



ST. LAWRENCE HIGH SCHOOL



A Jesuit Christian minority Institution

Subject: Mathematics

Class- X

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Study material-2

Chapter- Simple interest

Topic- Basic concept of simple interest

What is Simple Interest?

Simple interest is a type of interest that is applied to the amount borrowed or invested for the entire duration of the loan, without taking any other factors into account, such as past interest (paid or charged) or any other financial considerations. Simple interest is generally applied to short-term loans, usually one year or less, that are administered by financial companies. The same applies to money invested for a similarly short period of time.

The simple interest rate is a ratio and is typically expressed as a percentage. It plays an important role in determining the amount of interest on a loan or investment. The amount of interest charged or earned depends on three important quantities that we will examine next.

Important components of Simple Interest:

Sarah needs to borrow \$2,000 in order to buy furniture. She's approved for two different loans. Loan One allows her to borrow \$2,000 now, provided that she pay off the loan by returning \$2,200 exactly one year from the day that she borrows the money. Loan Two offers her \$2,000 upfront as well, with a similar loan period of one year, at an annual interest rate of 7%. Which is the better deal for Sarah?

The amount borrowed or invested is called the principal. Using the example above, when Sarah borrows \$2,000 to buy furniture, we say that the principal is \$2,000.

It's customary for financial institutions to quote a quantity called the interest rate as a percentage. This interest rate represents a ratio of the principal borrowed or invested. Typically, this interest rate is given as a percentage per year, in which case it is called the annual interest rate. For example, if we borrow \$100 at an annual rate of 5%, it means that we will be charged 5% of \$100 at the end of the year, or \$5.

The loan period or duration is the time that the principal amount is either borrowed or invested. It is usually given in years, but in some cases, it may be quoted in months or even days. If that is the case, we need to perform a conversion from a period given in months or days, into years.

Formula:

- Simple Interest = $\frac{P \times r \times t}{100}$ where P=principal, r= rate of interest , t= time
- Amount= Principal + simple interest
- $P = \frac{\text{simple interest} \times 100}{r \times t}$
- $r = \frac{\text{simple interest} \times 100}{P \times t}$
- $t = \frac{\text{simple interest} \times 100}{P \times r}$

Solved problems:

- 1) How much time will it take for an amount of 450 to yield 81 as interest at 4.5% per annum of simple interest?

Solution: Time = (simple interest x 100)/(P x r) = (100 x 81)/(450 x 4.5) = 4 years.

- 2) Reena took a loan of Rs 1200 with simple interest for as many years as the rate of interest. If she paid Rs432 as interest at the end of the loan period, what was the rate of interest?

Solution: Let rate = R% and time = R years.

Then, Simple Interest = $(P \times r \times t)/100$

Or, $(1200 \times R \times R)/100 = 432$

$$\text{Or, } 12R^2 = 432$$

$$\text{Or, } R^2 = 36$$

Therefore $R = 6\%$

- 3) A sum of Rs12,500 amounts to Rs15,500 in 4 years at the rate of simple interest. What is the rate of interest?

Solution: S.I. = Rs (15500 - 12500) = Rs 3000.

$$\text{Rate} = (\text{simple interest} \times 100) / (P \times t) = (100 \times 3000) / (12500 \times 4) \% = 6\%$$

- 4) An automobile financier claims to be lending money at simple interest, but he includes the interest every six months for calculating the principal. If he is charging an interest of 10%, find the effective rate of interest .

solution:

Let the sum be Rs. 100. Then,

$$\text{S.I. for first 6 months} = \text{Rs.} \left(\frac{100 \times 10 \times 1}{100 \times 2} \right) = \text{Rs. } 5$$

$$\text{S.I. for last 6 months} = \text{Rs.} \left(\frac{105 \times 10 \times 1}{100 \times 2} \right) = \text{Rs. } 5.25$$

$$\text{So, amount at the end of 1 year} = \text{Rs.} (100 + 5 + 5.25) = \text{Rs. } 110.25$$

$$\therefore \text{Effective rate} = (110.25 - 100) = 10.25\%$$

- 5) A principal at same rate of simple interest becomes Rs 600 in 3 years and Rs 660 in 5 years. Find Principal and rate of interest.

Solution: Let the principal be Rs x and rate of interest be r % .

$$x + \text{SI for 5 years} = 660 \dots\dots(i)$$

$$x + \text{SI for 3 years} = 600 \dots\dots(ii)$$

Subtracting (ii) from (i) we get SI for 2 years is Rs (660 - 600) = Rs 60

Therefore SI for 1 year is Rs (60 ÷ 2) = Rs 30

SI for 3 years = Rs (30 × 3) = Rs 90

Substituting SI for 3 years in equation (ii) we get

$$X = 600 - 90 = 510$$

Therefore Principal is Rs 510 (ans)

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

$$\text{Or, } 90 = 510 \times r \times 3 / 100$$

$$\text{Or, } r = 6$$

Therefore rate of interest is 4%. (ans)

6) Rahamatchacha had taken loan of Rs 2,40,000 at 12% p.a rate of simple interest from a bank for building a house. After one year of taking loan he had given the house on rent at Rs 5200/month. How long will he take to repay the loan including the interest from the time of taking loan.

Solution: let he would take n years to repay the loan from the time of taking it.

$$SI = \frac{2,40,000 \times 12 \times n}{100} = \text{Rs } 28,800 n$$

Amount he has to repay = P + SI = Rs (2,40,000 + 28,800 n)

He got rent for (n-1) years as he had rented the house one year after taking the loan

For 1 year rent is Rs (12 x 5200)

For (n-1) years the rent is Rs (n-1) (12x 5200)= Rs 62400(n-1)

According to the problem

$$2,40,000 + 28,800n = 62400(n-1)$$

$$\text{Or, } 62,400 n - 28,800 n = 2,40,000 + 62400$$

$$\text{Or, } 33600 n = 302400$$

$$\text{Or, } n = 302400 / 33600 = 9$$

Rahmatchacha will repay the loan after 9 years of taking it.

6) What will be the ratio of simple interest earned by certain amount at the same rate of interest for 6 years and that for 9 years?

Solution: Let the principal and rate of interest be P and R% respectively

$$SI \text{ for 6 years} = P \times r \times 6 / 100$$

$$SI \text{ for 9 years} = P \times r \times 9 / 100$$

$$\text{Ratio} = P \times r \times 6 / 100 : P \times r \times 9 / 100 = 2:3 \text{ (ans)}$$

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