

8th Chapter :- Commercial Mathematics

I. Introduction:-

- Ratio:- A ratio is a numerical relation of one quantity to another of the same type.

• Proportion:-

When two ratios are equal, their terms are said to be in proportion.

If $\frac{a}{b} = \frac{c}{d}$ then a, b, c and d are in proportion and can be written as $a:b::c:d$.

- The numbers a and d are called extremes, and b and c called mean of middle terms.

= Product of extremes = Product of means.

• Unitary method:-

The unitary method is a simple way of solving any mathematical

problems.

Revision

1) $\therefore$ is read as is to

2) $\therefore$ is read as $\therefore$ as

3) write $28:36$ in its simplest form:
$$= \frac{28}{36} = \frac{7}{9} = 7:9$$

4) Find the ratio of the following

a) 28 dozen to 8 dozen
$$\frac{28}{8 \times 2} = \frac{7}{2} = 7:2$$

b) 25 paise to 5 Rs

25 paise to 500 paise 1 Rs = 100 paise

$$\frac{25}{500} = \frac{1}{20} \quad \text{Rs} = 500$$

5) Find value of x

4) $3:5::x:75$

$$\frac{3}{5} = \frac{x}{75}$$

$$3 \times 75 = 5 \times x$$

$$x = \frac{3 \times 75}{5}$$

$$x = 15$$

5) $7:x::12:75$

$$\frac{7}{x} = \frac{12}{75}$$

$$7 \times x = 12 \times 75$$

$$x = \frac{12 \times 75}{7}$$

$$x = \frac{900}{7}$$

$$x = 128.57$$

$$x = 128.57$$

Exercise 8.1

- 1) Ten men can dig a well in 9 days. In how many days can 15 men dig the same well?

Men	Days	
10	9	[Inverse v]
15	x	[Horizontal as well]

$$\frac{10 \times 9}{15} = x$$

$$x = 6$$

$$x = 6 \text{ days}$$

- 2) Ten workers are paid ₹ 1680 for one day. How much money will be paid to 28 workers for one day?

	workmen		₹ Paid	
	10	1680		
	28	x		(Cross multiply)
$10 \times x = 1680 \times 28$				
$10x = 47040$				
$x = \frac{47040}{10}$				
$x = ₹4704 //$				

3] In a school, the monthly fee collection of 350 students is ₹ 3,85,000. what will be the collection fee is 58 student for a month?

→

	Student		(fee ₹)
	350	3,85,000	
	58	x	
(Cross multiply)			

$$\begin{aligned}
 350 \times x &= 3,85,000 \times 58 \\
 350x &= 22330000 \\
 x &= \frac{22330000}{350} \\
 x &= ₹63,8000
 \end{aligned}$$

- Q. A bag containing 30 apples weighs 6 kg. How much will 1080 such apples weight?

Apple	Weight
30	6
1080	x

[Cross multiply]

$$30 \times x = 1080 \times 6$$

$$30x = 6480$$

$$x = \frac{6480}{30}$$

$$x = 216 \text{ weight}$$

- Q. The total wages of 30 labourers were ₹ 3450 per day. What would be the total wages if 10 more labourers were added to them?

labourers	wages
30	3450
(30+10)=40	x

Cross Multiply

$$30 \times x = 3450 \times 40$$

$$30x = 138000$$

$$x = \frac{4500}{30}$$

$$x = 4500 \text{ wage}$$

7] A car takes 7 hours to cover a certain distance at the speed of 48 km/h. If the speed is decreased by 20 km/h, how much time will it take to cover the same distance?

→

Hours		Distance km/h
7	←→	48
x	←→	28 = 48 - 20

(horizontal multiply)

$$48 \times 7 = x \times 28$$

$$336 = 28x$$

$$x = \frac{336}{28}$$

$$x = 12 \text{ hours}$$

- 8] A man works 8 hours to paint a wall daily and completes a wall in 12 days. If he works 6 hours daily, in how many days will the same work be completed?

Time	Days
8	12
6	x

[Horizontal multiply]

$$8 \times 12 = 6 \times x$$

$$96 = 6x$$

$$x = \frac{96}{6}$$

$$x = 16$$

$$x = 16 \text{ days.}$$

- 9] Gautam takes 5 hours to paint a wall and Gamalshin takes 6 hours to paint the same wall. If they work together how long will they take to paint the wall?

$$\frac{1}{5} + \frac{1}{6} = \frac{1}{x}$$

$$\frac{6 + 5}{30} = \frac{1}{x} \Rightarrow \frac{11}{30} = \frac{1}{x} \Rightarrow x = \frac{30}{11}$$

Exc. 8.2

1. Express the following fractions as percentages.

a) $\frac{3}{4}$

$$= \frac{3 \times 25}{4 \times 100}$$

$$= 75\%$$

b) $\frac{5}{8}$

$$= \frac{5 \times 12.5}{8 \times 100}$$

$$= \frac{125\%}{2}$$

c) $1\frac{7}{8}$

$$= \frac{15 \times 25}{8 \times 100}$$

$$= \frac{375\%}{2}$$

$$= 187\frac{1}{2}\%$$

d) $\frac{11}{20}$

$$= \frac{11 \times 50}{20 \times 100}$$

$$= 50\%$$

2. Express the following ratio as per cents

a) $1:2$

$$= \frac{1 \times 50}{2 \times 100}$$

$$= 50\%$$

b) $3:4$

$$= \frac{3 \times 75}{4 \times 100}$$

$$= 75\%$$

$$1) \quad 5 : 12.25$$

$$= \frac{5 \times 100}{12.25}$$

$$= \frac{500}{12.25}$$

$$= \frac{125}{3} = 41\frac{2}{3} \% = 54\frac{1}{3} \%$$

$$2) \quad 27.50$$

$$= \frac{27.50 \times 100}{100}$$

$$= 27.50 \%$$

3. Express the following decimals as per cents.

$$a) \quad 0.02 = 0.02 \times 100 = 2\%$$

$$b) \quad 1.05 = 1.05 \times 100 = 105\%$$

$$c) \quad 0.250 = 0.250 \times 100 = 25.0\%$$

$$d) \quad 12.25 = 12.25 \times 100 = 1225\%$$

4. Express the following per cents as fractions.

$$a) \quad 2\frac{1}{2} \%$$

$$= \frac{2\frac{1}{2}}{100}$$

$$= \frac{5}{50}$$

$$= \frac{13}{50}$$

$$b) \quad 3\frac{1}{4} \%$$

$$= \frac{3\frac{1}{4} \times 100}{4}$$

$$= \frac{13 \times 1}{4 \times 100}$$

$$= \frac{13}{400} \%$$

$$c) \quad 35 \frac{1}{2} \%$$

$$= \frac{71 \times 100}{2}$$

$$= \frac{71 \times 1}{2 \times 100}$$

$$= \frac{71}{2000} \%$$

$$d) \quad 105\%$$

$$\begin{array}{r} 21 \\ + 100 \\ \hline 121 \end{array}$$

$$= \frac{21}{20} \%$$

5. Express the following in percent as ratio in the simplest form.

a) $1:2\%$
 $= \frac{1 \text{ is nothing}}{2 \text{ part}}$

b) $20\% \frac{1}{5}$
 $= \frac{20}{100} \times \frac{1}{5}$

$$\frac{12}{10} \times 100$$

$$= 1:5$$

$$\frac{12}{10} \times \frac{1}{100}$$

$$c) \quad 15 \frac{1}{2}$$

$$\begin{array}{r} 15 \frac{1}{2} \times 3 \\ \hline 1000 \\ \hline 500 \\ \hline 250 \end{array}$$

$$\frac{31}{2} \times 100$$

$$\frac{31}{2} \times \frac{1}{100}$$

$$= 3:500\%$$

$$= \frac{31}{200} \quad 31:200$$

$$\begin{array}{r} 72\% \\ 72 \\ \hline 100 \\ 75 \end{array}$$

$$= \frac{18}{75} = 18:75$$

6] Express the following per cents as decimals

a] 3%

$$= \frac{3}{100} = 0.03\%$$

b] 29%

$$= \frac{29}{100}$$

$$= 0.29\%$$

c] 25.6%

$$= \frac{25.6}{100}$$

$$= 0.256\%$$

d] 212%

$$= \frac{212}{100}$$

$$= 2.12\%$$

7] what is per cent of 60 is 600?

$$= \frac{60 \times x}{100} = 600$$

$$x = \frac{600 \times 100}{60} = 1000$$

$$x = 1800\%$$

b) ₹ 50 to ₹ 250 ?

$$\frac{50}{100} \times x = 250$$

$$x = \frac{250 \times 100}{50}$$

$$= \frac{250 \times 100}{50}$$

$$= 500\%$$

c) 8 hrs to 2 days ?

$$1 \text{ days} = 24 \text{ hrs}$$

$$2 \text{ days} = 48 \text{ hrs}$$

$$\frac{8}{100} \times x = 48$$

$$8 \times x = 48 \times 100$$

$$x = \frac{48 \times 100}{8}$$

$$x = 600\%$$

Q 12.5% is 2.5 kg?

$$1 \text{ kg} = 1000 \text{ g}$$

$$2.5 \times 100 = 125$$

$$2500 \text{ g} = 125$$

$$\frac{12.5}{100} \times x = 2500$$

$$12.5 \times x = 2500 \times 100$$

$$x = \frac{2500 \times 100}{12.5}$$

$$x = 20000$$

Q Find the number whose

a) 12% is 60

b) 25% is 70

$$\frac{12}{100} \times x = 60$$

$$\frac{25}{100} \times x = 70$$

$$x = \frac{60 \times 100}{12}$$

$$x = \frac{70 \times 100}{25}$$

$$x = 5000$$

$$x = 2800$$

c) 65% is 221

d) 12.5% is 1000

$$\frac{65}{100} \times x = 221$$

$$\frac{12.5}{100} \times x = 1000$$

$$x = \frac{221 \times 100}{65}$$

$$x = \frac{1000 \times 100}{12.5}$$

$$x = \frac{221 \times 100}{65}$$

$$x = \frac{1000 \times 100}{12.5}$$

$$x = 340$$

$$x = 8000$$

Q7) A railway ticket costs ₹ 720. A further 22% tax of this amount is added to it. What is the total amount of this ticket?

→ The cost of railway ticket = ₹ 720
 22% tax added

$$= \frac{22}{100} \times 720$$

$$= \frac{12}{5} \times 14.4 \text{ Rs}$$

$$\text{Total amount} = 720 + 14.4 \\ = 734.4 \text{ Rs}$$

Q8) In an examination, 90% of the candidates passed and 80 candidates failed. How many candidates appeared in the examination?

→

$$10\% \text{ of } x = 80$$

$$\frac{10}{100} \times x = 80 \quad \Rightarrow \quad 80 \times \frac{100}{10}$$

$$x = 800 //$$

12] Pulakish became 630 marks out of 900
and Radhika became 630 marks out of
1000. whose performance is better?

→ Pulakish score out of 900 = $\frac{630}{900} = 7$

Radhika score out of 1000 = $\frac{630}{1000} = 63$

a) Pulakish Percentage :-
 $\frac{7}{10} \times 100 = 70$

b) Radhika Percentage :-
 $\frac{63}{100} \times 100 = 63$

* Pulakish is highest.

13] A man travelled 50km by bus and 200km
by train. Find what per cent of the
total journey he travelled by bus
and what per cent by train.

→ Total distance travelled by bus
and train =

$$= 50 \text{ km} + 200 \text{ km}$$

$$= 250 \text{ km}$$

a) Percentage of distance travelled by train

$$\text{Percentage} = \frac{\text{Part}}{\text{Whole}} \times 100$$

$$= \frac{50}{250} \times 100$$

$$= 20\%$$

b) Percentage of distance travelled by train

$$\text{Percentage} = \frac{\text{Part}}{\text{Whole}} \times 100$$

$$= \frac{4}{200} \times 100$$

$$= 2\%$$

- 15] In a school, 35% of the student are girls and the number of boys is 910. Find the number of girls in the school. Also, find the total enrolment in the school.

→ 25% of student are girls
∴ Total percentage of boys = 100% - 25%
= 75%

∴ Total no of students
 $\frac{95 \times 75}{100} = 712.5$

$$x = 1425$$

∴ Total no of students = $x = 21400$
" " " = $14000 - 910$
= 2490

definition:-

* Profit and loss:-
The money paid by the shopkeeper to purchase an article is called its cost price CP. And money he gets by selling the same article is called its selling price SP.

1. If the selling price is greater than the cost price, then the shopkeeper gains some money. This is called gain and profit in the transaction.

$$\text{Profit} = \text{SP} - \text{CP}, \text{ when } \text{SP} > \text{CP}.$$

2. If the selling price is less than the cost price, then the shopkeeper earns a loss. This is called loss in the transaction.

$$\text{Loss} = \text{CP} - \text{SP}, \text{ when } \text{CP} > \text{SP}$$

3. If the price at which goods are sold and price paid to buy the goods are the same, then there is no profit and loss.

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

$$1) \text{ SP} = \text{CP} + \text{P}$$

$$2) \text{ SP} = \text{CP} - \text{L}$$

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

$$3) \text{ CP} = \text{SP} + \text{L}$$

Ex 8.3

i) Find the SP when -

a) $\text{CP} = ₹ 250$, Profit ₹ 22

= $\text{SP} = \text{CP} + \text{P}$

$\text{SP} = ₹ 250 + ₹ 22$

$\text{SP} = ₹ 272$

b) $\text{CP} = ₹ 720$, Profit = ₹ 105

$\text{SP} = \text{CP} + \text{P}$

$\text{SP} = 720 + 105$

$\text{SP} = ₹ 825$

c) $\text{CP} = ₹ 790$, Loss = ₹ 20

= $\text{SP} = \text{CP} - \text{L}$

$\text{SP} = ₹ 790 - ₹ 20$

$\text{SP} = ₹ 770$

d) $\text{CP} = ₹ 1550$, Loss = ₹ 200

$$SP = CP - L$$

$$SP = 21550 - 220$$

$$SP = 21330$$

2. Find the CP when

a) $SP = ₹ 400$, Profit = 235

$$CP = SP - P$$

$$CP = 400 - 235$$

$$CP = ₹ 165$$

b) $SP = ₹ 1250$, Profit = ₹ 250

$$CP = SP - P$$

$$CP = ₹ 1250 - 250$$

$$CP = ₹ 1000$$

c) $SP = ₹ 1250$, Loss = ₹ 150

$$CP = SP + L$$

$$CP = ₹ 1250 + 150$$

$$CP = ₹ 1400$$

d) $SP = ₹ 1800$, Loss = ₹ 325

$$CP = SP + L$$

$$CP = ₹ 1800 + 325$$

$$CP = ₹ 2125$$

Word Sum 5:-

1) An old study table was bought for Rs 1500. Some repairs were done for Rs 375. The study table was then sold for Rs 2900. Find the profit or loss.

$$CP = \text{Rs } 1500 + \text{Rs } 375 = \text{Rs } 1875$$

$$SP = \text{Rs } 2900$$

Since $SP > CP$, there is profit

$$\text{Profit} = SP - CP$$

$$P = 2900 - 1875$$

$$P = \text{Rs } 1025$$

2) Paper bags which cost ₹ 1.50 each are sold at ₹ 30 dozen. If 5 dozen paper bags are sold, what is the profit or loss incurred?

$$\rightarrow \text{Cost price of 1 bag} = ₹ 1.50$$

$$\begin{aligned} \text{Cost price of 5 dozen} &= 5 \times 12 \times ₹ 1.50 \\ &= 60 \times ₹ 1.50 \\ &= ₹ 90 \end{aligned}$$

$$\begin{aligned} \text{SP of 5 dozen paper bags} &= ₹ 30 \times 5 \\ &= ₹ 150 \end{aligned}$$

$$CP = ₹ 90 \quad SP = ₹ 150$$

$$P = SP - CP$$

$$P = ₹ 150 - ₹ 25$$

$$P = ₹ 125$$

∴ Profit is earned

- 1) Junior sells a sofa set for ₹ 23,450, thereby earning a profit of ₹ 2350. If he would have sold it for ₹ 25,560. How much profit would have he earned? How much more profit would he earn with new selling price.

→ Initial of sofa set = ₹ 23,450

$$\text{Profit} = ₹ 2350$$

$$CP = SP - P$$

$$= ₹ 23,450 - ₹ 2350$$

$$= ₹ 21,100$$

$$\text{New SP of sofa set} = ₹ 25,560$$

$$\text{New profit} = \text{New SP} - CP =$$

$$= ₹ 25,560 - ₹ 21,100$$

$$= ₹ 4460$$

$$\text{Extra profit} = \text{New Profit} - \text{old price}$$

$$= ₹ 4460 - ₹ 2350$$

$$= ₹ 2110$$

Definition

- 1) The money invested is called a loan for borrowed

- 2) After a time period having a certain interest

- 3) The sum of loan

- 4) The value paid daily

Definition :-

1) The money which is borrowed or invested is called the Principal denoted by P . The time (T) is the period for which the money is borrowed.

2) After a specified period of time, the additional money to be paid for having used the borrowed money is called the Simple Interest or interest denoted by I .

3) The interest rate is percentage of sum borrowed at the time of taking the money throughout the loan period and denoted by R .

4) The money repaid or given back, which includes the interest and principal is called Amount and denoted by A .

Formula:

Ex 8.4

Formula

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

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

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

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

$$A = P + SI \quad \text{Ex: } 21, 22, 23$$

$$SI = A - P$$

$$P = A - SI$$

II Extra Sum:-

Q.1 Given :- $P = 10,000$
 $R = 10\%$
 $T = 20 \text{ years}$
 $SI = ?$

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

$$SI = \frac{10,000 \times 10 \times 2}{100}$$

$$SI = 1000 \times 2$$

$$SI = 2000$$

Q.2 Given :- $R = 5\%$
 $T = 4 \text{ years}$
 $SI = 3450 \text{ Rs}$
 $P = ?$

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

$$P = \frac{3450 \times 100}{100} \times \frac{5}{100}$$

$$P = 3450 \times 5$$

$$P = 17250$$

3) $P = Rs. 100$
 $R = 8\%$
 $T = 3 \text{ years}$
 $SI = ?$ $A = ?$

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

$$SI = \frac{100 \times 8 \times 3}{100}$$

$$SI = 24$$

$$SI = 24$$

$$A = P + SI$$

$$= 100 + 24$$

$$= 124$$

4) $P = 10,000 Rs$
 $R = 8\%$
 $T = 3 \text{ years}$
 $SI = ?$ $A = ?$

$$A = P + I$$

$$A = P + SI$$

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

$$SI = \frac{10000 \times 8 \times 3}{100}$$

$$SI = 24000$$

$$SI = 24000 //$$

$$* A = P + SI$$

$$A = 10000 + 24000$$

$$A = 34000 //$$

II worded sums :-

1) Find the principal which will earn an interest of Rs 203 at 3 1/2% rate of interest per annum in 7 1/2 years.

$$\rightarrow I = \text{Rs } 203, R = 3 \frac{1}{2} \%, P = ?$$

$$T = 7 \frac{1}{2} \text{ years} = \frac{15}{2} \text{ years}$$

$$P = ?$$

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

$$P = \frac{203 \times 100}{7 \times 29}$$

$$P = \frac{203 \times 100}{203}$$

$$P = 100 \times 8$$

$$P = 800\text{Rs.}$$

2) Find the simple interest $P = 2200$
for 1 year at 10% per annum

$$P = 2000\text{Rs.}$$

$$T = 1\text{ year}$$

$$R = 10\%$$

$$SI = ?$$

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

$$SI = \frac{2000 \times 10 \times 1}{100}$$

$$SI = 200\text{Rs.}$$

$$SI = \text{A} - P$$

$$SI = 1375 - 1250$$

$$SI = 125$$

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

$$T = \frac{125 \times 100}{12 \times 1250}$$

$$T = \frac{5}{2}$$

$$T = 2.5$$

3) Find the simple interest on Rs 500
for 3 years at 5% p.a.

$$P = \text{Rs } 500$$

$$T = 3 \text{ years}$$

$$R = 5\%$$

$$SI = ?$$

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

$$SI = \frac{500 \times 5 \times 3}{100}$$

$$SI = 5 \times 5 \times 3$$

$$SI = 75 \text{ Rs}$$

4) Calculate the time in which ₹ 1250
would become ₹ 1375 at 4% rate of
interest per annum

$$P = 1250 \text{ Rs}$$

$$A = 1375 \text{ Rs}$$

$$R = 4\%$$

$$T = ? \quad I = ? \quad 125$$

$$= A = \cancel{SI} \times \cancel{SI} \quad \frac{SI \times 100}{R \times P}$$

$$* \quad \cancel{SI} = \frac{P \times R \times T}{100}$$