

Simple Interest and Compound Interest

Examples

$$\text{time} \times \text{rate} = \frac{\text{S.I}}{\text{Principal}} \times 100$$

$$\text{Amount} = \text{S.I} + \text{Principal}$$

1

Find the simple interest, If

1. P = Rs.1000, R = 20% per annum, T = 4 years.
2. P = Rs.600, R = 5% per annum, T = 4 months.
3. P = Rs.200, R = 6% per six months, T = 3 years.
4. P = Rs.500, R = 2% per six months, T = $5\frac{1}{2}$ years.
5. P = Rs.400, R = 3% per three months, T = 2 months.
6. P = Rs.730, R = 10% per annum, T = 120 days.
7. P = Rs. 3000, R = $6\frac{1}{4}$ per annum, T = period from 4th Feb to 18th Apr.

Solution

1. $4 \times 20 \times 10 = 800$

$$20 \times 4 = \frac{\text{S.I}}{1000} \times 100$$

$$20 \times 4 \times 10 = \text{S.I}$$

2. $2 \times 5 = 10$

Simple Interest and Compound Interest

$$\frac{4}{12} \times 5 = \frac{\text{S.I.}}{600} \times 100$$

$$\frac{1}{3} \times 5 \times 6 = \text{S.I.}$$

$$\text{S.I.} = 5 \times 2 = 10$$

3. $6 \times 2 \times 3 \times 2 = 72$

$$(6 \times 2) \times 3 = \frac{\text{S.I.}}{200} \times 100$$

$$6 \times 2 \times 3 \times 2 = \text{S.I.}$$

4. $5 \times 2 \times 5 = 50$

$$\frac{5}{2} \times (2 \times 2) = \frac{\text{S.I.}}{500} \times 100$$

$$5 \times 2 \times 5 = \text{S.I.}$$

5. $4 \times 2 = 8$

$$(\text{time} \times \text{rate}) = \frac{\text{S.I.}}{\text{Principal}} \times 100$$

$$\frac{2}{12} \times (3 \times 1) = \frac{\text{S.I.}}{400} \times 100$$

$$2 \times 4 = \text{S.I.}$$

6. $73/3 = 24$

Simple Interest and Compound Interest

$$\frac{4}{12} \times 10 = \frac{\text{S.I.}}{730} \times 100$$

$$\frac{73}{10} \times 10 \times \frac{1}{3} = \text{S.I.}$$

7. 37.50

$$T = (24+31+18)\text{days} = 73 \text{ days} = \frac{73}{365} = \frac{1}{5} \text{ yr.}$$

$$\frac{1}{5} \times \frac{25}{4} = \frac{\text{S.I.}}{3000} \times 100$$

$$\frac{5}{4} \times 30 = \text{S.I.}$$

#2

Find the following:

1. P = Rs. 100, R = 3% per annum, T = 2 year, A = ?
2. P = Rs. 500, R = 6% per annum, T = 4 months, A = ?
3. P = Rs. 400, R = 3.65% per annum, T = 150 days, A = ?
4. A = Rs. 540, S.I = Rs. 108, R = 5%, T = ?
5. A = Rs. 1,120, R = 5%, T = $2\frac{2}{5}$ yr, S.I = ?

Solution:

1. S.I = 6 ; A = S.I + principal ; A = 6 + 100 = 106

Simple Interest and Compound Interest

Method I

$$r \times t = \frac{\text{S.I.}}{\text{Principal}}$$

$$3 \times 2 = \frac{\text{S.I.}}{100} \times 100$$

$$6 = \text{S.I.}$$

$$\text{Amount} = \text{S.I.} + \text{Principal}$$

$$\text{Amount} = 6 + 100$$

$$A = 106$$

Method II

$$A = P \left[1 + \frac{RT}{100} \right]$$

$$A = 100 \left[1 + \frac{3 \times 2}{100} \right]$$

$$A = 100 \times \frac{106}{100}$$

$$\text{Amount} = 106$$

2. $\text{S.I} = 10$; $A = \text{S.I} + P$; $A = 10 + 500 = 510$

3. $\text{S.I} = 6$; $A = 400 + 6 = 406$

$$R \times T = \frac{\text{S.I.}}{\text{Principal}} \times 100$$

$$\frac{365}{100} \times \frac{150}{365} = \frac{\text{S.I.}}{400} \times 100$$

$$\frac{3}{2} \times 4 = \text{S.I.}$$

$$6 = \text{S.I.}$$

$$\text{Amount} = \text{S.I.} + \text{Principal}$$

$$A = 6 + 400$$

4. $T = 5$ yr.

$$R \times T = \frac{\text{S.I.}}{\text{Principal}} \times 100$$

$$T = \frac{108}{5 \times 432} \times 100$$

$$[27 \times 4 = 108]$$

$$[27 \times 16 = 432]$$

$$T = 5 \text{ yr.}$$

Note :

Divisibility Method: $9 \times 3 = 27$

$1+0+8 = 9$, $4+3+2 = 9$

9 which is divisible by 9 & 3
hence also divisible by 27

5. 120

Method I	Method II
$\frac{12}{5} \times 5 = \frac{S.I}{x} \times 100$	$\frac{A}{SI} = 1 + \frac{100}{RT}$
$\frac{12x}{100} = S.I$	$540 = 108 \left(1 + \frac{100}{RT} \right)$
$A = S.I + P$	$\Rightarrow \frac{1120}{S.I.} = \frac{112}{12}$
$A = \frac{12x}{100} + x$	
$1120 = \frac{112x}{100}$	
$1000 = x$	
$S.I = A - P$	
$S.I = 1120 - 1000 \Rightarrow 120$	

#3

1. A sum of money lent out at simple interest amounts to Rs. 720 after 2 years and to Rs. 1020 after a further period of 5 years. Find the sum and the rate %.
2. Adam borrowed some money at the rate of 6% p.a. for the first two years, at the rate of 9% p.a. for the next three years, and at the rate of 14% p.a. for the period beyond five years. If he pays a total interest of Rs. 11,400 at the end of nine years, how much money did he borrow ? **(Bank P.O 1999)**

Simple Interest and Compound Interest

3. A person borrows Rs. 5000 for 2 years at 4% p.a. simple interest. He immediately lends it to another person at $6\frac{1}{4}\%$ p.a. for 2 years. Find his gain in the transaction per year. **(S.S.C.2000)**
4. A certain sum of money amounts to Rs. 1008 in 2 years and to Rs. 1164 in $3\frac{1}{2}$ years. Find the sum and the rate of interest?
5. The simple interest on a certain sum of money for $2\frac{1}{2}$ years at 12% per annum is Rs. 40 less than the simple interest on the same sum for $3\frac{1}{2}$ years at 10% per annum. Find the sum.

Solution

1. **Principal = 600, R = 10%**

$$r \times t = \frac{SI}{P} \times 100$$

$$SI = 1020 - 720 = 300$$

$$\text{In 2 Years} = SI = \frac{300}{5} \times 2$$

$$\Rightarrow \text{Rs. } 120$$

$$P = 720 - 120 \Rightarrow 600$$

$$R = \frac{120}{2 \times 600} \times 100$$

$$R = 10\%$$

2. **12000**

Simple Interest and Compound Interest

$$\left(\frac{x \times 6 \times 2}{100}\right) + \left(\frac{x \times 9 \times 3}{100}\right) + \left(\frac{x \times 14 \times 4}{100}\right) = 11400$$

$$\left(\frac{3x}{25} + \frac{27}{100} + \frac{14}{25}\right) = 11400$$

$$\frac{95x}{100} = 11400$$

$$x = \frac{11400 \times 100}{95}$$

3. **112.50**

Simple Interest and Compound Interest

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$$\left[6\frac{1}{4} - 4 \right] \Rightarrow 6 - 4 = 2$$

Now, We have $2\frac{1}{4}$

$$\frac{9}{4} \times 2 = \frac{\text{S.I.}}{5000} \times 100$$

$$9 \times 25 = \text{SI}$$

Gain in 1 yr.

$$\frac{225}{2} = 112.50$$

4. [$1164 - 1008 = 156$] $\frac{156}{3 \times 4} = 208$; $R = \frac{208}{2 \times 800} \times 100 = 13$

5. $\frac{7x}{20} - \frac{3x}{10} = 40$ $x = (40 \times 20)$ $x = 800$ [Hint : Given Below]

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

Let $P = x$

$$\frac{5}{2} \times 12 = \frac{\text{SI}}{x} \times 100$$

$$\frac{30x}{100} = \text{SI}$$

$$\text{SI} = \frac{3x}{10}$$

COMPOUND INTEREST

Simple Interest and Compound Interest

$P = 1000$ $R = 10\%$ $T = 3\text{yrs}$

$\begin{array}{r} 100 \\ 100 \\ 100 \end{array}$

 (10% of 100) → 10

 (10% of 10) → 1

 (20% of 200) → 20

$300 + 30 + 1 = 331$

$1000 + 331 = 1331$

Ans.

Formulas

Basic Formula

$$A = P + CI$$

Amount after 't' years

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

P=Principal

R=Rate of interest

T=Time

Compound interests after 't' years

$$CI = A - P$$

Case 1. When interest is not Compound yearly,

$$\text{Amount after 't' years } A = P \left[1 + \frac{r}{n \times 100} \right]^{nt}$$

n= no of compounding per year

When interest is compounded half yearly, n = 2

compounded quarterly, n = 4

compounded monthly, n = 12

Case 2. When rate % is not equal every year and interest is compounded yearly

Basic formula :

$$P \left[1 + \frac{r}{100} \right] \left[1 + \frac{r}{100} \right] \dots \text{upto 't' times}$$

Simple Interest and Compound Interest

But as rate % is not same every year, so

$$A = P [1 + r_1/100]^{t_1} [1 + r_2/100]^{t_2} \dots \text{and so on}$$

Where R_1 = Rate% p.a. for t_1 years. and R_2 = Rate % p.a. for t_2 years.

Case 3 When interest is compounded yearly but time is in fraction

$$T = 5\frac{3}{4} \text{ years}$$

$A = (\text{whole part}) \times (\text{fraction part of time})$

$$A = P [1 + r/100]^5 \times [1 + \frac{3r}{4 \times 100}]$$

Difference between Compound Interest and Simple Interest

$$CI - SI = P [R/100]^2$$

When time $t = 3$ years

$$CI - SI = P [(R/100)^3 + 3 (R/100)^2]$$

Examples

#1

- If the compound interest on a certain sum for two years at 10% p.a. is Rs 2,100 the simple interest on it at the same rate for two years will be. (**RRB, 2009**)
- 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.
- The difference between simple interest and compound interest on a sum for 2 years at 8% when the interest is compounded annually is Rs. 16, if the interest were compounded half yearly, the difference in one interest would be nearly.
- The difference in C.I and S.I for 2 years on a sum of money is Rs. 160. If the S.I for 2 years be Rs. 2880, the rate of percent is .

Solution

Simple Interest and Compound Interest

1. 2000

$$P \left(1 + \frac{10}{100} \right)^2 - P = 2100$$

$$P (1.21 - 1) = 2100$$

$$P \times 0.21 = 2100$$

$$P = \frac{2100}{0.21} \times 100$$

$$P = 10,000$$

$$P = 10,000$$

$$\text{SI} = 2000$$

2. 98.56

Year	SI	CI
I.	400	400
II.	400	432
III.	400	400 + 66.56

Rs. 32

$r\% = 8\%$

SI 66.56 + 32 = 98.56

3. 04

Simple Interest and Compound Interest

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$$P \left(\frac{r}{100} \right) = 16$$

$$P \times \frac{16}{100} \times 100 = 16$$

$$P = 2500$$

S.I

$$r \times t = \frac{SI}{2500} \times 100$$

$$8 \times 2 = \frac{SI}{2500} \times 100$$

$$16 \times 8 \times 2 = SI$$

C.I

$$P \left(1 + \frac{R}{100 \times 2} \right) - P$$

$$= 2500 \left(1 + \frac{8}{100 \times 2} \right) - 2500$$

$$= 2500 \times \frac{26}{25} + \frac{26}{25} - 2500$$

$$676 \times 4 - 2500 \Rightarrow 204 \text{ CI}$$

4.

Year	2880	
↓	S.I	C.I
I.	1440	1440
II.	1440	1600
		160

$$r\% = \frac{160}{1440} \times 100$$

$$= \frac{100}{9}$$

$$= 11\frac{1}{9}\%$$