

## Compound Interest

- **Interest: (I)** Interest is money paid to the lender by the borrower for using his money for a specified period of time. Various terms and their general representation are as follows:
- **Principal(P):** The original sum borrowed
- **Time (t):** Time for which money is borrowed.
- **Rate of Interest(r):** Rate at which interest is calculated on the original sum.
- **Amount (A):** Sum of Principal and Interest. (P+I).

$$A = P\left[1 + \frac{r}{100}\right]^t$$

$$A = P + I$$

### Type I: Times

<u>Times</u>	<u>Year</u>
X	Y
$X^N$	NY

If a sum becomes X times in Y years at CI, It will be  $X^N$  times in NY years.

**Exp 1:** A Sum of money invested at CI doubles itself in 6 years. At the same rate of interest it will amount to eight times of itself in:

Solution:

<u>Times</u>	<u>Year</u>
X	Y
$X^N$	NY

<u>Times</u>	<u>Year</u>
2	6
$2^3(8)$	$3 \times 6 = 18$

=18 years

**Type II: Rate**

If a Sum becomes X times of itself in T years .Find rate %

$$R\% = ((X)^{\frac{1}{T}} - 1) \times 100$$

**Exp2:** If the amount is 2.25 times of the sum after 2 years at CI (annually), the rate of percent per annum is:

Solution:

$$R\% = ((X)^{\frac{1}{T}} - 1) \times 100$$

$$R\% = ((2.25)^{\frac{1}{2}} - 1) \times 100 = 50\%$$

**Type III X=CI-SI**

When difference between CI and SI on a certain sum of money for 2 years at R % is Rs. X, then Principal is given by:

$$P = X \times \left[\frac{100}{R}\right]^2$$

When difference between CI and SI on a certain sum of money for 3 years at R % is Rs. X, then Principal is given by:

$$P = \frac{X \times 100^3}{R^2 \times (300 + R)}$$

**Exp 3:** The difference between the CI and SI on a sum at 4% rate of interest per annum for two years is Rs 80, Find the Principal:

$$P = X \times \left[\frac{100}{R}\right]^2$$

$$P = 80 \times \left[\frac{100}{4}\right]^2 = 50000$$

**Type IV:** If the difference between CI and SI for 2 year is X and Rate is R% then:

$$R\% = \frac{2 \times X \times 100}{SI}$$

**Exp 4:** If the CI on a certain sum for 2 years at 3 % pa is Rs. 101.50, then the SI on the same sum at the same rate and for same time will be:

$$R\% = \frac{2 \times X \times 100}{SI} \qquad 3 = \frac{2 \times (101.50 - SI) \times 100}{SI}$$

**SI=100**

**Type V:** An amount of money grows up to Rs. A<sub>1</sub> in N years and A<sub>2</sub> in N+ 1 year on CI. Find Rate% and principal:

$$R\% = ((A_2 - A_1) \times) / A_1$$

$$P = A_1 \left( \frac{A_1^N}{A_2} \right)$$

**Exp 5:** A certain sum of money amounts to Rs. 4840 in 2 years and to Rs 5324 in 3 years at CI. The rate % pa is:

$$R\% = ((A_2 - A_1) \times 100) / A_1$$

$$R\% = ((5324 - 4840) \times 100) / 4840$$

$$= 10\%$$

$$P = 4000$$

**Type VI:** If a sum A becomes B in T<sub>1</sub> years at CI, then after T<sub>2</sub> years the sum becomes:

$$\frac{B^{T_2/T_1}}{A^{(\frac{T_2}{T_1} - 1)}}$$

**Exp 6:** Rs 4800 becomes Rs 6000 in 4 years at a certain rate of compound interest. What will be the sum after 12 years?

**=9375**

**Type V:** Annual Payment

$$\text{Annual Payment} = \frac{P \times R}{100 \left[ 1 - \left( \frac{100}{100+R} \right)^N \right]} = \frac{P}{\left( \frac{100}{100+R} \right)^1 + \left( \frac{100}{100+R} \right)^2 + \dots}$$

**Exp 7:** A builder borrows Rs. 2550 to be paid back with CI at the rate of 4 % per annum by the end of 2 years in two equal yearly installments. How much will be each installments be ?

Solution:

$$= \frac{P}{\left( \frac{100}{100+R} \right)^1 + \left( \frac{100}{100+R} \right)^2 + \dots}$$

$$\frac{2550}{\left( \frac{100}{100+4} \right)^1 + \left( \frac{100}{100+4} \right)^2}$$

**=1352**

Note

$$\frac{CI}{SI} = \frac{R}{200} + 1$$