PERCENTAGES

Concept:

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

1. If A is R\% more than B, then B is less than A by \( \frac{R}{(100+R)} * 100 \)
2. If A is R\% less than B, then B is more than A by \( \frac{R}{(100-R)} * 100 \)
3. If the price of a commodity increases by R\%, then reduction in consumption, not to increase the expenditure is: \( \frac{R}{(100+R)} * 100 \)
4. If the price of a commodity decreases by R\%, then the increase in consumption, not to decrease the expenditure is: \( \frac{R}{(100-R)} * 100 \)

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 = \( \frac{P}{\left( 1 + \frac{R}{100} \right)^n} \)

3. If a number is increased by \( x \% \) and thereafter reduced by \( x \% \), then the number will be reduced by \( (x^2)/100 \) percent.

4. If a number is reduced by \( x \% \) and thereafter increased by \( x \% \), then the number will be reduced by \( \left( \frac{x^2}{100} \right) \text{percent.} \)
5. If in an examination, in which the minimum pass percentage is \(x\)%, a candidate secures \(y\) marks and fails by \(z\) marks, then the total number of marks in this examination will be

\[
\frac{100 \times (y + z)}{x}
\]

6. If in an examination \(x\)% and \(y\)% candidates respectively fail in two different subjects while \(z\)% candidates fail in both the subjects, then the percentage of candidates who pass in both the subjects will be

\[
\left[ 100 - (x + y - z) \right] \%
\]

TIPS:
1. If an object's price is increased or decreased by \(x\)% and the other factor is decreased by \(y\)% then the net effect is given by: Net Effect = \([ x + y + xy / 100 ]\%
2. If the net effect is nil, i.e. there is no loss or no gain, then the above formula becomes: \(y = \frac{100x}{100 + x}\)
3. If the price of an article is successively increased by \(x\)% , \(y\)% and \(z\)% then single equivalent increase in the price will be \([ x + y + z + (xy + yz + zx) / (100) + xyz / (100)^2 ]\%
4. If after spending \(p1\)% first, then \(p2\)% from the remaining and so on, \(B\) is the balance amount, then the total (original) amount is given by: Total amount = \(B \times 100 \times 100... / (100 - p1) (100 - p2)\)...Population formula: 1) If the population increases by \(x\)% during the first year, by \(y\)% during the second year, by \(z\)% during the third year, the population after three years will be:

\[P \times \frac{1 + x}{100} \times \frac{1 + y}{100} \times \frac{1 + z}{100}\]