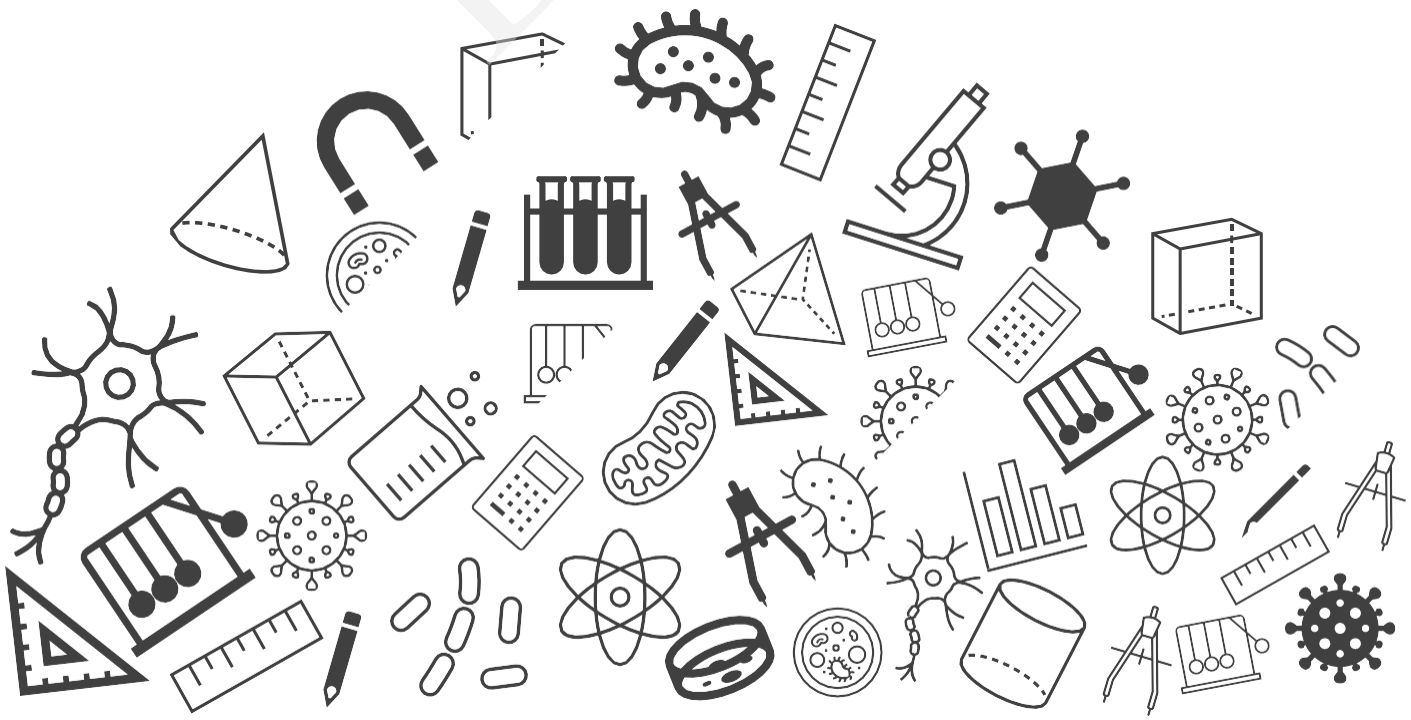
Grade 08
Maths Chapter Notes



BYJU'S Classes

Chapter Notes

Comparing Quantities

Grade 08

Topics to be Covered

1. Ratios and Percentages

1.1. Ratio
1.2. Percentage
1.3. Converting ratio to percentages
1.4. Percentage change

2. Discount

3. Taxation

4. Interest

4.1. Compound interest
4.2. Simple interest versus compound interest
4.3. Conversion period
4.4. Application of compound interest formula

1. Ratios and Percentages

1.1. Ratio

- The ratio of two quantities a and b of the same kind and same units is the fraction which is written as $a : b$, read as 'a is to b'.

= 1:4

1.2. Percentage

- A percentage is a number or ratio that can be expressed as a fraction of 100.

$$\frac{1}{4} = 25\%$$

1.3. Converting ratio to percentages

To convert ratio into percentage we use the following formula: **Percentage = Ratio in fraction form × 100%**

For example:

Ratio	Ratio to percentage conversion	Percentage
$1 : 4$	$\left(\frac{1}{4}\right) \times 100\%$	25%
$8 : 5$	$\left(\frac{8}{5}\right) \times 100\%$	160%

1.4. Percentage change

- Change in percentage = $\frac{\text{Amount of change}}{\text{Initial Value}} \times 100\%$
- Percentage change is always calculated on the initial value. Change can be either an increase or a decrease.
- New value = Initial value $\pm \frac{\%\ \text{change}}{100} \times$ Initial value

For example:

Initial number of washing machines sold = 8
Final number of washing machines sold = 8 + 2 = 10

Increase in percentage = $\frac{\text{Amount of change}}{\text{Initial value}} \times 100\%$

$= \frac{10 - 8}{8} \times 100\% = 25\%$

When old value is same as the new value then there is neither a decrease nor an increase in the quantity and the net percentage change is 0%.

2. Discount

Discount is a reduction given on the marked price (M.P.) of an article.

$$\text{Discount} = \text{Marked price} - \text{Sale price}$$

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

Example:

An item is marked at ₹100 is sold at ₹80. What is discount and discount percent?

Discount = ₹100 – ₹80 = ₹20

Discount % = $\frac{20}{100} \times 100\% = 20\%$

3. Taxation

Sales tax (ST)

Sales tax (ST) is charged by the government on the sale of an item and is added to the bill amount.

Sales tax (ST)

Value-added tax (VAT) is another form of tax added at every stage of transfer of goods or services.

Sales tax (ST)

Goods and services tax (GST) is another form of tax levied on supply of goods or services or both.

The taxes are calculated on the selling price of the commodity.

- Tax = Tax % × Bill amount
- Total amount = Bill amount + Tax

More about GST

GST or the **Goods and Services Tax**, came into effect in India from **1st July 2017**. This replaces all the indirect taxes levied on most goods and services such as VAT, excise duty, luxury tax, and so on.

4. Interest

4.1. Compound Interest

- Compound interest is an interest accumulated on the principal and final amount together over a given time period.
- $A = P\left(1 + \frac{R}{100}\right)^n$
  - A = Amount after n years
  - P = Principal
  - R = Rate of interest
  - n = Number of years
- $CI = A - P$

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

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

4. Interest

4.1. Compound Interest

Derivation of Compound Interest Formula

Let's consider the following:

- Principal amount = P
- Time = n years
- Rate = R

After 1st year,

- Simple interest $(SI_1) = \frac{P \times R \times T}{100}$
- Amount $= P + SI_1$

$$= P + \frac{P \times R \times T}{100}$$

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

$$= P_2$$

After 2nd year,

- Simple interest $(SI_2) = \frac{P_2 \times R \times T}{100}$
- Amount $= P_2 + SI_2$

$$= P_2 + \frac{P_2 \times R \times T}{100}$$

$$= P_2\left(1 + \frac{R}{100}\right)$$

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

$$= P\left(1 + \frac{R}{100}\right)^2$$

Similarly, if we proceed further to n years, we can get:

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

4.2. Simple Interest versus Compound Interest

In simple interest, the principal amount remains the same every year.
For example, if simple interest is calculated at 10% per annum on a principal amount of ₹100, then the interest at the end of every year will be ₹10 and the principal remains the same every year.

In compound interest, the interest for a particular year is added to the principal amount and then the interest is calculated on the new principal.
For example, if compound interest is calculated at 10% per annum on a principal amount of ₹100 for 2 years, the interest at the end of the first year will be ₹10 and the amount will be ₹(100 + 10) = ₹110 which will be the principal for the next year. For the second year the interest will be ₹11 and the amount will be ₹(110 + 11) = ₹121 which will be the principal for the next year.

		Simple Interest	Compound Interest
1st year	Principal	100	100
	Interest at 10%	10	10
	Amount	110	110
2nd year	Principal	100	110
	Interest at 10%	10	11
	Amount	120	121

4.3. Conversion Period

If the rate of interest annually is $R\%$ and time period is n years, then:

- for half yearly interest, compounded rate is $\frac{R}{2}$ and time period is $2n$.
- for quarterly interest, compounded rate is $\frac{R}{4}$ and time period is $4n$.
- for monthly interest, compounded rate is $\frac{R}{12}$ and time period is $12n$.

The table shows the general form of rate of interest for the different conversion periods.

Interest compounded	Rate of interest (R)	Time period (n)
Annually	R	n
Half - yearly	$\frac{R}{2}$	$2n$
Quarterly	$\frac{R}{4}$	$4n$
Monthly	$\frac{R}{12}$	$12n$

4.4. Application of Compound Interest Formula

There are some situations where we could use the compound interest formula.
Here are a few examples:

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

Growth

$$\text{Final value} = \text{Present value} \times \left(1 + \frac{R}{100}\right)^n$$

Depreciation

$$\text{Final value} = \text{Present value} \times \left(1 - \frac{R}{100}\right)^n$$

Growth/Depreciation rate = $R\%$ per annum
Time = n years

Mind Map