CBSE Class 8 Maths Notes Chapter 7 Comparing Quantities

Discount is a reduction given on marked price.
Discount = Marked Price – Selling price.

Discount can be calculated when the discount percentage is given.
Discount = Discount % of marked Price.

Additional expenses made after buying an article are included in the cost price and are known as overhead expenses.
C.P = Buying Price + Overhead expenses

Sales tax is charged on the sale of an item by the government and is added to the bill amount.
Sales tax = Tax % of bill amount

VAT (value added tax) is charged on the selling price of an article.
Percent: The word percent is an abbreviation of the Latin phrase 'per centum' which means per hundred or hundredths.

$$\text{Sales Tax} = \frac{\text{C.P.} \times \text{Rate of S.T.}}{100}$$

M.P. = Marked Price
S.P. = Selling Price
M.P = S.E + Discount
Discount = M.P – S.P

$$\text{Discount\%} = \frac{\text{Discount} \times 100}{\text{M.P.}}$$

When profit % is given, then S.P > C.P and

$$\text{S.P.} = \left(\frac{100 + \text{Profit \%}}{100}\right) \times \text{C.P}$$

$$\text{C.P.} = \frac{\text{S.P.} \times 100}{100 + \text{Profit \%}}$$

$$\text{Profit} = \frac{\text{Profit \%} \times \text{C.P.}}{100}$$

$$\text{Profit (gain)} = \text{S.P.} - \text{C.P.}$$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$$

When loss % is given S.P < C.P and

Increase and Decrease Percent

$$\text{Increase \%} = \left(\frac{\text{Increase}}{\text{Original value}} \times 100\right)\%$$

$$\text{Decrease \%} = \left(\frac{\text{Decrease}}{\text{Original value}} \times 100\right)\%$$

Simple Interest(SI): When the interest is paid to the lender regularly every year or half year on the same interest, we call it a simple interest. In other words, interest is said to simple, if it is calculated on the original

principle throughout the loan period.

$S.I. = \frac{P \times R \times T}{100}$

Where, P = Principal, R = Rate of Interest, T = Time.

Compound Interest (CI): If the borrower and the lender agree to fix up a certain interval of time (say, a year or a half-year or a quarter of a year, etc.), so that the amount at the end of an interval becomes the principal for the next-interval, then the total interest over all the interval calculated in this way is called the compound interest.

Also, CI = Amount – Principal

(a) When interest is compounded annually, then

$$\text{Amount } A = P\left(1+\frac{R}{100}\right)^n \text{ and CI} = \text{A} - \text{P} = \text{P}\left\{\left(1+\frac{\text{R}}{100}\right)^n - 1\right\}$$

where P is Principal, R is the rate of interest and n is time period.

(b) When Interest is Compounded Half-Yearly, then

$$\text{Amount } A = P\left(1+\frac{R}{2\times 100}\right)^{2n}, \quad \text{where } \begin{cases} \frac{\text{R}}{2} \text{ is half yearly rate and} \\ 2n = \text{number of half-years} \end{cases}$$

$$\text{and CI} = \text{A} - \text{P} = \text{P}\left\{\left(1+\frac{\text{R}}{2\times 100}\right)^{2n} - 1\right\}$$

When R_1, R_2 and R_3 are different rates for the first, second and third year, then

$$\text{Amount } A = P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right)$$

$$\text{and CI} = \text{A} - \text{P} = \text{P}\left\{\left(1+\frac{\text{R}_1}{100}\right)\left(1+\frac{\text{R}_2}{100}\right)\left(1+\frac{\text{R}_3}{100}\right) - 1\right\}$$

Recalling Ratios and Percentages

We usually compare two quantities by division, i.e., by using fractions.

Comparison by division is called ratio.

Note that two quantities can be compared only when they have the same units. Consequently, the ratio has no unit. However, if the two quantities are not in the same unit, then we convert them into the same unit before comparison.

Two quantities can also be compared using percentages. By percentage, we mean a fraction where the denominator is 100. The numerator of the fraction is called rate per cent.

For example: $\frac{5}{100}$ means 5%. The symbol % is often used for the expression 'per cent' (p.c.).

To convert ratio into a percentage, we convert it into a fraction whose denominator is 100. [or we multiply by 100 and employ % sign.]

To convert percentage into a fraction, we divide the numerator by 100 and express it in the lowest form.
For example: 5% = $\frac{5}{100} = \frac{1}{20}$

In unitary method, we find the value of one unit from the given value of some units and then we find the value of required number of units.

Finding Discounts

Discount = Marked Price – Sale Price

$$\text{Discount per cent} = \frac{\text{Discount}}{\text{Marked Price}} \times 100\%$$

Estimation in Percentages

- Round off the bill to the nearest tens.
- Find the amount of discount.
- Reduce the bill amount by discount amount.

Profit/Loss Percent:

Profit/Loss is always calculated on the CP.

$$\text{Profit \%} = \frac{\text{Profit}}{\text{CP}} \times 100\ \% \quad \text{or} \quad \text{P\%} = \frac{\text{P}}{\text{CP}} \times 100\%$$

$$\text{Loss \%} = \frac{\text{Loss}}{\text{CP}} \times 100\ \% \quad \text{or} \quad \text{L\%} = \frac{\text{L}}{\text{CP}} \times 100\%$$

Overall Gain:

Overall gain = Combined SP – Combined CP

Sales Tax/Value Added Tax

Sales tax is charged at a specified rate on the sale price of an item by the state government and is added to the bill amount. It is different for different items and also for different states.
Amount of Sales Tax = Tax% of the bill amount
These days, the prices include the tax known as Value Added Tax (VAT).

Compound Interest

Interest: Interest is the extra money paid by institutions like banks or post offices on money which is deposited (kept) with them. Interest is also paid by people when they borrow money. The money deposited or borrowed is called the principal. Interest is generally given in per cent for a period of one year.

Simple interest (SI): The interest is called simple when the principal does not change.

The formula for Simple Interest: Simple interest on a principal of ₹ P at R% rate of interest per year for T years is given by

$$\text{Simple Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\text{or,} \qquad \text{SI} = \frac{\text{PRT}}{100}.$$

Amount: Amount(A) = Principal (P) + Simple Interest (SI)

Deducing a Formula for Compound Interest

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

where

P = Principal

R = Rate of interest per annum compounded annually

n = Number of years

A = Amount

CI = A − P

Rate Compounded Annually or Half Yearly (Semi-Annually)

The word annually mentioned after the rate means that the interest is charged at the end of every year, whereas the rate is given for one year.

We could also have interest rates compounded half-yearly or quarterly. This means that the rate for the one-half year (i.e., 6 months) is half of the rate given for one year and the time period is of two half years because interest is charged twice a year.

So if a sum of ₹ 50,000 is taken for 1 year at 10% p.a. compounded semi-annually, it means time period = 2 half years (i.e., 1 × 2) and rate = $\frac{1}{2}$ × 10% = 5%.

Note:

1. The time period for which the interest is calculated and added each time to form a new principle is called the conversion period or time period.
2. If interest is compounded half-yearly, then there are two conversion periods in a year each after 6 months. In such situations, we compute the interest two times. So, the time period becomes twice and the rate becomes half of the annual rate.
3. If interest is compounded quarterly, then there are four conversion periods in a year each after 3 months. In such situations, we compute the interest four times. So, the time period becomes four times and the rate becomes one-fourth of the annual rate.

Applications of Compound Interest Formula

We use the compound interest formula to find

- Increase (or decrease) in population.
- The growth of bacteria if the rate of growth is known.
- The value of an item, if its price increases or decreases in the intermediate years.

Note: For increase, R is positive and for decrease, R is negative.