FRACTIONS & DECIMALS

2
CHAPTER

CONTENTS

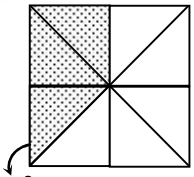
DEFINITION : FRACTION

A fraction is a number which can be written in the form $\frac{a}{b}$, where both a and b are natural numbers and the number 'a' is called numerator and 'b' is called the denominator of the fraction $\frac{a}{b}$, $b \neq 0$.

For example, $\frac{2}{5}, \frac{1}{3}, \frac{0}{5}, \frac{7}{15}$, are fractions.

PICTURES FORM

A fraction represents a part of a whole, where the denominator of the fraction represents the number in which equal parts the whole is divided and the numerator shows the number of equal parts taken.



$\frac{3}{8}$

For example, the shaded part of the figure represents the fraction $\frac{3}{8}$.

TYPES OF FRACTION

- **Proper Fraction :** A proper fraction is a fraction in which the numerator is smaller than the denominator.

  For example, $\frac{2}{9}, \frac{3}{7}, \frac{12}{29}$,..., etc. are proper fractions.

- **Improper Fraction :** An improper fractions is a fraction in which the numerator is greater than the denominator.

For example, $\frac{7}{5}, \frac{29}{17}, \frac{17}{13}$, ... , etc. are improper fractions.

◈ **Like Fractions :** The fractions with the same denominator are called like fractions.

For example, $\frac{7}{12}, \frac{5}{12}, \frac{11}{12}$, ... , etc. are like fractions.

◈ **Unlike Fractions :** The fractions with different denominators are called unlike fractions.

For example, $\frac{2}{3}, \frac{4}{5}, \frac{11}{13}, \frac{7}{8}$, ... , etc. are unlike fractions.

◈ **Unit Fractions :** The fraction with numerator 1 are called unit fractions.

For example, $\frac{1}{2}, \frac{1}{4}, \frac{1}{3}, \frac{1}{7}$, ..., etc. are unit fractions.

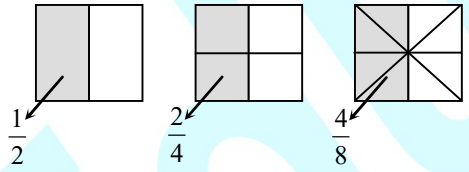
◈ **Mixed Numerals :** Mixed numerals are combination of a whole number and a proper fraction.

For example, fractions $3\frac{1}{2}, 5\frac{1}{3}, 8\frac{1}{4}$, etc. are mixed numerals or mixed fractions.

◈ **Equivalent Fractions :** If $\frac{c}{d} = \frac{m \times a}{m \times b}$, then the fractions $\frac{a}{b}$ and $\frac{c}{d}$ are called equivalent fractions because they represent the same portion of the whole.

For example, $\frac{4}{6} = \frac{2 \times 2}{3 \times 2}$; $\frac{15}{48} = \frac{5 \times 3}{16 \times 3}$

For example, the shaded parts of each of the following figures are same but they are represented by different fractional numbers.



$\frac{1}{2}$ $\frac{2}{4}$ $\frac{4}{8}$

They are called equivalent fractions.

So we write $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$, etc.

◈ **Decimal fractions :** A fraction whose denominator is any of the number 10,100,1000 etc. is called a decimal fraction.

For example : $\frac{8}{10}, \frac{11}{100}, \frac{17}{1000}$ etc. are decimal fractions.

◈ **Vulgar fractions :** A fraction whose denominator is a whole number, other than 10,100,1000 etc. is called a vulgar fractions.

For example , $\frac{2}{7}, \frac{3}{8}, \frac{11}{17}$ etc. are vulgar fractions.

➢ SIMPLEST FORM OF FRACTIONS

If numerator and denominator of a fraction have no common factor other than 1, then the fraction is said to be in its simplest form i.e. HCF of both is 1.

For example, $\frac{3}{5}, \frac{4}{5}, \frac{3}{7}, \frac{12}{13}$, etc. are the fractions in simplest form.

➢ ADDITION AND SUBTRACTION OF FRACTIONS

There are two case of adding and subtracting fractions :

1. Fractions with Similar Denominators. (Like fractions)
2. Fractions with Different Denominators (Unlike fractions)

◈ **Fractions with Similar Denominators :**

For example :

Ex.1 Solve the following :

(i) $\frac{2}{5} + \frac{3}{5}$

(ii) $\frac{4}{7} - \frac{3}{7}$

Sol. (i) $\frac{2}{5} + \frac{3}{5} = \frac{2+3}{5} = \frac{5}{5} = 1$

(ii) $\frac{4}{7} - \frac{3}{7} = \frac{4-3}{7} = \frac{1}{7}$

◈ **Fractions with Different Denominators :**

Use of L.C.M. of denominators.

For example :

Ex.2 Solve the following :

(i) $\frac{2}{5} + \frac{4}{3}$ (ii) $\frac{3}{9} - \frac{1}{8}$

Sol. (i) $\frac{2}{5} + \frac{4}{3}$ [L.C.M. of 5 and 3 = 15]

$= \frac{2 \times 3 + 4 \times 5}{15} = \frac{6+20}{15} = \frac{26}{15} = 1\frac{11}{15}$

(ii) $\frac{3}{9} - \frac{1}{8}$ [L.C.M. of 8 and 9 = 72]

$= \frac{3 \times 8 - 9 \times 1}{72} = \frac{24-9}{72} = \frac{15}{72} = \frac{5}{24}$

❖ EXAMPLES ❖

Ex.3 Solve the following :

(i) $2-\frac{3}{5}$ (ii) $4+\frac{7}{8}$ (iii) $\frac{9}{11}-\frac{4}{15}$

(iv) $8\frac{1}{2}-3\frac{5}{8}$ (v) $2\frac{2}{3}+3\frac{1}{2}$ (vi) $\frac{7}{10}+\frac{2}{5}+\frac{3}{2}$

Sol. (i) $2-\frac{3}{5}=\frac{2}{1}-\frac{3}{5}$ [L.C.M. of 1 and 5 = 5]

$=\frac{2\times5-3\times1}{5}=\frac{10-3}{5}=\frac{7}{5}=1\frac{2}{5}$

(ii) $4+\frac{7}{8}=\frac{4}{1}+\frac{7}{8}$

$=\frac{4\times8+7\times1}{8}=\frac{32+7}{8}$

$=\frac{39}{8}=4\frac{7}{8}$

(iii) $\frac{9}{11}-\frac{4}{15}$ [L.C.M. of 11 and 15 = 165]

$=\frac{15\times9-11\times4}{165}=\frac{135-44}{165}=\frac{91}{165}$

(iv) $8\frac{1}{2}-3\frac{5}{8}$

$=\frac{17}{2}-\frac{29}{8}$ [L.C.M. of 2 and 8 = 8]

$=\frac{17\times4-29\times1}{8}$

$=\frac{68-29}{8}=\frac{39}{8}=4\frac{7}{8}$

(v) $2\frac{2}{3}+3\frac{1}{2}$

$=\frac{8}{3}+\frac{7}{2}$ [L.C.M. of 3 and 2 = 6]

$=\frac{16+21}{6}=\frac{37}{6}=6\frac{1}{6}$.

(vi) $\frac{7}{10}+\frac{2}{5}+\frac{3}{2}$ [L.C.M. of 2, 5 and 10 = 10]

$=\frac{7\times1+2\times2+3\times5}{10}=\frac{7+4+15}{10}$

$=\frac{11+15}{10}=\frac{26}{10}=\frac{13}{5}=2\frac{3}{5}$

Ex.4 Arrange the following in descending order :

$\frac{1}{5},\frac{3}{7},\frac{7}{10}$

Sol. $\frac{1}{5},\frac{3}{7},\frac{7}{10}$ [L. C. M of 5, 7 and 10 = 70]

$=\frac{1\times14}{5\times14},\frac{3\times10}{7\times10},\frac{7\times7}{10\times7}$

$=\frac{14}{70},\frac{30}{70},\frac{49}{70}$

Descending order is $\frac{49}{70}>\frac{30}{70}>\frac{14}{70}$

i.e., $\frac{7}{10}>\frac{3}{7}>\frac{1}{5}$

$\Rightarrow \frac{7}{10},\frac{3}{7},\frac{1}{5}$ are in descending order.

Ex.5 A rectangular sheet of paper is $12\frac{1}{2}$ cm long and $10\frac{2}{3}$ cm wide. Find its perimeter.

Sol. Length of paper = $12\frac{1}{2}$ cm = $\frac{25}{2}$ cm

Breadth of paper = $10\frac{2}{3}=\frac{32}{3}$ cm

Perimeter of rectangular paper sheet

= 2(length + breadth)

$=2\left(\frac{25}{2}+\frac{32}{3}\right)=2\left(\frac{25\times3+32\times2}{6}\right)$

$=2\left(\frac{75+64}{6}\right)=\frac{2\times139}{6}=\frac{139}{3}=46\frac{1}{3}$ cm.

Ex.6 Ritu ate $\frac{3}{5}$ part of an apple and the remaining apple was eaten by her brother Somu. How much part of the apple did Somu eat ? Who had the larger share ? By how much ?

Sol. Ritu ate = $\frac{3}{5}$ part of apple

Somu ate = $\left(1-\frac{3}{5}\right)$ part of apple

So, Somu ate = $\frac{2}{5}$ part of apple

Ritu ate more apple than Somu. $\left(\because \frac{3}{5}>\frac{2}{5}\right)$

Ritu ate $\left(\frac{3}{5}-\frac{2}{5}\right)$ more share.

i..e., Ritu ate $\left(\frac{3-2}{5}=\frac{1}{5}\right)$ more apple than Somu.

Ex.7 Michael finished colouring a picture in $\frac{7}{12}$ hr. Vaibhav finished colouring the same picture in $\frac{3}{4}$ hr. Who worked longer ? By that fraction was it longer ?

Sol. Michael finished colouring picture in = $\frac{7}{12}$ hr.

Vaibhav finished colouring picture in = $\frac{3}{4}$ hr.

i.e., Vaibhav finished colouring picture in

$= \frac{3\times3}{4\times3} = \frac{9}{12}$ hr.

Vaibhav worked longer, because $\frac{9}{12} > \frac{7}{12}$

Vaibhav worked longer by = $\left(\frac{9}{12} - \frac{7}{12}\right)$ hr.

$= \frac{9-7}{12} = \frac{2}{12} = \frac{1}{6}$ hr.

Ex.8 Write three equivalent fractions of $\frac{2}{7}$.

Sol. $\frac{2}{7} = \frac{2\times2}{7\times2} = \frac{4}{14}$

$\frac{2}{7} = \frac{2\times3}{7\times3} = \frac{6}{21} \Rightarrow \frac{2}{7} = \frac{2\times4}{7\times4} = \frac{8}{28}$

So, three equivalent fractions of $\frac{2}{7}$ are $\frac{4}{14}$, $\frac{6}{21}$ and $\frac{8}{28}$.

Ex.9 Identify proper, improper and mixed fractions from the following numbers :

$2\frac{1}{3}, \frac{7}{3}, \frac{4}{7}, \frac{11}{100}, 3\frac{1}{4}, \frac{37}{13}, 1\frac{4}{9}$

Sol. Proper fractions are = $\frac{4}{7}, \frac{11}{100}$

Improper fractions are = $\frac{7}{3}, \frac{37}{13}$

Mixed fractions are = $2\frac{1}{3}, 3\frac{1}{4}, 1\frac{4}{9}$

➢ MULTIPLICATION OF FRACTIONS

Rule : Product of fractions

$$= \frac{\text{Product of their Numerators}}{\text{Product of their Denominators}}$$

(i) Whole number by a fraction

(ii) Fraction by a fraction

(iii) Whole number by a mixed fraction

(iv) Multiplication of two mixed fractions

◈ **Whole number by a fraction :** To multiply a whole number by a fraction, we simply multiply the numerator of the fraction by the whole number, keeping the denominator same.

❖ EXAMPLES ❖

Ex.10 Find the product

(i) $3 \times \frac{2}{7}$ (ii) $3 \times \frac{1}{8}$ (iii) $\frac{7}{9} \times 6$

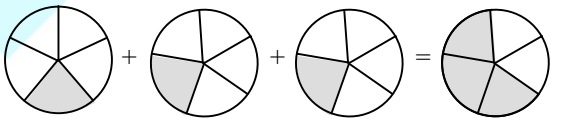
Sol. (i) $3 \times \frac{2}{7} = \frac{3}{1}\times\frac{2}{7} = \frac{3\times2}{1\times7} = \frac{6}{7}$

(ii) $3 \times \frac{1}{8} = \frac{3}{1}\times\frac{1}{8} = \frac{3\times1}{1\times8} = \frac{3}{8}$

(iii) $\frac{7}{9} \times 6 = \frac{7}{9}\times\frac{6}{1} = \frac{14}{3} = 4\frac{2}{3}$

Ex.11 Show $3 \times \frac{1}{5}$ by picture.

Sol.



$\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $3\times\frac{1}{5} = \frac{3}{5}$ (Shaded part)

Note : Multiplication is commutative i.e. ab = ba

◈ **Fraction by a fraction :**

Ex.12 Find the product :

(i) $\frac{5}{8}\times\frac{3}{7}$ (ii) $\frac{6}{14}\times\frac{7}{9}$ (iii) $2\frac{4}{7}\times2\frac{3}{4}\times1\frac{2}{5}$

Sol. (i) $\frac{5}{8}\times\frac{3}{7} = \frac{5\times3}{8\times7} = \frac{15}{56}$

(ii) $\frac{6}{14}\times\frac{7}{9} = \frac{6}{14}\times\frac{7}{9} = \frac{2\times1}{2\times3} = \frac{1\times1}{1\times3} = \frac{1}{3}$

(iii) $2\frac{4}{7}\times2\frac{3}{4}\times1\frac{2}{5} = \frac{18}{7}\times\frac{11}{4}\times\frac{7}{5}$

$= \frac{18\times11\times7}{7\times4\times5} = \frac{9\times11}{2\times5} = \frac{99}{10} = 9\frac{9}{10}$

◈ **Whole Number by a Mixed Fraction :**

Ex.13 Find $8 \times 5\frac{1}{6}$

$= 8 \times \frac{31}{6}$ (Converting the mixed fraction into an improper fraction).

$= \frac{248}{6}$ (Multiplying the numerator by the whole number)

$= \frac{124}{3}$ (Simplifying into lowest term).

$= 41\frac{1}{3}$ (Converting the improper fraction into a mixed numeral).

To multiply a whole number by a mixed fraction, we follow the following steps :

Step 1.

Convert the mixed fraction into an improper fraction.

Step 2.

Multiply the numerator by the whole number keeping the denominator same.

Step 3.

After multiplication, the fraction should be converted in its lowest form.

Step 4.

Convert the improper fraction (product so obtained) into a mixed numeral.

❖ **EXAMPLES** ❖

Ex.14 Find $6 \times 3\frac{1}{2}$

Sol. Step 1. $3\frac{1}{2} = \frac{3\times2+1}{2} = \frac{7}{2}$

Step 2. $6 \times 3\frac{1}{2} = 6 \times \frac{7}{2} = \frac{6\times7}{2} = \frac{42}{2}$

Step 3. $\frac{42}{2} = 21$; Hence, $6 \times 3\frac{1}{2} = 21$

Ex.15 Find $5 \times 4\frac{1}{3}$.

Sol. $5 \times 4\frac{1}{3} = 5 \times \frac{13}{3} = \frac{5\times13}{3} = \frac{65}{3}$

$\left[\because 4\frac{1}{3} = \frac{4\times3+1}{3}\right]$

Hence, $5 \times 4\frac{1}{3} = \frac{65}{3} = 21\frac{2}{3}$

Ex.16 Find $7\frac{1}{8}$ of 36.

Sol. $7\frac{1}{8}$ of $36 = 7\frac{1}{8} \times 36 = \frac{57}{8} \times 36$

(Converting the mixed fraction into an improper fraction)

$= \frac{57\times36}{8}$

(Multiplying numerator by the whole number)

$= \frac{57\times9}{2}$

(Writing the fraction into lowest term) $= \frac{513}{2}$

(Multiplying 57 by 9) $= 256\frac{1}{2}$

(Converting the improper fraction into a mixed numeral)

Ex.17 The weight of one packet of tea is $\frac{1}{4}$ kg. What is the weight of 20 such packets ?

Sol. Weight of one packet of tea = $\frac{1}{4}$ kg

Therefore, weight of 20 packets of tea

$= \frac{1}{4} \times 20 = 5$ kg.

Ex.18 In a Cinema hall's parking, 90 cars can be parked at a time. During a night show, $\frac{5}{9}$ of the parking lot was full. How many cars were there at that time ?

Sol. Total capacity of Parking place = 90 cars

$\therefore$ Number of cars during night show $= 90 \times \frac{5}{9}$

$= \frac{90\times5}{9} = 10 \times 5 = 50$ cars.

◈ **Multiplication of two Mixed Fractions :**

To multiply two or more mixed numerals, we follow the following steps :

Step 1. Convert the mixed fractions into improper fractions.

Step 2. Multiply the improper fractions.

Step 3. Reduce to lowest form.

Step 4. If the product is an improper fraction, convert it into mixed fraction.

❖ EXAMPLES ❖

Ex.19 Find the product of :

(i) $3\frac{4}{5}\times\frac{10}{21}$ (ii) $\frac{15}{22}\times4\frac{5}{7}$ (iii) $5\frac{2}{15}\times3\frac{4}{7}$

Sol. (i) $3\frac{4}{5}\times\frac{10}{21}=\frac{19}{5}\times\frac{10}{21}=\frac{38}{21}=1\frac{17}{21}$

Thus, $3\frac{4}{5}\times\frac{10}{21}=1\frac{17}{21}$

(ii) $\frac{15}{22}\times4\frac{5}{7}=\frac{15}{22}\times\frac{33}{7}=\frac{15}{2}\times\frac{3}{7}=\frac{45}{14}=3\frac{3}{14}$

(iii) $5\frac{2}{15}\times3\frac{4}{7}=\frac{77}{15}\times\frac{25}{7}=\frac{11\times5}{3\times1}=\frac{55}{3}=18\frac{1}{3}$

Ex.20 Find $6\frac{1}{4}\times4\frac{1}{3}$

Sol. $6\frac{1}{4}\times4\frac{1}{3}=\frac{25}{4}\times\frac{13}{3}=\frac{25\times13}{4\times3}=\frac{325}{12}=27\frac{1}{2}$

◈ **Facts :**

1. It is not necessary first to multiply the fractions and then simplify. We may simplify first then multiply. For example,

   (i) $\frac{21}{25}\times\frac{45}{68}=\frac{21\times45}{25\times68}=\frac{21\times9}{5\times68}=\frac{189}{340}$

   (ii) $\frac{25}{7}\times\frac{12}{5}\times\frac{7}{4}=\frac{25\times12\times7}{7\times5\times4}=\frac{5\times3\times1}{1\times1\times1}=15$

2. Cancellation could use only for fractions are multiplied and could not use for addition & subtraction of fractions.

3. Double of 3 or half of 7 can be written as 2×3 and $\frac{1}{2}\times7$ respectively.

   ∴ If word 'OF' is in between two fractions then multiply those fractions.

4. Product of two proper fractions < Each proper fraction.

   Ex. $\frac{2}{7}\times\frac{1}{3}=\frac{2}{21}$ ∴ $\frac{2}{21}<\frac{2}{7}$ and $\frac{2}{21}<\frac{1}{3}$

5. Product of two improper fractions > Each improper fraction.

   Eg. $\frac{9}{4}\times\frac{7}{3}=\frac{63}{12}$ ∴ $\frac{63}{12}>\frac{9}{4}$ & $\frac{63}{12}>\frac{7}{3}$

6. Proper fraction < Product of proper and improper fraction < Improper fraction

   Eg. $\frac{1}{7}\times\frac{5}{2}=\frac{5}{14}$ ∴ $\frac{1}{7}<\frac{5}{14}<\frac{5}{2}$

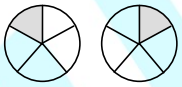
7. When the product of two fractional numbers or a fractional number and a whole number is 1, then either of them is the multiplicative inverse (or reciprocal) of the other. So the reciprocal of a fraction (or a whole number) is obtained by interchanging its numerator and denominator.

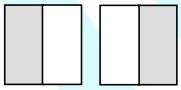
   Note : Reciprocal of zero (0) is not possible.

❖ EXAMPLES ❖

Ex. 21 Match the following :

(i) $2\times\frac{1}{5}$ (a) 

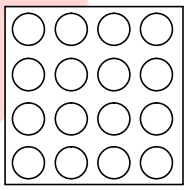
(ii) $2\times\frac{1}{2}$ (b) 

(iii) $3\times\frac{2}{3}$ (c) 

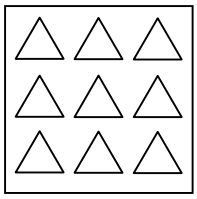
(iv) $3\times\frac{1}{4}$ (d) 

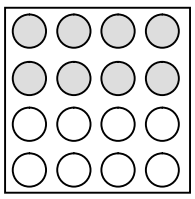
Sol. (i) = (b); (ii) = (c); (iii) = (a); (iv) = (d)

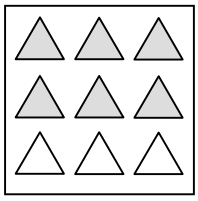
Ex.22 (i) Shade $\frac{1}{2}$ of the circles in a box.



(ii) Shade $\frac{2}{3}$ of the triangle in a box.



Sol. (i) 

(ii) 

Ex.23 Find :

(i) $\frac{3}{4}$ of 16

(ii) $\frac{1}{4}$ of $\frac{3}{5}$

(iii) $\frac{1}{2}$ of $2\frac{3}{4}$

Sol. (i) $\frac{3}{4}$ of $16 = \frac{3}{4} \times 16 = \frac{3}{4} \times \frac{16}{1} = \frac{3 \times 4}{1 \times 1} = 12$

(ii) $\frac{1}{4}$ of $\frac{3}{5} = \frac{1}{4} \times \frac{3}{5} = \frac{1 \times 3}{4 \times 5} = \frac{3}{20}$

(iii) $\frac{1}{2}$ of $2\frac{3}{4} = \frac{1}{2} \times \frac{11}{4} = \frac{1 \times 11}{2 \times 4} = \frac{11}{8}$

Ex.24 Vidya and Pratap went for a picnic. Their mother gave them a water bottle that contained 5 litres of water. Vidya consumed $\frac{2}{5}$ of the water. Pratap consumed the remaining water.

(i) How much water did Vidya drink ?

(ii) What fraction of the total quantity of water did Pratap drink ?

Sol. Total water = 5 litres.

(i) Water consumed by Vidya = $\frac{2}{5}$ of 5 litres

$= \frac{2}{5} \times 5$ litres = 2 litres

(ii) Water drunk by Pratap = (5 – 2) = 3 litres.

The fraction of total quantity of water that Pratap drunk = $\frac{3}{5}$

Ex.25 A car runs 16 km using 1 litre of petrol. How much distance will it cover using $2\frac{3}{4}$ litres of petrol ?

Sol. Car runs in 1 litre of petrol = 16 km

$\therefore$ Car will run in $2\frac{3}{4}$ litres of petrol

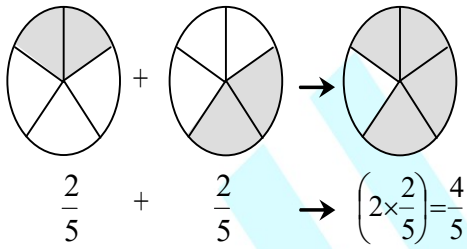
$= \left(16 \times 2\frac{3}{4}\right)$ km

$= \left(\frac{16}{1} \times \frac{11}{4}\right)$ km $= \left(\frac{4 \times 11}{1 \times 1}\right)$ km = 44 km.

Hence, car will go 44 km in $2\frac{3}{4}$ litres of petrol.

Ex.26 Represent pictorially $2 \times \frac{2}{5} = \frac{4}{5}$

Sol.



$\frac{2}{5}$ + $\frac{2}{5}$ → $\left(2 \times \frac{2}{5}\right) = \frac{4}{5}$

Ex.27 Find : (i) $\frac{1}{4}$ of a rupee in paise

(ii) $\frac{2}{5}$ of an hour in minutes

(iii) $\frac{7}{3}$ of a year in months

(iv) $\frac{3}{8}$ of a day in hours

Sol. (i) $\frac{1}{4}$ of a rupee $= \left(\frac{1}{4} \times 1\right)$ Rupee

$= \left(\frac{1}{4} \times 100\right)$ paise ($\because$ 1 Rupee. = 100 paise)

= 25 paise.

(ii) $\frac{2}{5}$ of an hour $= \left(\frac{2}{5} \times 1\right)$ hr

$= \left(\frac{2}{5} \times 60\right)$ min ($\because$ 1 hr = 60 minutes)

= (2 × 12) min

= 24 min.

(iii) $\frac{7}{3}$ of a year $= \left(\frac{7}{3} \times 1\right)$ year

$= \left(\frac{7}{3} \times 12\right)$ months ($\because$ 1 year = 12 months)

= 28 months

= 2 years 4 months.

(iv) $\frac{3}{8}$ of a day $= \left(\frac{3}{8} \times 1\right)$ day

$= \left(\frac{3}{8} \times 24\right)$ hours ($\because$ 1 day = 24 hours)

= 9 hours

➢ DIVISION OF FRACTIONAL NUMBERS

∵ We know Division = Dividend ÷ Divisor

When a fraction number (or whole no.) divide by fractional number (or whole no.) then we multiply dividend to reciprocal of divisor.

❖ EXAMPLES ❖

Ex.28 Find the value of

(i) $\frac{5}{7} \div \frac{25}{21}$ (ii) $\frac{7}{8} \div \frac{15}{8}$

(iii) $1\frac{2}{7} \div 2\frac{1}{14}$

Sol. (i) $\frac{5}{7} \div \frac{25}{21} = \frac{5}{7} \times \frac{21}{25} = \frac{3}{5}$

(ii) $\frac{7}{8} \div \frac{15}{8} = \frac{7}{8} \times \frac{8}{15} = \frac{7}{15}$

(iii) $1\frac{2}{7} \div 2\frac{1}{14} = \frac{9}{7} \div \frac{29}{14} = \frac{9}{7} \times \frac{14}{29} = \frac{18}{29}$

◈ Facts :

1. (Fractional number) ÷ 1 = same fractional number

   $\frac{2}{3} \div 1 = \frac{2}{3} \times \frac{1}{1} = \frac{2}{3}$

2. 0 ÷ Fractional number = 0 (always)
3. non zero fractional number ÷ same number = 1 (always)

   $\frac{2}{3} \div \frac{2}{3} = \frac{2}{3} \times \frac{3}{2} = 1$

4. '0' cannot be a divisor (∵ reciprocal of zero is not possible)

❖ EXAMPLES ❖

Ex.29 Simplify : $\frac{2\frac{3}{4}}{1\frac{5}{7}}$

Sol. $\frac{2\frac{3}{4}}{1\frac{5}{7}}$ is same as $2\frac{3}{4} \div 1\frac{5}{7}$

Now, $2\frac{3}{4} \div 1\frac{5}{7}$

$= \frac{11}{4} \div \frac{12}{7}$ ← (Rewrite the mixed numerals as improper fractions)

$= \frac{11}{4} \times \frac{7}{12}$ ← (Change ÷ to × and replace the divisor by its reciprocal.)

$= \frac{77}{48}$ ← (Reduce to lowest form and multiply the numerators and multiply the denominators)

$= 1\frac{29}{48}$ ←(Rewrite the improper fraction as mixed numeral)

Ex.30 Find :

(i) $12 \div \frac{3}{4}$ (ii) $2\frac{1}{5} \div 1\frac{1}{5}$

(iii) $\frac{2}{5} \div 1\frac{1}{2}$ (iv) $3\frac{1}{2} \div 4$

Sol. (i) $12 \div \frac{3}{4} = \frac{12}{1} \times \frac{4}{3} = \frac{4 \times 4}{1 \times 1} = \frac{16}{1} = 16$

(ii) $2\frac{1}{5} \div 1\frac{1}{5} = \frac{11}{5} \div \frac{6}{5} = \frac{11}{5} \times \frac{5}{6}$

$= \frac{11 \times 5}{5 \times 6} = \frac{11}{6} = 1\frac{5}{6}$

(iii) $\frac{2}{5} \div 1\frac{1}{2} = \frac{2}{5} \div \frac{3}{2} = \frac{2}{5} \times \frac{2}{3} = \frac{2 \times 2}{5 \times 3} = \frac{4}{15}$

(iv) $3\frac{1}{2} \div 4 = \frac{7}{2} \div \frac{4}{1} = \frac{7}{2} \times \frac{1}{4} = \frac{7 \times 1}{2 \times 4} = \frac{7}{8}$

Ex.31 Find the reciprocal of each of the following fractions. Classify the reciprocals as proper fractions, improper fractions and whole numbers :

(i) $\frac{3}{7}$ (ii) $\frac{9}{5}$ (iii) $\frac{1}{8}$ (iv) $\frac{1}{11}$

Sol. Reciprocal of $\frac{3}{7} = \frac{7}{3} = 2\frac{1}{3}$ (mixed fraction)

Reciprocal of $\frac{9}{5} = \frac{5}{9}$ (proper fractional)

Reciprocal of $\frac{1}{8} = \frac{8}{1} = 8$ (whole number)

Reciprocal of $\frac{1}{11} = \frac{11}{1} = 11$ (whole number)

Ex.32 A piece of cloth of length $11\frac{1}{4}$ m is cut into 9 pieces of equal length. Find the length of each piece.

Sol. Length of cloth = $11\frac{1}{4}\text{m} = \frac{45}{4}\text{m}$

Number of equal pieces = 9

Length of each piece = $\left(\frac{45}{4} \div 9\right)\text{m}$

$= \left(\frac{45}{4} \times \frac{1}{9}\right)\text{m}$

$= \frac{45}{4} \times \frac{1}{9} = \frac{45 \times 1}{4 \times 9} = \frac{5}{4} = 1\frac{1}{4}\text{m}$

Hence, length of each piece = $1\frac{1}{4}$ m.

Ex.33 The area of a rectangle is $50\frac{1}{2}$ sq. cm. If its breadth is $2\frac{1}{4}$ cm. find its length.

Sol. Area of rectangle = length × breadth

$50\frac{1}{2} = \text{length} \times 2\frac{1}{4} \Rightarrow \frac{101}{2} = \text{length} \times \frac{9}{4}$

$\frac{101}{2} \div \frac{9}{4} = \text{length}$

$\left(\frac{101}{2} \times \frac{4}{9}\right)\text{ cm} = \text{length}$

Length = $\frac{101 \times 2}{9}\text{ cm} = \frac{202}{9} = 22\frac{4}{9}\text{ cm}$

Hence, length of rectangle = $22\frac{4}{9}$ cm.

➢ SIMPLIFYING BRACKETS IN FRACTIONS

❖ EXAMPLES ❖

Ex.34 Simplify : $\frac{4}{7} + \left[\frac{1}{2} - \left\{\frac{3}{4} - \left(\frac{1}{5} + \overline{\frac{3}{7} - \frac{1}{5}}\right)\right\}\right]$

Sol. Let us first solve bar brackets :

$\frac{4}{7} + \left[\frac{1}{2} - \left\{\frac{3}{4} - \left(\frac{1}{5} + \overline{\frac{3}{7} - \frac{1}{5}}\right)\right\}\right]$

$= \frac{4}{7} + \left[\frac{1}{2} - \left\{\frac{3}{4} - \left(\frac{1}{5} + \overline{\frac{15-7}{35}}\right)\right\}\right]$

$= \frac{4}{7} + \left[\frac{1}{2} - \left\{\frac{3}{4} - \left(\frac{1}{5} + \frac{8}{35}\right)\right\}\right]$

$= \frac{4}{7} + \left[\frac{1}{2} - \left\{\frac{3}{4} - \left(\frac{7+8}{35}\right)\right\}\right]$

$= \frac{4}{7} + \left[\frac{1}{2} - \left\{\frac{3}{4} - \frac{15}{35}\right\}\right]$

$= \frac{4}{7} + \left[\frac{1}{2} - \left\{\frac{3}{4} - \frac{3}{7}\right\}\right]$

$= \frac{4}{7} + \left[\frac{1}{2} - \left\{\frac{21-12}{28}\right\}\right] = \frac{4}{7} + \left[\frac{1}{2} - \frac{9}{28}\right]$

$= \frac{4}{7} + \left[\frac{14-9}{28}\right] = \frac{4}{7} + \left[\frac{5}{28}\right]$

$= \frac{4}{7} + \frac{5}{28} = \frac{4 \times 4 + 5}{28} = \frac{21}{28}$

Ex.35 Simplify : $\frac{\frac{2}{3} - \overline{\frac{1}{2} - \frac{1}{3}}\text{ of }\frac{1}{2}}{\frac{5}{6} - \frac{2}{3}\text{ of }\frac{1}{3} + \frac{1}{9}}$

Sol. We have $\frac{\frac{2}{3} - \overline{\frac{1}{2} - \frac{1}{3}}\text{ of }\frac{1}{2}}{\frac{5}{6} - \frac{2}{3}\text{ of }\frac{1}{3} + \frac{1}{9}}$

$= \frac{\frac{2}{3} - \overline{\frac{3-2}{6}}\text{ of }\frac{1}{2}}{\frac{5}{6} - \frac{2}{3}\text{ of }\frac{1}{3} + \frac{1}{9}}$

$= \frac{\frac{2}{3} - \frac{1}{6}\text{ of }\frac{1}{2}}{\frac{5-4}{6}\text{ of }\frac{1}{3} + \frac{1}{9}}$

$= \frac{\frac{2}{3} - \frac{1}{6} \times \frac{1}{2}}{\frac{1}{6} \times \frac{1}{3} + \frac{1}{9}} = \frac{\frac{2}{3} - \frac{1}{12}}{\frac{1}{18} + \frac{1}{9}}$

$= \frac{\frac{8-1}{12}}{\frac{1+2}{18}} = \frac{\frac{7}{12}}{\frac{3}{18}} = \frac{7}{12} \times \frac{18}{3} = \frac{7 \times 6}{12 \times 1} = \frac{7}{2}$

➢ DECIMALS

Let us consider 6598302

Place value	Ten Lakh	Lakh	Ten Thousand	Thousand	Hundred	Tens	ones
face value	6	5	9	8	3	0	2

← moving from right to left

When we move from right to left place value is increase (by 10 times) but from left to right, place value is decreasing (by one tenth of place value)

Again consider 9321

Let us proceed from 9 to the right.

- The place value of 9 is 9 thousand.
- The place value of 3 is 3 hundred
- The place value of 2 is 2 tens.
- The place value of 1 is 1 ones.

So, a number right to 1 must have for its value on-tenth of one. This fractional part is usually **separated from the whole number by means of a dot (.) called the decimal point.**

Consider 9321.6,

- The place value of 6 is 6 tenths or $\frac{6}{10}$.

Consider, 9321.65,

- The place value of 5 is 5 hundredths or $\frac{5}{100}$.

Consider, 9321.654,

- The place value of 4 is 4 thousandths or $\frac{4}{1000}$.

So the expanded form of 9321.654 is

9 thousand + 3 hundred + 2 tens + 1 ones

+ 6 tenths + 5 hundredths + 4 thousandths.

or 9321.654

$= 9000 + 300 + 20 + 1 + \frac{6}{10} + \frac{5}{100} + \frac{4}{1000}$

9321.654 is read as "Nine thousand three hundred twenty one" point six hundred and fifty four.

- **Place value table represents the value of the places :**

Thousands	Hundreds	Tens	ones	Tenths	Hundredths	Thousandths
1,000	100	10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$

➢ DEFINITION : DECIMALS

The numbers expressed in decimal forms are called **decimals**. For example, 5.2, 21.32, 8.469, ... etc. are decimals.

Decimal has two parts :

(i) whole number part (ii) decimal part.

For example, in 21.32

21 → whole part 32 → decimal part

and read as twenty one **point** three two.

◈ **Decimal places :** The number of decimal places is equal to the number of digits contained in decimal part of a decimal.

For example, in 8.3, 6.23, 10.145 all the numbers have one, two three digits in decimal parts respectively.

◈ **Types of Decimals :**

(i) Like decimals :

Definition : Decimals having the same number of decimal places.

For example, 2.37, 9.01, 14.23 are like decimals, having 2 decimal places.

(ii) Unlike decimals :

Definition : Decimals having the different number of decimal places.

For example, 1.12, 2.329, 42.8 are unlike decimals having 2, 3 and 1 decimal places respectively.

Note : 2.7 = 2.70 = 2.700 = 2.7000 = ...

i.e. we can put any number of zero after extreme right decimal part.

➢ COMPARING DECIMALS

◈ **Methods :**

(i) Convert the given decimals into like decimals if it is unlike.

(ii) First compare the whole numbers.

(iii) If whole-number parts are equal, compare the tenths′ digits.

(iv) If tenth's digit are equal, compare the hundredths' digits and so on.

❖ EXAMPLES ❖

Ex.36 Compare : (i) 173.856 and 173.456

(ii) 235.67 and 254.98

Sol. (i) ∵ 1, 7, 3, 5 and 6 are same in both numbers but $8 > 4$ ∴ $173.856 > 173.456$

(ii) ∵ In whole part ten's place $3 < 5$ but hundreds place is same.

∴ $235.67 < 254.98$

Ex.37 Which is greater :

(i) 0.5 or 0.05 (ii) 0.7 or 0.5

(iii) 1.37 or 1.49 (iv) 0.8 or 0.88

Sol. (i) Digits on the left side of decimal in 0.5 and 0.05 are same i.e., 0. At tenths place $5 > 0$, $0.5 > 0.05$.

(ii) Digits on the left side of decimals in 0.7 and 0.5 are same i.e., 0. At tenths place $7 > 5$, so, $0.7 > 0.5$.

(iii) Digits on the left side of decimals in 1.37 and 1.49 are same i.e., 1. Now the digits at tenths place $(3 < 4)$, so $1.49 > 1.37$.

(iv) 0.8 or 0.88 $\Rightarrow$ 0.80 or 0.88

Digits at the left side of decimals are same i.e., zero.

Now digits at tenths place are same i.e. eight (8)

Now digits at hundredth place is $(8 > 0)$, so $(0.88 > 0.80)$

➢ ADDITION & SUBTRACTION OF DECIMALS

◈ **Addition of Decimals :**

Let us add 24.06 and 8.2.

Here the first number has two decimal places and the second has one decimal place. So, the maximum number of decimal places is 2.

Hence we write each of them as two place decimal by putting zeroes wherever necessary at the right of the numbers as shown below :

24.06 and 8.2 as 8.20

To add these, we write the decimals in columns keeping the decimal points in the same column.

$$\begin{array}{r} 24.06 \\ +\ 8.20 \\ \hline 32.26 \end{array}$$

While adding, we put the decimal point in the column of the decimal points.

Note : It must be noted that the carried digit from tenths place may to beyond the decimal point to reach ones place.

◈ **Subtraction of Decimals :** To subtract a decimal from another decimal, we follow the same procedure as we in addition. Let us recall the procedure :

Step 1 : We arrange the decimals in column form by keeping the decimal points in the same column.

Step 2 : We subtract as usual ignoring the decimal points. Then finally, we put the decimal point in the difference in the column of decimal points.

❖ EXAMPLES ❖

Ex.38 Subtract 0.7342 from 1.

Sol.
$$\begin{array}{r} 1.0000 \\ -\ 0.7342 \\ \hline 0.2658 \end{array}$$

Ex.39 Evaluate :

(i) $3.21 + 2.34$

(ii) $0.0345 + 6.124$

(iii) $6.9 + 32.26$

Sol. (i) $3.21 + 2.34$

$$\begin{array}{r} 3.21 \\ +\ 2.34 \\ \hline 5.55 \end{array}$$

(ii) $0.0345 + 6.124 = 0.0345 + 6.1240$

$$\begin{array}{r} 0.0345 \\ +\ 6.1240 \\ \hline 6.1585 \end{array}$$

(iii) $6.9 + 32.26 = 6.90 + 32.36$

$$\begin{array}{r} 6.90 \\ +\ 32.36 \\ \hline 39.16 \end{array}$$

Ex.40 Evaluate the following :

(i) $4.12 - 2.22$ (ii) $62.7 - 60.74$

Sol. (i)
$$\begin{array}{r} 4.12 \\ -\ 2.22 \\ \hline 1.90 \end{array}$$

(ii)
$$\begin{array}{r} 62.70 \\ -\ 60.74 \\ \hline 1.96 \end{array}$$

➢ CONVERSION OF A DECIMAL NUMBER INTO A DECIMAL FRACTION

To convert a decimal number into a decimal fraction, we follow the steps given below :

Step 1 :

Count the decimal places in the decimal number.

Step 2 :

Ignore the decimal point and write all the digits of the decimal number as the numerator for the decimal fraction.

Step 3 :

Write the denominator as 1 with as many zeroes at the right as the number of decimal places.

Step 4 :

The decimal fraction thus obtained may be reduced to its simplest form.

❖ EXAMPLES ❖

Ex.41 Convert 56.432 into a decimal fraction.

Sol. Decimal places = 3

Numerator = 56432

Denominator = $10^3 = 1000$

$$\text{Decimal fraction} = \frac{56432}{1000} = \frac{28216}{500} = \frac{7054}{125}$$

➢ MULTIPLICATION OF DECIMAL NUMBERS

Shreyansh purchased 2.5 kg sugar at the rate of ₹22.50 per kg. How much money should he pay? Certainly it would be ₹ (2.5 × 22.50). Both 2.5 and 22.50 are decimal numbers. So, we have come across a situation where we need to know how to multiply two decimals. There are three cases of multiplication of decimals which are :

◈ **Multiplication of a decimal by 10, 100, 1000 etc.**

Method : On multiplying a decimal number by 10, 100, 1000, … the decimal point is shifted to the right by one, two, three, … places respectively.

For example,

673.234 × 10 = 673.234 = 6732.34

673.234 × 100 = 673.234 = 67323.4

673.234 × 1000 = 673.234 = 673234.0

◈ **Multiplication of a decimal by a whole number**

Method : Multiply the whole number by decimal (without the decimal point). Mark the decimal point in the product from right side to have as many decimals as there are in the given decimal.

For example, 12 × 3.82

First find the product of 12 and 382

(ignoring decimal) 382 × 12

$$\begin{array}{r} 382 \\ \times\ 12 \\ \hline 764 \\ 382\times \\ \hline 4584 \end{array}$$

Now, 3.82 × 12 = 45.84 (mark the point after two digits from right).

◈ **Multiplication of a decimal by a decimal**

Method :

1. Multiply the decimal numbers as of ordinary number (ignoring decimal points)
2. Mark the decimal point in the product after as many places (from the right) as the **sum** of the decimal places in the each number.

For example, 82.53 × 7.4

First find the product of 8253 and 74 (ignoring decimal point)

8253 × 74

$$\begin{array}{r} 8253 \\ \times\ 74 \\ \hline 33012 \\ 577710\times \\ \hline 610722 \end{array}$$

Now, 82.53 × 7.4 = 610.722 (mark the decimal point after (2 + 1 = 3) digits from right).

Ex.42 Multiply : (i) 1.6 by 0.3 (ii) 8.03 by 2.9 (iii) 0.657 by 27

Sol. (i) We write it as 1.6 × 0.3

$$= \frac{16}{10}\times\frac{3}{10} = \frac{48}{100} = 0.48$$

Hence, 1.6 × 0.3 = 0.48

(ii) We write it as 8.03 × 2.9

$$= \frac{803}{100}\times\frac{29}{10} = \frac{23287}{1000} = 23.287$$

Hence, 8.03 × 2.9 = 23.287

(iii) We write it as 0.657 × 27

$$= \frac{657}{1000}\times 27 = \frac{657\times 27}{1000}$$

$$= \frac{17739}{1000} = 17.739$$

Hence, 0.657 × 27 = 17.739

Ex.43 Find the following products :

(i) 23.25 × 5 (ii) 2.325 × 25

Sol. (i) 23.25 × 5

$$\begin{array}{r} 2325 \\ \times\ 5 \\ \hline 11625 \end{array}$$

So, 23.25 × 5 = 116.25

Step 1 :

Multiply the multiplicand by the multiplier without bothering about the decimal point.

Step 2 :

Count the number of digits in the multiplicand after decimal point. It is 2 in this case. Count two digits from the unit place in the product and put a decimal point.

Therefore, 23.25 × 5 = 116.25

(ii) 2.325 × 25

$$\begin{array}{r} 2325 \\ \times\ 25 \\ \hline 11625 \\ 46500 \\ \hline 58125 \end{array}$$

So, 2.325 × 25 = 58.125

Step 1 :
Multiply the multiplicand by the multiplier without bothering about the decimal point.
Step 2 :
The multiplicand has 3 places of decimal. Count three digits from the unit place of the product and put the decimal point.
Therefore, $2.325 \times 25 = 58.125$

Ex.44 Multiply $6.7 \times 4.25 \times 12.3$

Sol. (i) $6.7 \times 4.25 \times 12.3 = (6.7 \times 4.25) \times 12.3$
$= 28.475 \times 12.3 = 350.2425$

67	28475
× 425	× 123
335	85425
+1340	+569500
+26800	+2847500
28475	3502425

Also we can make the grouping as

(ii) $6.7 \times 4.25 \times 12.3$
$= 6.7 \times (4.25 \times 12.3) = 6.7 \times 52.275$
$= 350.2425$

425	52275
× 123	× 67
1275	365925
+8500	+3136500
+42500	3502425
52275	

We find that
$(6.7 \times 4.25) \times 12.3 = 6.7 \times (4.25 \times 12.3)$
Hence, To find the product of three decimal fractions, we can regroup them in any order, the result is the same in both cases. Thus, multiplication of decimals is associative.

Ex.45 Find
(i) 10.05×1.05 (ii) 100.01×1.1

Sol. (i) First multiply 1005 by 105

1005
×105
5025
0000×
1005××
105525

Sum of decimal places in the given decimal
$= (2 + 2) = 4$
So, product will contain 4 places of decimals from the right side.
$10.05 \times 1.05 = 10.5525$

(ii) 100.01×1.1

First multiply 10001 by 11.

10001
×11
10001
10001×
110011

Sum of decimal places in the given decimals
$= (2 + 1) = 3$
So, product will contain 3 places of decimals from the right side. $100.01 \times 1.1 = 110.011$

Ex.46 Find the area of rectangle whose length is 5.7 cm and breadth is 3 cm.

Sol. Length of rectangle = 5.7 cm

Breadth of rectangle = 3 cm

Area of rectangle = length × breadth

$= (5.7 \times 3)\text{cm}^2 = 17.1\ \text{cm}^2$

Ex.47 A two-wheeler covers a distance of 55.3 km in one litre of petrol. How much distance will it cover in 10 litres of petrol ?

Sol. Distance covered in one litre petrol = 55.3 km

Distance convered in 10 litres of petrol

$= 55.3 \times 10$ km

$= 553.0$ km $= 553$ km

Ex.48 If $625 \times 5 = 3125$, find value of

(i) 6.25×5

(ii) 62.5×5 orally.

Sol. As $625 \times 5 = 3125 \Rightarrow 6.25 \times 5 = 31.25$

As $625 \times 5 = 3125 \Rightarrow 62.5 \times 5 = 312.5$

Tip : Squaring of a number with decimal or without decimal ending with 5.

Eg. (i) 1.5×1.5
$= (1.5)^2$
$= 2.25$
(1×2) (square of 5)

Eg. (ii) $(2.5)^2$
$= 6.25$
(2×3) (square of 5)

Eg. (iii) $(0.35)^2$
$= 0.12\ 25$
(3×4) (square of 5)

Eg. (iv) $(7\ 5)^2$
$= 56\ 25$
(7×8) (square of 5)

In general $(a5)^2 = a(a + 1)25$

We can set correct position of decimal.

Note : In multiplication of two numbers a & b is

$a \times b = ab$

here a = multiplier,

b = multiplicand,

ab = product

➢ DIVISION OF DECIMAL NUMBERS

◈ **Dividing a decimal by 10, 100, 1000 etc.**

Method : On dividing a number by 10, 100, 1000, … the digits of the number and quotient are same but the decimal point in the quotient shifts to left by one, two, three, … places.

For example,

$3.27 \div 10 = 0.327$

$3.27 \div 100 = 0.0327$

$3.27 \div 1000 = 0.00327$

◈ **Dividing a decimal by a whole number**

Method :

(i) Divide the dividend considering it as a whole number.

(ii) When the division of whole-number part of the dividend is complete, mark the decimal point in the quotient and proceed with the division as in case of whole number.

For example,

$149.236 \div 8$

$$\begin{array}{r} 18.6545 \\ 8\overline{)\,149.236} \\ 8 \\ \hline 69 \\ -64 \\ \hline 52 \\ -48 \\ \hline 43 \\ -40 \\ \hline 36 \\ -32 \\ \hline 40 \\ -40 \\ \hline 0 \end{array}$$

◈ **Dividing a decimal by a decimal**

Method :

(i) Convert the divisor into a whole number by multiplying it by 10, 100, 1000, … etc, depending upon the number of decimal places in it. Also we multiply the dividend by the same multiplier.

(ii) Divide the new dividend by the whole number obtained above.

For example, $22.08 \div 1.5$

$$= \frac{22.08}{1.5} = \frac{2208 \times 10}{100 \times 15} = \frac{220.8}{15}$$

$$\begin{array}{r} 14.72 \\ 15\overline{)\,220.8} \\ -15 \\ \hline 70 \\ -60 \\ \hline 108 \\ -105 \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

❖ EXAMPLES ❖

Ex.49 Find $15.225 \div 0.35$

Sol. We can write it as

$$= \frac{15225}{1000} \div \frac{35}{100}$$ [Writing decimal fractions as fractions]

[Change ÷ by × and replace the divisor by its reciprocal]

$$= \frac{15225}{1000} \times \frac{100}{35} = 1522.5 \div 35$$

Thus, we note that

$15.225 \div 0.35 = 1522.5 \div 0.35 = 1522.5 \div 35$

Thus if the decimal point is moved to two places towards right in the divisor then the decimal point is also moved to the right in dividend by same number of places.

Ex.50 Find $50.76 \div 9.4$

Sol. $$= \frac{5076}{100} \div \frac{94}{10} = \frac{5076}{100} \times \frac{10}{94} = \frac{5076}{10} \times 94 = 507.6 \div 94$$

Hence, $50.76 \div 9.4 = 507.6 \div 94$

Thus, we note that we can make the divisor as a whole number by shifting the decimal point to right by as many places as the number of the decimal places in the divisor. This way, the divisor is changed into a whole number.

Ex. 51 Divide (i) 15.225 by 0.35 (ii) $50.76 \div 9.4$

Sol. (i) $15.225 \div 0.35 = 1522.5 \div 35$

$$\begin{array}{r} 43.5 \\ 35\overline{)\,1522.5} \\ -140 \\ \hline 122 \\ -105 \\ \hline 175 \\ -175 \\ \hline \times \end{array}$$

Thus, $15.225 \div 0.35 = 43.5$

(ii) $50.76 \div 9.4 = 507.6 \div 94$

$$\begin{array}{r} 5.4 \\ 94\overline{)\,507.6} \\ -470 \\ \hline 376 \\ -376 \\ \hline \times \end{array}$$

Thus, $50.76 \div 9.4 = 5.4$

Ex.52 Find the quotient of 0.06688 ÷ 0.038

Sol. Make the divisor a whole number by shifting the decimal point in dividend to the right by three places, we have 0.06688 ÷ 0.038

= 0.06688 ÷ 0.038 = 66.88 ÷ 38

$$\begin{array}{r} 1.76 \\ 38\overline{)\ 66.88} \\ -38 \\ \hline 288 \\ -266 \\ \hline 228 \\ -228 \\ \hline \times \end{array}$$

Thus, 0.06688 ÷ 0.038 = 1.76

Ex. 53 Find 0.024 ÷ 0.6

Sol. $0.024 \div 0.6 = \dfrac{0.024}{0.6}$

$= \dfrac{0.24}{6} = 0.04$

$$\begin{array}{r} 0.04 \\ 6\overline{)\ 0.24} \\ -0.24 \\ \hline \times \end{array}$$

Ex.54 Find 64 ÷ 0.08

Sol. $64 \div 0.08 = \dfrac{64.00}{0.08} = \dfrac{64.00 \times 100}{0.08 \times 100}$

$= \dfrac{6400}{8}$

= 800

[Shift the decimal points two places to the right in both the numbers]

◈ **Dividing of a whole number by a decimal**

For example,

9 ÷ 0.3

$= \dfrac{9}{0.3} = \dfrac{9 \times 10}{3}$

$= \dfrac{90}{3} = 30$

9 ÷ 0.3 = 30

❖ EXAMPLES ❖

Ex.55 Find the quotient of :

(i) 34 ÷ 1.36 (ii) 1032 ÷ 2.064

Sol. (i) **Step 1 :** Make the divisor as a whole number, we have

34 ÷ 1.36 = 3400 ÷ 136

Step 2 : Divide 3400 ÷ 136

$$\begin{array}{r} 25 \\ 136\overline{)\ 3400} \\ -272 \\ \hline 680 \\ -680 \\ \hline \times \end{array}$$

Thus 34 ÷ 1.36 = 25

(ii) **Step 1 :** Make the divisor as a whole number 1032 ÷ 2.064 = 1032000 ÷ 2064

Step 2 : Divide the new dividend by new divisor :

$$\begin{array}{r} 500 \\ 2064\overline{)\ 1032000} \\ -1032000 \\ \hline \times \end{array}$$

Therefore, 1032 ÷ 2.064 = 500

Ex.56 Alka gets ₹ 89.25 as daily allowance for tea in 7 days. How much money does she get in 1 day?

Sol. Money received in 7 days = ₹ 89.25

Therefore, money received in 1 day

= ₹ 89.25 ÷ 7

$$\begin{array}{r} 12.75 \\ 7\overline{)\ 89.25} \\ -7 \\ \hline 19 \\ -14 \\ \hline 52 \\ -49 \\ \hline 35 \\ -35 \\ \hline \times \end{array}$$

Therefore, money received in 1 day = ₹ 12.75

Ex. 57 If 21.875 litres of oil is in $3\frac{1}{2}$ cans of tin of equal capacity, find the capacity of oil in each can.

Sol. Number of cans $= 3\frac{1}{2} = 3 + \frac{1}{2}$

$= 3 + 0.5 = 3.5$

Total quantity of oil = 21.875 litres

$$\begin{array}{r} 6.25 \\ 35\overline{)\ 218.75} \\ -210 \\ \hline 87 \\ -70 \\ \hline 175 \\ -175 \\ \hline \times \end{array}$$

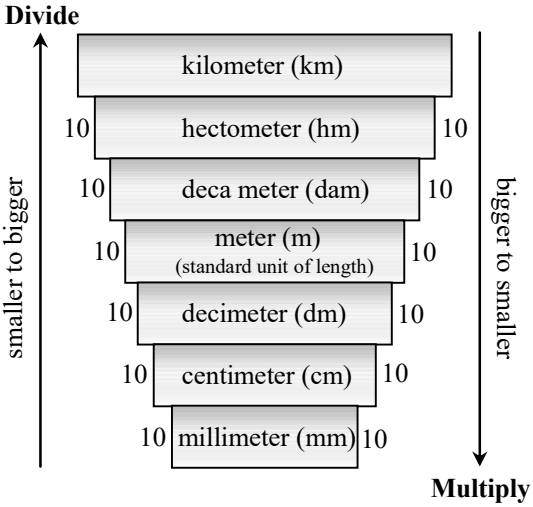
Therefore, capacity of one can

= 21.875 ÷ 3.5 litres.

= 218.75 ÷ 35 = 6.25 litres

➢ CONVERSION OF UNITS

Units of length :



Note : Centimetres (length), grams (weight), litres (capacity) belonges to a set of units. This set is called **Metric system of units.**

Fact : The metric system was developed in France in 1790, so as that units in the system would be related to each other by a multiple of 10.

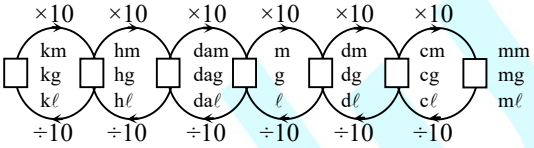
Tip : To learn the order of units of length, we can use

" **K**aha **H**o **D**addy **M**umma, **D**idi, **C**all **M**e "

K → km ; H → hm ; D → dam ; M → metre ;

D → dm ; C → cm ; M → mm

Also,



❖ EXAMPLES ❖

Ex.58 Express the given quantity in terms of the units given in brackets :

(i) 45.93 km to (m)

(ii) 73.72 kg to (cm)

(iii) 225 m 37 cm to (cm)

(iv) 9.432 g to (mg)

Sol. (i) 45.93 km = 45.93 × 1000 m = 45930 m

(ii) 73.72 km = 73.72 × 100000 cm = 7372000 cm

(iii) 225 m 37 cm = 225 × 100 cm + 37 cm

= 22500 cm + 37 cm

= 22537 cm

(iv) 9.432 g to mg = 9.432 × 1000 mg = 9432 mg

Ex.59 Express the given quantity in terms of the units given in brackets :

(i) 24.43 mg to (cg) (ii) 6795 g to (kg)

(iii) 4203 mm to (hm) (iv) 15.89 mℓ to (ℓ)

Sol. (i) $24.43 \text{ mg} = \frac{24.43}{10} \text{ cg} = 2.443 \text{ cg}$

(ii) $6795 \text{ g} = \frac{6795}{1000} \text{ kg} = 6.795 \text{ kg}$

(iii) $4203 \text{ mm} = \frac{4203}{100000} \text{ hm} = 0.04203 \text{ hm}$

(iv) $15.89 \text{ mℓ} = \frac{15.89}{1000} \text{ ℓ} = 0.01589 \text{ ℓ}$

Ex.60 Find the following products in the units given in brackets :

(i) 3 × 42 g 745 mg in (g)

(ii) 3 × 5 t 5460 kg in (t)

Sol. (i) Before multiplying, change the unit in the required unit

$42 \text{ g} + 745 \text{ mg} = 42 \text{ g} + \frac{745}{1000} \text{ g}$

$= 42 \text{ g} + 0.745 \text{ g} = 42.745 \text{ g}$

∴ 3 × 42g 745 mg = 3 × 42.745g = 128.235 g

(ii) Now, 5t 5460 kg = 5t + 5460 kg

$= 5\text{t} + \frac{5460}{1000} \text{ t} = 5\text{t} + 5.46 \text{ t} = 10.46 \text{ t}.$

∴ 3 × 5t 5460 kg = 3 × 10.46 t = 31.38 t

◈ Other Units of Length (Imperial Units of Length) :

12 inches	=	1 foot (ft)
3 feet	=	1 yard (yd)
1760 yards	=	1 mile

Ex.61 Express the given quantity in the units given in brackets :

(i) 549 inch (into ft)

(ii) 2 miles 9504 yards (into miles)

(iii) 1285 inch (into ft and inches)

Sol. (i) We know 12 inches = 1 foot

∴ $1 \text{ inch} = \frac{1}{12} \text{ foot}$

⇒ $549 \text{ inch} = \frac{549}{12} \text{ feet} = 45\frac{9}{12} \text{ feet}$

= 45 feet and 9 inch.

$$12\overline{)549}\ 45 \text{ feet}$$
$$-48$$
$$69$$
$$-60$$
$$9 \text{ inch}$$

(ii) 2 miles 9504 yards

In order to change 2 miles 9504 yards, we have to change number of yards into miles.

$\Rightarrow$ 2 miles 9504 yards = 2 miles + 9504 yards

$\because$ 1760 yards = 1 mile

1 yard = $\frac{1}{1760}$ mile

$\Rightarrow$ 9504 yards = $\frac{9504 \times 1}{1760}$ = 5.4 miles

$\therefore$ 2 miles + 9504 yards = 2 miles + 5.4 miles

= 7.4 miles

(iii) 1285 inches

12 inches = 1 ft

1285 inches = $\frac{1285 \times 1}{12}$ ft = $107\frac{1}{12}$ ft

= 107 ft and 1 inch

Ex.62 How many metres are there in 6728 cm?

Sol. We know that 100 cm = 1 m

$\Rightarrow$ 1 cm = $\frac{1}{100}$ m

So, 6728 cm = (6728 ÷ 100) m

6728 cm = 67.28 meters

Ex.63 How many decimeters are there in 23.7 cm ?

Sol. We know that 10 cm = 1 dm $\Rightarrow$ 1 cm = $\frac{1}{10}$ dm

So, 23.7 cm = (23.7 ÷ 10) dm

23.7 cm = 2.37 decimeters

Ex.64 How many grams are there in 725.65 hectograms ?

Sol. We known that 1 hectogram = 100 grams

So, 725.65 hectograms = (725.65 × 100) grams

725.65 hectograms = 72565 grams

Ex.65 How many milliliters are there in 6.1072 litres?

Sol. We know that 1 litre = 100 ml.

6.1072 litres = (6.1072 × 1000) ml

6.1072 litres = 6107.2 ml

Ex.66 Express as rupees using decimals :

(i) 7 paise (ii) 7 rupees 7 paise

(iii) 235 paise

Sol. (i) We know that 100 paise = 1 Rupee

$\Rightarrow$ 1 paise = $\frac{1}{100}$ Rupees

So, 7 paise = $\frac{1}{100} \times 7$ Rupees = $\frac{7}{100}$

7 paise = 0.07 Rupees

(ii) 7 Rupees and 7 Paise = ₹ 7 + 7 Paise

= ₹ 7 + ₹ $\frac{7}{100}$

= ₹ $\left(7 + \frac{7}{100}\right)$

= ₹ (7 + 0.07) = ₹ 7.07

(iii) 235 paise = ₹ $\frac{235}{100}$ ($\because$ 100 paise = ₹1)

235 paise = ₹ 2.35

Ex.67 Express 5 cm in metres and kilometers.

Sol. 5 cm = $\frac{1}{100}$ × 5 metres

($\because$ 100 cm = 1m and 1 cm = $\frac{1}{100}$ m)

= $\frac{5}{100}$ metres

5 cm = 0.05 metres

5 cm = 5 × $\frac{1}{100000}$ km

($\because$ 100000 cm = 1 km $\therefore$ 1 cm = $\frac{1}{100000}$ km)

5 cm = 0.00005 km.

Ex.68 Express in kg

(i) 200 g

(ii) 3470 g

(iii) 4 kg 8 g

Sol. (i) 200 gm = $\frac{200}{1000}$ kg

($\because$ 1000 gm = 1 kg $\therefore$ 1 gm = $\frac{1}{1000}$ kg)

$\therefore$ 200 gm = 0.200 kg

(ii) 3470 g = $\frac{3470}{1000}$ kg

($\because$ 1000 gm = 1 kg $\therefore$ 1 gm = $\frac{1}{1000}$ kg)

$\therefore$ 3470 gm = 3.470 kg

(iii) 4 kg 8 gm = 4 kg + $\frac{8}{1000}$ kg

($\because$ 1000 gm = 1 kg $\therefore$ 1 gm = $\frac{1}{1000}$ kg)

= (4 + 0.008) kg

$\therefore$ 4 kg 8 g = 4.008 kg