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## Aptitude Made Simple

### Simple Interest

Simple Interest is one of the most common topics across all competitive and academic exams.

#### Why you want Interest?

Let us assume one of your friend comes to you and ask for money of 10000 Rs. He will be giving you money back after 5 years.

Are you really interested in giving money to him if he is just going to return you same amount 10000 Rs only after 5 years?

Obviously not !!! You would be definitely expecting some amount more than that you given him. This **extra amount which you are expecting from friend is Interest.**

We will be focusing on Simple Interest only for now and once you get comfortable with simple interest we will look for Compound Interest.

Terms/ Terminologies in Simple Interest Calculation:

Terms	Symbol	Meaning
Principal	P	Original amount given to / taken from someone.
Number of Years	N	Number of years for which amount given
Rate of Interest	R	Rate of Interest in %
Simple Interest	I or SI	Simple Interest (Extra amount over original amount)
Amount	A	Original Amount + Simple Interest

**Formulae:**

Only 2 formulae are sufficient to solve any problem of Simple Interest.

It is just the way to use the formulae looking at given values matters.

**Formula 1:**

$$\text{Simple Interest} = \frac{P * N * R}{100}$$

**Formula 2:**

$$A = P + SI$$

Let us understand this with simple example

**Sample Example**

If you given 10000 Rs money to your friend at rate of 10% per year with simple interest for 5 Years. How much money your friend should return you after 5 years?

**Solution:**

$$P = 10000 \text{ Rs}$$

$$R = 10 \%$$

$$N = 5 \text{ Years}$$

$$\text{Simple Interest} = \frac{P * N * R}{100}$$

$$\text{Simple Interest} = \frac{10000 * 5 * 10}{100}$$

$$= 100 * 50$$

$$= 5000$$

**You would get 5000 Rs interest from your friend.**

To calculate total amount:

$$A = P + SI$$

$$= 10000 + 5000$$

$$= 15000$$

**Answer is your friend should return 15000 Rs to you after 5 years**

We will look at type of problems asked in Simple Interest and then we will solve problems for each type.

**Note:**

Principal	P
Number of Years	N
Rate of Interest	R
Simple Interest	I or SI
Amount	A

Type	Given	To find
Type 1	Out of P, N, R, I, any 3 values are given	4 <sup>th</sup> value?
Type 2	Out of P, N, R, I, A any 3 values given	4 <sup>th</sup> or 5 <sup>th</sup> value?
Type 3	Interest / Amount given for 2 different time periods (eg. 3 years and 5 years)	Rate of interest?
Type 4	Principal split in 2 parts and given on 2 different Interest rates	Original spited values of Principal?
Type 5	Amount gets x times in n years	Rate of interest?

**Type 1:**

**Problem 1:**

Find Simple Interest on 8000 Rs at 5% per annum for 4 years?

**Solution :**

$$P = 8000 \text{ Rs}$$

$$R = 5 \%$$

$$N = 4 \text{ Years}$$

$$\text{Simple Interest} = \frac{P * N * R}{100}$$

$$\text{Simple Interest} = \frac{8000 * 5 * 4}{100}$$

$$= 80 * 5 * 4$$

$$= 80 * 20$$

$$= 1600$$

**Answer is Simple Interest is 1600 Rs**

**Problem 2:**

Find Simple Interest on 7500 Rs at 10% per annum for 2 Years 4 Months?

**Solution :**

$$P = 7500 \text{ Rs}$$

$$R = 10 \%$$

$$N = 2 \text{ Years } 4 \text{ months}$$

$$= 2 \frac{4}{12} = 2 \frac{1}{3} \text{ Years} = \frac{7}{3} \text{ Years}$$

$$\text{Simple Interest} = \frac{P * N * R}{100}$$

$$\text{Simple Interest} = \frac{7500 * 7 * 10}{100 * 3}$$

$$= 25 * 70$$

$$= 1750$$

**Answer is Simple Interest is 1750 Rs**

**Problem 3:**

A sum fetched a total simple interest of 4016.25 Rs at rate of 9% in 5 years.

What is the sum?

**Solution :**

$$SI = 4016.25 \text{ Rs}$$

$$R = 9 \%$$

$$N = 5 \text{ Years}$$

$$P = ?$$

$$\text{Simple Interest} = \frac{P * N * R}{100}$$

$$4016.25 = \frac{P * 5 * 9}{100}$$

$$P = \frac{4016.25 * 100}{5 * 9}$$

$$= \frac{4016.25 * 20}{9}$$

$$= 446.25 * 20$$

$$= 8925.00$$

$$= 8925$$

**Answer is Sum is 8925 Rs.**

**Problem 4:**

Anil has given amount of 10000 Rs to Sunil at the rate of 10% Simple Interest. After how much duration Sunil has to return money so that Anil will get Interest of 5000Rs?

**Solution**

$$P = 10000 \text{ Rs}$$

$$SI = 5000 \text{ Rs}$$

$$R = 10\%$$

$$N = ?$$

$$5000 = \frac{10000 * N * 10}{100}$$

$$N = \frac{5000 * 100}{10000 * 10}$$

$$= 5$$

**Answer is 5 Years**

**Type 2:****Problem 1**

A sum of 12,500 Rs amounts to 15,500 Rs in 4 years at the rate of simple interest. What is rate of Interest?

**Solution :**

$$P = 12500 \text{ Rs}$$

$$A = 15500 \text{ Rs}$$

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

$$R = ?$$

As you can see here, we have to find rate of interest.

In order to find rate of Interest we need to first find the Simple interest.

$$A = P + SI$$

$$15500 = 12500 + SI$$

$$SI = 3000$$

As per Simple Interest formula,

$$\text{Simple Interest} = \frac{P * N * R}{100}$$

$$3000 = \frac{12500 * 4 * R}{100}$$

$$R = \frac{3000 * 100}{12500 * 4}$$

$$= \frac{3000 * 4}{500 * 4}$$

$$= 6$$

**Answer is Rate of Interest is 6%**



**Problem 2**

Reema took loan of 1200 Rs with Simple Interest for as many as years as the rate of Interest. If she paid 432 Rs as Interest at the end of loan period, what was rate of Interest?

**Solution:**

$$P = 1200 \text{ Rs}$$

$$SI = 432 \text{ Rs}$$

$$N = R = \text{Let us assume it as } x$$

$$R = ?$$

$$\text{Simple Interest} = \frac{P * N * R}{100}$$

$$432 = \frac{1200 * x * x}{100}$$

$$x^2 = \frac{432 * 100}{1200}$$

$$= 36$$

$$x^2 = 36$$

$$x = 6$$

**Answer is Rate of Interest is 6%**

### Problem 3:

The Simple Interest on sum of money will be 600 after 10 years. If the principal is trebled (# times) after 5 years, what will be total interest

### Solution:

Before solving this question we will see the pattern for simple Interest with Simple Example

P = 100 Rs, R = 10% and we will find Interest till 5 years with Simple Interest

Number of years (N)	Total Interest	Amount
1	10 Rs	$100 + 10 = 110$
2	20 Rs	$100 + 20 = 120$
3	30 Rs	$100 + 30 = 130$
4	40 Rs	$100 + 40 = 140$
5	50 Rs	$100 + 50 = 150$

If you look at interest of 5 years:

10, 20, 30, 40, 50

→ Consistently increasing by 10 Rs.

So In **Simple Interest** as long as **Principal and Rate of Interest** is constant **Amount of Interest at any 1 year is constant value.**

Let us solve problem now.

SI for 10 years = 600 Rs

If Principal trebled after 5 years Total Interest = ??

As 10 years interest is 600 Rs,

$$\text{One Year Interest} = \frac{600}{10} = 60$$

One Year Interest is 60 Rs.

10 Years Interest = Interest of 1<sup>st</sup> 5 Years + Interest of last 5 years after Trebled Principal

As Principal is trebled after 5 years, Interest would also get trebled after 5 years.

**[60 \* 3 per month]**

1 <sup>st</sup> 5 Year Interest	Last 5 Year Interest	Total Interest
$60 * 5 = 300$	$60 * 3 * 5 = 900$	$300 + 900 = 1200$

**Answer is Total interest after 10<sup>th</sup> year is 1200 Rs**

**Type 3:**

**Problem 1 :**

A certain sum of money amounts to 1008 Rs in 2 Years and 1164 Rs in 3.5 years. Find Sum and rate of Interest?

**Solution :**

A (after 2 years) = 1008

A (after 3.5 years) = 1164

P = ?

R = ?

1.5 years Interest =  $1164 - 1008 = 156$  Rs

We will find 1 year interest

$$\begin{aligned}\text{One year interest} &= \frac{156}{1.5} = \frac{1560}{15} \\ &= 104\end{aligned}$$

One year Interest is 104

A = P + SI

Amount after 2 years = 1008

$$P = 1008 - (2 * 104)$$

$$P = 1008 - 208 = 800$$

**Sum is 800**

Now we will have to find rate of Interest (R)

$$SI \text{ for 2 years} = 2 * 104 = 208$$

$$P = 800$$

$$N = 2$$

$$R = ?$$

$$\text{Simple Interest} = \frac{P * N * R}{100}$$

$$208 = \frac{800 * 2 * R}{100}$$

$$R = \frac{208 * 100}{800 * 2}$$

$$= \frac{208}{16}$$

$$= 13$$

**Rate of Interest is 13%**

**Answer is Sum is 800 Rs and Rate of Interest is 13%**

## Problem 2

A certain sum of money at Simple interest amounts to 1012 in 2.5 years and to 1067.20 in 4 years. The rate of interest per annum is?

**Solution:**

$$A \text{ (after 2.5 years)} = 1012$$

$$A \text{ (after 4 years)} = 1067.20$$

$$P = ?$$

$$R = ?$$

$$1.5 \text{ years Interest} = 1067.20 - 1012 = 55.20 \text{ Rs}$$

We will find 1 year interest

$$\begin{aligned} \text{One year interest} &= \frac{55.20}{1.5} = \frac{5520}{150} \\ &= 36.8 \end{aligned}$$

One year Interest is 36.8

$$A = P + SI$$

$$\text{Amount after 4 years} = 1067.20$$

$$P = 1067.20 - (4 * 36.8)$$

$$P = 1067.20 - 147.20 = 920$$

**Sum is 920 Rs**

Now we will have to find rate of Interest (R)

$$SI \text{ for 4 years} = 4 * 36.8 = 147.2$$

$$P = 928$$

$$N = 4$$

$$R = ?$$

$$\text{Simple Interest} = \frac{P * N * R}{100}$$

$$147.2 = \frac{920 * 4 * R}{100}$$

$$R = \frac{147.20 * 100}{920 * 4} = \frac{14720}{920 * 4} = \frac{1472}{92 * 4} = \frac{368}{92} = \frac{16}{4} = 4$$

**Rate of Interest is 4%**

**Answer is Sum is 920 Rs and Rate of Interest is 4%**

#### **Type 4**

##### **Problem 1:**

A Sum of 1550 Rs is lent out into 2 parts .1 of part at 8% and another at 6%.If the annual income is 106 Rs, find the money at each rate?

##### **Solution:**

Here we have 2 Principals, 2 different rate of Interest and Total interest is given.

Let us assume 1 part of Principal (P1) as x.

Other part of Principal(P2) = 1550 –x

R1 = 8%

R2 = 6%

SI = 106

We know total interest but not individual interest.

Total Interest = Interest of Part1 (x) + Interest of Part 2 (1550-x)

$$\text{Simple Interest} = \frac{P * N * R}{100}$$

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

$$106 = \frac{8x + 9300 - 6x}{100}$$

$$10600 = 2x + 9300$$

$$2x = 1300$$

$$x = 650$$

Principal 1 (P1) which is at 8% = 650 Rs

$$P2 = 1550 - x = 1550 - 650 = 900$$

**Answer is Sum given at 8% is 650 Rs and Sum given at 6% is 900**

**Type 5:**

**Problem 1:**

At what rate percent per annum will a sum of money double in 16 Years?

**Solution:**

Similar kind of question can be asked with triple, 8 time of sum etc.

Here we need to understand how much interest we should get to make amount double.

Assume if Principal is P.

To get sum 2P we will  $2P - P = P$  Simple Interest

So,  $P = P$

$SI = P$

$N = 16$

$R = ?$

$$\text{Simple Interest} = \frac{P * N * R}{100}$$

$$P = \frac{P * 16 * R}{100}$$

$$R = \frac{100}{16} = \frac{50}{8} = \frac{25}{4} = 6\frac{1}{4}$$

**Answer is To get Sum double in 16 years Rate of Interest should be  $6\frac{1}{4}\%$**

### **Problem 2:**

In how many years a sum of money will be double itself at 12 % per annum?

### **Solution :**

Similar kind of question can be asked with triple, 8 time of sum etc.

Here we need to understand how much interest we should get to make amount double.

Assume if Principal is P.

To get sum 2P we will  $2P - P = P$  Simple Interest

So,  $P = P$

$SI = P$

$R = 12\%$

$N = ?$

$$P = \frac{P * 12 * N}{100}$$

$$N = \frac{100}{12} = \frac{50}{6} = \frac{25}{3} = 8\frac{1}{3} = 8 \text{ Year} + 4 \text{ months [1/3 means 4 Months]}$$

**Answer is to get Sum double with 12 % annum will be 8 Year and 4 Months**