

Simple Interest

POINTS TO REMEMBER

1. **Simple Interest :** $\frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

(i) or S.I. or Interest = $\frac{P \times R \times T}{100}$ where, P = Principal, R = Rate % and T = Time or period

(ii) $P = \frac{\text{S.I.} \times 100}{R \times T}$ (iii) $R = \frac{\text{S.I.} \times 100}{P \times T}$ and (iv) $T = \frac{\text{S.I.} \times 100}{P \times R}$

2. **Amount ;** Principal + S. Interest

i.e. $A = P + \text{S.I.}$ or $A = P + I = P + \frac{PRT}{100}$

Question 1.

Find the S.I. and amount on :

(i) Rs. 150 for 4 years at 5% per year.

(ii) Rs. 350 for $3\frac{1}{2}$ years at 8% p.a.

(iii) Rs. 620 for 4 months at 8 p. per rupee per month.

(iv) Rs. 3,380 for 30 months at $4\frac{1}{2}$ % p.a.

(v) 600 from July 12 to Dec. 5 at 10% p.a.

(vi) Rs. 850 from 10th March to 3rd August at $2\frac{1}{2}$ % p.a.

(vii) Rs. 225 for 3 years 9 months at 16% p.a.

Solution:

(i) P = Rs. 150, R = 5% per year

T = 4 years

$$\therefore \text{S.I.} = \frac{P \times R \times T}{100} = \frac{150 \times 5 \times 4}{100}$$

$$= \text{Rs. } 30$$

$$\text{and amount} = P + \text{S.I.}$$

$$= \text{Rs. } 150 + \text{Rs. } 30 = \text{Rs. } 180$$

$$(ii) P = \text{Rs. } 350, R = 8\% \text{ p.a.}$$

$$T = 3\frac{1}{2} \text{ years} = \frac{7}{2} \text{ years}$$

$$\therefore \text{S.I.} = \frac{P \times R \times T}{100} = \frac{350 \times 8 \times 7}{100 \times 2}$$

$$= \text{Rs. } 98$$

$$\text{Amount} = P + \text{S.I.} = \text{Rs. } 350 + \text{Rs. } 98$$

$$= \text{Rs. } 448$$

$$(iii) P = \text{Rs. } 620$$

$$R = 8 \text{ p. per rupee per month} = 8\% \text{ p.m.}$$

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

$$\therefore \text{S.I.} = \frac{P.R.T.}{100} = \frac{620 \times 8 \times 4}{100}$$

$$= \text{Rs. } \frac{19840}{100} = \text{Rs. } 198.40$$

$$\therefore \text{Amount} = P + \text{S.I.}$$

$$= \text{Rs. } 620 + \text{Rs. } 198.40 = \text{Rs. } 818.40$$

$$(iv) \text{ Principal (P)} = \text{Rs. } 3380$$

$$\text{Rate} = 4\frac{1}{2}\% \text{ p.a.} = \frac{9}{2}\%$$

$$\text{Period} = 30 \text{ months} = \frac{30}{12} \text{ years}$$

$$\text{S.I.} = \frac{\text{PRT}}{100} = \frac{3380 \times 9 \times 30}{100 \times 2 \times 12}$$

$$= \text{Rs. } \frac{1521}{4} = \text{Rs. } 380.25$$

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

$$= \text{Rs. } 3380 + 380.25 = \text{Rs. } 3760.25$$

$$(v) P = \text{Rs. } 600, R = 10\% \text{ p.a.}$$

$$T = \text{July 12 to Dec. 5}$$

$$\text{July} = 19 \text{ Days}$$

$$\text{Aug.} = 31 \text{ Days}$$

$$\text{Sep.} = 30 \text{ Days}$$

$$\text{Oct.} = 31 \text{ Days}$$

$$\text{Nov.} = 30 \text{ Days}$$

$$\text{Dec.} = 05 \text{ Days}$$

$$\text{Total} \quad \underline{\underline{146 \text{ Days}}}$$

$$= \frac{146}{365} \text{ years} = \frac{2}{5} \text{ years}$$

$$\therefore \text{S.I.} = \frac{\text{P.R.T.}}{100} = \frac{600 \times 10 \times 2}{100 \times 5} = \text{Rs. } 24$$

$$\therefore \text{Amount} = \text{P} + \text{S.I.} = \text{Rs. } 600 + \text{Rs. } 24 \\ = \text{Rs. } 624$$

$$(vi) \text{ P} = \text{Rs. } 850,$$

$$\text{R} = 2\frac{1}{2}\% = \frac{5}{2}\% \text{ p.a.}$$

$$\text{T} = 10\text{th march to 3rd Aug.}$$

March	= 21 days
April	= 30 days
May	= 31 days
June	= 30 days
July	= 31 days
Aug.	= 03 days
Total	<u>146 days</u>

$$= \frac{146}{365} = \frac{2}{5} \text{ years}$$

$$\therefore \text{S.I.} = \frac{\text{P.R.T.}}{100} = \frac{850 \times 5 \times 2}{100 \times 2 \times 5} = \frac{850}{100} \\ = \text{Rs. } 8.50$$

$$\therefore \text{Amount} = \text{P} + \text{S.I.} \\ = \text{Rs. } 850 + \text{Rs. } 8.50 = \text{Rs. } 858.50$$

$$(vii) \text{ P} = \text{Rs. } 225, \text{ R} = 16\% \text{ p.a.}$$

$$\text{T} = 3 \text{ years } 9 \text{ months}$$

$$= 3\frac{9}{12} = 3\frac{3}{4} \text{ years} = \frac{15}{4} \text{ years}$$

$$\therefore \text{S.I.} = \frac{\text{P.R.T.}}{100} = \frac{225 \times 16 \times 15}{100 \times 4} = \text{Rs. } 135$$

$$\therefore \text{Amount} = \text{P} + \text{S.I.} = \text{Rs. } 225 + \text{Rs. } 135 \\ = \text{Rs. } 360$$

Question 2.

On what sum of money does the S.I. for 10 years at 5% become Rs. 1,600 ?

Solution:

$$\text{S.I.} = \text{Rs. } 1600, R = 5\% \text{ p.a.}$$

$$T = 10 \text{ years}$$

$$\therefore P = \frac{\text{S.I.} \times 100}{R \times T} = \frac{1600 \times 100}{5 \times 10} = \text{Rs. } 3200$$

Question 3.

Find the time in which Rs. 2,000 will amount to Rs. 2,330 at 11% p.a. ?

Solution:

$$\text{Amount (A)} = \text{Rs. } 2,330$$

$$\text{Principal (P)} = \text{Rs. } 2,000$$

$$\begin{aligned}\therefore \text{S.I.} &= A - P = \text{Rs. } 2,330 - \text{Rs. } 2,000 \\ &= \text{Rs. } 330\end{aligned}$$

$$R = 11\% \text{ p.a.}$$

$$\therefore \text{Time} = \frac{\text{S.I.} \times 100}{P \times R} = \frac{330 \times 100}{2000 \times 11}$$

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

Question 4.

In what time will a sum of money double it self at 8% p.a ?

Solution:

$$\text{Let the principal (P)} = ₹100$$

$$\therefore \text{Amount (A)} = ₹100 \times 2 = ₹200$$

$$\begin{aligned}\therefore \text{S.I.} &= A - P = ₹200 - ₹100 \\ &= ₹100\end{aligned}$$

$$\text{Rate (R)} = 8\% \text{ p.a.}$$

$$\therefore \text{Time} = \frac{\text{S.I.} \times 100}{P \times R} = \frac{100 \times 100}{100 \times 8}$$

$$= \frac{25}{2} = 12\frac{1}{2} \text{ years}$$

Question 5.

In how many years will be ₹870 amount to ₹1,044, the rate of interest being $2\frac{1}{2}$ % p.a ?

Solution:

$$\text{Principal (P)} = ₹870$$

$$\text{Amount (A)} = ₹1044$$

$$\begin{aligned}\therefore \text{S.I.} &= P - A = ₹1044 - ₹870 \\ &= ₹174\end{aligned}$$

$$\text{Rate (R)} = 2\frac{1}{2} = \frac{5}{2}\% \text{ p.a.}$$

$$\begin{aligned}\therefore \text{Time} &= \frac{\text{S.I.} \times 100}{P \times R} = \frac{174 \times 100 \times 2}{870 \times 5} \\ &= 8 \text{ years.}\end{aligned}$$

Question 6.

Find the rate percent if the S.I. on ₹275 is 2 years is ₹22.

Solution:

$$\text{Principal (P)} = ₹275, \text{ S.I.} = ₹22$$

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

$$\begin{aligned}\therefore \text{Rate} &= \frac{\text{S.I.} \times 100}{P \times T} = \frac{22 \times 100}{275 \times 2} \\ &= 4\% \text{ p.a.}\end{aligned}$$

Question 7.

Find the sum which will amount to ₹700 in 5 years at 8% rate p.a.

Solution:

Amount = ₹700, Rate (R) = 8% p.a.

Time (T) = 5 years

Let principal (P) = ₹100

$$\text{then S.I.} = \frac{P.R.T.}{100} = \frac{100 \times 8 \times 5}{100} = ₹40$$

$$\therefore \text{Amount (A)} = P + \text{S.I.}$$

$$= ₹100 + 40 = ₹140$$

If amount is ₹140, then principal = ₹100

and, if amount is Rs. 700, then principal

$$= ₹ \frac{100 \times 700}{140} = ₹500$$

Question 8.

What is the rate of interest, if ₹3,750 amounts to ₹4,650 in 4 years ?

Solution:

Principal (P) = ₹3,750

Amount (A) = ₹4,650

$$\therefore \text{S.I.} = A - P = ₹4,650 - 3,750 \\ = ₹900$$

Time (T) = 4 years.

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{P \times T} = \frac{900 \times 100}{3750 \times 4} \\ = 6\% \text{ p.a.}$$

Question 9.

In 4 years, ₹6,000 amount to ₹8,000. In what time will ₹525 amount to ₹700 at the same rate ?

Solution:

In first case, Principal (P) = ₹6,000

Amount (A) = ₹8,000

$$\begin{aligned}\therefore \text{S.I.} &= A - P = ₹8,000 - ₹6,000 \\ &= ₹2000\end{aligned}$$

Time (T) = 4 years

$$\begin{aligned}\therefore R &= \frac{\text{S.I.} \times 100}{P \times T} = \frac{2000 \times 100}{6000 \times 4} \\ &= \frac{25}{3}\% = 8\frac{1}{3}\% \text{ p.a.}\end{aligned}$$

In second case, Principal (P) = ₹525

Amount (A) = ₹700

$$\begin{aligned}\therefore \text{S.I.} &= A - P = ₹700 - ₹525 \\ &= ₹175\end{aligned}$$

$$\text{Rate (R)} = \frac{25}{3}\% \text{ of p.a.}$$

$$\therefore \text{Time} = \frac{\text{S.I.} \times 100}{P \times R} = \frac{\text{Rs. } 175 \times 100 \times 3}{525 \times 25} = 4 \text{ years}$$

Question 10.

The interest on a sum of money at the end of $2\frac{1}{2}$ years is $\frac{4}{5}$ of the sum. What is the rate percent ?

Solution:

Let the sum (P) = Rs. 100

$$\therefore \text{S.I.} = \text{Rs. } 100 \times \frac{4}{5} = \text{Rs. } 80$$

$$\text{Period (T)} = 2\frac{1}{2} = \frac{5}{2} \text{ years.}$$

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{P \times T} = \frac{80 \times 100 \times 2}{100 \times 5} = 32\% \text{ p.a.}$$

Question 11.

What sum of money lent out at 5% for 3 years will produce the same interest as Rs. 900 lent out at 4% for 5 years ?

Solution:

In second case, Principal (P) = Rs. 900

Rate (R) = 4%, Time (T) = 5 years

$$\therefore \text{S.I.} = \frac{P \times R \times T}{100} = \frac{900 \times 4 \times 5}{100} = \text{Rs. } 180$$

In first case, S.I. = Rs. 180

Rate = 5%, Time = 3 years

$$\therefore \text{Sum} = \frac{\text{S.I.} \times 100}{R \times T} = \frac{180 \times 100}{5 \times 3} = \text{Rs. } 1200.$$

Question 12.

A sum of Rs. 1,780 become Rs. 2,136 in 4 years,

Find :

(i) the rate of interest.

(ii) the sum that will become Rs. 810 in 7 years at the same rate of interest ?

Solution:

(i) In first case, Principal (P) = Rs. 1,780

Amount (A) = Rs. 2,136

$$\therefore \text{S.I.} = A - P = \text{Rs. } 2,136 - 1,780 = \text{Rs. } 356$$

Time (T) = 4 years

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{P \times T} = \frac{356 \times 100}{1780 \times 4} = 5\% \text{ p.a.}$$

(ii) In second case, Let principal (P) = Rs. 100

Rate (R) = 5% p.a., Time (T) = 7 years

$$\therefore \text{S.I.} = \frac{P \times R \times T}{100} = \frac{100 \times 5 \times 7}{100} = \text{Rs. } 35$$

$$\therefore \text{Amount} = P + \text{S.I.} = \text{Rs. } 100 + 35 = \text{Rs. } 135$$

If amount is Rs. 135, then principal = Rs. 100

and if amount is Rs. 810, then principal

$$= \text{Rs. } \frac{100 \times 810}{135} = \text{Rs. } 600$$

Question 13.

A sum amounts to Rs. 2,652 in 6 years at 5% p.a. simple interest.

Find :

(i) the sum

(ii) the time in which the same sum will double itself at the same rate of interest.

Solution:

.(i) In first case, Let principal (P) = Rs. 100

Rate (R) = 5% p.a., Time (T) = 6 years

$$\therefore \text{S.I.} = \frac{P \times R \times T}{100} = \frac{100 \times 5 \times 6}{100} = \text{Rs. } 30$$

and, amount = Rs. 100 + Rs. 30 = Rs. 130

If amount is Rs. 130, then principal = Rs. 100

and, if amount is Rs. 2652, then principal

$$= \frac{100 \times 2,652}{130} = \text{Rs. } 2040$$

In second case, Let sum (P) = Rs. 100

Amount (A) = Rs. 100 $\times$ 2 = Rs. 200

S.I. = A – P = Rs. 200 – 100 = Rs. 100

Rate = 5% p.a.

$$\text{Time} = \frac{\text{S.I.} \times 100}{P \times R} = \frac{100 \times 100}{100 \times 5} = 20 \text{ years}$$

Question 14.

P and Q invest Rs. 36,000 and Rs. 25,000 respectively at the same rate of interest per year. If at the end of 4 years, P gets Rs. 3,080 more interest than Q; find the rate of interest.

Solution:

P's investment (P_1) = Rs. 36000

and Q's investment (P_2) = Rs. 25000

Period (T) = 4 years, Let rate of interest = x %

$$\text{Q's interest} = \text{Rs. } \frac{36000 \times x \times 4}{100}$$

$$= \text{Rs. } 1440x \quad \left(\because \text{S.I.} = \frac{PRT}{100} \right)$$

$$\text{and Q's interest} = \frac{25000 \times x \times 4}{100} = \text{Rs. } 1000x$$

Difference in their interest

$$= \text{Rs. } (1440 - 1000)x = \text{Rs. } 440x$$

But difference = Rs. 3080

$$\therefore 440x = 3080 \Rightarrow x = \frac{3080}{440} \Rightarrow x = 7\%$$

$\therefore$ Rate of interest = 7% p.a.

Question 15.

A sum of money is lent for 5 years at R% simple interest per annum. If the interest earned be one-fourth of the money lent, find the value of R.

Solution:

Let the sum (P) = ₹100

$$\therefore \text{S.I.} = \frac{1}{4} \times ₹100 = ₹25$$

Period (T) = 5 years

$$\therefore \text{Rate}\% = \frac{\text{S.I.} \times 100}{P \times T} = \frac{25 \times 100}{100 \times 5} = 5\%$$

Question 16.

The simple interest earned on a certain sum in 5 years is 30% of the sum. Find the rate of interest.

Solution:

Let the sum (P) = ₹100

$$\text{S.I.} = \frac{30}{100} \times ₹100 = ₹30$$

Period (T) = 5 years

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{P \times T} = \frac{30 \times 100}{100 \times 5} = 6\%$$