

6. Percentage & Profit & Loss

6.1 Percentage

To increase a number by x %:

- If a number is increased by 10 %, then it becomes 1.1 times of itself.
- If a number is increased by 20 %, then it becomes 1.2 times of itself.
- If a number is increased by 30 %, then it becomes 1.3 times of itself.
- If a number is increased by 40 %, then it becomes 1.4 times of itself.

To decrease a number by x %:

- If a number is decreased by 10 %, then it becomes 0.90 times of itself.
- If a number is decreased by 20 %, then it becomes 0.80 times of itself.
- If a number is decreased by 30 %, then it becomes 0.70 times of itself.

- If a number is decreased by 40 %, then it becomes 0.60 times of itself.

Salary/weight/income more;

If A's income is R % more than B, then B is income is less than that of A by $100 \times \frac{R}{100 + R}$

%. Given below are some of the important results in that context

Salary/weight/income less;.

If A's income is R% less than B, then B's

income is more than that of A by $100 \times \frac{R}{100 - R}$

%.

Given below are some important results in that context.

- If A is $16\frac{2}{3}$ % less than B, then B is 20 % more than A.

- If A is 20 % less than B, then B is 25 % more than A.
- If A is 25 % less than B, then B is $33\frac{1}{3}$ % more than A.
- If the price is increased, then the consumption should be decreased by $\frac{100 \times R}{(100 + R)}$ If the price is decreased, then consumption should be increased by $\frac{100 \times R}{(100 - R)}$

Increase and decrease by the same % age;

- If a number is increased by R % and then this number is decreased by R %, then in total there would be a decrease of $\frac{R^2}{100}$ %.

Increase and decrease by different% age;

- If a number is decreased by X %, then this is again increased by Y %. Then the total increase in the no. will be $X + Y + \frac{XY}{100}$.

6.2 Simple Interest & Compound Interest

- Simple Interest = $(P \times R \times T)/100$, where, P is the amount invested or borrowed, T is the time in years and R is the annual interest rate.
- $A = P + SI$, where, A is the amount payable or receivable at the end of period T, P is the principal and SI is the simple interest.
- $A = P (1+R/100)^n$, where, A is the amount receivable on compound interest basis, P is the principal invested, R is the annual rate of interest and n is the number of years for which the sum has been invested.
- Compound Interest = $A - P$, where, C.I is the compound interest, A is the amount

receivable with interest and P is the principal invested.

Interest rate on monthly installment plans

- $R = 24 \times I \times 100 / N(F+L)$, where, R is the interest, I is the installment, N is the number of installments, F is the principal left before the first installment and L is the principal left before last installment.

Equated Installment

$$X = \frac{A}{1 - \left(\frac{100}{100+R}\right)^n} \times \frac{R}{100} \text{ where,}$$

X is the equated installment, A is the amount borrowed, R is the rate of interest and n is the number of years.

$A = P(1+R/200)^{2N}$, if the interest is calculated half-yearly.

$A = P(1+R/400)^{4N}$, if the interest is calculated quarterly.

Rule Of 72 - Time taken to double one's investment can be obtained by dividing 72 by the interest rate. This is only in case of compound interest.

Rule Of 69 - This rule is also used to determine the time taken to double one's investment. However, it is a more refined formula. Time taken = $0.35 + (69/\text{Interest rate})$. This is also true in case of compound interest only.

If D is the difference in CI and SI for 2 years, and R is the rate of interest and P the principal then, $D = R/100 \times R/100 \times P$

The following table lists the values of an initial investment, P = Re. 1 for certain time periods and rates of interest, calculated at both, simple and compound interest. This would be of great help in time management during the paper, if memorized.

Time ↓ Rate ⇒	5%		10%		20%		30%	
	SI	CI	SI	CI	SI	CI	SI	CI
1 year	1.05	1.05	1.1	1.1	1.2	1.2	1.3	1.3
2 yrs	1.10	1.1025	1.2	1.21	1.4	1.44	1.6	1.69
3 yrs	1.15	1.1575	1.3	1.331	1.6	1.728	1.9	2.197
4 yrs			1.4	1.4641	1.8	2.0736		

6.3 Profit & Loss

Cost Price (CP): The price paid to buy a particular product is called its cost price.

Some overhead expenses such as transportation, taxes etc. are also included in the cost price.

Selling Price (SP): The sum of money received for the product.

Marked Price (MP): The price that is listed or marked on the product. This is also known as printed price/quotation price/invoice price/catalogue price.

Profit: There is a gain in a transaction if the selling price is more than the cost price. The excess of the selling price to the cost price is called profit.

PROFIT = SELLING PRICE – COST PRICE

Loss:

When the selling price is less than the cost price, there is a loss in the transaction. The

excess of cost price over the selling price is called loss.

- $\text{Loss} = \text{Cost Price} - \text{Selling Price}$
- $\% \text{ Profit} = 100 \times \text{Profit} / \text{Cost Price}$
- $\% \text{ Loss} = 100 \times \text{Loss} / \text{Cost price}$

Equal % profit & loss on the same selling price of two articles:

If two items are sold each at Rs X, one at a gain of p % and the other at a loss of p %, then the two transactions have resulted in an overall loss of $\frac{p^2}{100}$ %, and the absolute value

of the loss is = Rs. $\frac{2 \cdot p^2 \cdot X}{100^2 - p^2}$

Equal % profit & loss on the same cost price

of two articles:

If the cost price of two items is X , and one is sold at a profit of $p\%$ and the other at a loss of $p\%$, then the two transactions have resulted in no gain or no loss.

Trade Discount: To attract customers, it is a common practice to announce discount on the marked price of an article.

Note: The discount is always taken as a % of the marked price, unless otherwise specified.

E.g. Let the list price of an article be Rs. 450.

A discount of 5% on its list price is announced. Then, the new selling price = $450 \times \frac{95}{100} = \text{Rs } 422.5$.

Cash Discount: In addition to trade discount, the manufacturer may offer an additional discount called the Cash Discount if the buyer makes full payment within a certain specified time. Cash Discount is usually offered on the net price (the price after subtracting discount from the marked price). Therefore, Cash Price = Net Price – Cash Discount

Note: Cash discount is always calculated on net price, unless otherwise specified.

Wrong Weight: When a tradesman claims to sell at cost price, but uses a false weight, then the percentage profit earned =

$$\frac{100 \times \text{Error}}{\text{True Weight} - \text{Error}}$$

Successive Discounts: When a tradesman offers more than one discount to the customer, then the total discount offered is calculated by applying the method of decimals learned in the topic of percentage.

- **Example:** A tradesman offers two successive discounts of 20 % and 10 %. Calculate the gross discount offered by the tradesman.

After a discount of 20%, we are left with 80% or 0.8. Further, after applying a discount of 10%, we are left with 90% or 0.9. The total discount is calculated as: $1 - (0.8 \times 0.9) = 0.28$. Hence, there is a total discount of 28%.

- When the SP of x articles is equal to CP of y articles, what is the profit percent earned?

$$\text{Profit percent} = \frac{100 \times \text{difference in } x \text{ and } y}{X}$$