

Class – 09

Topic – Compound Interest

1. A person invests Rs. 10000 for 3 years at a certain rate of interest compounded annually. At the end of one year this sum amounts to Rs. 11200. Calculate: [2006]

- (i) The rate of interest
- (ii) The amount at the end of second year
- (iii) The amount at the end of third year

**Solution:**

(i) The rate of interest:  $P = \text{Rs. } 10000$  ;  $A = 11200 \text{ Rs.}$  ;  $r = x\%$

$$A = P \left(1 + \frac{r}{100}\right)^n \Rightarrow 11200 = 10000 \left(1 + \frac{x}{100}\right)^1$$

$$\Rightarrow x = 12\%$$

(ii) Amount at the end of the second year

$$A = P \left(1 + \frac{r}{100}\right)^n \Rightarrow A = 10000 \left(1 + \frac{12}{100}\right)^2$$

$$= \text{Rs. } 12544$$

(iii) Amount at the end of third year

$$A = P \left(1 + \frac{r}{100}\right)^n \Rightarrow A = 10000 \left(1 + \frac{12}{100}\right)^3$$

$$= \text{Rs } 14049.28$$

2. A sum of Rs. 9600 is invested for 3 years at 10% per annum at compound interest.

- (i) What is the sum due at the end of the first year?
- (ii) What is the sum due at the end of the second year?
- (iii) Find the difference between the answers of the (ii) and (i) and find the interest on this sum (difference) for one year
- (iv) Hence, write down the compound interest for the third year [1996]

**Solution:**

(i) Sum due at the end of the first year?

$$P = \text{Rs. } 9600 ; A = ? ; r = 10\% ; n = 1$$

$$A = P \left(1 + \frac{r}{100}\right)^n \Rightarrow A = 9600 \left(1 + \frac{10}{100}\right)^1 = \text{Rs. } 10560$$

(ii) Sum due at the end of the second year?

$$P = \text{Rs. } 9600 ; A = ? ; r = 10\% ; n = 2$$

$$A = P \left(1 + \frac{r}{100}\right)^n \Rightarrow A = 9600 \left(1 + \frac{10}{100}\right)^2$$

$$= \text{Rs. } 11616$$

(iii) Difference between the answers of the (ii) and (i)

$$11616 - 10560 = \text{Rs. } 1056$$

$$\text{Interest} = 1056 \times \frac{10}{100} \times 1$$

$$= \text{Rs. } 105.6$$

(iv) Compound Interest for third year =  $1056 + 105.6 = \text{Rs. } 1161.60$

3. What sum of money will amount to Rs. 9261 in 3 years at 5% per annum compound interest?

[2009]

**Solution:**

$$\text{Given } P = \text{Rs. } x ; A = \text{Rs. } 9261 ; r = 5\% ; n = 3$$

$$A = P \left(1 + \frac{r}{100}\right)^n \Rightarrow 9261 = x \left(1 + \frac{5}{100}\right)^3$$

$$\Rightarrow x = \text{Rs. } 8000$$

4. In what period of time will Rs. 12000 yield Rs. 3972 as compound interest at 10%, if compounded on a yearly basis?

[2011]

**Solution:**

$$\text{Given } P = 12000 \text{ Rs. } A = (12000 + 3972) = \text{Rs. } 15972, r = 10\% ; n = n$$

$$A = P \left(1 + \frac{r}{100}\right)^n \Rightarrow 15972 = 12000 \left(1 + \frac{10}{100}\right)^n$$

$$\Rightarrow n = 3 \text{ years}$$

5. On what sum of money will the difference between the compound interest and the simple interest for two years be equal to Rs. 25, if the rate of interest charged for both is 5% p.a.?

**Solution:**

[2012]

Let the sum be Rs.  $x$ .

$$\text{Simple Interest for 2 years} = x \times \frac{5}{100} \times 2 = 0.1x$$

Amount Compound Interest

$$A = P \left(1 + \frac{r}{100}\right)^n \Rightarrow A = x \left(1 + \frac{5}{100}\right)^2 \Rightarrow A = \text{Rs. } 1.1025x$$

Given difference = Rs. 25

$$\text{Therefore C.I. - S.I.} = 25 \Rightarrow (1.1025x - x) - (0.1x) = 25$$

$$\Rightarrow x = \text{Rs. } 10000$$

6. The simple interest on a sum of money for 2 years at 4% p.a. is Rs. 340. Find

(i) The sum of the money

[2008]

(ii) The compound interest on this sum for one year payable half-yearly at the same rate

**Solution:**

(i) Simple Interest

Given:  $I = \text{Rs. } 340$ ,  $n = 2$  years;  $r = 4\%$ ;  $P = \text{Rs. } x$

$$340 = x \times \frac{4}{100} \times 2$$

$$\Rightarrow x = \text{Rs. } 4250$$

(ii) Compound Interest

$P = \text{Rs. } 4250$   $n = 1$  years;  $r = 4\%$  Compounded half yearly;

$$A = P \left(1 + \frac{r}{100}\right)^n \Rightarrow A = 4250 \left(1 + \frac{4}{2 \times 100}\right)^2 \Rightarrow A = \text{Rs. } 4421.7$$

$$\text{C.I.} = 4421.7 - 4250 = \text{Rs. } 171.70$$

7. Simple interest on a sum of money for 2 years at 4% is Rs. 450. Find compound interest on the same sum and at the same rate for 1 year, if the interest on the same sum and at the same rate for year, if the interest is reckoned half-yearly. [1997]

**Solution:**

Simple Interest

$$P = x \text{ Rs.}; T = 2 \text{ Years}; r = 4\%$$

$$S.I = x \times \frac{4}{100} \times 2 = \frac{2}{25}x$$

$$450 = \frac{2}{25}x \Rightarrow x = \text{Rs. } 5625$$

Compounded Half Yearly

$$P = \text{Rs. } 5625 \quad r = 4\%; \text{ Compounded half yearly } n = 1 \text{ year}$$

$$A = P \left(1 + \frac{r}{100}\right)^{1 \times 2} = 5625 \left(1 + \frac{4}{2 \times 100}\right)^{1 \times 2} = \text{Rs. } 5852.25$$

$$\text{Compound Interest} = 5852.25 - 5625 = \text{Rs. } 227.25$$

8. Rohit borrows Rs. 86000 from Arun for 2 years at 5% per annum simple interest. He immediately lends his money to Akshay at 5% compounded interest annually for the same period. Calculate Rohit's profit at the end of two years. [2010]

**Solution:**

Simple Interest for 2 years

$$S.I. = P \times \frac{r}{100} \times 2$$

$$S.I. = 86000 \times \frac{5}{100} \times 2 = \text{Rs. } 8600$$

Compound Interest for 2 years

$$P = \text{Rs. } 86000 \quad r = 5\%; \text{ Compounded yearly } n = 2 \text{ year}$$

$$A = P \left(1 + \frac{r}{100}\right)^2 \Rightarrow A = 86000 \left(1 + \frac{5}{100}\right)^2 \Rightarrow A = \text{Rs. } 9481.50$$

$$\text{Gain} = (9481.50 - 86000) - 8600 = \text{Rs. } 215$$

9. Nikita invests Rs.6000 for two years at a certain rate of interest compounded annually, at the end of first year it amounts to Rs.6720. Calculate. [2010]

(i) The rate of interest;

(ii) The amount at the end of the second year

**Solution:**

Compound Interest for 1 year

$P = \text{Rs. } 6000, r = x\%; \text{ Compounded yearly } n = 1 \text{ year}$

$$A = P \left(1 + \frac{r}{100}\right)^1 \Rightarrow A = 6000 \left(1 + \frac{r}{100}\right)^1$$

$$\text{Given } 6000 \left(1 + \frac{x}{100}\right)^1 = 6720 \Rightarrow x = 12\%$$

Amount at the end of second year

$$A = P \left(1 + \frac{r}{100}\right)^2 \Rightarrow A = 6000 \left(1 + \frac{12}{100}\right)^2 = \text{Rs. } 7526.40$$

10. The interest is compounded half-yearly. Calculate the amount when principal is Rs.7400; the rate of interest is 5% per annum and the duration is one year. [2005]

**Solution:**

$P=7400 \text{ Rs. } r=5\%; \text{ Compounded half yearly } n=1 \text{ year}$

$$A = P \left(1 + \frac{r}{2 \times 100}\right)^{n \times 2} = 12000 \left(1 + \frac{5}{2 \times 100}\right)^{1 \times 2}$$
$$= \text{Rs. } 7774.63$$

11. At what rate per cent will a sum of Rs.4000 yield Rs.1324 as compound interest in 3 years?

[2013]

**Solution:**

$P = \text{Rs. } 4000, r = x\%; n = 3 \text{ year; Interest} = \text{Rs. } 1324$

$$A = P \left(1 + \frac{r}{100}\right)^n = 4000 \left(1 + \frac{x}{100}\right)^3$$

Given Interest = Rs. 1324

$$\Rightarrow 4000 \left(1 + \frac{x}{100}\right)^3 - 4000 = 1324$$

$$\Rightarrow x = 10\%$$

12. The difference between compound interest for a year payable half-yearly and simple interest on a certain sum of money lent out at 10% for a year is Rs.15. Find the sum of money lent out. [1998]

**Solution:**

Simple Interest  $P = \text{Rs. } x$ ;  $T = 1$  Years;  $r = 10\%$

$$S.I = x \times \frac{10}{100} \times 1 = 0.1x$$

Compound Interest

$P = x$ ;  $A = A$ ;  $r = 10\%$ ;  $n = 2$  half years

$$A = x \times \left(1 + \frac{10}{100}\right)^2 = x \times \left(\frac{21}{20}\right)^2$$

$$C.I. = x \times \left(\frac{21}{20}\right)^2 - x$$

$$\text{Given } C.I. - S.I. = x \times x \times \left(\frac{21}{20}\right)^2 - x - 0.1x = 15$$

$$\Rightarrow x = \text{Rs. } 6000$$

13. The compound interest, calculated yearly, on a certain sum of money for the second year is Rs. 1320 and for the third year is Rs. 1452. Calculate the rate of interest and the original sum of money. [2014]

**Solution:**

Difference between the Compound interest of two successive years =  $1452 - 1320 = \text{Rs. } 132$

$\Rightarrow \text{Rs. } 132$  is the interest on Rs. 1320

$$\therefore \text{Rate of Interest} = \frac{100 \times I}{P \times T} \% = \frac{100 \times 132}{1320 \times 1} \% = 10\%$$

Let the sum of money = Rs. 100

Therefore Interest on it for 1st Year = 10% of Rs. 100 = Rs. 10

$\Rightarrow$  Amount in one year =  $100 + 10 = \text{Rs. } 110$

$\therefore$  Interest on it for 2<sup>nd</sup> Year = 10% of 110 = Rs. 11

$\Rightarrow$  Amount in 2nd year =  $110 + 11 = \text{Rs. } 121$

When interest of 2nd year = Rs. 11, sum is Rs. 100

$$\Rightarrow \text{When interest of 2nd year} = \text{Rs. } 1320, \text{ then sum} = \frac{100}{11} \times 1320 = \text{Rs. } 12000$$

14. Ramesh invests Rs.12800 for three years at the rate of 10% per annum compound interest. Find; [2007]

- (i) The sum due to that person at the end of the first year.
- (ii) The interest he earns for the second year.
- (iii) The total amount due to him at the end of the third year.

**Solution:**

For 1st year:  $P = \text{Rs. } 12800$ ;  $R=10\%$  and  $T=1$  year

$$\text{Therefore Interest} = \frac{12800 \times 10 \times 1}{100} = \text{Rs. } 1280$$

And, Amount =  $12800 + 1280 = \text{Rs. } 14080$

For 2nd year:  $P = \text{Rs. } 14080$ ;  $R=10\%$  and  $T=1$  year

$$\text{Therefore Interest} = \frac{14080 \times 10 \times 1}{100} = \text{Rs. } 1408$$

And, Amount =  $14080 + 1408 = \text{Rs. } 15488$

For 3rd year:  $P = \text{Rs. } 15488$ ;  $R=10\%$  and  $T=1$  year

$$\text{Therefore Interest} = \frac{15488 \times 10 \times 1}{100} = \text{Rs. } 1548.80$$

And, Amount =  $15488 + 1548.80 = \text{Rs. } 17036.80$

15. The compound interest, calculated yearly, on a certain sum of money for the second year is Rs. 880 and for the third year is Rs. 968. Calculate the rate of interest and the sum of money.

[1995]

**Solution:**

Difference between the Compound interest of two successive years =  $968 - 880 = \text{Rs. } 88$

$\Rightarrow \text{Rs. } 88$  is the interest on Rs. 880

$$\therefore \text{Rate of Interest} = \frac{100 \times I}{P \times T} \% = \frac{100 \times 88}{880 \times 1} \% = 10\%$$

For 1st year:  $P = \text{Rs. } x$ ;  $R = 10\%$  and  $T = 1$  year

$$\text{Therefore Interest} = \frac{x \times 10 \times 1}{100} = \text{Rs. } 0.1x$$

And, Amount =  $x + 0.1x = \text{Rs. } 1.1x$

For 2nd year:  $P = \text{Rs. } 1.1x$ ;  $R=10\%$  and  $T=1$  year

$$\text{Therefore Interest} = \frac{1.1x \times 10 \times 1}{100} = \text{Rs. } 0.11x$$

Given  $0.11x = 880 \Rightarrow x = \text{Rs. } 8000$