

1.4

CHAPTER

Simple Interest & Compound Interest

Simple Interest

It is calculated on the basis of a basic amount borrowed for the entire period at a particular rate of interest.

The amount borrowed is the principal for the entire period of borrowing.

$$SI = \frac{P \times R \times T}{100}$$

Where P is principal amount

R is % rate of interest

T is the time duration

Compound Interest

The interest of the previous years are added to the principal for the calculation of the compound interest.

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

Where P is principal amount

R is Rate of interest

T is time duration

Case 1: When interest is compounded annually then amount A will be

$$A = \left[1 + \frac{R}{100} \right]^T$$

Case 2: When interest is compounded half yearly then

$$A = \left[1 + \frac{R/2}{100} \right]^{2T}$$

Case 3: When interest is compounded quarterly

$$A = \left[1 + \frac{R/4}{100} \right]^{4T}$$

Case 4: When differential rate of interest is charged i.e. rate of interest is

$R_1\%$ for first year.

$R_2\%$ for second year and

$R_3\%$ for third year then

$$\text{Amount} = P \left[1 + \frac{R_1}{100} \right] \times \left[1 + \frac{R_2}{100} \right] \left[1 + \frac{R_3}{100} \right]$$

□□□□



Solved Examples: 1

Example 1.

A sum of 12000 Rs. is deposited into SBI Bank for 3 years. If the bank is providing 5% rate then calculate the amount after the maturity period.

Solution:

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

$$SI = \frac{12000 \times 5 \times 3}{100} = \text{Rs. } 1800$$

Amount = Principal + SI

$$13800 = 12000 + 1800$$

Example 2.

An amount become double in 8 years calculate the rate of interest.

Solution:

Let the amount be Rs. x

Since it become double in 8 years so SI in 8 years = Rs. x

$$\text{Now } SI = \frac{P \times R \times T}{100}, \quad x = \frac{x \times R \times 8}{100}$$

$$\therefore R = \frac{100}{8} = 12\frac{1}{2}\%$$

Example 3.

An amount become 5 times in 20 years at simple interest. Calculate the rate of interest given.

Solution:

Principal = Rs. x

Total Amount = Rs. 5x. So

SI = Rs. 4x

$$\text{Now } SI = \frac{PRT}{100}, \quad 4x = \frac{x \times R \times 20}{100}$$

$$R = \frac{400}{20} = 20\%$$

Example: 4.

An amount of 25000 is deposited in to Citi bank for 2 years. Calculate the interest incurred if rate of interest is 10% compounded annually.

Solution:

Here P = Rs. 25000

R = 10%

R = 2 years

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

$$= 25000 \left[1 + \frac{10}{100} \right]^2 - 25000$$

$$= 30250 - 25000 = \text{Rs. } 5250$$

□□□□

**Solved Example: 2**

1. Rs. 1200 is lent out at 5% per annum simple interest for 3 years. Find the amount after 3 years.

- (a) Rs. 1380 (b) Rs. 1290
(c) Rs. 1470 (d) Rs. 1200

Ans. (a)

Here P = Rs. 1200

R = 5%, T = 3 years

$$SI = \frac{PRT}{100} = \frac{1200 \times 5 \times 3}{100} = \text{Rs. } 180$$

$$\text{Amount} = P + SI = 1200 + 180 = 1380$$

2. Rs. 2100 is lent at compound interest of 5% per annum for 2 years. Find the amount after two years.

- (a) Rs. 2300 (b) Rs. 2315.25
(c) Rs. 2310 (d) None of these

Ans. (b)

Here P = 2100, R = 5%, T = 2 years.

$$A = P \left[1 + \frac{R}{100} \right]^T = 2100 \left[1 + \frac{5}{100} \right]^2$$

$$= 2100 \times \frac{21}{20} \times \frac{21}{20} = \text{Rs. } 2315.25$$

3. Find the difference between the simple and the compound interest at 5% per annum for 2 years on a principal of Rs. 2000.

- (a) 5 (b) 105
(c) 4.5 (d) None of these

Ans. (a)

Here P = Rs. 2000, R = 5%, T = 2 years

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

$$= \left\{ \left[2000 \times \frac{105}{100} \times \frac{105}{100} \right] - 2000 \right\}$$

$$= \frac{2000 \times 5 \times 2}{100}$$

$$= 205 - 200 = \text{Rs. } 5$$

Alternative:

Difference between CI and SI for two years

$$(CI - SI)_{2Y} = P \left(\frac{R}{100} \right)^2 = (200) \left(\frac{5}{100} \right)^2 = 5$$

4. What is the difference between the simple interest on a principal of Rs. 500 being calculated at 5% per annum for 3 years and 4% per annum for 4 years

- (a) Rs. 5 (b) Rs. 10
(c) Rs. 20 (d) Rs. 40

Ans. (a)

P = Rs. 500, $R_1 = 5\%$, $R_2 = 4\%$,

$T_1 = 3$ years, $T_2 = 4$ years

$$\text{Difference} = \frac{PR_1T_1}{100} - \frac{PR_2T_2}{100} = \text{Rs. } 5.$$

5. What is the simple interest for five years on a sum of Rs. 700 if the rate of interest for the first 3 years is 8% per annum and for another 2 years is 7% per annum?

- (a) 400 (b) 392
(c) 352 (d) 266

Ans. (d)

$$\frac{700 \times 3 \times 8}{100} + \frac{700 \times 2 \times 7}{100} = 266$$

6. Find the compound interest on Rs. 1000 at the rate of 20% per annum for 18 months when interest is compounded half-yearly.

- (a) Rs. 331 (b) Rs. 1331
(c) Rs. 320 (d) None of these

Ans. (a)

Here P = Rs. 1000, R = 20%,

T = 18 months or $1\frac{1}{2}$ years.

Compound interest when interest is compounded annually

$$CI = 1000 \left[1 + \frac{R/2}{100} \right]^{2T}$$

$$= 1000 \left[1 + \frac{10}{100} \right]^3 = \text{Rs. } 1331$$

7. Find the principal if the interest compounded at the rate of 10% per annum for two years is Rs. 420.

- (a) Rs. 2000 (b) Rs. 2200
(c) Rs. 1000 (d) Rs. 1100

Ans. (a)

$P = ?$, $CI = \text{Rs. } 420$, $R = 10\%$, $T = 2$ years.

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

$$420 = P \left[\left(1 + \frac{10}{100} \right)^2 - 1 \right]$$

$$= P \left[\frac{21}{100} \right]$$

$$\therefore P = \frac{420 \times 100}{21} = \text{Rs. } 2000$$

8. What is the rate of simple interest for the first 4 years if the sum of Rs. 360 becomes Rs. 540 in 9 years and the rate of interest for the last 5 years is 6%?

- (a) 4% (b) 5%
(c) 3% (d) 6%

Ans. (b)

$P = \text{Rs. } 360$, $A = \text{Rs. } 540$, $SI = \text{Rs. } 180$.

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

$$180 = \frac{360 \times R \times 4}{100} + \frac{360 \times 6 \times 5}{100}$$

$$72 = \frac{360 \times R \times 4}{100}, R = 5\%$$

9. Ajay borrows Rs. 1500 from two money-lenders. He pays interest at the rate of 12% per annum for one loan and at the rate of 14% per annum for the other. The total interest he pays for the entire year is Rs. 186. How much does he borrow at the rate of 12%?

- (a) Rs. 1200 (b) Rs. 1300
(c) Rs. 1400 (d) Rs. 300

Ans. (a)

$P = 1500$, $R_1 = 12\%$, $R_2 = 14\%$, $T = 1$ year
 $SI = 186$

Let Rs. x be amount invested at 12% Rate

$$= \frac{x \times 12 \times 1}{100} + \frac{(1500 - x) \times 14}{100} = 186$$

$$\frac{21000}{100} - \frac{2x}{100} = 186, x = 1200$$

10. Two equal sums were borrowed at 8% simple interest per annum for 2 years and 3 years respectively. The difference on the interest was Rs. 56. The sum borrowed were

- (a) Rs. 690 (b) Rs. 700
(c) Rs. 740 (d) Rs. 780

Ans. (b)

$$\frac{PRT_1}{100} - \frac{PRT_2}{100}$$

$$P \left[\frac{8 \times 3 - 8 \times 2}{100} \right] = 56, P = 700$$

11. If the difference between the simple interest and compound interest on some principal amount at 20% per annum for 3 years is Rs. 48, then the principle amount must be

- (a) Rs. 550 (b) Rs. 500
(c) Rs. 375 (d) Rs. 400

Ans. (c)

Here $P = ?$, $R = 20\%$, $T = 3$ year

Difference Rs. 48

$$48 = P \left[1 + \frac{R}{100} \right]^T - P - \frac{PRT}{100}$$

$$48 = P \left[\left(1 + \frac{20}{100} \right)^3 - 1 - \frac{20 \times 3}{100} \right]$$

On solving $P = 375$.

12. Raju lent Rs. 400 to Ajay for 2 years, and Rs. 100 to Manoj for 4 years and received together from both Rs. 60 as interest. Find the rate of interest, simple interest being calculated.

- (a) 5% (b) 6%
(c) 8% (d) 9%

Ans. (a)

$$\frac{P_1 R_1 T_1}{100} + \frac{P_2 R_2 T_2}{100} = 60$$

$$\frac{400 \times 2 \times R}{100} + \frac{100 \times 4 \times R}{100} = 60$$

$$12R = 60, R = 5\%$$

13. A sum of money doubles itself in 5 years. In how many years will it become four fold (if interest is compounded)?

- (a) 15 (b) 10
(c) 20 (d) 12

Ans. (b)

Let sum = x

$$\text{Then, } 2x = x \left[1 + \frac{R}{100} \right]^5$$

$$\Rightarrow \left[1 + \frac{R}{100} \right] = 2^{1/5} \quad \dots(i)$$

$$4x = x \left[1 + \frac{R}{100} \right]^T$$

$$\Rightarrow 4 = [2^{1/5}]^T$$

$$\Rightarrow 2^2 = 2^{T/5}$$

$$\Rightarrow \frac{T}{5} = 2$$

$$\therefore T = 10 \text{ yrs.}$$

14. A sum of money placed at compound interest doubles itself in 3 years. In how many years will it amount to 8 times itself?

- (a) 9 years (b) 8 years
(c) 27 years (d) 7 years

Ans. (a)

Let sum = x

$$\text{Then, } 2x = x \left[1 + \frac{R}{100} \right]^3$$

$$\Rightarrow \left[1 + \frac{R}{100} \right] = 2^{1/3} \quad \dots(i)$$

$$8x = x \left[1 + \frac{R}{100} \right]^T$$

$$\Rightarrow 8 = [2^{1/3}]^T$$

$$\Rightarrow 2^3 = 2^{T/3}$$

$$\Rightarrow \frac{T}{3} = 3$$

$$\therefore T = 9 \text{ yrs.}$$

Alternative:

If certain sum of money becomes 'm' times in 'y' years. Then it will become (m^n) times in 'n × y' years. Hence 2^3 in $3 \times 3 = 9$ years.

15. Divided Rs. 6000 into two parts so that simple interest on the first part for 2 years at 6% p.a. may be equal to the simple interest on the second part for 3 years at 8% p.a.

- (a) Rs. 4000, Rs. 2000
(b) Rs. 5000, Rs. 1000
(c) Rs. 3000, Rs. 3000
(d) None of these

Ans. (a)

Let one part be Rs. x then

$$\frac{x \times 2 \times 6}{100} = \frac{(6000 - x) \times 3 \times 8}{100}$$

$$12x = 144000 - 24x$$

$$36x = 144000$$

$$x = 4000$$

16. A sum of money becomes $7/4$ of itself in 6 years at a certain rate of simple interest. Find the rate interest.

- (a) 12% (b) 12.5%
(c) 8% (d) 14%

Ans. (b)

Let sum be x

$$A = \frac{7}{4}x, \text{ So, } SI = \frac{3}{4}x$$

$$T = 6 \text{ years, } R = ?$$

$$R = \frac{SI \times 100}{P \times T} = \frac{\frac{3}{4}x \times 100}{x \times 6} = 12.5\%$$

17. Sanjay borrowed Rs. 900 at 4% p.a. and Rs. 1100 at 5% p.a. for the same duration. He had to pay Rs. 364 in all as interest. What is the time period in years?

- (a) 5 years (b) 3 years
(c) 2 years (d) 4 years

Ans. (d)

$$\frac{P_1 R_1 T_1}{100} + \frac{P_2 R_2 T_2}{100} = 364$$

$$\left[\frac{900 \times 4T}{100} + \frac{1100 \times 5T}{100} \right] = 364$$

$$36T + 55T = 364$$

$$T = 4 \text{ years}$$

18. If a certain sum of money becomes double at simple interest in 12 years, what would be the rate of interest per annum?

- (a) $8\frac{1}{3}$ (b) 10
(c) 12 (d) 14

Ans. (a)

$$x = \frac{x \times 12 \times R}{100}$$

$$R = \frac{100}{12} = 8\frac{1}{3}$$

19. A sum of Rs. 600 amounts to Rs. 720 in 4 years at simple Interest. What will it amount to if the rate of interest is increased by 2%?

- (a) Rs. 648 (b) Rs. 768
(c) Rs. 726 (d) Rs. 792

Ans. (b)

$$P = \text{Rs. } 600, \quad A = \text{Rs. } 720$$

$$T = 4 \text{ years}, \quad R = ?$$

$$R = \frac{\text{S.I.} \times 100}{P \times T} = \frac{120 \times 100}{600 \times 4} = 5\%$$

at 7% Rate

$$\text{SI} = \frac{600 \times 7 \times 4}{100} = 168$$

$$A = 600 + 168 = 768$$

□□□□

Simple Interest



Practice Exercise: I

1. Avinash borrowed Rs. 5000 from Sanjay at simple Interest. After 3 years, Sanjay got Rs. 300 more than what he had given to Avinash. What was the rate of interest per annum?

- (a) 2% (b) 5%
(c) 8% (d) 10%

2. Rs. 800 amounts to Rs. 920 in 3 years at simple interest. If the interest rate is increased by 3%, it would amount to how much?

- (a) Rs. 992 (b) Rs. 1056
(c) Rs. 1112 (d) Rs. 1182

3. The simple interest on a sum of money at 5% is Rs. 48 for 4 years. The simple interest on the same sum for 5 years at 4% will be.

- (a) Rs. 40 (b) Rs. 48
(c) Rs. 50 (d) Rs. 60

4. A sum of money at simple interest amounts to Rs. 2240 in 2 years and to Rs. 2600 in 5 years. What is the principal amount?

- (a) Rs. 1520 (b) Rs. 1880
(c) Rs. 2120 (d) None

5. The simple interest on a certain sum of money at the rate of 5% p.a. for 8 years in Rs. 840. At what rate of interest the same amount of interest can be received on the same sum after 5 years?

- (a) 6% (b) 8%
(c) 9% (d) 10%

6. A sum of money was lent at simple interest at 11%

p.a. for $3\frac{1}{2}$ years and $4\frac{1}{2}$ years respectively. If the

difference in interests for two period was Rs. 412.50, the sum is:

- (a) Rs. 3250 (b) Rs. 3500
(c) Rs. 3750 (d) Rs. 4250

7. Prabhat took a certain amount as a loan from a bank at the rate of 8% p.a. S.I. and gave the same amount to Ashish as a loan at the rate of 12% p.a. If at the end of 12 years, he made a profit of Rs. 320 in the deal, what was the original amount.

- (a) Rs. 2000 (b) Rs. 3000
(c) Rs. 4000 (d) None of these

8. Rahul borrowed Rs. 830 from Mr. Lal at 12% p.a. S.I. for 3 years. He then added some more money to the borrowed sum and lent it to Shobha for the same period at 14% p.a. rate of interest. If Rahul gains Rs. 93.90 in the whole transaction, how much money did he add from his side?

- (a) Rs. 35 (b) Rs. 55
(c) Rs. 80 (d) Rs. 105

9. Mr. Roopchand finds that an increase in the rate of

interest from $4\frac{7}{8}\%$ to $5\frac{1}{8}\%$ per annum increases

his yearly income by Rs. 25. His investment is:

- (a) Rs. 10,000 (b) Rs. 12,000
(c) Rs. 15,000 (d) Rs. 20,000

10. The rate at which a sum becomes four times of itself in 15 years at S.I. will be:

- (a) 15% (b) $17\frac{1}{2}\%$
(c) 20% (d) 25%

11. The simple interest on a sum of money at the end of four years is $\frac{1}{5}$ th of its principal. What is the rate of interest per annum?

- (a) 4% (b) 5%
(c) 6% (d) Data inadequate

12. A sum of money triples itself in 15 years 6 months. In how many years would it double itself?

- (a) 6 years 3 months
(b) 7 years 9 months
(c) 8 years 3 months
(d) 9 years 6 months

13. A sum of Rs. 10 is lent to be returned in 11 monthly installments of Rs. 1 each, interest being simple. The rate of interest is:

- (a) $9\frac{1}{11}\%$ (b) 10%
(c) 11% (d) $21\frac{9}{11}\%$

14. The rate of simple interest on a sum of money is 6% p.a. for the first 3 years, 8% p.a. for the next 5 years and 10% p.a. for the period beyond 8 years. If the simple interest accrued by the sum for a total period of 10 years is Rs. 1560, what is the sum?

- (a) Rs. 1500 (b) Rs. 2000
(c) Rs. 3000 (d) Data inadequate

15. A monthly installment of Rs. 180 is required to be paid for repayment of an interest free loan in 40 months. If it is decided to pay it in 30 months, how much will be the monthly instalment in rupees?

- (a) 60 (b) 198
(c) 240 (d) 330

16. 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, the money lent at 8% is:

- (a) Rs. 650 (b) Rs. 720
(c) Rs. 840 (d) Rs. 900

17. A sum of Rs. 1550 was lent partly at 5% and partly at 8% p.a. simple interest. The total interest received after 3 years was Rs. 300. The ratio of the money lent at 5% to that lent at 8%.

- (a) 8 : 5 (b) 5 : 8
(c) 31 : 6 (d) 16 : 15

18. A man invests an amount of Rs. 15860 in the names of his three sons A, B and C in such a way that they

get the same amount after 2, 3 and 4 years respectively. If the rate of simple interest is 5% then the ratio of amounts invested among, A, B and C will be:

- (a) 10 : 15 : 20 (b) 22 : 23 : 24
(c) 6 : 4 : 3 (d) 2 : 3 : 4

□□□□

Solutions

1. Ans. (a)

$$\text{Rate} = \left(\frac{100 \times 300}{5000 \times 3} \right) \% = 2\%.$$

2. Ans. (a)

Principal = Rs. 800, S.I. = Rs. 120,
Time = 3 years.

$$\therefore \text{Rate} = \left(\frac{100 \times 120}{800 \times 3} \right) \% = 5\%.$$

New rate = 8%, Principal = Rs. 800
Time 3 years.

$$\text{S.I.} = \text{Rs.} \left(\frac{800 \times 8 \times 3}{100} \right) = \text{Rs. 192}$$

$$\therefore \text{New amount} = \text{Rs.} (800 + 192) = \text{Rs. 992}$$

3. Ans. (b)

$$\text{Principal} = \text{Rs.} \left(\frac{100 \times 48}{5 \times 4} \right) = \text{Rs. 240}.$$

$$\text{SI} = \text{Rs.} \left(\frac{240 \times 5 \times 4}{100} \right) = \text{Rs. 48}$$

4. Ans. (d)

$$\text{S.I. for} = \text{Rs.} (2600 - 2240) = \text{Rs. 360}.$$

$$\text{S.I. For 2 years} = \text{Rs.} \left(\frac{360}{3} \times 2 \right) = \text{Rs. 240}$$

$$\therefore \text{Principal} = \text{Rs.} (2240 - 240) = \text{Rs. 2000}$$

5. Ans. (b)

$$\text{Sum} = \left(\frac{100 \times 840}{5 \times 8} \right) = \text{Rs. 2100}.$$

$$\text{Rate required} = \left(\frac{100 \times 840}{2100 \times 5} \right) \% = 8\%.$$

6. Ans. (c)

Let the sum be Rs. x . Then,

$$\left(x \times 11 \times \frac{9}{2} \times \frac{1}{100} - x \times 11 \times \frac{7}{2} \times \frac{1}{100} \right) = 412.50$$

$$\text{or } \frac{22x}{200} = 412.50$$

$$\Rightarrow 11x = 41250$$

$$\Rightarrow x = 3750$$

7. Ans. (d)

Let the original amounts be Rs. x . then,

$$\frac{x \times 12 \times 12}{100} - \frac{x \times 8 \times 12}{100} = 320$$

$$\Rightarrow x = \frac{2000}{3} = \text{Rs. } 666.67$$

8. Ans. (d)

$$\frac{(830+x) \times 14 \times 3}{100} - \frac{830 \times 12 \times 3}{100} = 93.90$$

$$\text{or } 830 \times 42 + 42x - 830 \times 36 = 9390$$

$$42x = 9390 - 4980$$

$$\Rightarrow x = \frac{4410}{42} = 105.$$

\therefore Money added = Rs. 105.

9. Ans. (a)

Let the investment be Rs. x . Then,

$$x \times \frac{41}{8} \times \frac{1}{100} - x \times \frac{39}{8} \times \frac{1}{100} = 25$$

$$\Rightarrow 2x = 20000 \Rightarrow x = 10000.$$

10. Ans. (c)

Let sum = x , Then, S.I. = $3x$

$$\therefore \text{Rate} = \left(\frac{100 \times 3x}{x \times 15} \right) \% = 20\%$$

11. Ans. (b)

Let sum = x , Then, S.I. = $\frac{x}{5}$, Time = 4 years.

$$\therefore \text{Rate} = \left(100 \times \frac{x}{5} \times \frac{1}{x \times 4} \right) \% = 5\%.$$

12. Ans. (b)

Let sum = x ,

Then, S.I. = $2x$ & Time = $\frac{31}{2}$ years.

$$\text{Rate} = \left(\frac{100 \times 2x}{x} \times \frac{2}{31} \right) \% = \left(\frac{400}{31} \right) \%$$

Now, sum = x , S.I. = x & Rate $\left(\frac{400}{31} \right) \%$.

$$\therefore \text{Time} = \left(\frac{100 \times x}{x} \times \frac{31}{400} \right) \text{years}$$

= 7 years 9 months

13. Ans. (d)

Rs. 10 + S.I. on Rs. 10 for 11 months

= Rs. 11 + S. I. on Rs. 1 for (1 + 2 + 3 + 4 + ... + 10) months

Rs. 10 + S.I. on Rs. 1. for 110 months

= Rs. 11 + S.I. on Rs. 1 for 55 months

S.I. on Rs. 1 for 55 months = Rs. 1.

$$\therefore \text{Rate} = \left(\frac{100 \times 12}{1 \times 55} \right) \% = 21 \frac{9}{11} \%$$

14. Ans. (b)

Let the sum be Rs. x . Then

$$\frac{x \times 6 \times 3}{100} + \frac{x \times 8 \times 5}{100} + \frac{x \times 10 \times 2}{100} = 1560$$

$$\text{or } 78x = 156000$$

$$\text{or } x = 2000$$

15. Ans. (c)

$$180 \times 40 = x \times 30 \text{ or } x = 240$$

16. Ans. (a)

Let the money lent at 8% be Rs. x . then,

$$\frac{x \times 8 \times 1}{100} + \frac{(1550 - x) \times 6 \times 1}{100} = 106$$

$$\text{or } 2x + 9300 = 10600 \text{ or } x = 650.$$

17. Ans. (d)

Let the sum at 5% be Rs. x . Then,

$$\frac{x \times 5 \times 3}{100} + \frac{(1550 - x) \times 8 \times 3}{100} = 300$$

$$\text{or } x = 800$$

$$\frac{\text{Money at 5\%}}{\text{Money at 8\%}} = \frac{800}{(1550 - 800)}$$

$$= \frac{800}{750} = \frac{16}{15}$$

18. Ans. (c)

Let the amounts invested be x, y, z respectively.

$$\text{Then, } \frac{x \times 2 \times 5}{100} = \frac{y \times 3 \times 5}{100} = \frac{z \times 4 \times 5}{100} = k.$$

$$\therefore x = 10k, y = \frac{20}{3}k \text{ \& } z = 5k.$$

$$\begin{aligned} \text{So, } x : y : z &= 10k : \frac{20}{3}k : 5k \\ &= 30 : 20 : 15 = 6 : 4 : 3. \end{aligned}$$



Compound Interest



Practice Exercise: I

- The difference in compound interest, and simple interest on a certain amount at 10% per annum at the end of the third year is Rs. 620. What is the principal amount?
(a) Rs. 40000 (b) Rs. 12000
(c) Rs. 10000 (d) Rs. 20000
- If the compound interest on a certain sum at $16\frac{2}{3}\%$ for 3 years is Rs. 1270, the simple interest on the same sum at the same rate and for the same period is:
(a) Rs. 1200 (b) Rs. 1165
(c) Rs. 1080 (d) Rs. 1220
- What is principal amount which earns Rs. 132 as compound interest for the second year at 10% per annum?
(a) Rs. 1000 (b) Rs. 1200
(c) Rs. 1320 (d) Rs. 1188
- A sum of money amounts to Rs. 4624 in 2 years and to Rs. 4913 in 3 years at compound interest. The sum is:
(a) Rs. 4096 (b) Rs. 4260
(c) Rs. 4335 (d) Rs. 4360
- A sum of money at compound interest amounts to thrice itself in 3 years. In how many years will it be 9 times itself?
(a) 12 (b) 9
(c) 6 (d) 8
- In how many years will a sum of Rs. 800 at 10% per annum compounded semiannually become Rs. 926.10?
(a) $2\frac{1}{2}$ (b) $1\frac{1}{2}$
(c) $2\frac{1}{3}$ (d) $1\frac{1}{3}$
- To find out the total compound interest on a sum of money after 5 years, which of the following informations given in the statements P and Q will be sufficient?
P : The sum was Rs. 20000.
Q : The total amount of simple interest on the sum after 5 years was Rs. 4000.
(a) Only P is sufficient
(b) Only Q is sufficient
(c) Either P or Q is sufficient
(d) Both P & Q are needed
- The least number of complete years in which a sum of money put out at 20% compound interest will be more than doubled is:
(a) 3 (b) 4
(c) 5 (d) 6
- A tree increases annually by $\frac{1}{8}$ th of its height. By how much will it increase after 2 years, if it stands today 64 cm high?
(a) 72 cm (b) 74 cm
(c) 75 cm (d) 81 cm
- 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 interest and the simple interest for 3 years will be :
(a) Rs. 48 (b) Rs. 66.56
(c) Rs. 98.56 (d) None of these
- A sum of Rs. 1100 was taken as a loan. This is to be repaid in two equal installments. If the rate of interest be 20% compounded annually, then the value of each installment is
(a) Rs. 842 (b) Rs. 792
(c) Rs. 720 (d) Rs. 700

12. What annual payment will discharge a debt of

Rs. 7620 due in 3 years at $16\frac{2}{3}\%$ per annum

compound interest?

- (a) Rs. 2540 (b) Rs. 3430
(c) Rs. 3260 (d) Rs. 3380

□□□□

Solutions

1. Ans. (d)

Let the sum be Rs. x . Then,

$$\begin{aligned} \text{C.I.} &= x \left(1 + \frac{10}{100} \right)^3 - x \\ &= \left(\frac{1331}{1000}x - x \right) = \frac{331x}{1000} \end{aligned}$$

$$\text{S.I.} = \frac{x \times 10 \times 3}{100} = \frac{3x}{10}$$

$$\therefore (\text{C.I.}) - (\text{S.I.}) = \left(\frac{331x}{1000} - \frac{3x}{100} \right) = \frac{31x}{1000}$$

$$\therefore \frac{31x}{1000} = 620$$

$$\text{or } x = 20000.$$

Hence, the principal amount is Rs. 20000.

Alternative:

$$(\text{CI} - \text{SI})_{3y} = 3P \left(\frac{R}{100} \right)^2 + P \left(\frac{R}{100} \right)^3$$

2. Ans. (c)

Let the sum be Rs. x . Then,

$$\text{C.I.} = \left[x \times \left(1 + \frac{50}{3 \times 100} \right)^3 \right] - x$$

$$= \left(\frac{343x}{216} - x \right) = \frac{127x}{216}$$

$$\therefore \frac{127x}{216} = 1270$$

$$\text{or } x = \frac{1270 \times 216}{127} = 2160.$$

Thus, the sum is Rs. 2160.

$$\begin{aligned} \therefore \text{S.I.} &= \text{Rs.} \left(2160 \times \frac{50}{3} \times 3 \times \frac{1}{100} \right) \\ &= \text{Rs. } 1080. \end{aligned}$$

3. Ans. (b)

Let the principal at the end of first year be Rs. x .

$$\text{Then, } \frac{x \times 10 \times 1}{100} = 132 \quad \text{or } x = 1320.$$

Now, let the original principal be Rs. P .

Then, amount after 1 year

$$= P + \frac{P \times 10 \times 1}{100} = \frac{11P}{10}$$

$$\therefore \frac{11P}{10} = 1320$$

$$\text{or } P = \frac{1320 \times 10}{11} = \text{Rs. } 1200.$$

4. Ans. (a)

Interest on Rs. 4624 for 1 year

$$= \text{Rs. } (6083.50 - 5290) = \text{Rs. } 793.50$$

$$\therefore \text{Rate} = \left(\frac{100 \times 793.50}{4624 \times 1} \right) \% = 6\frac{1}{4}\%$$

$$\text{Now, } x \left(1 + \frac{25}{4 \times 100} \right)^2 = 4624$$

$$\text{or } x \times \frac{17}{16} \times \frac{17}{16} = 4624$$

$$\therefore x = \left(4624 \times \frac{16}{17} \times \frac{16}{17} \right) = \text{Rs. } 4096.$$

5. Ans. (c)

$$P \left(1 + \frac{R}{100} \right)^3 = 3P \Rightarrow \left(1 + \frac{R}{100} \right)^3 = 3 \quad \dots (i)$$

$$\text{Let } P \left(1 + \frac{R}{100} \right)^n = 9P \Rightarrow \left(1 + \frac{R}{100} \right)^n = 9.$$

$$\therefore \left(1 + \frac{R}{100} \right)^n = 3^2$$

$$= \left[\left(1 + \frac{R}{100} \right)^3 \right]^2 = \left(1 + \frac{R}{100} \right)^6 \quad \{\text{using (i)}\}$$

Hence, $n = 6$ years.

6. Ans. (b)

Rate = 5% per half year.

Let time = $2n$ half years = n years.

$$\text{Then, } 800 \left(1 + \frac{5}{100} \right)^{2n} = 926.10$$

$$\Rightarrow \left(\frac{21}{20} \right)^{2n} = \frac{926.10}{800} = \frac{9261}{8000} = \left(\frac{21}{20} \right)^3$$

$$\therefore 2n = 3 \quad \text{or } n = \frac{3}{2} \text{ years.}$$

7. Ans. (d)

Clearly, both P and Q together are needed. Using P and Q rate can be calculated as

$$\text{Rate} = \left(\frac{100 \times 4000}{5 \times 20000} \right) = 4\%$$

Now, C.I. can be calculated.

8. Ans. (b)

$$P = \left(1 + \frac{20}{100} \right)^n > 2P \text{ or } \left(\frac{6}{5} \right)^n > 2$$

$$\text{Now } \left(\frac{6}{5} \times \frac{6}{5} \times \frac{6}{5} \times \frac{6}{5} \right) > 2$$

So, $n = 4$ years.

9. Ans. (d)

$$\text{Increase \%} = \left(\frac{1}{8} \times 100 \right) \% = 12\frac{1}{2}\%.$$

Height after 2 years

$$= \left[64 \times \left(1 + \frac{25}{2 \times 100} \right)^2 \right] \text{cm}$$

$$= \left(64 \times \frac{9}{8} \times \frac{9}{8} \right) \text{cm} = 81 \text{cm}.$$

10. Ans. (c)

Diff. in C.I. & S.I. for 2 years = Rs. 32.

S.I. for 1 year = Rs. 400.

\therefore S.I. on Rs. 400 for 1 year = Rs. 32.

$$\therefore \text{Rate} = \left(\frac{100 \times 32}{400 \times 1} \right) \% = 8\%.$$

Hence, diff. in C.I. and S.I. for 3rd year
= S.I. on Rs. 832

$$= \text{Rs.} \left(832 \times \frac{8}{100} \times 1 \right) = \text{Rs. } 66.56.$$

$$\text{Total difference} = \text{Rs. } (32 + 66.56) \\ = \text{Rs. } 98.56$$

11. Ans. (c)

Let the value of each installment be Rs. x .

Then,

(P.W. of Rs. x due 1 year hence) + (P.W. of Rs. x due 2 years hence) = Rs. 1100.

$$= \frac{x}{\left(1 + \frac{20}{100} \right)} + \frac{x}{\left(1 + \frac{20}{100} \right)^2} = 1100$$

$$\text{or } \frac{5x}{6} + \frac{25x}{36} = 1100; 55x = 36 \times 1100$$

$$\therefore x = \left(\frac{36 \times 1100}{55} \right) = \text{Rs. } 720.$$

12. Ans. (b)

Let each installment be Rs. x . Then,

$$\frac{x}{\left(1 + \frac{50}{3 \times 100} \right)} + \frac{x}{\left(1 + \frac{50}{3 \times 100} \right)^2}$$

$$+ \frac{x}{\left(1 + \frac{50}{3 \times 100} \right)^3} = 7620.$$

$$\text{or } \frac{6x}{7} + \frac{36x}{49} + \frac{216x}{343} = 7620.$$

$$294x + 252x + 216x = 7620 \times 343$$

$$\text{or } x = \frac{7620 \times 343}{762} = 3430.$$

\therefore Amount of each installment = Rs. 3430.

