$$

$\therefore$ x = Rs. 3000000

$\therefore$ The required sum of the money is Rs 300000

Model 19

एउटा वैङकले खाता A मा 10% प्रतिवर्ष अर्धवार्षिक चक्रिय व्याज दर र खाता B मा 12% वार्षिक व्याजदर कम्मन गरिउको छ । यदि तपाई 2 वर्षका लागि रु 30,000 सो वैङकमा जम्मा गर्दै भने कुन खातामा जम्मा गर्नुहुन्छ ? किन गणन्ण गरी कारण सहित उल्लेख गर्नुहोस् ।

A bank has fixed the rate of interest 10% p.a. semi–annually compound interest in accunta and 12% p.a. annually compound interest in account B. If youyr are going to leposite Rs 30,000 for 2 yrs in the same bank your in which account with you deposite and why? Give, grason with calculation.

Solution:

Here Account 'A'
principal (P) = Rs.30000
Time (T) = 2yrs
Rate of interest (R) = 10% (Semi-annually)
According to the question semiannually

$$CIs = p\left[\left(1+\frac{R}{200}\right)^{2t}-1\right]$$

$$Rs.30{,}000\left[\left(10+\frac{R}{200}\right)^{2\times 2}-1\right]$$

Rs.30,000 $[1+(0.05)^4-1]$
Rs.30,000 $[(1.05)^4-1$
Rs.30,000 $[(1+0.05)^4-1]$
Rs.30,000 × 1.21550625
Rs 6465.1875

Account 'B'
principal (P) = Rs 30,000
Time (T)(= 2yrs
Rate of interest (R) = 12% (annually)
again, according to the question

$$CIs = p\left[\left(1+\frac{R}{100}\right)^{t}-1\right]$$

$$Rs.30{,}000\left[\left(12+\frac{R}{200}\right)^{2}-1\right]$$

Rs.30,000 $[(1+0.12)^2-1]$
Rs.30,000 $[(1.12)^2-2]$
Rs.30,000 $(1.2544)-1]$
Rs.30,000 × 0.2544
Rs 7632

different of interest = Rs 7632 – 6465.1875 = Rs 1166.8125

∴ The yearly compound interest given in account B is greater than account A, So, I will deposite in account B of bank.

Model 20

हरिले राम र कृष्ण दुवैलाई 2 वर्षको लागि रु 6600 जम्मा रकम ऋण दिन्छ र रामले 15% वार्षिक साधरण व्याज र उहि ज्याजदर चक्रिय व्याज तिर्न मञ्जुर हुन्छन् । यदि रामले रु 112.50 व्याज कृष्ण भन्दा कम तिर्छ भने हरिले दुवैलाई कति कति रकम ऋण दिइएको रहेछ ? पत्ता लगाउनुहोस् ।

Hari lent altogenther for Rs 6600 to Ram and Krishna for 2 yrs. Ram agreed to simple pay compound interest at the same rate. If Ram paid Rs 112.50 hers than krishar. as the interest, find hoe much did he lend to each them.

Solution:

Let the principal of Rate be x prinicipal of Krishna(Rs 6600 – x)
Rate of simple interest (R) = 15% Rate of compound Interest (R) = 15%
(Time) (T)= 2yrs Time (T) = 2 yrs

$$SI = \frac{PTR}{100}$$

$$= \frac{x\times 2\times 15}{100}$$

$$= \frac{30x}{100} = 0.3x$$

$$CI = p\left[1+\frac{R}{100}\right]^{T}-1)$$

$$= (Rs\ 6600x)\left[1+\frac{15}{100}\right]^{2}-1)$$

$$= (Rs\ 6600-x)\,[(1+0.15)^2-1]$$

= Rs 6600 – x [(1.15)2 – 1
= (Rs 6600 – x) (1.3225 – 1)
= (Rs 6600 – x) × 0.3225
= Rs 2128.50 – 0.3225x)

according of the question

SI = CI + RS 112.50

or, $0.3x = Rs\ 2118.00 - 0.3225x + Rs\ 112.50$

or, $0.3x + 0.3225x = Rs\ 2241$

or, $0.6225x = Rs\ 2241$

or, $x = \frac{Rs\ 22241}{0.6285}$

$\therefore \quad x = Rs\ 3600$

The sum of lent Ram and krishna are Rs. 2600 and Rs 3000 respectively.

Practice Yourself

1. वार्षिक 7% ब्याजको दरले 2 वर्षमा कुनै रकमको वार्षिक चक्रिय ब्याज र साधारण ब्याजको अन्तर रु 1470 हुन्छ भने साँवा पत्ता लगाउनुहोस् ।
   The difference between compound interest and simple interest of a certain sum of money for 2 years at the rate of interest 7% per annum is Rs 1470. Find the sum
   (Ans. Rs. 3,00000)
2. वार्षिक 20% ब्याजदरले 2 वर्षमा हुने कुनै धनको वार्षिक मिश्रित ब्याज र अर्धवार्षिक ब्याजको योगफल रु 18082 भए सो धनराशी पत्ता लगाउनुहोस् ।
   The sum of annual compound interest and the semiannual compound interest on a sum of momey for 2 years at the interest rate of 20% per annum is Rs 18082. Find the principal.
   (Ans. Rs. 20,000
3. वार्षिक 10% ब्याजको दरले 2 वर्षमा कुनै धनराशीका वार्षिक चक्रिय ब्याज र अर्धवार्षिक चक्रिय ब्याजको अन्तर रु 400 भए सो धनराशी पत्ता लगाउनुहोस् ।
   The difference between the annual and semi-annual compound interest on a sum of momey is Rs 400 at the rate o finterest 10% per annually 2 years, find the principal.
   (Ans : Rs. 72,644,71)
4. वार्षिक चक्रिय ब्याजदरले कुनै रकमको मिश्रधन 2 वर्षमा रु 15840 र 3 वर्षमा रु 19008 पुग्दछ भने मूलधन र वार्षिक चक्रिय ब्याजदर पत्ता लगाउनुहोस् ।
   The compound amount of sum of momey 2 years is Rs 15840 and in 3 years is Rs 19008. Find the sum and rate of compound interest perannum.
   (Ans: Rs 11000, 20%)
5. वार्षिक चक्रिय ब्याजदर अनुसार 1 वर्ष र 2 वर्षमा कुनै रकमको चक्रिय ब्याज क्रमश रु 300 र रु 618 हुनछ भने ब्याजदर र मुलधन पत्ता लगाउनुहोस् ।
   The compound interest of a sum of money in 1 yearsand 2 years are Rs 300 and Rs 618 resspectively find the rate of interest compound yearly and the sum.Ans: 8% Rs 5000
6. रु 16000 को 2 वर्षमा 10% प्रतिवर्ष ब्याजको दरले वार्षिक चक्रिय ब्याज र अर्धवार्षिक ब्याजको अन्तर पत्ता लगाउनुहोस् ।
   Find the difference between compounded yearly and half-yearly on Rs 16000 in 2 years at 10% per annum. **(Ans: Rs 88.10)**
7. रामलखनले 5% साधारण ब्याजको दरले 2 वर्षका लागि केहि रकम सापट लियो र उनले हरि शंकरलाई उहि समय र उहि दरको चक्रिय व्याजदर मा दियो । उक्त कारोवारमा उसलाई Rs 1800 नाफा भयो भने कति रकम सापट लिएको रहेछ ?
   Ramlakhan borrowed a sum of money at the rate of 5% p.a simple interest for 2 years and he lent it to Harishanker in compound interest at the some rate for same duration of time. In the transaction if he gained Rs 1800, find the sum borrowed. **(Ans: Rs 720000)**
8. कुनै धनको 10%वार्षिक व्याजदरले साधारण व्याज मूलधनको आधा हुन्छ भने समय पत्ता लगाउनुहोस् । यदि साधारण व्याज रु 100 थियो भने त्यो धनको 3 वर्ष सम्मको त्यहि व्याजदरमा चक्रिय व्याज कति हुन्छ ?
   Simple interest on a sum of money is half of the principal at the rate of 10% per annum. Find the time. If the simple interest was Rs 1000 what would be the compound interest of the same principal at the same rate 2 years. **(Ans : Rs 6620**

9. रु 5000 को तीन वर्षको चक्रिय व्याज पत्ता लगाउनुहोस् । यहाँ पहिलो, दोस्रो र तेस्रो वर्षको व्याजदर क्रमश 4% , 3% र 2% छ ।
Find the compound interest on Rs 5000 for 3 years if the rate interest is 4% for the first year 3% for the 2nd year and 2% for the 3rd year.
Ans: Rs 463.12

10. रु 79002 A र B को नाममा चक्रिय व्याज पाउने गरी वैङ्कमा जम्मा गरियो । अहिले A12 वर्षको र B, 13 वर्षको छ । 10% प्रतिवर्षका दरले ब्याज दिदा दुवैले 18 वर्षको उमेर पुग्दा बराबर रकम पाउँछन् भने तिनीहरूलाई कति कति दिइएको रहेछ ? पत्ता लगाउनुहोस् ।
Rs 79002 is among A and B who are now 12 years and 13 years respectively. They deposite the divided amount in bank to get compound interest at the rate of 10% p.a. They get equal amount at the age of 18 years find the shares in sum.
(Ans: Rs 37620, Rs 41382)

11. वार्षिक चक्रिय व्याजदरमा कुनै रकमको 2 वर्षमा मिश्रधन रु 19360 र 4 वर्षमा रु 23425.60 पुग्दछ भने मूलधन र चक्रिय व्याजदर पत्ता लगाउनुहोस् ।
The compound amount of a sum of money becomes Rs 19360 and Rs 23425.60 in 2 years and 4 years respectively find the sum and rate of interest.
(Ans: 8% Rs 16000)

12. एक जना मानिसले रु 10,00,000 वैङ्कबाट कर्जा लिएछ । यदि प्रतिवर्ष प्रतिरुपैयाको व्याज 8 पैसा भए कति वर्षमा रु 2,59712 चक्रिय व्याज होला ?
A man took from the bank of Rs 10,00,000 . If the rate of loan compound interest is 8 paisa per rupee and per year in how many years will be compounded interest be Rs 259712.
(Ans: 3 years)

13. 20% अर्धवार्षिक व्याजको दरले $1\frac{1}{2}$ वर्षमा कति धनराशीको चक्रिय व्याज रु 1986 होला ?
What sum of money will yield Rs 1986 compound interest compounded semi-annually at 20% per anum in $1\frac{1}{2}$.
(Ans: 8000)

14. कुनै धनराशीको 3 वर्षमा साधारण व्याज रु 240 र 2 वर्षमा चक्रिय व्याज रु 170 हुन्छ । भने सो धनराशि र व्याजको दर पत्तालगाउनुहोस् ।
The simple interest on a sum of money in yreas is Rs 240 and compound interest in 2 years is Rs 170 at the same rate. Find the sum and the rate is interest.
(Ans: 640, $12\frac{1}{2}$%)

15. एउटा वैङकले खाता P मा 10% प्रतिवर्ष अर्धवार्षिक चक्रिय व्याजदर र खाता Q मा 12% प्रतिवर्ष वार्षिक चक्रिय व्याजदर कायम गरिएको छ । यदि तपाई 2 वर्षका लागि रु 50,000 सो वैङकमा जम्मा गर्दै हुनुहुन्छ भने कुन खातामा जम्मा गर्नुहुन्छ र किन? गणन्त गरी कारण सहित उल्लेख गर्नुहोस् ।
A bank has fixed the rate of interest 10% p.a. semi-yeonly compound interest in account p and 12% p.a. annually compound interest in account Q. If you are going to deposite Rs 50,000 for 2 yrs in the same bank in which account will deposit and why? Give your reason will colculatia.
(Ans: 1944.6875)

16. रु 10000 को 2 वर्ष 6 महिनामा 10% को दरले हुने साधारण व्याज सोही रकमको उहि समय र व्याजदरमा हुने वार्षिक चक्रिय व्याज भन्दा कति प्रतिशत कम हुन्छ ?
By what percent the simple interest on Rs 10,000 for 2 yrs 6 months at the rate of 10% perannum is less than the yeonly compound interest on the same sum of many same time and vate?
Ans 7.58%