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Interest

When we borrow money from any source (bank, agency, moneylender), we have to pay back the money after a certain period along with extra money for availing the facility to use the money borrowed.

What is Simple Interest?

- The money borrowed is called the principal (P).
- Extra money paid back is called the simple interest (S.I).
- Interest is expressed as rate par cent per annum (p.a.) i.e., 12% per month means, the interest on Rs. 100 for 1 year is Rs.12.
- The total money paid back after the given time is called the amount.
- Time for which money is borrowed is called the time period.

Rate of interest = 5% P.A
(Interest of Rs 5 will be charged for every Rs 100 every year)
What would be the interest on Rs 800?
Ans = Rs 40.
for 6 years → Rs 40×6 = Rs 240

1 year → Rs 100 —— interest is Rs 5 .|
" Rs 1 " " " $\frac{5}{100}$
" Rs 800 " " " $\frac{5}{100}\times 800$
6yrs → " " " $\frac{5}{100}\times 800\times 6$

$= \frac{800\times 6\times 5}{100}$

$SI = \left(\frac{P\times N\times R}{100}\right)$

formulae

1. $SI = \frac{PNR}{100}$
2. $P = \frac{SI \times 100}{N \times R}$
3. $N = \frac{SI \times 100}{P \times R}$
4. $R = \frac{SI \times 100}{P \times N}$
5. Amount (A) $= P + SI$
6. $P = A - SI$
7. $SI = A - P$

Where, N → No. of years
R → Rate of interest per annum
P → sum borrowed or lent
A → Total sum/money to be repaid or received

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1. Find simple interest on Rs. 42000 at 5% per annum for 8 years. Also, find the amount.

Soln: $P = Rs\ 42000$

$R = 5\%\ p.a$

$N = 8\ yrs$

$$SI = \frac{PNR}{100} = \frac{42000 \times 8 \times 5}{100}$$

$$SI = Rs\ 16800$$

$\therefore$ Amount $= Rs\ 42000 + 16800$

$A = Rs\ 58800$

2. Calculate the simple interest on Rs. 36400 at 10% p.a. for 9 months.

Soln: $P = Rs\ 36400$

$R = 10\%\ p.a$

$N = \frac{9}{12}$ years

$$SI = \frac{PNR}{100} = \frac{\overset{91}{\cancel{36400}} \times \cancel{9} \times 10}{\underset{4}{\cancel{12} \times \cancel{100}}}$$

$$= Rs\ 2730$$

3. At what per cent will Rs. 1500 amount to Rs. 2400 in 4 years?

Soln: $P = Rs\ 1500$

$A = Rs\ 2400$

$N = 4$ years

$R = ?$

$SI = A - P$

$= 2400 - 1500$

$= Rs\ 900$

$$R = \frac{SI \times 100}{P \times N} \Rightarrow R = \frac{\overset{60}{\cancel{900}} \times \cancel{100}}{\cancel{1500} \times 4} = 15\%\ p.a$$

4. In how much time will a sum of money triple itself at 15 % p.a.?

Soln: Let $P = Rs\ x$

$A = Rs\ 3x$

$R = 15\%\ p.a.$

$N = ?$

$SI = A - P = 3x - x = Rs\ 2x$

$$N = \frac{SI \times 100}{P \times R} = \frac{2x \times 100}{x \times 15} = \left(\frac{200}{15}\right) = \frac{40}{3}\ yrs$$

$= 13\frac{1}{3}\ yrs$

$= 13\ yrs\ 4\ months$

$$N = \frac{(No.\ of\ times - 1) \times 100}{R}$$

$$R = \frac{(No.\ of\ times - 1) \times 100}{N}$$

5. At what rate percent per annum simple interest will a sum of money double itself in 6 years?

6. Rs. 4000 were lent each to Ram and Shyam at 15% per annum for 3½ years and 5 years respectively. Find the difference in the interest paid by them.

RAM

$P = Rs\ 4000$

$N = 3\frac{1}{2}\ yrs = 3.5$

$R = 15\%$

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

$= \frac{4000 \times 3.5 \times 15}{100}$

$SI = Rs\ 2100$

SHYAM

$P = Rs\ 4000$

$N = 5\ yrs$

$R = 15\%$

$SI = \frac{4000 \times 5 \times 15}{100}$

$SI = Rs\ 3000$

∴ Difference in the interest paid $= 3000 - 2100$

$= Rs\ 900$

$\frac{4000 \times 1.5 \times 15}{100} = 900$

7. Rs. 4000 were lent each to Ram and Shyam at 12% per annum and 15% per annum respectively for 5 years . Find the difference in the interest paid by them.

$SI_1 = \frac{4000 \times 12 \times 5}{100}$

$SI_2 = 2400$

$SI_2 = \frac{4000 \times 15 \times 5}{100}$

$= Rs\ 3000$

$SI_2 \rightarrow \frac{4000 \times (15-12) \times 5}{100}$

$= \frac{4000 \times 3 \times 15}{100} = 600$

8. Rocky lends Rs.3000 to Kevin at 10% per annum and then Kevin lends the same sum to Michal at 12% per annum. Find Kevin's gain over a period of 3 years.

Soln: SI (gain) $= \frac{3000 \times (12-10) \times 3}{100}$

$= \frac{3000 \times 2 \times 3}{100} = Rs\ 180$

9. A certain sum amounts to Rs.2200 in 2 years to Rs.2800 in 4 years at simple interest. Find the sum and the rate per cent per annum.

Soln :- $A = P + N \times SI$ for 1 year

$P + SI \times 4 = 2800$

$P + SI \times 2 = 2200$ } Subtract

$2SI = 600$

$SI = \frac{600}{2} = Rs\ 300$ [for 1 year]

$P + 300 \times 2 = 2200 \quad \therefore P = 2200 - 600$

$\therefore P = Rs\ 1600$

$\therefore R = \frac{SI \times 100}{P \times N} = \frac{300 \times 100}{1600 \times 1} = 18.75\%$ P.A

10. A certain sum amounts to Rs.1725 in 3 years and Rs.1875 in 5 years. Find the rate % per annum?

Soln: $1875 = P + 5 \times SI$

$1725 = P + 3 \times SI$

$150 = 2SI \quad \therefore SI = 75$

$1725 = P + 3 \times 75$

$\therefore P = 1725 - 225 = Rs\ 1500$

$R = \frac{75 \times 100}{1500 \times 1}$

$R = 5\%$ P.A

11. Sonika deposited Rs.8000 which amounted to Rs.9200 after 3 years at simple interest. Had the interest been 2% more. How much additional interest She would get?

Soln: $SI = A - P = 9200 - 8000 = Rs\ 1200$

$N = 3 yrs.$

$R = \frac{SI \times 100}{P \times N} = \frac{1200 \times 100}{8000 \times 3} = 5\%$

New ROI = 7% PA

$SI = \frac{8000 \times 3 \times 7}{100} = Rs\ 1680$

$\therefore$ Additional $= 1680 - 1200 = Rs\ 480$

OR

$SI = \frac{8000 \times 2 \times 3}{100} = Rs\ 480$

12. **Suresh for 2 years invested Rs. 500 in SBI. He also invested Rs. 300 in ICICI for 4 years. At the end he received Rs. 220 from both banks as simple interest. What must have been rate of interest?**

(options 10%, 12%, 11%, 5.5%)

Soln:

$SI_1 = \frac{500 \times 2 \times R}{100}$ $\qquad$ $SI_2 = \frac{800 \times 4 \times R}{100}$

$SI_1 = 10R$ $\qquad$ $= 12R$

$\therefore SI_1 + SI_2 = 220$

$22R = 220$

$\therefore R = 10\%$ PA

13. **Soham gets Rs. 2600 for Rs. 2000 in 5 years at some rate of simple interest. Had he invested in other places where rate of simple interest is 3% more than current rate, how much would have Soham got in same time?**

a. Rs. 2900

b. Rs. 3000

c. Rs. 3100

d. Rs. 2800

Soln: Extra income $= \frac{2000 \times 5 \times 3}{100} = Rs\ 300$

∴ Total money Soham will get $= 2600 + 300$
$= Rs\ 2900$

14. **Aditi invested some money in a bank at rate of 6% per annum. At simple interest, after 9 years, she got Rs. 8470. How much did she invest?**

a. Rs. 5250

b. Rs. 6550

c. Rs. 6400

d. Rs. 5500

Soln: Let $P = Rs\ x$, $N = 9$, $R = 6\%$ PA

$$SI = \frac{PRN}{100} = \frac{x \times 9 \times 6}{100} = \frac{54x}{100} = 0.54x$$

$P + SI = A$

$x + 0.54x = 8470$

$1.54x = 8470$

$x = \frac{8470}{1.54} \Rightarrow$ Principal $(x) = Rs\ 5500$

15. Arman got a salary of Rs. 8600. The salary was invested by him in two parts. Find the difference between the two parts of his salary, if in first part he got some simple interest at 15% per annum in 4 years, which was same as the second part which he invested at 20% for 3 years.

a. Rs. 0 b. Rs. 2400 c. Rs. 100 d. Rs. 4500

16. Aman invests Rs. 8000 at some rate of interest. Being simple interest the money doubles in 5 years. Raj sees this and invests Rs. 6250 for 3 years at same rate of interest. How much interest does Raj get?

a. Rs. 3750 b. Rs. 6250 c. Rs. 3125 d. Rs. 4250

17. In 4 years the simple interest on certain sum of money is 9/25 of the principal. The annual rate of interest is

a. 4% b. 4 (1/2)% c. 9% d. 10%

18. A sum becomes Rs. 3000 at the rate of 12% per annum (simple interest). The same sum becomes Rs. 3300 at the rate of 15% per annum (simple interest) in the same duration. Find the sum and the duration.

a. Rs. 2000 and 20 years b. Rs. 1900 and 8.25 years

c. Rs. 1500 and 7 years d. Rs. 1800 and 5.5 years

19. A sum of 1550 was lent partly at 5 % and partly at 8 % simple interest . The total interest received after 3 years is 300. The ratio of money lent at 5 % to that of 8 % is :

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(1) At what rate of interest per annum will a sum double itself in 8 years? (Bank PO'86)

(2) At what rate percent per annum will a sum of money double in 16 years? (R.R.B. 2003)

(3) Out of a sum of Rs 850, a part was lent at 6% SI and the other at 12% SI. If the interest on the first part after 2 years is equal to the interest on the second part after 4 years, then the second sum is

(1) $P = Rs\ x, \quad A = 2x$

$I = A - P = 2x - x = x$

$N = 8, \quad R = ?$

$R = \frac{SI \times 100}{P \times N} = \frac{x \times 100}{x \times 8} = \frac{100}{8} = 12.5\%$ p.a.

(2) $\frac{100}{16} = 6.25\%$ $\left(R = \frac{(\text{No. of times} - 1) \times 100}{N} \right)$

(3)

850

Rs x | Rs $(850 - x)$

$R = 6\%$ | $R = 12\%$

$N = 2$ yrs | $N = 4$ yrs

SI_1 | SI_2

$SI_1 = SI_2$

$\frac{x \times 6 \times 2}{100} = \frac{(850 - x) \times 4 \times 12}{100}$

$12x = (850 - x) \times 48$

$12x = 40800 - 48x$

$12x + 48x = 4080 \quad \therefore 60x = 4080$

$x = 4080/60 = Rs\ 680$

$\therefore$ The second sum $= 850 - 680 = Rs\ 170$

∴ The second sum = 850 − 680 = Rs 170

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A certain amount earns simple Interest of Rs. 1,750/- after 7 years. Had the interest been 2% more, how much more interest would it have earned ?
(1) Rs. 35/- (2) Rs. 350/- (3) Rs. 245/- (4) Cannot be determined (5) None of these

Ans: $P = Rs\ x$, $R \to R\%$
$SI = Rs\ 1750$, $N = 7$ yrs

$$SI = \frac{P \times N \times R}{100} = \frac{x \times R \times 7}{100} = 1750$$

$$x \times R = \frac{1750 \times 100}{7} = Rs\ 25000 \quad \text{--- (1)}$$

$R = (R+2)\%$

$$SI = \frac{x \times 7 \times (R+2)}{100} = \frac{7x(R+2)}{100} = \frac{7(xR) + 14x}{100}$$

A sum of Rs 15000 earns simple Interest of Rs. 5250/- after 7 years. Had the interest been 2% more, how much more interest would it have earned ?

7350

$P = Rs\ 15000$, $I = 5250$, $R = ?$ $N = 7$

$$R = \left(\frac{5250 \times 100}{15000 \times 7}\right) = 5\%\ PA \qquad \frac{SI \times 100}{P \times N}$$

$R_2 = 7\%$ $(5 + 2) = 7\%$

$$SI = \frac{15000 \times 7 \times 7}{100} = 7350$$

Extra int earned $= 7350 - 5250$
$= Rs\ 2100$

$$\frac{15000 \times 2 \times 7}{100}$$

A certain sum of money amounts to Rs.1300 in 2 years and to Rs. 1525 in 3.5 years. Find the sum and the rate of interest.

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The simple interest on a sum of money is 4/9 of the principal. Find the rate percent and time, if both are numerically equal.(S.S.C. 2000)

$P = Rs\ x, \quad SI = \frac{4x}{9}, \quad \boxed{R = T = y}$

$$SI = \frac{P \times y \times y}{100}$$

$$\frac{4x}{9} = \frac{x \times y \times y}{100}$$

$$y^2 = \frac{100 \times 4}{9} \Rightarrow y = \sqrt{\frac{400}{9}} = \frac{20}{3}$$

$$R = \frac{20}{3}\% = 6\frac{2}{3}\%$$

$$N \text{ or } T = \frac{20}{3} \text{ yrs} = 6 \text{ yrs} + \frac{2}{3} \times 12$$

$$= 6 \text{ yrs } 8 \text{ months}$$

A sum of 1550 was lent partly at 5 % and partly at 8 % simple interest . The total interest received after 3 years is 300. The ratio of money lent at 5 % to that of 8 % is :

1550

P_1 Rs x | P_2 Rs $1550 - x$

R_1 5% | R_2 8% yr

N 3 yrs | N 3 yrs

SI_1 | SI_2

$$SI_1 + SI_2 = 300$$

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

$$\frac{15x + 24(1550 - x)}{100} = 300$$

$$\frac{15x + 24(1550 - x)}{100} = 300$$

$15x + 37200 - 24x = 300 \times 100$

$-9x = 30000 - 37200$

$+9x = +7200$

$x = \frac{7200}{9} = 800$

∴ sum lent at

5% PA = Rs 800

8% PA = 1550 − 800 = Rs 750

$$\text{Ratio} = \frac{800}{750} = \frac{16}{15} = 16:15$$

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1. Find the simple interest and amount in each of the following:

(a) P = Rs.1800 R = 5% T = 1 year

(b) P = Rs.2600 R = 12% T = 3 years

(c) P = Rs.3125 R = 15% T = 73 days

(d) P = Rs.5660 R = 11% T = 9 months

(e) P = Rs.180 R = 3% T = $1\frac{1}{4}$ year

$SI = \frac{PRT}{100} = \frac{PNR}{100} = 90$

$A = P + SI =$ Rs 1890

$\frac{73}{365}$

(b) Rs 936, Rs 3536

(c) $I = \frac{3125 \times 15 \times 73}{100 \times 365} =$ Rs 93.75

$A =$ Rs 3218.75

(d) $N = \frac{9}{12}$

$I =$ Rs 466.95 , $A =$ ——

(e) $T = \frac{5}{4}$

$I =$ Rs 6.75

Q In what time will Rs.400 amount to Rs.512 if the simple interest is the calculated at 14% p.a.?

Q

$P =$ Rs 400

$A =$ Rs 512

$R = 14\%$ PA

$N = ??$

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

$SI = A - P$

$= 512 - 400$

$=$ Rs 112

$= \frac{112 \times 100}{\quad} = 2$ years

$= \frac{112 \times 100}{400 \times 14} = 2$ years

A sum amount to Rs.2400 at 15% simple interest per annum after 4 years. Find the sum.

Rs 2400 → Amount
15% → R
4 → No. of years
N

$P = A - SI$

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

$P = Rs\ x$

$SI = \frac{PNR}{100} = \frac{x \times 4 \times 15}{100} = \frac{60x}{100} = \frac{6x}{10}$

$A = P + SI$

$\Rightarrow \frac{x}{1} + \frac{6x}{10} = 2400$

$x + 6x = 2400 \times 10$ ✗

$\frac{10x + 6x}{10} = 2400 \Rightarrow 16x = 2400 \times 10$

$x = \frac{2400 \times 10}{16} = 1500$

∴ Principal / Sum = Rs 1500

give

In how many years will Rs.400 yield an interest of Rs.112 at 14% simple interest?

$P = Rs\ 400$
$I = Rs\ 112$
$R = 14\%$
$N = ?$

$N = \frac{SI \times 100}{P \times R} = \frac{112 \times 100}{400 \times 14} = 2$ years

In how many years will Rs.600 double itself at 10% simple interest?

In how many years will Rs.600 double itself at 10% simple interest?

Soln: $P = Rs\ 600$

$A = 2 \times 600 = Rs\ 1200$

$SI = A - P = 1200 - 600 = Rs\ 600$

$R = 10\%$

$N = \dfrac{600 \times 100}{600 \times 10} = 10\ yrs$

In how many years will certain sum double itself at 10% simple interest?

At what rate percent, certain sum will double itself at simple interest in 10 years?

$\text{Triple} = \dfrac{2 \times 100}{R} \quad \dfrac{2 \times 100}{N} \quad \dfrac{100}{R} \quad \dfrac{100}{N}$

Q: The SI on Rs 5000 for 3.5 yrs at 6% PA is Rs 300 more than the SI on Rs 3000 for 2.5 yrs at a certain rate of interest. Find the rate of interest.

Soln: Method I:

$SI = \dfrac{5000 \times 3.5 \times 6}{100} = Rs\ 1050$

SI on Rs 3000 is $1050 - 300 = Rs\ 750$

$R = \dfrac{750 \times 100}{3000 \times 2.5} = 10\%\ PA$

Q: A sum of money amounts to Rs 51920 in 2 years and to Rs 59840 in 4 years at a certain rate of SI. Find the sum and the rate of interest.

Soln.

Amount = Principal + No. of years × SI for 1 year

$59840 = P + 4 \times SI \quad \text{---(i)}$

$59840 = P + 4 \times SI$ ——— (i)

$51920 = P + 2 \times SI$ ——— (ii)

$7920 = 2SI$

$\therefore SI = \frac{7920}{2} = 3960$ (Int for 1yr)

$51920 = P + 2 \times 3960$

$\therefore P = 51920 - 7920 = ₹44000$

$R = \frac{SI \times 100}{P \times N} = \frac{3960 \times 100}{44000 \times 1} = 9\%.PA$

Q: A sum of money amounts to Rs 6600 in 2 years and Rs 7200 in 4 years. Find the sum and the rate of simple interest.

Q: A person borrowed Rs 10,000 at a certain rate of SI. After 2 years, he returned Rs 4000 and after 2 more years he returned the remaining Rs 6000. The SI that he paid apart from the returning of the principal amount was totally Rs 1920 during the 4 years. Find the rate of interest.

Q: Mr. Ankit lent Rs 60,000 to Mr Krish and at the same time a certain amount to Ms. Mahek. In 3 years, he altogether received Rs 31320 as the SI at 9% from the two. Find the sum lent to Ms. Mahek.