

Percentage



Percentage: Percentage is a way of expressing a number as a fraction of 100. The word percent means per hundred. It is denoted using the % symbol.

$$\text{Percentage} = \left(\frac{\text{Part}}{\text{Whole}} \right) \times 100$$

For example: 25% means 25 out of 100

Conversions

1. Percentage to Decimal: Divide the percentage by 100.

$$\text{Example: } 75\% = \frac{75}{100} = 0.75$$

2. Decimal to Percentage: Multiply the decimal by 100 and add the % sign.

$$\text{Example: } 0.4 \times 100 = 40\%$$

3. Percentage to Fraction: Divide the percentage by 100 and simplify.

$$\text{Example: } 60\% = \frac{60}{100} = \frac{3}{5}$$

4. Fraction to Percentage: Multiply the fraction by 100 and add the % sign.

$$\text{Example: } \frac{3}{4} \times 100 = 75\%$$

5. Ratio to Percentage: Convert the ratio to fraction, multiply by 100.

$$\text{Example: } 2:5 = \frac{2}{5} \times 100 = 40\%$$

6. Increased and Decreased Percentage: To find % increase or decrease:

$$\text{Change \%} = \frac{\text{Difference}}{\text{Original value}} \times 100$$

$$\text{Example: From 50 to 60} \rightarrow \frac{10}{50} \times 100 = 20\% \text{ increase}$$

7. What percentage of one number is equal to another number?

To find what percentage of one number is of another, use the formula:

$$\text{Percentage} = \left(\frac{\text{Part}}{\text{Whole}} \right) \times 100$$

Example: What percentage of 30 is 12?

$$\frac{12}{30} \times 100 = 40\%$$

Important Formulae

1. $x\% = \frac{x}{100}$
2. To increase a number by a given percentage ($x\%$). Multiply the number by the following factor $= \left(\frac{100 + x}{100} \right)$
3. To decrease a number by a given percentage ($x\%$). Multiply the number by the following factor $= \left(\frac{100 - x}{100} \right)$
4. If an amount is increased by $a\%$ and then it is reduced by $a\%$ again, then percentage change will be a decrease of $= \frac{a^2}{100} \%$
5. If a number is first increased by $a\%$ and then again increased by $b\%$, then total increase percent is $\left(a + b + \frac{ab}{100} \right) \%$
6. If the cost of an article is increased by $A\%$ then, how much to decrease the consumption of article so that expenditure remains same is given by

OR

If the income of a man is $A\%$ more than another man then, income of another man is less in comparison to the 1st man by $\left(\frac{A}{(100 + A)} \times 100 \right) \%$ (decrease)

7. If the population/cost of a certain town/article is P and annual increment rate is $r\%$, then
 - (i) After ' t ' years population/cost $= P \left(1 + \frac{r}{100} \right)^t$
 - (ii) Before ' t ' years population/cost $= \frac{P}{\left(1 + \frac{r}{100} \right)^t}$
8. If the population/cost of a town/article is P and it decreases/reduces at the rate of $r\%$ annually, then,
 - (i) After ' t ' years population/cost $= P \left(1 - \frac{r}{100} \right)^t$
 - (ii) Before ' t ' years population/cost $= \frac{P}{\left(1 - \frac{r}{100} \right)^t}$

Practice Questions

1. 15% of a number is 75. What is the number?

Sol: Let number = x

$$15\% \text{ of } x = 75$$

$$0.15x = 75$$

$$x = 500$$

2. What is 25% of 160?

$$\text{Sol: } 25\% \text{ of } 160 = \frac{25}{100} \times 160 = 0.25 \times 160 = 40$$

3. 20% of what number is 50?

Sol: Let number = x

$$20\% \text{ of } x = 50$$

$$\frac{20}{100} \times x = 50$$

$$0.2x = 50$$

$$x = 250$$

4. An item's price is increased by 20% and then by 10%. Find net % change.

$$\text{Sol: Net \% change} = \left(a + b + \frac{ab}{100} \right) \%$$

$$\text{Net \% change} = \left(20 + 10 + \frac{20 \times 10}{100} \right) \%$$

$$\left(30 + \frac{200}{100} \right) \%$$

$$32\%$$