IMPORTANT FORMULAES: PERCENTAGE

1. **Concept of Percentage:**

   By a certain **percent**, we mean that many hundredths. Thus, *x* percent means *x* hundredths, written as *x*%.

   To express *x*% as a fraction: We have, $x\% = \frac{x}{100}$.

   Thus, $20\% = \frac{20}{100} = \frac{1}{5}$.

   To express $\frac{a}{b}$ as a percent: We have, $\frac{a}{b} = \left(\frac{a}{b} \times 100\right)\%$.

   Thus, $\frac{1}{4} = \left(\frac{1}{4} \times 100\right)\% = 25\%$.

2. **Percentage Increase/Decrease:**

   If the price of a commodity increases by R%, then the reduction in consumption so as not to increase the expenditure is:

$$\left[\frac{R}{(100 + R)} \times 100\right]\%$$

   If the price of a commodity decreases by R%, then the increase in consumption so as not to decrease the expenditure is:

$$\left[\frac{R}{(100 - R)} \times 100\right]\%$$

3. **Results on Population:**

   Let the population of a town be P now and suppose it increases at the rate of R% per annum, then:

   1. Population after *n* years $= P\left(1 + \frac{R}{100}\right)^n$
   2. Population *n* years ago $= \frac{P}{\left(1 + \frac{R}{100}\right)^n}$

4. **Results on Depreciation:**

Let the present value of a machine be P. Suppose it depreciates at the rate of R% per annum. Then:

1. Value of the machine after *n* years = $P\left(1 - \frac{R}{100}\right)^n$

2. Value of the machine *n* years ago = $\frac{P}{\left(1 - \frac{R}{100}\right)^n}$

3. If A is R% more than B, then B is less than A by $\left[\frac{R}{(100 + R)} \times 100\right]\%$.

4. If A is R% less than B, then B is more than A by $\left[\frac{R}{(100 - R)} \times 100\right]\%$.