CLASS : 7

Chapter :8

COMPARING QUANTITIES

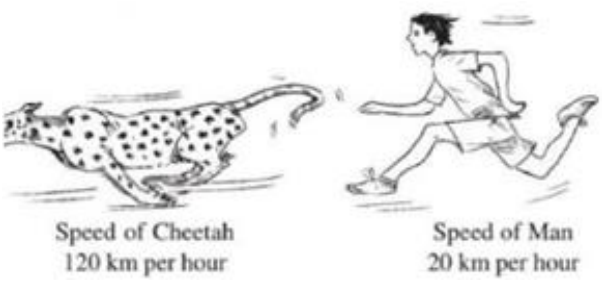
HANDOUT (MODULE -1/3)

In our daily life, there are many occasions we compare two quantities. Generally, we compare two quantities either by finding the difference of their magnitudes or by finding the division of their magnitudes. When we want to see how much more one quantity is less than the other , we find the difference of their magnitudes. When we compare the two quantities, of same kind, by division, we say that it is the ratio of two quantities.
To compare quantities, there are multiple methods, such as ratio and proportion, percentage, profit and loss, and simple interest.

Ratio

The ratio is used to compare two quantities. These quantities must have the same units. The ratio of two quantities of the same kind and in the same unit is the fraction that one quantity is of the other.
The ratio of ‘a is to b’ is written as a : b.
We can also write it in the form of “fraction” $\frac{a}{b}$.

Example
In the below picture height of Heena is 150 cm and height of Amir is 75 cm. We find that Heena is two times taller than Amir Or Amir’s height is ½ of Heena’s height.
We write the ratio of the heights as:
Heena’s height : Amir’s height is 150 : 75 or 2 : 1.



Example: Ratio of the speeds of cheetah and man= 120:20

or $\frac{120}{20} = \frac{6}{1}$ or 6: 1

EQUIVALENT RATIOS

The equivalent ratio is like the equivalent fractions so to find the equivalent ratio we need to write it in the form of a fraction. To find the equivalent ratio we need to multiply or divide the numerator and denominator with the same number.
Example: Are the ratios 1:2 and 2:3 equivalent?

To check this, we need to know whether 1: 2 and 2: 3

To check this, we need to know whether $\frac{1}{2} = \frac{2}{3}$.

We have, $\frac{1}{2} = \frac{1\times3}{2\times3} = \frac{3}{6}; \frac{2}{3} = \frac{2\times2}{3\times2} = \frac{4}{6}$

We find that $\frac{3}{6} < \frac{4}{6}$, which means that $\frac{1}{2} < \frac{2}{3}$.

Therefore, the ratio 1:2 is not equivalent to the ratio 2:3.

Proportion

Proportion shows the equality between two ratios. If two ratios are in proportion then these must be equal. If the two ratios are equal, the four quantities are said to be in proportion.

$$a : b = c : d \Rightarrow a : b :: c : d.$$

$$\frac{\text{the actual height of building}}{\text{actual height of tree}} = \frac{\text{height of building in drawing}}{\text{height of the tree in the drawing}}$$

$$\frac{a}{b} = \frac{c}{d}$$

Another example where proportions are used is in the making of national flags. The flags are always made in a fixed ratio of length to its breadth.
These may be different for different countries but are mostly around 1.5 : 1 or 1.7 : 1.
We can take an approximate value of this ratio as 3 : 2. Even the Indian post card is around the same ratio.

Percentage-Another way of comparing Quantities

Percentages are numerators of fractions with denominator 100 and have been used in comparing results. Per cent is represented by the symbol % and means hundredths too. That is 1% means 1 out of hundred or one hundredth. It can be written as: 1% = $\frac{1}{100}$ = 0.01

Converting Fractional Numbers to Percentage

We will follow the following steps for converting a fraction into a percentage:

Step I: Obtain the fraction. Let the fraction is x/y.

Step II: Multiply the fraction by 100 and write the percentage (%) symbol to find the required percent.

Therefore, $\frac{x}{y} = \frac{x}{y} \times \frac{100}{100} = \left[\frac{x \times 100}{y}\right] \times \frac{1}{100} = \frac{x \times 100}{y}$ %

Problem: Convert the given fractional numbers to percent:

(a) $\frac{1}{8}$ (b) $\frac{5}{4}$ (c) $\frac{3}{40}$ (d) $\frac{2}{7}$

Solution:

(a) $\frac{1}{8} = \frac{1}{8}$ x 100 % = $\frac{100}{8}$ % = 12.5 %

(b) $\frac{5}{4} = \frac{5}{4}$ x 100 % = $\frac{500}{4}$ % = 125 %

(c) $\frac{3}{40} = \frac{3}{40}$ x 100 % = $\frac{300}{40}$ % = $\frac{15}{2}$ % = 7.5 %

(d) $\frac{2}{7} = \frac{2}{7}$ x 100 % = $\frac{200}{7}$ % = 28.57 %.

Converting Decimal into Percentage:

Problem: Convert the given decimal fractions to per cents:

(a) 0.65 (b) 2.1 (c) 0.02 (d) 12.35

Solution:

(a) 0.65 = $\frac{65}{100}$ x 100% = 65%

(b) 2.1 = $\frac{21}{10}$ x 100% = 210%

(c) 0.02 = $\frac{2}{100}$ x 100 % = 2%

(b) 12.35 = $\frac{1235}{100}$ x 100% = 1235%.

Converting Percentages to Fractions or Decimals

Problem: Convert given percents to decimal fractions and also to fractions in simplest forms:

(a) 25% (b) 150% (c) 20% (d) 5%

Solution:

Per cents	Fractions	Simplest form	Decimal form
25%	$\frac{25}{100}$	$\frac{1}{4}$	0.25
150%	$\frac{150}{100}$	$\frac{3}{2}$	1.5
20%	$\frac{20}{100}$	$\frac{1}{5}$	0.2
5%	$\frac{5}{100}$	$\frac{1}{20}$	0.05

Converting Percentages to "How Many"

(a) 50% of 164

$= \frac{50}{100} \times 164 = 82$

(b) 9 is 25% of what number?

Let the number be 'x'

25% of x = 9

$\frac{25}{100} \times x = 9$

x = 36

∴ the number is 36.

Increase or decrease as Percent

$$\text{Increase or decrease percentage} = \frac{\text{Amount of change}}{\text{Original amount}} \times 100$$

Example

The total marks of Charlie increased from 365 to 380 from last year's result. Find the increase in percentage.

Solution

Original amount = Marks of Charlie last year = 365

Amount of change = increase in the number of marks = 380 – 365 = 15.

Therefore,

The percent of increase $= \frac{change\ in\ marks}{original\ marks} \times 100\%$

$= \frac{15}{365} \times 100\%$

$= 4.10\%$

Increase or Decrease as Percent

There are times when we need to know what the increase in a certain quantity or decrease in it is as percent.

For example, if the population of a city is increased from 5,50,000 to 6,05,000, this could more clearly be understood if written as:

The population is increased by 10%.

$$\text{Percentage increase (or decrease)} = \frac{\text{Amount of change (increase or decrease)}}{\text{Original amount (or base)}} \times 100\%.$$

Increase = 6,05,000 - 5,50,000 = 55,000

Percentage of increase $= \frac{55000}{550000}$ x100% = 10%