2 FRACTIONS

Learning Objectives

After going through this chapter, you will be able to

- recapitulate fractions, types of fractions and conversion of fractions
- find equivalent fractions, reduce fractions to the simplest form, compare and order fractions
- add, subtract, multiply and divide different types of fractions
- simplify fractions using BODMAS rule
- solve application-based questions based on fractions

Let's Recall

1. Compare the following fractions and put <, > or = sign accordingly.

(a) $\frac{2}{7}\square\frac{2}{5}$ (b) $\frac{21}{15}\square\frac{7}{5}$ (c) $\frac{4}{3}\square\frac{5}{4}$ (d) $2\frac{1}{2}\square 2\frac{3}{4}$

2. Arrange the following fractions in ascending and descending orders.

(a) $\frac{7}{8}, \frac{3}{4}, \frac{2}{3}, \frac{7}{6}$ (b) $\frac{1}{2}, \frac{3}{2}, \frac{4}{5}, \frac{5}{4}$ (c) $\frac{5}{18}, \frac{12}{13}, \frac{4}{9}, \frac{7}{12}$ (d) $\frac{2}{9}, \frac{7}{8}, \frac{11}{5}, \frac{3}{14}$

3. Write the first three equivalent fractions for $\frac{5}{7}$.

4. Evaluate: (a) $\frac{5}{9}+\frac{3}{5}-\frac{2}{7}$ (b) $8-\frac{1}{12}+\frac{2}{11}$ (c) $12\frac{7}{15}+9\frac{8}{5}$

Let's Begin

'Is the glass **half empty or half full?'** is a common expression, an idiom, used usually to indicate that a particular situation could be a cause for optimism (half full) or pessimism (half empty). It is an indication of the way a person perceives the world. A person with a positive outlook will see the glass half full, whereas a person with a negative outlook will see it half empty. This is the importance and significance that fractions have in our daily life. The concept of fractions is also routinely used in cooking, telling time and shopping.

FRACTIONS

A number of the form $\frac{p}{q}$, where p and q are whole numbers and $q \neq 0$ is called a **fraction**. For example, $\frac{5}{9}$, $\frac{15}{29}$ and $\frac{47}{32}$

Types of Fractions

Proper Fraction: Any fraction whose numerator is less than the denominator is called a proper fraction. For example, $\frac{2}{5}$, $\frac{3}{4}$ and $\frac{11}{24}$

Improper Fraction: Any fraction whose numerator is greater than the denominator is called an improper fraction. For example, $\frac{11}{5}$, $\frac{19}{7}$ and $\frac{37}{21}$

Unit Fraction: Any fraction with numerator 1 is called a unit fraction. For example, $\frac{1}{2}$, $\frac{1}{7}$ and $\frac{1}{12}$

Mixed Fraction: Any fraction consisting of a whole number part and a proper fraction part is known as a mixed fraction. For example, $1\frac{1}{3}$, $3\frac{4}{5}$ and $2\frac{11}{15}$

Like Fractions: Fractions with the same denominator are called like fractions. For example, $\frac{1}{7}$, $\frac{2}{7}$ and $\frac{3}{7}$

Unlike Fractions: Fractions with different denominators are called unlike fractions. For example, $\frac{2}{7}$, $\frac{4}{5}$ and $\frac{15}{23}$

Decimal Fractions: Fractions with denominator as 10, 100, 1000, ... are called decimal fractions. For example, $\frac{7}{10}$, $\frac{31}{100}$ and $\frac{51}{1000}$

Common (or Vulgar) Fractions: Any fraction whose denominator is a natural number other than any power of 10 is known as a vulgar fraction. For example, $\frac{2}{3}$, $\frac{5}{7}$ and $\frac{7}{11}$

Equivalent Fractions

Fractions representing the same value are called equivalent fractions. They are obtained by multiplying or dividing the numerator and denominator by the same non-zero number.

For example, $\frac{4}{5}=\frac{4\times2}{5\times2}=\frac{8}{10}$, $\frac{4\times3}{5\times3}=\frac{12}{15}$ and $\frac{4\times4}{5\times4}=\frac{16}{20}$

Fractions in the Simplest Form

A fraction is said to be in the simplest form if its numerator and denominator do not have any common factor, other than 1. For example, $\frac{2}{3}$, $\frac{7}{9}$ and $\frac{13}{14}$ are in the simplest form.

Know More

The word fraction is derived from the Latin word 'fragere' meaning 'to break'.

My Notes

In a fraction, the number written above the horizontal line is called the **numerator** and the number written below the horizontal line is called the **denominator** of the fraction. For example, in $\frac{3}{7}$, 3 is the numerator and 7 is the denominator.

Let's Try

How will you decide whether a given fraction is:

1. less than 1?
2. equal to 1?
3. more than 1

just by looking at it?

My Notes

Two fractions $\frac{a}{b}$ and $\frac{c}{d}$ are equivalent, if:

$a \times d = b \times c$

To reduce a fraction in the simplest form, divide the numerator and denominato of the fraction by their HCF.

Conversion of Fractions

Let us learn to convert one fraction type to another.

Conversion of Mixed Fractions into Improper Fractions and vice versa

Example 1 Convert $2\frac{3}{7}$ into an improper fraction.

Solution: $2\frac{3}{7} = \frac{(2\times7)+3}{7} = \frac{14+3}{7} = \frac{17}{7}$

Example 2 Convert $\frac{133}{11}$ into a mixed fraction.

Solution: Divide 133 by 11.

Divisor = 11, Quotient = 12, Remainder = 1

$\therefore \frac{133}{11} = 12\frac{1}{11}$

```
   12
11)133
  -11
   23
  -22
    1
```

Let's Try

1. Check whether $\frac{17}{16}$ and $\frac{102}{96}$ are equivalent fractions or not.
2. Convert the following into improper fractions.
   (a) $1\frac{4}{5}$ (b) $3\frac{2}{7}$
3. Convert the following into mixed fractions.
   (a) $\frac{49}{5}$ (b) $\frac{68}{7}$

My Notes

A fraction should always be expressed in the simplest form.

Error Alarm

Like fractions have the same denominator and not the same numerator.

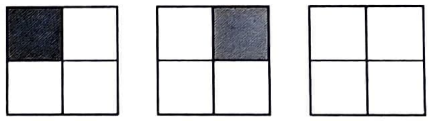
✗ $\frac{5}{8}, \frac{5}{11}, \frac{5}{7}$ are like fractions

✓ $\frac{2}{7}, \frac{6}{7}, \frac{9}{7}$ are like fractions

MULTIPLICATION OF FRACTIONS

Multiplication of a Fraction by a Whole Number

Observe the given squares.



Each of these squares have $\frac{1}{4}$ part coloured. Let us represent these coloured parts in one square.

We observe that 3 squares having $\frac{1}{4}$ part coloured is the same as 1 square havi $\frac{3}{4}$ parts coloured. Thus, $3\times\frac{1}{4} = \frac{3}{4}$

Rule: To multiply a fraction by a whole number, multiply the numerator of t fraction with the whole number keeping the denominator same.

For example, $\frac{12}{17}\times5 = \frac{12\times5}{17} = \frac{60}{17} = 3\frac{9}{17}$

Multiplication of a Mixed Fraction by a Whole Number

Rule: To multiply a mixed fraction by a whole number, first convert the mix fraction into an improper fraction and then multiply as we multiply a fracti by a whole number.

For example, $9\frac{1}{2}\times5 = \frac{19}{2}\times5 = \frac{19\times5}{2} = \frac{95}{2} = 47\frac{1}{2}$

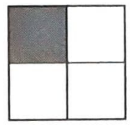
Fraction as an Operator 'Of'

'Of' acts as an operator between fractions or a fraction and a number. It represents multiplication. To solve questions involving 'of', replace 'of' by '×' sign.

For example, $\frac{1}{4}$ of $28 = \frac{1}{4} \times 28 = 7$

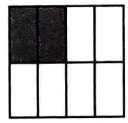
Multiplication of a Fraction by Another Fraction

Let us multiply $\frac{1}{2}$ by $\frac{1}{4}$.



Consider the square with $\frac{1}{4}$ part coloured.

To find $\frac{1}{2}$ of $\frac{1}{4}$, we need to divide $\frac{1}{4}$ part into 2 equal parts.



The square is now divided into 8 equal parts with 2 parts coloured.

But, $\frac{1}{2}$ of $\frac{1}{4}$ means, we need to consider only 1 part out of 2 coloured parts.

Thus, $\frac{1}{2} \times \frac{1}{4} = \frac{1 \times 1}{2 \times 4} = \frac{1}{8}$

Rule: To multiply a fraction by another fraction, multiply their numerators and denominators separately and represent them as a fraction.

$$\text{Product of two fractions} = \frac{\text{Product of numerators}}{\text{Product of denominators}}$$

For example, (a) $\frac{7}{5} \times \frac{2}{3} = \frac{7 \times 2}{5 \times 3} = \frac{14}{15}$ (b) $1\frac{2}{5} \times \frac{6}{11} = \frac{7}{5} \times \frac{6}{11} = \frac{7 \times 6}{5 \times 11} = \frac{42}{55}$

Multiplication of Three or More Fractions

Rule: To multiply three or more fractions, multiply the numerators of all the fractions and the denominators of all the fractions separately and represent them as a fraction.

$$\text{Product of three or more fractions} = \frac{\text{Product of all numerators}}{\text{Product of all denominators}}$$

For example, $\frac{2}{3} \times \frac{5}{7} \times \frac{1}{9} = \frac{2 \times 5 \times 1}{3 \times 7 \times 9} = \frac{10}{189}$

Example 3 Madan had ₹ 300. He went to a shopping mall and spent $\frac{1}{3}$ of the amount on watching a movie, $\frac{1}{4}$ of the amount on fun activities and $\frac{1}{5}$ of the amount on snacks. How much money did he spend on each item?

Let's Try

Find:

1. $\frac{2}{3}$ of 27
2. $\frac{3}{4}$ of 32
3. $\frac{1}{4}$ of a rupee
4. $\frac{7}{25}$ of a litre
5. $\frac{2}{3}$ of a leap year

My Notes

1. The product of two proper fractions is always smaller than each of the two fractions.
2. The product of two improper fractions is always greater than each of the two fractions.
3. The product of a proper and an improper fraction is smaller than the improper fraction and greater than the proper fraction.

Let's Try

Find:

1. $\frac{2}{3} \times \frac{9}{14}$
2. $8 \times \frac{7}{12}$
3. $1\frac{3}{5} \times 2\frac{1}{4}$
4. $6\frac{2}{3} \times \frac{1}{4}$

Solution: Amount spent on watching a movie $= \frac{1}{3}$ of the amount left with Ma

$= \frac{1}{3}$ of ₹ 300 = ₹ $\left(\frac{1}{3} \times 300\right)$ = ₹

Amount spent on fun activities $= \frac{1}{4}$ of the amount left with Ma

$= \frac{1}{4}$ of ₹ 300 = ₹ $\left(\frac{1}{4} \times 300\right)$ = ₹

Amount spent on snacks $= \frac{1}{5}$ of the amount left with Ma

$= \frac{1}{5}$ of ₹ 300 = ₹ $\left(\frac{1}{5} \times 300\right)$ = ₹

Maths in My Life

My father owns a small garden. My younger sister Preeti has a share of $\frac{3}{5}$ of it and my elder sister Shilpi has twice as much as mine. What fraction of the garden belongs to me?

Example 4 The price of 1 kg mangoes is ₹ $38\frac{3}{5}$. What would be the price $2\frac{4}{7}$ kg mangoes?

Solution: Price of 1 kg mangoes = ₹ $38\frac{3}{5}$

Price of $2\frac{4}{7}$ kg mangoes = ₹ $\left(38\frac{3}{5} \times 2\frac{4}{7}\right)$

= ₹ $\left(\frac{193}{5} \times \frac{18}{7}\right)$

= ₹ $\frac{3474}{35}$ = ₹ $99\frac{9}{35}$

Thus, the price of $2\frac{4}{7}$ kg mangoes is ₹ $99\frac{9}{35}$.

Example 5 A motorbike runs 35 km in 1 L petrol. How much distance wil cover in $3\frac{1}{5}$ L of petrol?

Solution: Distance covered by motorbike in 1 L petrol = 35 km

Distance covered by motorbike in $3\frac{1}{5}$ L of petrol

= $\left(35 \times 3\frac{1}{5}\right)$ km = $\left(35 \times \frac{16}{5}\right)$ km = 112 km

Thus, the motorbike will run 112 km in $3\frac{1}{5}$ L of petrol.

EXERCISE 2.1

1. Find the product and represent in the simplest form.

(a) $\frac{13}{24}\times\frac{8}{11}$ (b) $\frac{12}{17}\times\frac{3}{8}$ (c) $2\frac{5}{8}\times 12$ (d) $\frac{1}{9}\times 21$

(e) $\frac{3}{4}\times 5\frac{2}{3}$ (f) $2\frac{5}{7}\times 3\frac{4}{9}$ (g) $3\frac{10}{13}\times 1\frac{3}{5}$ (h) $5\frac{3}{8}\times\frac{33}{43}$

2. Find the value of:

(a) $\frac{3}{5}$ of 105 (b) $\frac{1}{6}$ of 72 (c) $\frac{2}{3}$ of 57 (d) $\frac{4}{7}$ of 112

(e) $\frac{16}{7}$ of $\frac{14}{8}$ (f) $\frac{20}{3}$ of $\frac{9}{5}$ (g) $\frac{3}{4}$ of $2\frac{2}{3}$ (h) $\frac{2}{3}$ of $3\frac{15}{22}$

3. Simplify:

(a) $\frac{14}{25}\times\frac{35}{51}\times\frac{17}{49}$ (b) $\frac{7}{10}\times 2\frac{1}{14}\times\frac{20}{58}$ (c) $6\frac{7}{8}\times 6\frac{2}{11}\times\frac{3}{10}$ (d) $2\frac{1}{9}\times\frac{5}{38}\times 2\frac{1}{5}$

(e) $3\frac{4}{7}\times 2\frac{2}{5}\times 1\frac{3}{4}$ (f) $1\frac{2}{9}\times 2\frac{2}{3}\times 1\frac{3}{4}$

4. Find:

(a) $\frac{1}{4}$ of an hour (b) $\frac{2}{3}$ of 15 kg (c) $\frac{4}{7}$ of 91 L (d) $\frac{5}{6}$ of 900 m

5. The cost of 1 L juice is ₹ $98\frac{1}{2}$. What would be the cost of $34\frac{1}{4}$ L of juice?

6. One bottle of jam holds $\frac{38}{43}$ kg of jam. How many kilogram of jam does 25 such bottles hold?

7. Manan and Ziya together have ₹ 2,500. Manan's share is $\frac{3}{5}$ of the total amount. Find Ziya's share.

8. Find the perimeter of a square whose side is $7\frac{1}{8}$ m.

9. Find the area of a rectangular park which is $15\frac{1}{3}$ m long and $13\frac{1}{2}$ m wide.

10. In a music group of 45 people, $\frac{1}{9}$ are vocalists and the rest play instruments. How many people play instruments in the group?

11. For a particular game show, each ticket costs ₹ $126\frac{1}{2}$. Calculate the amount collected, if 206 tickets of the show were sold.

12. In a collection of 110 balloons, $\frac{3}{10}$ balloons are pink, $\frac{2}{5}$ balloons are blue and the rest of the balloons are yellow. How many pink, blue and yellow balloons are there?

13. Megha purchased $2\frac{3}{5}$ kg apples, $\frac{2}{5}$ of which are rotten. Tarun purchased $5\frac{4}{9}$ kg mangoes, $\frac{4}{7}$ of which are rotten. Find the quantity of rotten fruits.

My Notes

To find the reciprocal of a mixed fraction, we first express the mixed fraction as an improper fraction and then find its reciprocal. For example, the reciprocal of $3\frac{1}{4}$, that is, $\frac{13}{4}$ is $\frac{4}{13}$.

Tricky Maths

1. Joy has 63 cookies. He gave $\frac{1}{9}$ cookies to his brother, Roy. Joy ate 4 and shared 4 with his friends. Half of the remaining were broken into two equal pieces and the rest into three equal pieces. How many half pieces and one-third pieces were left in the cookie jar?
2. Tejas wants to bake 3 cakes. Each cake requires $5\frac{1}{4}$ cups of flour. He has $20\frac{1}{2}$ cups of flour with him. Will he have enough flour left for a pizza base that requires $3\frac{3}{4}$ cups?

Let's Try

Find:

1. $4 \div \frac{16}{7}$
2. $\frac{12}{11} \div 18$
3. $\frac{6}{5} \div \frac{12}{90}$
4. $1\frac{1}{4} \div \frac{16}{5}$

DIVISION OF FRACTIONS

To understand the division of fractions, we need to first study about reciproc of fractions.

Reciprocal of a Fraction

If the product of two fractions is 1, then the fractions are called the reciproc of each other. Reciprocal is also called multiplicative inverse.

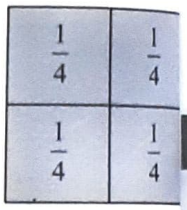
For example, the reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$ as $\frac{2}{3} \times \frac{3}{2} = 1$.

Properties of reciprocal:

- The reciprocal of 1 is 1.
- The reciprocal of 0 does not exist.
- If a number is greater than 1, then its reciprocal is smaller than 1 and vice vers

Division of a Whole Number by a Fraction

Let us find the value of $1 \div \frac{1}{4}$. Consider a square and divide it into 4 equal parts such that each part is one-fourth of the whole. The number of $\frac{1}{4}$ parts in this whole is 4.



$\therefore 1 \div \frac{1}{4} = 4$ or $1 \div \frac{1}{4} = 1 \times 4 = 4$

Rule: To divide a whole number by a fraction, multiply the whole number b the multiplicative inverse or reciprocal of the fraction.

For example, $2 \div \frac{4}{5} = 2 \times$ Reciprocal of $\frac{4}{5} = 2 \times \frac{5}{4} = \frac{5}{2} = 2\frac{1}{2}$

Division of a Fraction by a Whole Number

Rule: To divide a fraction by a whole number, multiply the fraction by th multiplicative inverse or reciprocal of the whole number.

For example, $\frac{8}{15} \div 16 = \frac{8}{15} \times$ Reciprocal of $16 = \frac{8}{15} \times \frac{1}{16} = \frac{1}{30}$

Division of a Fraction by Another Fraction

Rule: To divide a fraction by another fraction, multiply the first fraction by th reciprocal of the second fraction.

For example, $\frac{5}{32} \div \frac{10}{16} = \frac{5}{32} \times \frac{16}{10} = \frac{5 \times 16}{32 \times 10} = \frac{1}{4}$

Example 6 The cost of $3\frac{1}{4}$ kg mangoes is ₹ 130. Find the cost of 1 kg mangoes.

Solution: The cost of $3\frac{1}{4}$ kg mangoes = ₹ 130

The cost of 1 kg mangoes = ₹ $\left(130 \div 3\frac{1}{4}\right)$

= ₹ $\left(130 \div \frac{13}{4}\right)$ = ₹ $\left(130 \times \frac{4}{13}\right)$ = ₹ 40

Example 7 A carpenter used $1\frac{1}{6}$ cans of paint to paint 7 tables. How many cans of paint did he use to paint each table, if he used the same amount of paint for each table?

Solution: Number of cans required to paint 7 tables = $1\frac{1}{6}$

Number of cans required to paint 1 table = $1\frac{1}{6} \div 7 = \frac{7}{6} \times \frac{1}{7} = \frac{1}{6}$

Thus, $\frac{1}{6}$ of a can was used to paint each table.

Project Work

Make a model of a football field. Mark and explain the parts mentioning what fraction of the field each part is. Ensure that the measurements in the model accurately represent an actual football field. Elaborate the rules of the game including all the terms related to the game.

EXERCISE 2.2

1. Find the reciprocal of the following fractions.

(a) $\frac{3}{7}$ (b) $\frac{5}{38}$ (c) $\frac{35}{51}$ (d) $\frac{48}{5}$ (e) $2\frac{2}{3}$ (f) $17\frac{1}{6}$

2. Divide:

(a) $\frac{5}{9}$ by 8 (b) $\frac{3}{7}$ by 10 (c) $\frac{6}{9}$ by 4 (d) $\frac{14}{27}$ by 162

(e) 18 by $\frac{4}{9}$ (f) 153 by $\frac{9}{2}$ (g) 96 by $1\frac{1}{2}$ (h) 115 by $1\frac{3}{12}$

3. Solve:

(a) $\frac{12}{17} \div \frac{8}{15}$ (b) $\frac{15}{16} \div \frac{20}{32}$ (c) $2\frac{1}{5} \div \frac{11}{15}$ (d) $3\frac{5}{9} \div \frac{8}{15}$

(e) $\frac{8}{15} \div 8\frac{3}{5}$ (f) $4\frac{3}{8} \div 3\frac{3}{4}$ (g) $7\frac{3}{5} \div 3\frac{9}{10}$ (h) $5\frac{3}{7} \div 2\frac{1}{14}$

4. The product of two fractions is $9\frac{3}{5}$. Find the other fraction, if one of the fractions is $9\frac{3}{7}$.

5. A strip of length $8\frac{1}{3}$ m is cut into 5 pieces of equal length. Find the length of each piece.

6. The cost one chocolate is ₹ $12\frac{3}{4}$. How many chocolates can be purchased for ₹ 153?

7. The length of a cloth piece is $16\frac{8}{11}$ m. How many pieces of length $\frac{4}{11}$ m can be cut from this cloth?

8. There is $31\frac{2}{3}$ L of water in a container. How many bottles of $1\frac{2}{3}$ L capacity can be fi the container?

9. The thickness of a book having 240 pages is $5\frac{1}{4}$ cm. Find the thickness of each page.

10. Each student in a hostel is given $1\frac{5}{6}$ L of milk every week. A total of 308 L of milk is co in a week. Find the number of students in the hostel.

SIMPLIFICATION OF FRACTIONS

BODMAS represents the order of performing operations to simplify an expr

B racket
O f
D ivision
M ultiplication
A ddition
S ubtraction

Brackets are solved in the following order:
- line brackets or bar brackets or vinculum '—
- simple or round brackets '( )'
- curly brackets or braces '{ }'
- square brackets '[ ]'

My Notes

If there are only division and multiplication symbols in an expression, then perform them equally from left to right.

Maths in My Life

1. Kundan purchased a watch at the price of ₹ $375\frac{4}{7}$ and sold it for ₹ $415\frac{3}{11}$. He purchased and sold 15 such watches. How much money would he have saved?

2. Riya purchased $15\frac{8}{15}$ kg of fruits for ₹ $48\frac{3}{5}$. To save ₹ $3\frac{1}{3}$ on each kg, at what price should she sell these fruits?

3. Saurabh was given $\frac{5}{7}$ of a basket of oranges. The number of oranges remaining in the basket was 24. How many oranges did Saurabh get?

Example 8 Find the value of $\frac{2}{5}$ of $\left(7\frac{1}{3}\div\frac{12}{15}\right)$.

Solution:

$$\frac{2}{5}\text{ of }\left(7\frac{1}{3}\div\frac{12}{15}\right)=\frac{2}{5}\text{ of }\left(\frac{22}{3}\div\frac{12}{15}\right)$$

$$=\frac{2}{5}\text{ of }\left(\frac{22}{3}\times\frac{15}{12}\right)=\frac{2}{5}\text{ of }\frac{55}{6}=\frac{2}{5}\times\frac{55}{6}=\frac{11}{3}=3\frac{2}{3}$$

Example 9 Simplify: $\frac{3}{8}\div\left\{5\frac{2}{3}-\left(4+\overline{\frac{1}{2}-\frac{1}{3}}\right)\right\}+5\frac{1}{2}$

Solution:

$$\frac{3}{8}\div\left\{5\frac{2}{3}-\left(4+\overline{\frac{1}{2}-\frac{1}{3}}\right)\right\}+5\frac{1}{2}$$

$$=\frac{3}{8}\div\left\{\frac{17}{3}-\left(4+\frac{3-2}{6}\right)\right\}+\frac{11}{2}$$ (Simplifying line bracket

$$=\frac{3}{8}\div\left\{\frac{17}{3}-\left(4+\frac{1}{6}\right)\right\}+\frac{11}{2}$$ (Simplifying round brackets

$$=\frac{3}{8}\div\left\{\frac{17}{3}-\frac{25}{6}\right\}+\frac{11}{2}$$ (Simplifying curly brackets

$$=\frac{3}{8}\div\left\{\frac{34-25}{6}\right\}+\frac{11}{2}=\frac{3}{8}\div\frac{9}{6}+\frac{11}{2}=\frac{3}{8}\div\frac{3}{2}+\frac{11}{2}=\frac{3}{8}\times\frac{2}{3}+\frac{11}{2}$$

$$=\frac{1}{4}+\frac{11}{2}=\frac{1+22}{4}=\frac{23}{4}=11\frac{1}{2}$$

EXERCISE 2.3

Simplify the following expressions.

1. $\left(\frac{3}{2}+\frac{5}{6}\right)\times\frac{7}{4}$

2. $1\frac{5}{9}\times\left(\frac{9}{11}-\frac{1}{3}\right)$

3. $\frac{2}{5}$ of $\left(1\frac{1}{4}\div 1\frac{1}{2}\right)$

4. $\frac{1}{5}$ of $\left(\frac{3}{2}\div\frac{9}{4}\right)-\frac{1}{5}\times 3\frac{1}{12}$

5. $\frac{6}{7}+1\frac{2}{21}\times\frac{5}{42}\div\frac{7}{15}-\frac{1}{6}$

6. $\frac{5}{9}\div\left\{\left(\frac{13}{15}-\frac{10}{75}\right)+\frac{3}{8}\right\}\times\frac{2}{7}$

7. $\left(\frac{17}{26}+\frac{11}{13}\right)$ of $\frac{4}{9}-\frac{2}{7}\times\frac{4}{9}$

8. $\frac{1}{3}\times\frac{5}{6}\div\left\{\left(\frac{11}{17}+\frac{13}{17}\right)-\frac{5}{34}\right\}$

9. $\frac{2}{3}$ of $\frac{1}{3}+\left\{\left(\overline{10\frac{1}{3}-\frac{2}{9}}\div\frac{5}{18}\right)$ of $\left(\frac{3}{8}+\frac{1}{4}\right)\right\}$

10. $\frac{25}{51}\div\left[1+\left\{8+\left(7\frac{1}{3}+8\frac{2}{3}\right)\right\}\right]$

Concept Map

FRACTION
A number of the form $\frac{a}{b}$, where a and b are whole numbers and $b \neq 0$

Types of Fractions

- **Proper fraction** — Numerator < Denominator
- **Improper fraction** — Numerator > Denominator
- **Mixed fraction** — Combination of whole number and a proper fraction
- **Unit fraction** — Numerator = 1
- **Like fraction** — A fraction with the same denominators
- **Unlike fraction** — A fraction with different denominators
- **Common fraction** — A fraction with denominator other than any power of 10
- **Decimal fractions** — Fractions with denominator 10, 100, 1000, ...

Multiplication

- **Two fractions** — Multiply the numerators together and multiply the denominators together
- **Fraction and a whole number** — Multiply the numerator of the fraction with the whole number keeping the denominator same

Division

- **Fraction by a fraction** — Multiply the first fraction with the reciprocal of the second
- **Fraction by a whole number** — Multiply the fraction with the reciprocal of the whole number
- **Whole number by a fraction** — Multiply the whole number with the reciprocal of the fraction

- **Simplest form** — Standard form with HCF of numerator and denominator = 1
- **Equivalent fractions** — Fractions obtained by multiplying or dividing the numerator and the denominator by the same non-zero number

Test Zone

SECTION—I

1. Tick (✔) the correct option.

(a) The sum of $\frac{7}{15}$ and $\frac{3}{8}$ is

i. $\frac{110}{120}$ ii. $\frac{101}{120}$ iii. $\frac{11}{120}$ iv. $\frac{111}{120}$

(b) Which of the following statements is true?

i. $\frac{8}{11}=\frac{16}{24}$ ii. $\frac{8}{11}<\frac{16}{24}$

iii. $\frac{8}{11}>\frac{16}{24}$ iv. $\frac{8}{11}\div\frac{16}{24}<1$

(c) Which of the following has a greater value?

i. $\frac{2}{3}$ of $\frac{9}{8}$ ii. $\frac{1}{5}$ of $\frac{25}{4}$

iii. $\frac{3}{4}$ of $3\frac{1}{5}$ iv. $\frac{5}{6}$ of $\frac{1}{120}$

(d) By what number should $1\frac{5}{7}$ be multiplied to get $\frac{24}{35}$?

i. $\frac{2}{5}$ ii. $\frac{1}{7}$ iii. $2\frac{2}{5}$ iv. $\frac{21}{24}$

(e) Which of the following is equal to 1?

i. $1\frac{1}{3}\div\frac{3}{4}$ ii. $1\frac{1}{2}\div2\frac{1}{2}$

iii. $3\frac{1}{2}\div\frac{7}{2}$ iv. $\frac{8}{5}\div1\frac{2}{5}$

2. Fill in the blanks.

(a) $\frac{1}{2}$ of $\frac{4}{3}$ is a _____ than $\frac{1}{3}$ of $\frac{6}{5}$.

(b) $\frac{13}{33}$ is a proper and a _____ fraction.

(c) $2\frac{2}{5}$ of ₹ 1 is equal to _____.

(d) The multiplicative inverse of $\frac{253}{747}$ is _____.

(e) The division of $\frac{15}{60}\div\frac{75}{16}$ will give a _____ fraction.

SECTION—II

3. Solve:

(a) $3\frac{3}{4}+\frac{1}{2}$ (b) $8\frac{1}{3}-\frac{5}{8}$

(c) $5\frac{1}{7}+3\frac{1}{9}$ (d) $2\frac{3}{4}-1\frac{1}{3}$

(e) $\frac{8}{3}\times4$ (f) $\frac{13}{6}\times\frac{3}{26}$

(g) $19\frac{1}{2}\times1\frac{1}{4}$ (h) $2\frac{8}{19}\times5\frac{3}{7}\times3\frac{10}{13}$

(i) $7\div\frac{2}{3}$ (j) $3\frac{1}{2}\div4$

(k) $2\frac{1}{3}\div\frac{3}{5}$ (l) $4\frac{3}{8}\div2\frac{5}{6}$

(m) $3\frac{3}{8}-\frac{2}{11}+\frac{15}{8}\times\frac{2}{5}$ (n) $\left(\frac{5}{9}-\frac{25}{45}\right)\div\frac{37}{51}\times\frac{48}{57}$

(o) $5\frac{1}{6}+3\frac{1}{4}-2\frac{1}{3}$ (p) $10\frac{3}{5}+2\frac{5}{6}-5\frac{1}{6}$

(q) $\left\{\left(\frac{\overline{12}}{19}\times\frac{2}{3}\div\frac{4}{19}+3\frac{3}{8}\right)-\frac{1}{4}\right\}+\frac{7}{10}$ of 25

4. What should be added to $8\frac{1}{7}$ to get 6?

5. What should be subtracted from $12\frac{3}{5}$ to get $7\frac{1}{5}$?

6. How many seconds are there in $\frac{3}{8}$ of 2 days?

7. A bike runs $50\frac{3}{5}$ km in 1 L of petrol. How far it can go, if the bike has $4\frac{7}{8}$ L of petrol in it?

8. Rajan painted $\frac{3}{5}$ of the wall and Amit painted $\frac{2}{3}$ of the wall. Who painted larger part of the wall and by how much?

9. Shivam has $470\frac{2}{7}$ kg of banana with him. He gets an order to supply $385\frac{3}{4}$ kg banana. How many kilograms of banana will be left with him?

10. The ticket of a magic show for an adult was ₹ $320\frac{3}{4}$ and for a child was ₹ $180\frac{1}{2}$. There were 45 adults and 22 children in the show. How much money was collected by selling tickets for the show?

11. Suresh travelled $565\frac{3}{8}$ km in $4\frac{5}{7}$ hours. How many kilometres did Suresh travel in an hour?

12. $\frac{1}{9}$ of the hats sold at a local sports shop had laces. $\frac{5}{8}$ of the remainder were made of net. The rest of the hats were made of denim cloth. The shop had 81 denim hats. How many more net hats than denim hats did the shop have?

13. Out of a class of 350 students, one-seventh opted for Sanskrit, two-seventh for French and the rest for Hindi. How many students opted for Hindi?

14. Six-sevenths of a number is 252. Find the number.

Mental Maths

1. Fill the boxes with the correct number.

(a) $\frac{\square}{\square} + \frac{5}{27} = \frac{12}{27}$ (b) $\frac{\square}{\square} - \frac{3}{6} = \frac{3}{6}$ (c) $\frac{40}{13} \times \frac{\square}{\square} = \frac{2}{3}$ (d) $\frac{\square}{\square} \div \frac{168}{34} = \frac{2}{3}$

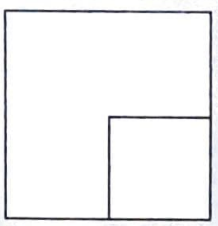
(e) $1\frac{1}{2} = \frac{\square}{2}$ (f) $\frac{80}{100} = \frac{\square}{\square}$ (g) $\frac{100}{3} = \square\frac{\square}{3}$ (h) $\frac{\square}{\square}$ of $75 = 25$

2. Fill in the blanks with the simplest form of fraction.

(a) 3 months is _____ of a year.
(b) 4 hours is _____ of a day.
(c) 50 paise is _____ of one rupee.
(d) 250 g is _____ of 1 kg.
(e) 20 sec is _____ of 1 minute.
(f) Four is _____ of a dozen.
(g) 75% is _____.
(h) A score is _____ of 1000.

Maths Master

A builder had a square plot of land. He gave $\frac{1}{4}$ to a charitable trust as shown in the figure and sold the remaining portion equally among three customers such that each of them get a plot of the same shape. Mark the divisions on the diagram to show their share.



Applications of Fractions

Fractions can be seen in every aspect of our life. It is an intangible part of our daily activities a surroundings, that we often overlook. Cooking, sharing, reading the time, percentage, discounts in ret and grocery, weights of vegetables and fruits all involve fractions. Photography, jewellery makin vision tests and chemical compositions in medicines are based on fractions. Even for a simple gestur such as sharing a pizza or cutting a birthday cake, fractions are the foundation.

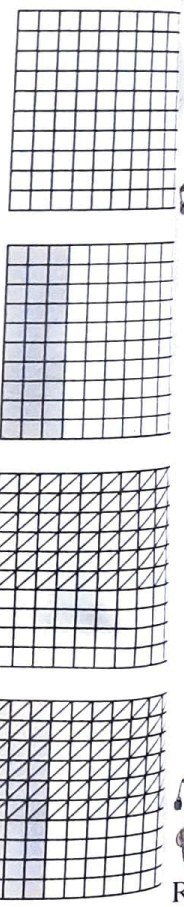
In the Lab

Aim: To multiply two fractions say, $\frac{6}{10}$ and $\frac{3}{10}$ using a squared paper

Materials Required: Paper, OHP (Overhead projector) sheet, colours, sketch pen, ruler, pencil and eras

Procedure:

1. Draw a 10 × 10 grid on a paper as shown. Each small square of this grid represents $\frac{1}{100}$.
2. Trace out the same grid on an OHP sheet.
3. Convert the given fractions into equivalent fractions with denominator 100, that is, $\frac{6}{10} = \frac{60}{100}$ and $\frac{3}{10} = \frac{30}{100}$.
4. Colour 30 blocks on the squared paper to represent the fraction $\frac{30}{100}$.
5. On the OHP sheet, draw diagonal lines across 60 blocks to represent the fraction $\frac{60}{100}$.
6. Place the OHP sheet over the coloured sheet.
7. Count these and write them as a fraction of 100. Reduce the fraction to its lowest form. This will be the product of the two given fractions.



Inference:

The number of coloured striped blocks = ☐

The product of $\frac{6}{10}$ and $\frac{3}{10}$ = $\frac{\square}{100} = \frac{\square}{\square}$.

Note: Repeat this activity with two fractions of your own choice.