

APTITUDE MASTERY SERIES

MODULE 12 – SIMPLE INTEREST AND COMPOUND INTEREST

1. Sahil deposited Rs. 7500 in a bank at a simple quarterly interest of 8%. How much will the amount yield him in two and a half years?

- (a) **Rs. 9000** (b) Rs. 9050 (c) Rs. 9300 (d) Rs. 9350

Solution:

$$\text{Simple Interest} = \frac{PRT}{100}$$

$$\text{Principal} = P = \text{Rs.}7500$$

$$\text{Rate of Interest} = R = 8\% \text{ Quarterly} = \frac{R}{4} = \frac{8}{4} = 2\%$$

$$\text{Time Period} = T = 2.5 \text{ years} = 4T = 10 \text{ (Quarters)}$$

$$\text{Amount after 2.5 years} = \text{Principal} + \text{Simple Interest}$$

$$\text{Amount} = 7500 + \frac{7500 \times 10 \times 2}{100} = 7500 + 1500 = \text{Rs.}9000$$

2. How much time will it take for an amount of Rs. 450 to yield Rs. 81 as interest at 4.5% per annum at simple interest?

- (a) 3.5 years **(b) 4 years** (c) 4.5 years (d) 5 years

Solution:

$$S.I = \frac{PNR}{100}$$

$$81 = \frac{450 \times N \times 4.5\%}{100}$$

$$N = \frac{100 \times 81}{450 \times 4.5} \text{ years} = 4 \text{ years}$$

3. Ravi took a loan of Rs. 1200 with simple interest for as many years as the rate of interest. If he paid Rs. 432 as interest at the end of the loan period, what was the rate of interest?

- (a) 3.6 (b) 4 (c) 18 **(d) 6**

Solution:

Let rate = R% and time = R years.

$$\text{Then, } (1200 \times R \times R)/100 = 432$$

$$\Rightarrow 12R^2 = 432$$

$$\Rightarrow R^2 = 36$$

$$\Rightarrow R = 6.$$

4. Mr. Roy invested an amount of Rs. 13,900 divided in two different schemes A and B at the simple interest rate of 14% p.a. and 11% p.a. respectively. If the total amount of simple interest earned in 2 years be Rs. 3508, what was the amount invested in Scheme B?

- (a) Rs. 6500 (b) **Rs. 6400** (c) Rs. 7200 (d) Rs. 7500

Solution:

Let the sum invested in Scheme A be Rs. x and that in Scheme B be Rs. (13900 - x).

Then, $[x \times 14 \times 2]/100 + [(13900 - x) \times 11 \times 2]/100 = 3508$

$$\rightarrow 28x - 22x = 350800 - (13900 \times 22)$$

$$\rightarrow 6x = 45000$$

$$\rightarrow x = 7500. \text{ So, sum invested in Scheme B} = \text{Rs. } (13900 - 7500) = \text{Rs. } 6400.$$

5. A sum of Rs. 725 is lent in the beginning of a year at a certain rate of interest. After 8 months, a sum of Rs. 362.50 more is lent but at the rate twice the former. At the end of the year, Rs. 33.50 is earned as interest from both the loans. What was the original rate of interest?

- (a) 3.6% (b) 4.5% (c) 5% (d) **3.46%**

Solution:

Let the original rate be R%. Then, new rate = (2R)%.

Here, original rate is for 1 year(s); the new rate is for only 4 months i.e. for 1/3 year.

$$\therefore [(725 \times R \times 1)/100] + [362.50 \times 2R \times 1]/(100 \times 3) = 33.50$$

$$\rightarrow (2175 + 725) R = 33.50 \times 100 \times 3$$

$$\rightarrow (2175 + 725) R = 10050$$

$$\rightarrow (2900) R = 10050$$

$$\rightarrow R = (10050/2900) = 3.46$$

$$\therefore \text{Original rate} = 3.46\%$$

6. Find the compound interest on Rs. 10,000 at 10% per annum for a time period of three and a half years.

- (a) Rs. 3795.50 (b) Rs. 3579.50 (c) **Rs. 3975.50** (d) Rs. 3550.50

Solution:

Time period of 3 years and 6 months means for 3 years, the interest is compounded yearly and for the remaining 6 months, the interest is compounded half yearly. This means that we have 3 cycles of interest compounded yearly and 1 cycle of interest compounded half yearly.

$$\text{So, Amount} = P [1 + (R / 100)]^3 [1 + (\{R/2\} / 100)]$$

$$\rightarrow \text{Amount} = 10000 [1 + 0.1]^3 [1 + 0.05]$$

$$\rightarrow \text{Amount} = 10000 (1.1)^3 (1.05)$$

$$\rightarrow \text{Amount} = \text{Rs. } 13975.50$$

$$\rightarrow \text{Compound Interest, CI} = \text{Amount} - \text{Principal} = 13975.50 - 10000$$

$$\text{Therefore, CI} = \text{Rs. } 3975.50$$

7. If Rs. 5000 amounts to Rs. 5832 in two years compounded annually, find the rate of interest per annum.

(a) 6%

(b) 8%

(c) 10%

(d) 12%

Solution:

Here, $P = 5000$, $A = 5832$, $n = 2$

$$A = P [1 + (R / 100)]^n$$

$$\rightarrow 5832 = 5000 [1 + (R / 100)]^2$$

$$\rightarrow [1 + (R / 100)]^2 = 5832 / 5000$$

$$\rightarrow [1 + (R / 100)]^2 = 11664 / 10000$$

$$\rightarrow [1 + (R / 100)] = 108 / 100$$

$$\rightarrow R / 100 = 8 / 100$$

$$\rightarrow R = 8 \%$$

Thus, the required rate of interest per annum is 8 %

8. An investment doubles itself in 15 years if the interest is compounded annually. How many years will it take to become 8 times?

(a) 35 years

(b) 40 years

(c) 45 years

(d) 30 years

Solution: It is given that the investment doubles itself in 15 years.

Let the initial investment be Rs. P

\rightarrow At the end of 15 years, $A = 2P$

Now, this $2P$ will be invested.

\rightarrow Amount after 15 more years $= 2 \times 2P = 4P$

Now, this $4P$ will be invested.

\rightarrow Amount after 15 more years $= 2 \times 4P = 8P$

Thus, the investment (P) will become 8 times ($8P$) in $15 + 15 + 15 = 45$ years

9. The difference between the SI and CI on a certain sum of money at 10 % rate of annual interest for 2 years is Rs. 549. Find the sum.

(a) Rs. 54900

(b) Rs. 53700

(c) Rs. 59400

(d) Rs. 56800

Solution:

Let the sum be P .

$$R = 10 \%$$

$$n = 2 \text{ years}$$

$$SI = P \times R \times n / 100 = P \times 10 \times 2 / 100 = 0.20P$$

$$CI = A - P = P [1 + (R / 100)]^n - P = 0.21 P$$

Now, it is given that $CI - SI = 549$

$$\rightarrow 0.21 P - 0.20 P = 549$$

$$\rightarrow 0.01 P = 549$$

$$\rightarrow P = 54900$$

Therefore, the required sum of money is Rs. 54,900

10. A sum of Rs. 1000 is to be divided among two brothers A and B such that if the interest being compounded annually is 5 % per annum, then the money with A after 4 years is equal to the money with B after 6 years. Find their shares?

(a) A - 542.83, B - 457.17

(b) A - 524.38, B - 475.62

(c) A - 538.24, B - 461.76

(d) A - 543.82, B - 456.18

Solution:

Let A be given Rs. P

\rightarrow Money with B = Rs. 1000 - P

Now, according to the question,

$$P [1 + (5 / 100)]^4 = (1000 - P) [1 + (5 / 100)]^6$$

$$\rightarrow P (1.05)^4 = (1000 - P) (1.05)^6$$

$$\rightarrow 0.9070 P = 1000 - P$$

$$\rightarrow 1.9070 P = 1000$$

$$\rightarrow P = 524.38$$

Therefore, share of A = Rs. 524.38

Share of B = Rs. 475.62

11. The simple interest charged on an amount of Rs. 22,500 at the end of four years is Rs. 10,800. What will be the compound interest on the same amount at the same rate at the end of two years?

(a) Rs. 14,908

(b) Rs. 5,724

(c) Rs. 26,234

(d) Rs. 8,568

Solution:

$$\text{Rate} = \frac{10800 \times 100}{22500 \times 4} = 12\%$$

$$\text{Therefore, CI} = 22500 \left[\left(1 + \frac{12}{100} \right)^2 - 1 \right]$$

$$= 22500 \left(\frac{28^2}{25^2} - 1 \right)$$

$$= \text{Rs. } 5724$$

12. A sum of Rs. 91,000 is borrowed at 20% per annum compounded annually for two years. If it were borrowed at the rate of 100/7% per annum simple interest for four years then, find the difference between C.I and S.I

(a) Rs. 16,910

(b) Rs. 12,800

(c) Rs. 12,960

(d) Rs. 11,960

Solution:

$$CI = 91000 \left[\left(1 + \frac{20}{100} \right)^2 - 1 \right]$$

$$= 91000 \left(\frac{36}{25} - 1 \right)$$

$$= 91000 \times 11/25$$

$$= 40,040$$

$$\text{And, S.I} = \frac{91000 \times 100 \times 4}{700}$$

$$= 52,000$$

Therefore, required difference = 52000 – 40040 = Rs. 11960

13. Harish invested Rs. 80000 in two different parts one at the rate of 20% CI per annum and another one at the rate of 15% SI per annum. If he interchanges the rate of interest he got Rs. 2875 less at the end of two years. Find the difference of the two sums:

- (a) 20000 (b) 24000 (c) 26000 (d) 28000

Solution:

Let us take one part as x and another part as 80000 – x

Given,

$$(44/100 * x + (80000 - x) * 30/100) - (x * 32.25/100 + (80000 - x) * 40/100) = 2875$$

$$14x + 7.75x - 940000 = -287500$$

$$21.75x = 652500$$

$$X = 30000$$

$$\text{Required Difference} = (80000 - 30000) - 30000 = 20000$$

14. Hari lends a sum of Rs.8000 at 20% per annum at compound interest. He obtains an amount of Rs.13824 after a certain period. After how many years will he get that amount?

- (a) 2 (b) 1 (c) 4 (d) 3

Solution:

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

When interest is compounded annually, total amount can be calculated by using the formula

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

Given that, P = Rs.8000, R = 20% per annum

$$\text{Compound Amount} = \text{Rs. } 13824$$

We have to find the time period during which the amount will be Rs.13824

$$\Rightarrow \text{Rs. } 13824 = 8000 \times (1 + 20/100)^n$$

$$\Rightarrow (13824 / 8000) = (120 / 100)^n$$

$$\Rightarrow (24 / 20)^3 = (12 / 10)^n$$

$$\Rightarrow (12 / 10)^3 = (12 / 10)^n$$

Therefore, n = 3.

Hence the required time period is 3 years.

15. Sandeep borrows Rs 65,000 at 10% per annum simple interest for 3 years and lends it at 10% per annum compound interest for 3 years. Find his gain after three years.

(a) Rs. 2015

(b) Rs. 1330

(c) Rs. 1300

(d) Rs. 2105

Solution:

S.I. on Rs 65000 @ 10% for years

$$= \frac{65000 \times 10 \times 3}{100} = \text{Rs } 19500$$

C.I. on Rs 65000 @ 10% for 3 years

$$= 65000 \left[1 + \frac{10}{100} \right]^3 - 65000$$

$$= 65000 \left[\frac{11 \times 11 \times 11 - 10 \times 10 \times 10}{1000} \right]$$

$$= \text{Rs. } 21515$$

$$\text{Required Gain} = 21515 - 19500 = \text{Rs. } 2015$$

HOME WORK

16. The compound interest on a sum for 2 years is Rs. 832 and the simple interest on the same sum for the same period is Rs. 800. The difference between the compound and simple interest for 3 years will be:

(a) Rs. 48

(b) Rs. 66.56

(c) **Rs. 98.56**

(d) None of these

Solution:

Given that simple interest for 2 years is Rs.800

i.e., Simple interest for 1st year is Rs.400

and simple interest for 2nd year is also Rs.400

Compound interest for 1st year will be 400

and Compound interest for 2nd year will be $832 - 400 = 432$

you can see that compound interest for 2nd year is more than simple interest for 2nd year by $432 - 400 = \text{Rs.}32$

i.e, Rs. 32 is the interest obtained for Rs.400 for 1 year

$$\text{Rate, } R = 100 \times \frac{\text{SI}}{\text{P} \times \text{T}} = 100 \times \frac{32}{400 \times 1} = 8\% \quad \text{Rate, } R = 100 \times \frac{\text{SI}}{\text{P} \times \text{T}} = 100 \times \frac{32}{400 \times 1} = 8\%$$

Difference between compound and simple interest for the 3rd year
 = Simple Interest obtained for Rs.832

$$= \frac{PRT}{100} = \frac{832 \times 8 \times 1}{100} = \text{Rs. } 66.56$$

Total difference between the compound and simple interest for 3 years
 = 32 + 66.56 = Rs.98.56

17. Asha wants to invest some amount for 3 years in a new scheme which says that the compound rate of interest for three years will be 5%, 12% and 8% respectively. How much investment will yield her Rs 6350.40 at the end of the investment period?

- (a) **Rs. 5000** (b) Rs. 5800 (c) Rs. 6000 (d) Rs. 6500

Solution:

$$\text{Total Amount} = \text{Rs. } 6350.40 = P \left(1 + \frac{R}{100} \right)^n$$

Rate of interest, $R_1 = 5\%$ for 1st year; Time, $n_1 = 1$ year (1st year)

$R_2 = 12\%$ for 2nd year; $n_2 = 1$ year (2nd year)

$R_3 = 8\%$ for 3rd year; $n_3 = 1$ year (3rd year)

$$\therefore 6350.40 = P \left(1 + \frac{5}{100} \right)^1 \left(1 + \frac{12}{100} \right)^1 \left(1 + \frac{8}{100} \right)^1$$

$$\therefore 6350.40 = P \left(\frac{105}{100} \right) \left(\frac{112}{100} \right) \left(\frac{108}{100} \right)$$

$$\therefore P = \frac{6350.40 \times 100 \times 100 \times 100}{105 \times 112 \times 108}$$

$$\therefore \mathbf{P = Rs. 5000}$$

18. Ranjan says that, an amount became 4 times in 6 years. His friend wanted to know how many years will it take for the amount to become 64 times provided the rate of interest remains same?

- (a) 12 years (b) 16 years (c) **18 years** (d) 24 years

Solution:

Initial Amount = P.

P becomes 4 times in 6 years $\therefore P \rightarrow 4P$ in 6 years

$\therefore 4P \rightarrow 4 \times (4P) = 16P$ in next 6 years.

Continuing this, $16P \rightarrow 4 \times (16P) = 64P$ in next 6 years.

So total time to get to 64 times i.e. $64P = 6+6+6 = \mathbf{18 \text{ years.}}$

19. At the end of 3 years, the difference between the compound interest and simple interest comes to be Rs 320. The rate of interest is 25%. Find the principal amount.

- (a) Rs. 1525.50 (b) Rs. 1545.78 (c) Rs. 1550 **(d) Rs. 1575.38**

Solution:

Principal = P

Compound Interest = Total Amount - Principal = $P \left(1 + \frac{R}{100} \right)^n - P$

Simple Interest = $\frac{PRT}{100}$

R = 25% per annum; T and n = 3 years

Compound Interest - Simple Interest = Rs. 320

$$P \left(1 + \frac{R}{100} \right)^n - P - \frac{PRT}{100} = 320$$

$$\therefore P \left(1 + \frac{25}{100} \right)^3 - P - \frac{P \times 25 \times 3}{100} = 320$$

$$\therefore P \left(\frac{5}{4} \right)^3 - P - \frac{3P}{4} = 320$$

$$\therefore P \left(\frac{125}{64} \right) - \left(P + \frac{3P}{4} \right) = 320$$

$$\therefore \frac{125P}{64} - \frac{7P}{4} = 320$$

$$\therefore P = \text{Rs. 1575.38}$$

20. A sum becomes triple in 6 years at S.I. The same sum will become 19 times in how many years?

- (a) 50 years (b) 48 years **(c) 54 years** (d) 57 years

Solution:

SI=A-P=> A=3P as sum triples

SI=3P-P=2P in 6 years

In 19 times SI=18 P—54 years (2:6 hence 18=54)