CLASS - X
MATHEMATICS

Compound Interest and Uniform Rate of Increase or Decrease

1. What is the difference between Compound and Simple interest?

Ans.

Simple Interest : When interest is calculated on principal or capital only, that interest is said to be simple interest. In this case principal remains unchanged normally.

Compound Interest : But after a definite period of time, the interest acquired is added to the principal to get the new principal. For the definite period of time, if the interest is calculated on the new principal, the interest is called Compound Interest. In this case normally principal will be changed.

2. For Compound Interest, how the amount will be calculated if the period of interest is 6 months or 3 months.

Ans.

(i) Period of interest = 6 months; rate of interest per annum = $r\%$

$\therefore$ Interest for first 6 months or $\frac{1}{2}$ year on ₹ P = ₹ $\dfrac{p \times r \times \frac{1}{2}}{100}$

$\therefore$ Amount for first 6 months (1 period) on ₹ P = ₹ $\left(p + \dfrac{p \times \frac{r}{2}}{100} \right)$

$$= ₹ \, p \left(1 + \dfrac{\frac{r}{2}}{100} \right)^{1}$$

$\therefore$ Similarly amount for first 1 year (2 periods) on ₹ P = ₹ $p \left(1 + \dfrac{\frac{r}{2}}{100} \right)^{2}$

$\therefore$ Similarly amount for first n years (2n periods) on ₹ P = ₹ $p \left(1 + \dfrac{\frac{r}{2}}{100} \right)^{2n}$

(ii) Similarly if the period of interest is 3 months, then the amount on ₹ P, under rate of interest $r\%$ per annum is equal to $₹ \, p \left(1 + \dfrac{\frac{r}{4}}{100} \right)^{4n}$

3. **Find the Compound Interest on ₹1000 for 1 year at the rate of 10% Compound Interest per annum Compounded at the interest of 6 months.**

Ans.

Princpal (P) = ₹ 1000, rate of interest $(r\%)$ = 10% p.a., period of interest = 6 months

Amount for n years (n = 1) $= ₹\ p\left(1 + \dfrac{\frac{r}{2}}{100}\right)^{2n}$

$= ₹\ 1000\left(1 + \dfrac{10}{200}\right)^{2\times 1}$

$= ₹\ 1000\left(1 + \dfrac{5}{100}\right)^{2} = ₹1000 \times \dfrac{105 \times 105}{100 \times 100}$

$= ₹\ 1102.50$

∴ Compound Interest $= ₹(1102.50 - 1000) = ₹102.50$

4. **Find the Compound Interest on ₹1600 for 2 years at the rate of 10% Compound Interest per annum Compounded at the interval of 6 months.**

Ans.

Principal (P) = ₹1600; time (n) = 2 years; Rate of interest $(r\%)$ = 10% p.a.
Period of interest = 6 months,

∴ Amount for n years (n=2) $= ₹\ p\left(1 + \dfrac{r}{200}\right)^{2n}$

$= ₹1600\left(1 + \dfrac{10}{200}\right)^{2\times 2} = ₹\ 1600\left(\dfrac{21}{20}\right)^{4}$

$= ₹1600 \times \dfrac{21 \times 21 \times 21 \times 21}{\underset{100}{20 \times 20 \times 20 \times 20}} = ₹\ 1944.81$

∴ Amount for 2 years = ₹1944.81 and Compound Interest $= ₹(1944.81 - 1600) = ₹344.81$.

5. **The price of a machine depreciates at the rate n% per annum and the price of the machine after r years is ₹ v. Find the price of the machine that was r years before.**

Ans.

Let the price of the machine r years before be ₹ P.

If the price of the machine depreciates at the rate n% per annum then the price of the machine after

r years will be $= ₹ \; P\left(1 - \dfrac{n}{100}\right)^{r}$

$\therefore$ By the problem, $\qquad P\left(1 - \dfrac{n}{100}\right)^{r} = v$

or, $\qquad P = \dfrac{v}{\left(1 - \dfrac{n}{100}\right)^{r}}$

$\therefore$ The price of the machine that was r years before was $₹ \; \dfrac{v}{\left(1 - \dfrac{n}{100}\right)^{r}}$.