ST. LAWRENCE HIGH SCHOOL

A Jesuit Christian minority Institution

Subject: Mathematics   Class- X   Date:08/05/2020

Study material -5

Chapter- Compound Interest and uniform rate of increase or decrease

Topic- Compound Interest and uniform rate of increase or decrease

Compound Interest

Compound interest (or compounding interest) is interest calculated on the initial principal, which also includes all of the accumulated interest from previous periods on a deposit or loan.

Some formula related to compound interest

Amount=$p(1+r/100)^n$ where p = principal, r= rate of compound interest , n= number of years

Compound Interest= Amount- principal = $p(1+r/100)^n$ - p

$$= p[(1+r/100)^n-1]$$

If compounding period is not annual, rate of interest is divided in accordance with the compounding period. For example, if interest is compounded half yearly, then rate of interest would be r / 2, where 'r' is the annual rate of interest. In that case formula becomes : Amount= $p(1 + \frac{r/2}{100})^{2n}$ where p= principal, r=rate of interest,n= number of years

Similarly ,If it is getting compounded for t times then the formula becomes

Amount= $p(1+ \frac{r/t}{100})^{tn}$, t=number of times it is getting compounded

Solved problems

1)The difference between the SI and CI on a certain sum of money at 10 % rate of annual interest for 2 years is Rs. 549. Find the sum.

Solution: Let the sum be P.

R = 10 %

n = 2 years

SI = P x R x n / 100 = P x 10 x 2 / 100 = 0.20 P

CI = A – P = P [1 + (R / 100)]² – P = 0.21 P

Now, it is given that CI – SI = 549

=> 0.21 P – 0.20 P = 549

=> 0.01 P = 549

=> P = 54900   (Ans)

2) A sum of Rs. 1000 is to be divided among two brothers such that if the interest being compounded annually is 5 % per annum, then the money with the first brother after 4 years is equal to the money with the second brother after 6 years.

Solution: Let the first brother be given Rs. P

=> Money with second brother = Rs. 1000 – P

Now, according to the question,

P [1 + (5 / 100)]⁴ = (1000 – P) [1 + (5 / 100)]⁶

=> P (1.05)⁴ = (1000 – P) (1.05)⁶

=> 0.9070 P = 1000 – P

=> 1.9070 P = 1000

=> P = 524.38

Therefore, share of first brother = Rs. 524.38

Share of second brother = Rs. 475.62

3) Find out in how many years Rs 40,000 will become Rs 46,656 at 8% rate of compound interest.

Solution: According to the problem

$46656 = 40000(1 + 8/100)^n$

Or, $46656 / 40000 = (108/100)^n$

Or, $11664/10000 = (108/100)^n$

Or, $(108 / 100)^2 = (108/ 100)^n$

 Therefore n=2   (Ans)

4)If Rs 1600 is getting compounded half yearly at the rate of 10% compound interest for $1\frac{1}{2}$ years. Then find compound interest and amount.

Solution:Amount= $P(1 + \frac{r/2}{100})^{2n}$

P= Rs 1600 , r= 10% , n= 3/2 years

Amount= $1600 (1+ 5/100)^{2 \times 3/2}$

= 1600 x 105/100 x 105/100 x 105/100

= Rs 1852.20 (Ans)

Compound interest= Rs (1852.20-1600)= Rs 252.20(Ans)

Uniform rate of increase or decrease

If the increase or decrease in any value occurs at the same rate, we call it as uniform rate increase or decrease.

This concept is as similar as the concept of compound interest.

In case of increase

New value= $p (1+r/100)^n$, p=original value , r=   rate of increase, n= number of years

In case of decrease

New value= $p(1-r/100)^n$, p= original value , r= rate of decrease , n= number of years

1) The population of a village increases by 10% every year. If the present population is 6000, what will be the population of the village after 3 years?

Solution: The present population P = 6000,

Rate (r) = 10

Unit of time being year (n) = 3

$Q = P(1 + r/100)^n$

$\implies Q = 6000(1 + 10/100)^3$

$\implies Q = 6000(1 + 1/10)^3$

$\implies Q = 6000(11/10)^3$

$\implies Q = 6000 \times (11/10) \times (11/10) \times (11/10)$

$\implies Q = 7986$

Therefore population after 3 years is 7986

2) A factory has a machine worth of Rs 1,80,000.Every year its value decreases by 10% .Find the value of the machine after 3 years.

Solution: decreased value of the machine after 3 years= $1,80,000(1- 10/100)^3$

$= 1,80,000 \times 90/100 \times 90/100 \times 90/100$

$= 7290 \times 18$

$=131220$

Therefore value of the machine will become Rs 131220 after 3 years

3)Weight of Shovon babu is 80 kg. He started walking to reduce weight. He decided that he will make it reduced by 10% every year. Find his weight after 3 years.

Solution: Weight after 3 years= $80 (1-10/100)^3$ kg

$= (80 \times 90/100 \times 90/100 \times 90/100)$ kg

$= 58.32$ kg (ans)

Therefore his weight after 3 years is 58.32 kg

3) The present population of Berlin is 2000000. If the rate of increase of population of Berlin at the end of a year is 2% of the population at the beginning of the year, find the population of Berlin after 3 years?

Solution: Population of Berlin after 3 years

$Q = P(1 + r100)^n$

$\Longrightarrow Q = 200000(1 + 2/100)^3$

$\Longrightarrow Q = 200000(1 + 1/50)^3$

$\Longrightarrow Q = 200000(51/50)^3$

$\Longrightarrow Q = 200000(51/50) \times (51/50) \times (51/50)$

$\Longrightarrow Q = 2122416$

Therefore population of berlin after 3 years is= 2122416 (ans)

Aparajita Mondal