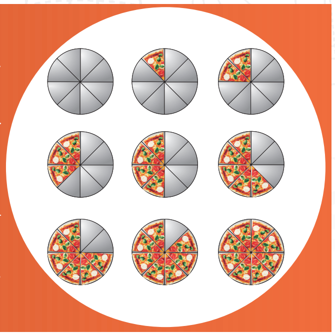
7 Fraction

Why This Chapter Matters



Have you ever had to share a chocolate bar with your friends and wanted to make sure everyone got a fair piece? Or have you followed a recipe that asked for half a cup of sugar? That's the magic of fractions! They are a secret code for talking about parts of things. What if a pizza recipe called for $\frac{2}{3}$ of a cup of cheese, but you only have a $\frac{1}{6}$ cup measure? How many scoops would you need? This chapter will turn you into a fraction master, get ready to solve everyday puzzles like these!

Meet EeeBee.AI

Hi, I'm EeeBee! I love breaking down big ideas into smaller, fun-sized pieces. And what's a better way to do that than with fractions? I'll be your guide through this chapter. Whenever you see me, I might have a tricky question, a helpful hint, or a super cool fact about how numbers work. Let's slice up this topic together and have some fun!

Learning Outcomes

By the end of this chapter, you will be able to:

- Define a fraction and identify its numerator and denominator.
- Represent fractions as parts of a whole, on a number line, and as part of a collection.
- Classify fractions as proper, improper, and mixed.
- Convert between improper fractions and mixed numbers.
- Generate and identify equivalent fractions.
- Compare and order like and unlike fractions.
- Perform addition and subtraction on all types of fractions.
- Solve real-world problems involving fractional concepts.

From Last Year's Notebook

Remember what you learned in Grade 5? Let's quickly review the basics before we dive deeper.

- **Parts of a Whole:** You learned that fractions like $\frac{1}{2}$ or $\frac{1}{4}$ represent parts of a whole shape.
- **The Two Parts:** You know a fraction has a numerator (the top number) and a denominator (the bottom number).
- **'Like' Fractions:** You were introduced to fractions that have the same denominator.

Real Math, Real Life

Fractions aren't just for your math class—they are everywhere! Here's a quick look at how people use them every day:

- **In the Kitchen:** Chefs use fractions in recipes, like $\frac{3}{4}$ teaspoon of salt.
- **For Building & Making:** Carpenters measure wood to parts of an inch, like $5\frac{1}{2}$ inches.
- **In Sports:** A team's winning record is a fraction, like winning 7 out of 10 games $\frac{7}{10}$.
- **In Art & Finance:** They are used in music for rhythms, in art for perspective, and in finance for stock prices.

Quick Prep

a) If a pizza is cut into 8 equal slices and you eat 1 slice, what part of the pizza have you eaten?

b) Look at the word "MATHEMATICS". What fraction of the letters are vowels?

c) Which is bigger: a quarter of a cake or half of the same cake?

d) If you have 10 marbles and 3 are blue, what fraction of the marbles are blue?

e) Draw a rectangle and shade $\frac{3}{4}$ of it.

f) What number is on the top of a fraction? What is it called?

g) What number is at the bottom of a fraction? What is it called?

Introduction to Fractions

Welcome to the very beginning of our journey into fractions! Think of this section as getting your tools ready. Before we can build amazing things with fractions, we need to understand what they are and learn to tell them apart. We'll explore the basic building blocks—the numerator and denominator—and then discover the three main "**families**" of fractions: proper, improper, and mixed. Mastering these fundamentals will make everything that comes next much easier.

Chapter Overview

In this chapter, we will explore the exciting world of fractions! Here is a map of what you will learn:

Understanding the Basics: We'll review what fractions are, see them on a number line, and represent them as parts of a whole or a collection.

Types of Fractions: You will master the differences between proper, improper, and mixed fractions and learn how to convert between them.

Comparing & Ordering: We will learn techniques like finding equivalent fractions and using the LCM to compare and order any set of fractions.

Fraction Operations: You will become confident in adding and subtracting like, unlike, and mixed fractions.

Real-World Applications: We'll use our new skills to solve fun word problems!

From History

The concept of fractions is ancient, evolving over thousands of years from practical needs. Ancient Egyptians, around 2000 BCE, were pioneers, primarily using unit fractions—fractions with a 1 in the numerator, like $\frac{1}{3}$ or $\frac{1}{8}$. They represented more complex fractions as a sum of these unit fractions. For instance, to express $\frac{3}{4}$, they would write it as $\frac{1}{2}+\frac{1}{4}$. This clever system was a crucial first step towards the versatile fractions we use in mathematics today.

What is a Fraction?

A fraction simply represents a part of a whole. The 'whole' can be a single object (like a pizza) or a collection of objects (like a class of students). To understand a fraction, we need to know two things: how many equal parts the whole is divided into, and how many of those parts we are talking about. These two pieces of information are given by the denominator and the numerator, respectively.

Sub-concepts to be Covered

1. **Numerator:** The top number in a fraction. It tells us the number of equal parts that have been taken or are being considered.
2. **Denominator:** The bottom number in a fraction. It tells us the total number of equal parts the whole has been divided into.
3. **Fractional Units and Equal Shares:** Representing a fraction using a single shape or object divided into equal parts.
4. **Fractional Units as Parts of a Whole:** Representing a fraction where the whole is a group of items.

Mathematical Explanation

A fraction is written in the form $\frac{\text{Numerator}}{\text{Denominator}}$.

Numerator

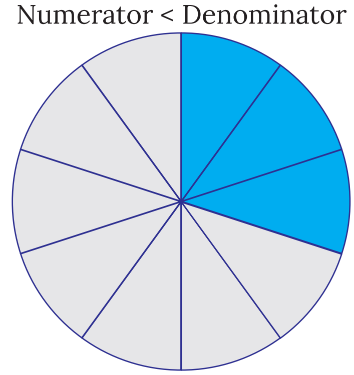
This number counts the parts you are interested in. In the fraction $\frac{3}{10}$, we are considering 3 of those 10 equal parts.

Denominator

The denominator tells you the total number of equal pieces the whole is broken into. For the fraction $\frac{3}{10}$, the whole is divided into 10 equal parts. The key idea here is equal parts. If you cut a cake into four slices, but they are all different sizes, you cannot say each slice is $\frac{1}{4}$ of the cake.

The denominator can never be zero, because you cannot divide something into zero parts!

Numerator < Denominator



$\frac{3}{10}$ *Fig. 7.1*

Fractional Units and Equal Shares

When working with fractions, it's important to understand the concepts of fractional units and equal shares. These two ideas help us understand how a whole can be divided into parts and how fractions represent these parts.

Fractional Units

A fractional unit refers to a single part of a whole when it is divided into equal parts. The number of parts into which the whole is divided is shown by the denominator of the fraction.

For example

- $\frac{1}{2}$ represents one part out of two equal parts. Here, 2 is the denominator, which tells us the whole is divided into 2 parts, and 1 is the numerator, which tells us how many parts we have.

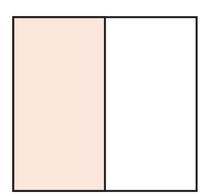


Fig. 7.2

- $\frac{1}{4}$ represents one part out of four equal parts. Here, 4 is the denominator, showing the whole is divided into 4 parts.

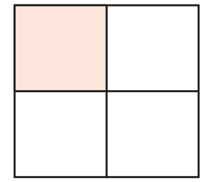


Fig. 7.3

Equal Shares

Equal shares mean dividing something into parts that are exactly the same size. This helps in distributing a whole object, quantity, or set into parts that are equal in value.

For example

- If you divide a pizza into 4 equal parts, each part is called a fractional share of the whole pizza. Each slice would be $\frac{1}{4}$ of the pizza.

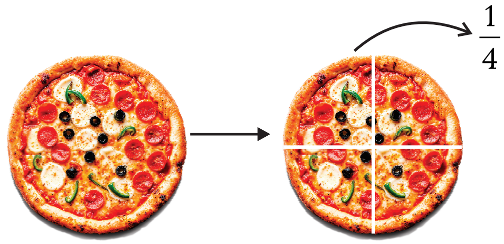


Fig. 7.4

- If you divide ₹10 into 5 equal shares, each share would be ₹2. Mathematically, each share would be $\frac{2}{10}$ or simplified as $\frac{1}{5}$ of the total amount.

Fig. 7.5

Examples of Equal Shares

1. **Dividing a Cake into Equal Shares:** If you cut a cake into 6 equal parts, each part is a fractional unit and would be represented as $\frac{1}{6}$ of the cake.
2. **Dividing a Chocolate Bar:** If you break a chocolate bar into 4 equal parts, each part is $\frac{1}{4}$ of the chocolate bar.
3. **Sharing a Pizza:** If a pizza is cut into 8 equal slices, each slice is $\frac{1}{8}$ of the pizza.

Fractional Units as Parts of a Whole

When we talk about fractional units as parts of a whole, we are referring to how a whole is divided into equal-sized pieces or parts, each of which can be represented as a fraction.

A fraction shows how many parts of a whole are being considered, and the size of each part depends on how many equal parts the whole is divided into.

When a whole is divided into equal parts, each part is a fractional unit. For example:

- If a whole is divided into 2 parts, each part is $\frac{1}{2}$ of the whole.
- If a whole is divided into 3 parts, each part is $\frac{1}{3}$ of the whole.
- If a whole is divided into 4 parts, each part is $\frac{1}{4}$ of the whole.

Examples of Fractional Units as Parts of a Whole

1. **Pizza Example:**

- If you have a whole pizza and cut it into 4 equal slices, each slice is $\frac{1}{4}$ of the pizza. So, $\frac{1}{4}$ represents one part out of the 4 equal parts.
- If you eat 2 slices, you've eaten $\frac{2}{4}$ of the pizza, or half of it. The fractional units here are $\frac{1}{4}$.

2. **Cake Example:** If you cut a cake into 8 equal pieces, each piece is $\frac{1}{8}$ of the cake. This means the whole cake is divided into 8 parts, and each piece is a fractional unit of the cake.

3. **Chocolate Bar Example:**

- If a chocolate bar is divided into 5 equal pieces, each piece is $\frac{1}{5}$ of the chocolate bar. If you have 3 pieces, that means you have $\frac{3}{5}$ of the bar.

Importance of Fractions

Fractions are used in everyday life, for example:

- Sharing food, like pizza or cake.
- Measuring ingredients while cooking.
- Dividing a set of objects or money.

Example 1 : A pizza is cut into 6 equal slices. If Sarah eats 2 slices, what fraction of the pizza has she eaten?

Solution: The pizza is divided into 6 equal parts, so each slice is $\frac{1}{6}$ of the pizza.

Sarah ate 2 slices, so she ate $\frac{2}{6}$ of the pizza.

Simplify the fraction $\frac{2}{6}$:

$\frac{2}{6} = \frac{1}{3}$.

Sarah ate $\frac{1}{3}$ of the pizza.

Example 2 : A cake is divided into 8 equal parts. If 3 parts are eaten, what fraction of the cake is left?

Solution: The total number of parts in the cake is 8, and 3 parts are eaten.

Number of parts left = 8 − 3 = 5

Fraction of the cake that is left is $\frac{5}{8}$.

$\frac{5}{8}$ part of the cake is left.

Example 3 : A chocolate bar is divided into 5 equal pieces. If you have 4 pieces, what fraction of the chocolate bar do you have?

Solution: The chocolate bar is divided into 5 equal parts, so each part is $\frac{1}{5}$.

You have 4 pieces, so you have $\frac{4}{5}$ of the chocolate bar.

You have $\frac{4}{5}$ of the chocolate bar.

Fig. 7.6

Example 4 : A group of friends decides to share a chocolate cake. If they divide the cake into 12 equal slices and one person eats 4 slices, what fraction of the cake has that person eaten?

Solution: The cake is divided into 12 equal slices, so each slice is $\frac{1}{12}$ of the cake.

The person ate 4 slices, so they ate $\frac{4}{12}$ of the cake.

Simplify the fraction $\frac{4}{12}$:

$\frac{4}{12} = \frac{1}{3}$.

The person ate $\frac{1}{3}$ of the cake.

Example 5 : A ribbon is 3 meters long. It is cut into 6 equal pieces. What fraction is denoted by each piece?

Solution: The ribbon is divided into 6 equal parts.

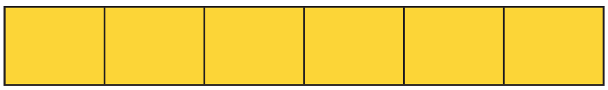


Fig. 7.7

So, each part is $\frac{1}{6}$ of the total length of the ribbon.

Knowledge Checkpoint

a) What does the fraction $\frac{4}{9}$ represent?

b) In a fruit basket with 5 oranges and 6 bananas, what is the fraction of oranges?

c) Can a fraction have a denominator of 0? Why or why not?

Activity

Human Fractions

- **Objective:** To understand fractions as part of a collection.
- **Materials:** None.
- **Steps:**
  - Ask a group of 10 students to come to the front of the class. This group is the 'whole'.
  - Ask 3 students to sit down.
  - Ask the class: "What fraction of the group is sitting down?"
  - Ask the class: "What fraction of the group is standing?"
  - Repeat with different numbers of students and different actions (e.g., raising a hand, holding a book). This makes the concept of numerator and denominator tangible.

Facts Flash

- The line that separates the numerator and the denominator in a fraction is called a vinculum.
- Ancient Romans didn't use the fractions we use. They based their fractions on the unit 'as', which was made up of 12 'unciae'. So, their fractions were always out of 12.

Do It Yourself

If you have a fraction, and you double the denominator but keep the numerator the same, does the fraction get bigger or smaller? For example, compare $\frac{1}{4}$ and $\frac{1}{8}$. Why do you think this happens?

Key Terms

- **Fraction:** A number representing a part of a whole or a collection.
- **Numerator:** The top number of a fraction, showing how many parts are being considered.
- **Denominator:** The bottom number of a fraction, showing the total number of equal parts in the whole.

Mental Mathematics

- **Strategy:** Visualizing Fractions of 100.
  - What is $\frac{1}{2}$ of 100?
  - What is $\frac{1}{4}$ of 100?
  - What is $\frac{3}{4}$ of 100?
  - What is $\frac{1}{10}$ of 100?
- This helps build an intuition for the size of common fractions. If you know $\frac{1}{4}$ is 25 out of 100, you have a better feel for its value.

Gap Analyzer™ Homework

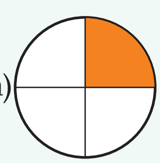
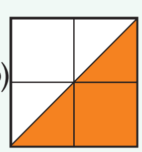
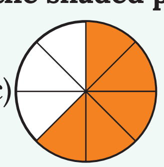
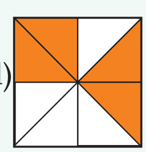
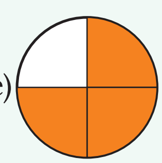
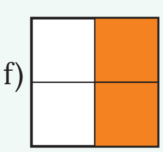
Watch Remedial

Exercise 7.1

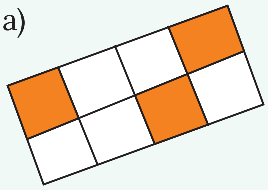
1. **A chocolate bar is divided into 5 equal pieces. If you have 1 piece, what fraction of the chocolate bar do you have?**
2. **Write the numerator and denominator of each of the following fractions:**

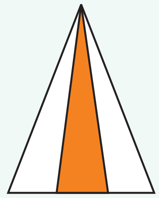
   a) $\frac{12}{15}$ b) $\frac{7}{9}$ c) $\frac{28}{14}$ d) $\frac{22}{09}$ e) $\frac{16}{14}$ f) $\frac{12}{19}$ g) $\frac{25}{25}$

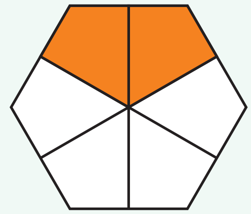
3. A ribbon is 4 meters long. It is cut into 8 equal pieces. How long is each piece?
4. **Guess the fraction?**
   a) I am a fraction with denominator 12. If my numerator is doubled, I become $\frac{8}{12}$. What was my original numerator?
   b) I am a fraction with denominator 9. My numerator is 5 more than 2. Who am I?
   c) I am a fraction with denominator 13. My numerator is a prime number more than 3 but less than 7. Who am I?
5. A cake is divided into 12 equal parts. If 9 parts are eaten, what fraction of the cake is remaining?
6. **Write the fraction representing the shaded portion:**

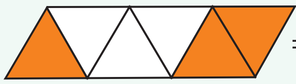
   a)  b)  c)  d)  e)  f) 

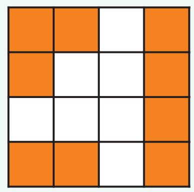
7. In a bag, there are 6 mangoes and 2 apples. What fraction of fruits are mangoes?
8. A class is sharing a bag of 30 marbles. If each student gets 9 marbles, What fraction of marbles did each student get?
9. **Fill the blank of following fractions representing shaded portion:**

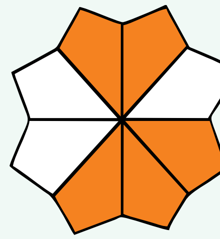
a)  $= \frac{3}{\square}$

b)  $= \frac{\square}{3}$

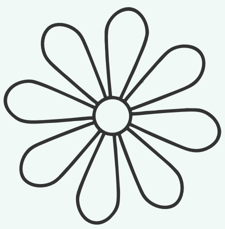
c)  $= \frac{\square}{5}$

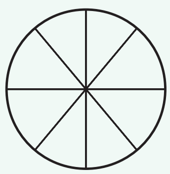
d)  $= \frac{3}{\square}$

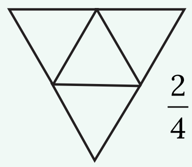
e)  $= \frac{\square}{16}$

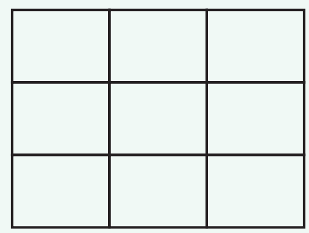
f)  $= \frac{5}{\square}$

10. **Shade according to the given fraction:**

a)  $\frac{3}{8}$

b)  $\frac{7}{8}$

c)  $\frac{2}{4}$

d)  $\frac{1}{9}$

Types of Fractions

Just like animals are classified into groups like mammals, reptiles, and birds, fractions also have different classifications based on the relationship between their numerator and denominator. Understanding these types—proper, improper, and mixed—is like learning the grammar of fractions. It helps us understand what a fraction's value represents (is it less than one whole, or more?) and is essential for performing calculations later.

Sub-concepts to be covered

1. **Proper Fraction:** A proper fraction is a fraction where the numerator (top number) is smaller than the denominator (bottom number). This means the value of the fraction is less than 1.

2. **Improper Fraction:** An improper fraction is a fraction where the numerator is greater than or equal to the denominator. This means the value of the fraction is equal to or greater than 1.

3. **Mixed Fraction:** A mixed fraction (or mixed number) is a combination of a whole number and a proper fraction. It is used to show numbers that are greater than 1.

4. **Equivalent Fractions:** Equivalent fractions are different fractions that represent the same amount or value. You can find equivalent fractions by multiplying or dividing both the numerator and denominator by the same number.

Mathematical Explanation

Proper Fractions

Think of these as "normal" parts of a single whole. If you have one pizza, any slice you take will be a proper fraction of it $\left(\text{e.g.,}\frac{1}{8},\frac{3}{8},\frac{7}{8}\right)$. The numerator is properly smaller than the denominator.

Examples: $\frac{2}{5},\frac{7}{10},\frac{1}{100}$.

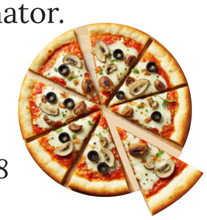


Fig. 7.8

Improper Fractions

These represent one whole, or more than one whole. If you have 9 slices of a pizza that was cut into 8 slices, you have $\frac{9}{8}$ of a pizza. This means you have one whole pizza $\left(\frac{8}{8}\right)$ and one extra slice $\left(\frac{1}{8}\right)$. The numerator is improperly larger than (or equal to) the denominator.

Examples: $\frac{9}{8},\frac{5}{3},\frac{7}{7}$. A fraction like $\frac{7}{7}$ is an improper fraction because it is equal to one whole.

$\frac{8}{8}$  $\frac{1}{8}$

Fig. 7.9

Mixed Fractions

This is a more intuitive way to write an improper fraction. Instead of saying you have $\frac{9}{8}$ of a pizza, you would say you have 1 and $\frac{1}{8}$ pizzas, written as $1\frac{1}{8}$. It's a "mix" of a whole number and a proper fraction.

Examples: $3\frac{1}{2},5\frac{2}{7},10\frac{1}{4}$.

Fig. 7.10

1 whole pizza *Each Slice represents $\frac{1}{8}$*

Conversion of Improper Fraction to Mixed Fraction

To convert an improper fraction into mixed fraction, just divide the numerator by the denominator.

For example: To convert $\frac{21}{4}$ into mixed fraction, we divide 21 by 4.

4) 21 (5
    -20
    1

So $\frac{21}{4}=5\frac{1}{4}$

Conversion of Mixed Fraction to Improper Fraction

Similarly, mixed fraction can be converted into improper fraction, by following the given steps:

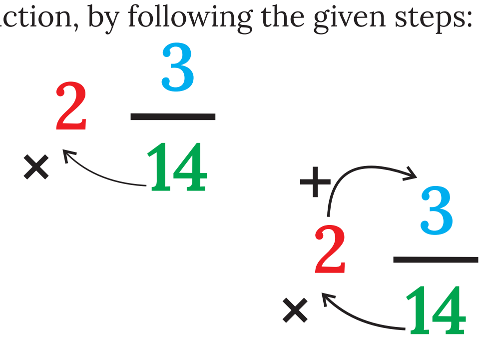
Step 1: Multiply the denominator by whole part.

$14 \times 2 = 28$

Step 2: Add the product and the numerator.

$28 + 3 = 31$

So, the improper fraction will be $\frac{31}{4}$.



Like Fractions

Like Fractions are fractions that have the same denominator.

Example: $\frac{2}{7}, \frac{4}{7}, \frac{6}{7}$ All have denominator 7, so they are like fractions.

Unlike Fractions

Unlike fractions are fractions that have different denominators.

Example: $\frac{2}{3}, \frac{5}{6}, \frac{7}{12}$ Here, the denominators (3, 6, 12) are different so they are unlike fractions.

Equivalent Fractions

Equivalent fractions are fractions that look different but represent the same value or portion of a whole.

Example: $\frac{1}{2} = \frac{2}{4} = \frac{3}{6}$

Fig. 7.11

All show an equal amount of pizza. So, these are equivalent fractions.

How to Find Equivalent Fractions

Method 1: Multiplying

Multiply both numerator and denominator by the same number.

For Example:

$\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}, \frac{2}{3} \times \frac{3}{3} = \frac{6}{9}, \frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$

So, $\frac{2}{3}, \frac{4}{6}, \frac{6}{9}$ and $\frac{8}{12}$, all are equivalent fractions.

Method 2: Dividing

Divide both numerator and denominator by the same number.

For Example:

$\frac{8}{12} \div \frac{4}{4} = \frac{2}{3}, \frac{8}{12} \div \frac{2}{2} = \frac{4}{6}$

So, $\frac{8}{12}, \frac{4}{6}, \frac{2}{3}$, all are equivalent fractions.

Example 6 : Which of the following fractions is a proper fraction?

a) $\frac{7}{8}$ b) $\frac{9}{7}$ c) $\frac{5}{5}$ d) $\frac{10}{3}$

Solution: a) $\frac{7}{8}$ – The numerator is smaller than the denominator, so it is a Proper Fraction.

b) $\frac{9}{7}$ – The numerator is larger than the denominator, so it is an Improper Fraction.

c) $\frac{5}{5}$ – The numerator is equal to denominator, so it is an Improper Fraction.

d) $\frac{10}{3}$ – The numerator is larger than the denominator, so it is an Improper Fraction.

The correct answer is a) $\frac{7}{8}$, which is a Proper Fraction.

Example 7 : Identify which of the following sets are like or unlike fractions.

a) $\frac{1}{7}, \frac{4}{7}, \frac{6}{7}, \frac{3}{7}$ b) $\frac{2}{3}, \frac{4}{5}, \frac{2}{5}, \frac{4}{3}$ c) $\frac{6}{9}, \frac{4}{8}, \frac{9}{11}, \frac{1}{20}$ d) $\frac{1}{9}, \frac{5}{9}, \frac{11}{9}, \frac{8}{9}$

Solution: a) Since, all fractions have same denominator, i.e., 7

$\frac{1}{7}, \frac{4}{7}, \frac{6}{7}, \frac{3}{7}$

So, these are like fractions.

b) Since, all fractions have different denominators, i.e., 3, 5, 5, 3

$\frac{2}{3}, \frac{4}{5}, \frac{2}{5}, \frac{4}{3}$

So, these are unlike fractions.

c) Since, all fractions have different denominators, i.e., 9, 8, 11, 20

$\frac{6}{9}, \frac{4}{8}, \frac{9}{11}, \frac{1}{20}$

So, these are unlike fractions.

d) Since, all fractions have same denominator, i.e., 9

$\frac{1}{9}, \frac{5}{9}, \frac{11}{9}, \frac{8}{9}$

So, these are like fractions.

Example 8 : Convert the mixed fraction $2\frac{3}{4}$ into an improper fraction.

Solution: To convert a mixed fraction into an improper fraction, multiply the whole number by the denominator and add the numerator. Then write the result over the denominator.

$$2\frac{3}{4} = \frac{(2 \times 4) + 3}{4}$$
$$= \frac{8+3}{4} = \frac{11}{4}$$

Example 9 : Find two equivalent fractions for $\frac{6}{8}$.

Solution: To find equivalent fractions, we can simplify by dividing both the numerator and the denominator by their greatest common divisor (GCD).

The GCD of 6 and 8 is 2.

$$\frac{6}{8} = \frac{6}{8} \div \frac{2}{2} = \frac{3}{4}$$

Another equivalent fraction can be found by multiplying both the numerator and denominator by 2:

$$\frac{6}{8} = \frac{6}{8} \times \frac{2}{2} = \frac{12}{16}$$

So, two equivalent fractions for

$\frac{6}{8}$ are $\frac{3}{4}$ and $\frac{12}{16}$.

Example 10 : Convert the improper fraction $\frac{13}{6}$ into a mixed fraction.

Solution: First, divide 13 by 6

$$\begin{array}{r} 6\overline{)\,13\,}(2 \\ -12 \\ \hline 1 \end{array}$$

Now, $\frac{13}{6}$ can be written as $2\frac{1}{6}$.

Example 11 : Simplify $\frac{12}{16}$ and check if it is equivalent to $\frac{3}{4}$.

Solution: To simplify $\frac{12}{16}$, divide both the numerator and denominator by their GCD (Greatest Common Divisor), which is 4:

$$\frac{12}{16} \div \frac{4}{4} = \frac{3}{4}$$

Since $\frac{12}{16}$ simplifies to $\frac{3}{4}$, the fractions are equivalent.

Example 12 : Simplify the fraction $\frac{24}{36}$ to its lowest terms.

Solution: **Method 1 (Step-by-step):**

Divide by 2: $\frac{24}{36} \rightarrow \frac{12}{18}$

Divide by 2 again: $\frac{12}{18} \rightarrow \frac{6}{9}$

Divide by 3: $\frac{6}{9} \rightarrow \frac{2}{3}$

Method 2 (Using GCD):

Find the factors of 24: 1, 2, 3, 4, 6, 8, 12, 24.

Find the factors of 36: 1, 2, 3, 4, 6, 9, 12, 18, 36.

The Greatest Common Divisor (GCD) is 12.

Divide both by 12: $\frac{24 \div 12}{36 \div 12} = \frac{2}{3}$

Knowledge Checkpoint

a) Is $\frac{12}{11}$ a proper or improper fraction? Why?

b) What are the two parts that make up a mixed fraction?

c) How would you write "three and five-sixths" as a mixed fraction?

Activity

Fraction Sorting

Objective: To help students identify and differentiate between Proper Fractions, Improper Fractions, and Mixed Fractions.

Materials: A set of cards with various fractions written on them $\left(\text{e.g,} \frac{2}{5}, \frac{8}{3}, 4\frac{1}{2}, \frac{1}{6}, \frac{10}{10}, \frac{12}{7} \text{etc.}\right)$.

Three labeled baskets/boxes or chart papers: "Proper Fractions," "Improper Fractions," "Mixed Fractions.

Instructions: Group Work: Divide the class into small groups.

- **Sorting Task:** Give each group a shuffled set of fraction cards.
  - Students sort the cards into three piles:
  - Proper Fractions (numerator < denominator)
  - Improper Fractions (numerator ≥ denominator)
  - Mixed Fractions (whole number + fraction)
- **Discussion:** Groups check and discuss why they placed each card in its pile.

Extension Challenge:

- Ask students to pick one improper fraction card and find its equivalent mixed fraction card $\left(\text{e.g.,} \frac{8}{3} \leftrightarrow 2\frac{2}{3}\right)$.
- Repeat with different numbers of students performing actions (e.g., raising a hand if they see an improper fraction, holding a book if it's a mixed fraction).

Class Reflection: End with a recap, reinforcing how the numerator and denominator determine the type of fraction.

Facts Flash

The ancient Romans did not have a good system for fractions and found them very difficult. They mostly used words to describe parts. We are lucky to have such a simple system today!

Do It Yourself

- Why do we need both improper fractions and mixed fractions if they can represent the same value?
- Think of a situation where using a mixed fraction (like $2\frac{1}{2}$ hours) is more natural than using an improper fraction (like $\frac{5}{2}$ hours). Now think of a situation (like a math calculation) where the improper fraction might be easier to use.

Key Terms

- **Proper Fraction:** A fraction with a numerator smaller than its denominator (value < 1).
- **Improper Fraction:** A fraction with a numerator greater than or equal to its denominator (value ≥ 1).
- **Mixed Fraction:** A number consisting of a whole number and a proper fraction.
- **Unit Fraction:** A fraction with a numerator of 1.

Mental Mathematics

- Convert to an improper fraction: $1\frac{1}{2}, 2\frac{1}{2}, 3\frac{1}{2}$.
- Convert to a mixed fraction: $\frac{3}{2}, \frac{5}{2}, \frac{7}{2}$.
- Is $\frac{5}{6}$ proper or improper?
- Is $\frac{6}{5}$ proper or improper?
- Is $1\frac{7}{8}$ a mixed, proper, or improper fraction?

Gap Analyzer™ Homework

Watch Remedial

Exercise 7.2

1. Identify the Proper, Improper, and unit fractions among the following.

a) $\frac{3}{5}$ b) $\frac{7}{3}$ c) $\frac{4}{4}$ d) $\frac{2}{7}$ e) $\frac{6}{8}$ f) $\frac{9}{10}$ g) $\frac{8}{3}$ i) $\frac{5}{5}$ j) $\frac{1}{4}$ k) $\frac{12}{15}$

2. Express the following as mixed fraction;

a) $\frac{15}{4}$ b) $\frac{22}{7}$ c) $\frac{18}{5}$ d) $\frac{9}{2}$ e) $\frac{14}{3}$ f) $\frac{23}{6}$

3. Express the following as improper fraction;

a) $1\frac{3}{5}$ b) $2\frac{2}{7}$ c) $3\frac{1}{4}$ d) $4\frac{3}{8}$ e) $5\frac{5}{6}$ f) $6\frac{7}{9}$

4. Which of the following group of fractions are like and which are unlike?

a) $\frac{3}{5}, \frac{6}{10}, \frac{9}{15}, \frac{12}{20}$ b) $\frac{2}{4}, \frac{3}{5}, \frac{4}{8}, \frac{5}{10}$ c) $\frac{11}{7}, \frac{4}{7}, \frac{9}{7}, \frac{2}{7}$ d) $\frac{3}{5}, \frac{7}{3}, \frac{4}{4}, \frac{2}{7}, \frac{6}{8}$ e) $\frac{13}{29}, \frac{27}{29}, \frac{4}{29}, \frac{10}{29}$

5. True/False questions in one line:

a) A proper fraction has a numerator greater than its denominator.

b) $\frac{4}{3}$ is an improper fraction.

c) $\frac{1}{2}$ and 36 are equivalent fractions.

d) $\frac{5}{5}$ is a proper fraction.

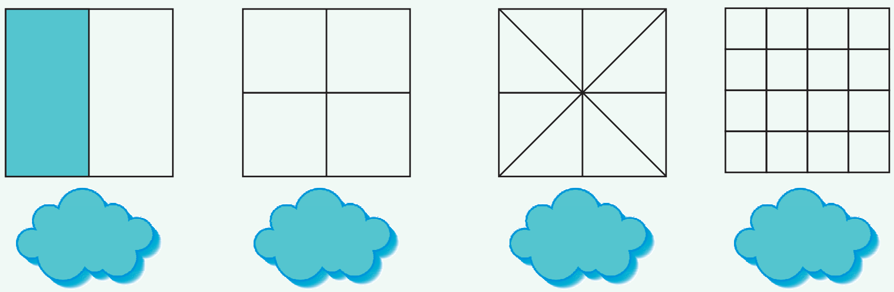
e) $\frac{6}{8}$ is in its simplest form.

6. Identify whether the following are proper, improper or mixed fractions.

Fractions	Proper	Improper	Mixed
$\frac{12}{8}$			

$\frac{4}{9}$			
$3\frac{3}{37}$			
$\frac{8}{19}$			
$11\frac{8}{13}$			

7. **Color the following such that all are equivalent fractions. Write the fraction denoted by each in the cloud given below:**



8. Convert the fraction $\frac{7}{9}$ to an equivalent fraction with a denominator of 27.

9. Find the equivalent fraction for $\frac{13}{26}$ with the smallest possible denominator.

10. **Anika and her brother Vikram each get an identical bar of chocolate.**
    - Anika bar is divided into 4 large, equal squares. She eats 2 of the squares.
    - Vikram's bar is divided into 8 small, equal squares. He eats 4 of the squares.

    a) Write the fraction of chocolate Anika ate.

    b) Write the fraction of chocolate Vikram ate.

    c) Draw a picture of both chocolate bars. Based on your drawing, did they eat the same amount of chocolate? What does this tell you about both the fractions?

Measuring and Marking of Fractions

In mathematics, measurement is the process of determining the size, length, weight, or amount of something. Often, measurements are not always whole numbers, especially when dealing with smaller parts of a unit. This is where fractional units come in handy.

In this concept, you'll learn how to mark fractional lengths on a number line. A number line is a straight line with numbers placed in order along it. It's a useful tool for visualizing numbers, including fractions.

Sub-concept to be covered

1. Measuring Using Fractional Units
2. Marking Fraction Lengths on the Number Line
3. Mixed Fraction (Converting)

Mathematical Explanation

Measuring Using Fractional Units

Fractional units represent a part of a whole. For example, if we divide a whole unit into equal parts, each part can be represented as a fraction. Fractions are written as one number over another, like this: $\frac{1}{2}, \frac{3}{4}$, or $\frac{5}{10}$. In this lesson, you will learn how to measure things using fractional units in different contexts.

Key Concepts

1. **Understanding Fractions:**
   - A fraction has two parts: the numerator (the top number) and the denominator (the bottom number).
   - The numerator tells you how many parts you have, and the denominator tells you how many equal parts the whole is divided into.

2. **Measuring Length Using Fractional Units:**
   - Sometimes, when measuring lengths, we use fractions of a unit. For example, a ruler can be marked with fractions of an inch or a centimeter. If a line is between $\frac{1}{2}$ and 1 inch, you would say the length is $\frac{3}{4}$ of an inch, depending on its exact position.

3. **Measuring Mass/Weight Using Fractional Units:**
   - When weighing objects, fractional units are also used. If you weigh fruits and vegetables, for example, you might see measurements like $\frac{1}{2}$ kilogram or $\frac{3}{4}$ pound.

4. **Measuring Capacity Using Fractional Units:**

- When measuring liquid amounts, you can use fractional units. For example, you might measure $\frac{1}{4}$ liter of water, or $\frac{3}{4}$ cup of flour.

Marking Fraction Lengths on the Number Line

A number line is like a ruler for numbers. It's not just for whole numbers like 0, 1, 2, 3. We can find a precise spot for every single fraction, no matter how complicated it looks. Placing fractions on a number line helps us visualize their value and easily see which fractions are bigger or smaller.

- **Representing Proper Fractions:** Since proper fractions are less than 1, they are always found in the segment between 0 and 1. To mark a proper fraction like $\frac{3}{5}$, we divide the segment from 0 to 1 into 5 equal parts (the denominator) and count 3 parts from 0 (the numerator).

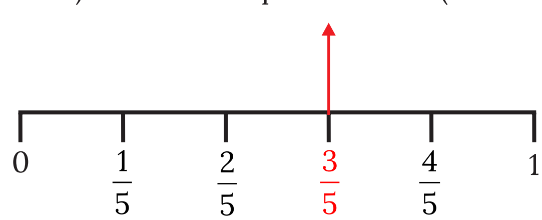


Fig. 7.12

- **Representing Improper/Mixed Fractions:** Since these fractions are greater than 1, they are found to the right of 1 on the number line. To mark an improper fraction like $\frac{7}{4}$, we can think of it as the mixed fraction $1\frac{3}{4}$. This means we go to the whole number 1, and then move $\frac{3}{4}$ of the way towards 2. We do this by dividing the segment between 1 and 2 into 4 equal parts and picking the 3rd mark.

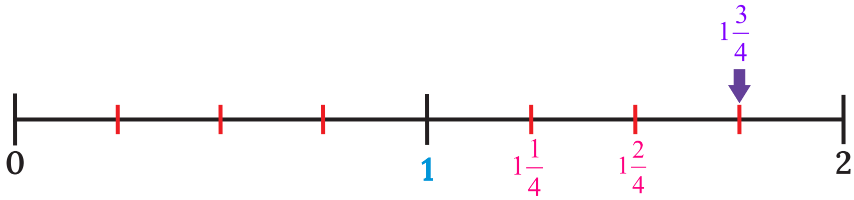


Fig. 7.13

Steps to Mark Fractions on a Number Line

1. **Draw a Number Line**
   - Start by drawing a horizontal line and labeling at least two whole numbers. For example, you might mark 0 and 1 on the line.

2. **Divide the Segment Between Two Whole Numbers**
   - To mark a fraction, you need to divide the segment between two whole numbers into equal parts. The number of parts depends on the denominator of the fraction.
   - For example, if you're marking $\frac{1}{2}$, divide the space between 0 and 1 into 2 equal parts.
   - For $\frac{1}{4}$, divide the space between 0 and 1 into 4 equal parts.

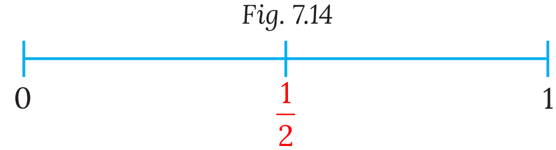
3. **Label the Fractions**
   - After dividing the segment into equal parts, label each point where the parts meet.
   - For $\frac{1}{2}$, you would label the first mark between 0 and 1 as $\frac{1}{2}$.
   - For $\frac{1}{4}$, you would label the first mark as $\frac{1}{4}$, the second mark as $\frac{2}{4}$ (or $\frac{1}{2}$), and so on.

4. **Mark Other Fractions**
   - If you need to mark fractions greater than 1, extend the number line beyond 1. For example, for $\frac{3}{4}$, you would divide the segment between 0 and 1 into 4 equal parts, and count three parts from 0.

Representing proper fractions on the number line.

Example: Marking $\frac{1}{2}, \frac{1}{4}$, and $\frac{3}{2}$ on a Number Line

Fig. 7.14



1. **Marking $\frac{1}{2}$:**
   Draw a number line from 0 to 1.
   Divide the space between 0 and 1 into 2 equal parts.
   Label the point halfway between 0 and 1 as.

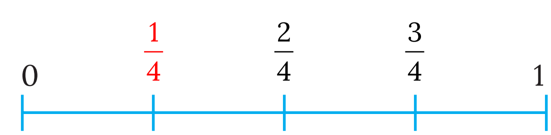


Fig. 7.15

2. **Marking $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}$:**
   Draw a number line from 0 to 1.
   Divide the space between 0 and 1 into 4 equal parts.
   Label the points as $\frac{1}{4}, \frac{2}{4}$ (or $\frac{1}{2}$), and $\frac{3}{4}$.

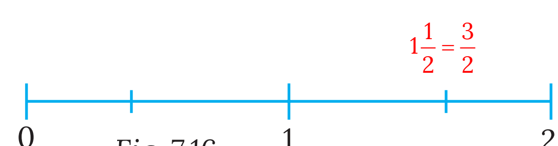


Fig. 7.16

3. **Marking $\frac{3}{2}$:**
   Extend the number line beyond 1.

Divide the space between 1 and 2 into 2 equal parts.

Label the first point as $\frac{1}{2}$ and the second point as $\frac{3}{2}$.

Example 13 : Mark $\frac{1}{2}, \frac{2}{3}$ and $\frac{3}{4}$ on number lines.

Solution: Draw a number line from 0 to 1.

Marking $\frac{1}{2}$: Divide the space between 0 and 1 into 2 equal parts. The first mark is at $\frac{1}{2}$.

Marking $\frac{2}{3}$: Divide the space between 0 and 1 into 3 equal parts. The second mark is at $\frac{2}{3}$.

Marking $\frac{3}{4}$: Divide the space between 0 and 1 into 4 equal parts. The third mark is at $\frac{3}{4}$.

Your number lines should look like this:

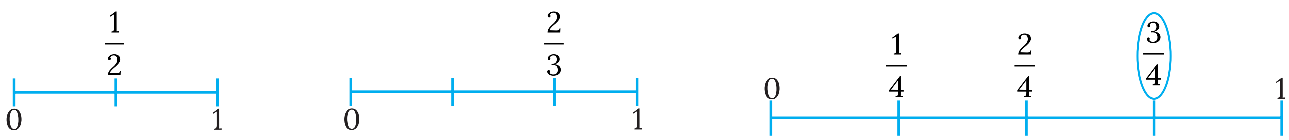


Fig. 7.17

Example 14 : Place $\frac{5}{6}$ and $\frac{7}{8}$ on the number line between 0 and 1.

Solution: **Marking** $\frac{5}{6}$: Divide the space between 0 and 1 into 6 equal parts. The fifth mark will be at $\frac{5}{6}$.

Marking $\frac{7}{8}$: Divide the space between 0 and 1 into 8 equal parts. The seventh mark will be at $\frac{7}{8}$.

Your number line should look like this:

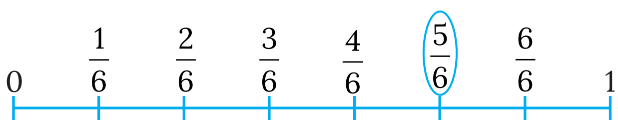
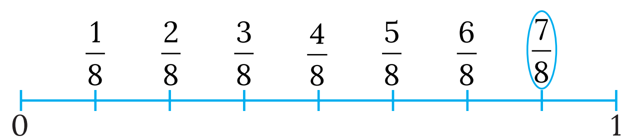


Fig. 7.18



Example 15 : A frog is sitting at 0 on a number line. Each jump it makes is exactly $\frac{1}{4}$ unit long. At which fraction will the frog land after 6 jumps?

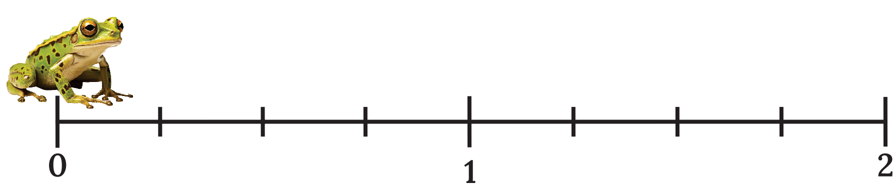


Fig. 7.19

Solution: Frog is taking jumps exactly $\frac{1}{4}$ long.

Number line is divided into 4 equal parts for each unit. (Denominator = 4)

After 6 jumps, he will be at $\frac{6}{4}$ which is equivalent to $\frac{3}{2}$ or $1\frac{1}{2}$.

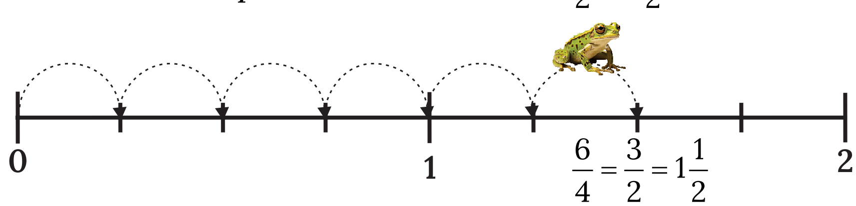


Fig. 7.20

Knowledge Checkpoint

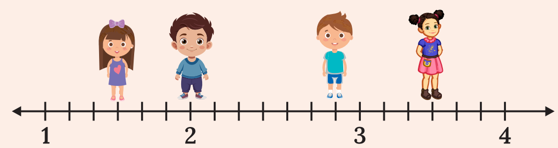
a) To mark the fraction $\frac{7}{10}$ on a number line, how many equal parts should the segment from 0 to 1 be divided into?

b) Is the fraction $\frac{11}{9}$ located to the left or right of 1 on the number line?

c) What whole number is the fraction $\frac{12}{4}$ equal to?

Activity

Human Number Line



Objective: To encourage students understand how fractions are placed on a number line.

Materials: Large cards with different fractions written on them $\left(e.g. \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, \frac{5}{4}, \frac{3}{2}, 2\right)$. A long rope, chalk line, or tape on the floor to represent the number line, markers to label 0, 1, and 2 clearly on the line.

Instructions: Lay a rope/chalk line on the classroom floor and mark **0, 1, and 2**.

- Shuffle the fraction cards and give one to each student.
- Ask students to **stand on the number line** at the correct position for their fraction, relative to others.
- Encourage them to discuss and adjust their positions by comparing values.

Facts Flash

The number line can be extended infinitely in both positive and negative directions! The fractions you are learning now all live on the positive side. Later, you will meet their negative counterparts like $\frac{1}{2}$.

Do It Yourself

- I am a fraction. I am halfway between $\frac{1}{3}$ and $\frac{2}{3}$ on the number line. What fraction am I? (Hint: Think about equivalent fractions).
- Can you find a fraction between $\frac{1}{100}$ and $\frac{2}{100}$? How many can you find? This suggests something amazing about how "crowded" the number line is with fractions!

Key Terms

- **Number Line:** A line on which numbers are marked at intervals, used to illustrate simple numerical operations.
- **Segment:** A part of a line that is bounded by two distinct end points.
- **Interval:** The space between two points on a line.

Mental Mathematics

- Visualize a number line. Is $\frac{1}{5}$ closer to 0 or 1?
- Is $\frac{7}{8}$ closer to 0 or 1?
- Which is greater, $\frac{1}{2}$ or $\frac{1}{4}$? (Think about their positions on the number line).
- What whole number is $\frac{10}{2}$ on the number line?
- Is $\frac{3}{2}$ greater or less than 1?

Gap Analyzer™ Homework

Watch Remedial

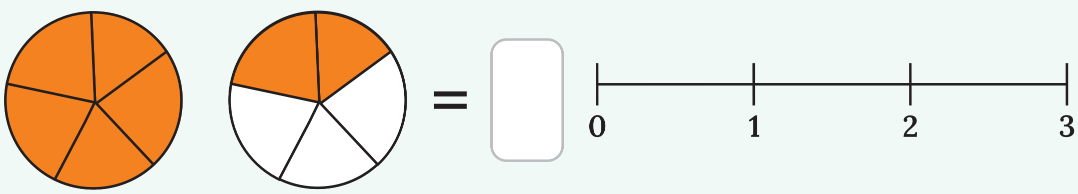
Exercise 7.3

1. Mark the following fractions on a number line:

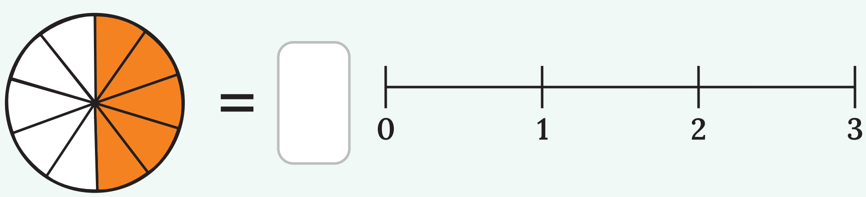
a) $\frac{1}{4}$ b) $\frac{1}{2}$ c) $\frac{3}{4}$ d) $\frac{5}{6}$ e) $\frac{7}{8}$ f) $\frac{7}{4}$ g) $\frac{3}{6}$ h) $\frac{10}{4}$

2. Identify the fraction and mark it on the number line.

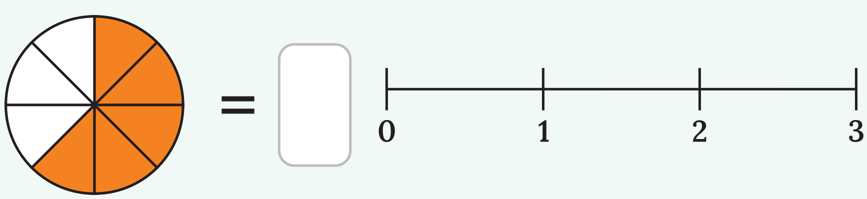
a)



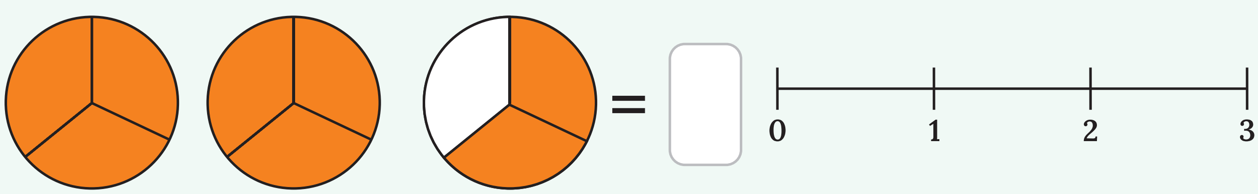
b)



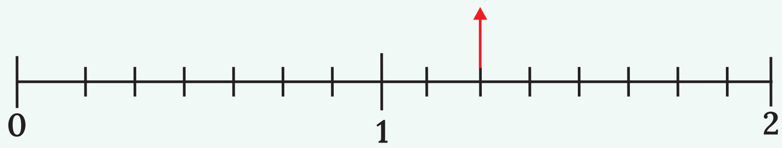
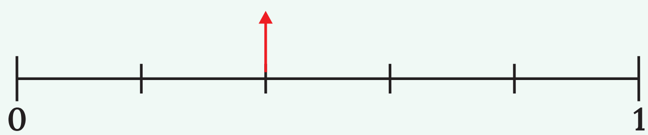
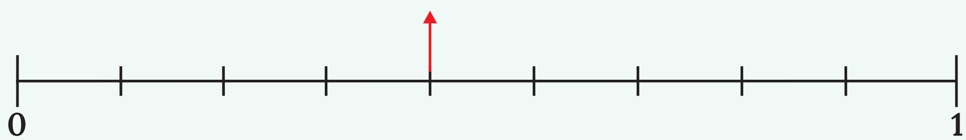
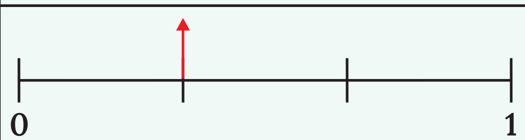
c)



d)

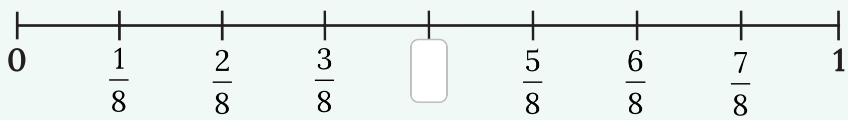


3. Match the following fractions with their representation on number line.

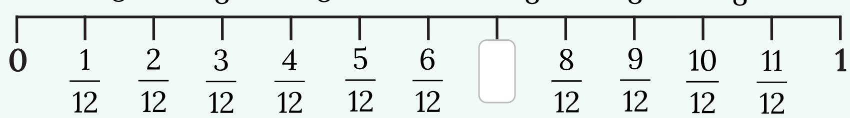
Fractions	Representation on number line
$\frac{2}{5}$	
$\frac{1}{3}$	
$1\frac{2}{7}$	
$\frac{4}{9}$	

4. Write the missing fractions on the number line.

a)



b)

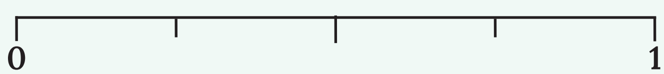


c)

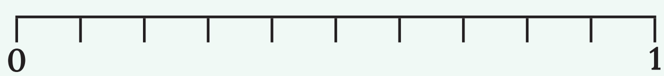
5. Draw a number line from 0 to 2 and mark $1\frac{1}{4}$ and $1\frac{3}{4}$ on it.

6. Which of the following is equivalent to $\frac{1}{2}$. Circle on the number line.

a)



b)



Comparing and Ordering Fractions

Comparing fractions means determining if one fraction is greater than (>), less than (<), or equal to (=) another. Ordering fractions means arranging a set of three or more fractions in a sequence, typically from least to greatest (ascending order) or greatest to least (descending order). The method we use depends on whether the fractions have the same denominator (like fractions) or different denominators (unlike fractions).

Sub-concepts to be covered

1. **Comparing Like Fractions:** Fractions with the same denominator. The one with the larger numerator is the larger fraction.

2. **Comparing Unlike Fractions:**
    - **Method 1: Finding a Common Denominator (LCM Method):** Convert the fractions into equivalent fractions with the same denominator (the LCM of the original denominators), then compare the numerators.
    - **Method 2: Cross-Multiplication:** A shortcut for comparing two unlike fractions.
3. **Ordering Fractions:** Applying comparison methods to arrange a list of fractions in ascending or descending order.

Mathematical Explanation

Comparing Like Fractions

This is the easiest case. If the denominators are the same, the whole is cut into same-sized pieces. So, the fraction with more pieces (larger numerator) is bigger.

Example: Compare $\frac{5}{9}$ and $\frac{7}{9}$. Since both are ninths, 7 pieces are more than 5 pieces. Therefore, $\frac{5}{9} < \frac{7}{9}$.

Comparing Unlike Fractions

Method 1: Finding a Common Denominator (LCM Method): This is the most reliable method. To compare $\frac{2}{3}$ and $\frac{3}{4}$:

Step 1: Find the LCM of the denominators (3 and 4). The LCM is 12.

Step 2: Convert each fraction to an equivalent fraction with a denominator of 12.

$$\frac{2}{3} = \frac{2\times4}{3\times4} = \frac{8}{12}$$

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

Step 3: Now compare the like fractions $\frac{8}{12}$ and $\frac{9}{12}$. Since 8 < 9, we have $\frac{8}{12} < \frac{9}{12}$.

Conclusion: Therefore, $\frac{2}{3} < \frac{3}{4}$.

Method 2: Method Cross-Multiplication

If the fractions have different denominators, you can use cross-multiplication to compare them.

Step 1: Multiply the numerator of the first fraction by the denominator of the second fraction.
Step 2: Multiply the numerator of the second fraction by the denominator of the first fraction.
Step 3: Compare the results of the cross-multiplication.

Example: Compare $\frac{3}{4}$ and $\frac{5}{6}$

Cross-multiply:
$3 \times 6 = 18$
$4 \times 5 = 20$
Since 18 < 20, $\frac{3}{4}$ is smaller than $\frac{5}{6}$.

Example 16 : Compare $\frac{5}{8}$ and $\frac{3}{5}$ using cross-multiplication.

Solution: **Cross-multiply:**

$5 \times 5 = 25$
$8 \times 3 = 24$

Since $25 > 24$, $-$ is greater than $\frac{3}{5}$.

Example 17 : Which fraction is smaller: $\frac{5}{7}$ or $\frac{3}{4}$?

Solution: To compare $\frac{5}{7}$ and $\frac{3}{4}$, find the LCD of 7 and 4, which is 28.

Convert each fraction to have a denominator of 28:

$\frac{5}{7} = \frac{20}{28}$ (multiply by 4)

$\frac{3}{4} = \frac{21}{28}$ (multiply by 7)

Now, compare the numerators: $\frac{20}{28}$ and $\frac{21}{28}$. Since $20 < 21$, $\frac{5}{7}$, is smaller than $\frac{3}{4}$.

$\frac{5}{7}$ is smaller than $\frac{3}{4}$.

When numerators are same with different denominators, compare only the denominators. Fractions with smaller denominator will be greater, whereas fraction with greater denominator will be smaller.

For example: Comparing fractions $\frac{2}{3}$ and $\frac{2}{5}$.

Here, Numerators are same, so comparing denominators: $3 < 5$

So, $\frac{2}{3} > \frac{2}{5}$

Example 18 : Compare $\frac{6}{13}$ and $\frac{6}{25}$

Solution: Numerators are same, so comparing denominators

$13 < 29$

So, $\frac{6}{13} > \frac{6}{25}$

Ordering Fractions

Ordering fractions means arranging them from the smallest to the largest or vice versa.

Method 1: Converting to Like Denominators

To order fractions, convert them to have the same denominator and then compare their numerators.

To order $\frac{1}{2}, \frac{5}{8}$ and $\frac{3}{4}$:

- Find the LCM of 2, 8, and 4, which is 8.
- Convert: $\frac{1}{2} = \frac{4}{8}$; $\frac{5}{8}$ stays $\frac{5}{8}$; $\frac{3}{4} = \frac{6}{8}$.
- Compare numerators: $4 < 5 < 6$.

- The order is: $\frac{4}{8}, \frac{5}{8}, \frac{6}{8}$.
- So, the original fractions in ascending order are: $\frac{1}{2}, \frac{5}{8}, \frac{3}{4}$.

Let us see one more example: To order $\frac{2}{3}, \frac{1}{2}$ and $\frac{3}{4}$

Convert each fraction to have a denominator of 12:

- $\frac{2}{3} = \frac{8}{12}$
- $\frac{1}{2} = \frac{6}{12}$
- $\frac{3}{4} = \frac{9}{12}$

Now compare the numerators: $\frac{6}{12}, \frac{8}{12}, \frac{9}{12}$.

Order from smallest to largest: $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$.

Method 2: Using Decimal Conversion

You can also convert fractions into decimals and then compare them.

- $\frac{2}{5} = 0.4$
- $\frac{3}{4} = 0.75$
- $\frac{5}{8} = 0.625$

Order: $\frac{2}{5} < \frac{5}{8} < \frac{3}{4}$

Example 19 : Order $\frac{2}{3}, \frac{5}{6}$ and $\frac{4}{5}$ from smallest to largest.

Solution: Convert each fraction to have a denominator of 30:

- $\frac{2}{3} = \frac{20}{30}$
- $\frac{5}{6} = \frac{25}{30}$
- $\frac{4}{5} = \frac{24}{30}$

Now compare the numerators: $\frac{20}{30}, \frac{24}{30}, \frac{25}{30}$.

Order: $\frac{2}{3}, \frac{4}{5}, \frac{5}{6}$.

Example 20 : Order the following fractions from largest to smallest: $\frac{1}{2}, \frac{3}{4}, \frac{2}{3}$

Solution: First, find the least common denominator (LCD) of 2, 3, and 4, which is 12.

Convert each fraction to have a denominator of 12:

- $\frac{1}{2}=\frac{6}{12}$
- $\frac{2}{3}\quad\frac{8}{12}$
- $\frac{3}{4}=\frac{9}{12}$

Now, order the fractions by comparing the numerators: $\frac{9}{12},\frac{8}{12},\frac{6}{12}$.

From largest to smallest: $\frac{3}{4},\frac{2}{3},\frac{1}{2}$.

The fractions in order are: $\frac{3}{4},\frac{2}{3},\frac{1}{2}$.

Example 21 : Arrange the following fractions in ascending order: $\frac{3}{5},\frac{5}{10},\frac{2}{3}$.

Solution: Find the least common denominator (LCD) of 5, 10, and 3, which is 30.

Convert each fraction to have a denominator of 30:

- $\frac{3}{5}=\frac{18}{30}$ (multiply by 6)
- $\frac{7}{10}=\frac{21}{30}$ (multiply by 3)
- $\frac{2}{3}=\frac{20}{30}$ (multiply by 10)

Now, order the fractions by comparing the numerators: $\frac{18}{30},\frac{20}{30},\frac{21}{30}$.

From smallest to largest: $\frac{3}{5},\frac{2}{3},\frac{7}{10}$.

The fractions in ascending order are: $\frac{3}{5},\frac{2}{3},\frac{7}{10}$.

Example 22 : Riya and Aarav each have a chocolate bar. Riya divides her bar into three equal parts and eats one piece. Aarav divides his bar into six equal parts and eats two pieces. Who ate more of their chocolate bar?

Solution: Riya ate 1 part out of 3 equal parts.

So, fraction = $\frac{1}{3}$

Aarav ate 2 parts out of 6 equal parts.

So, fraction = $\frac{2}{6}$

Comparing using cross multiplication method: $\frac{1}{3}$ and $\frac{2}{6}$

$1 \times 6 = 6$

$3 \times 2 = 6$

Since, 6 = 6

So, $\frac{1}{3}=\frac{2}{6}$

Both ate same amount of chocolates.

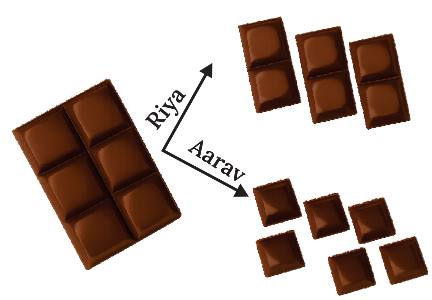


Fig. 7.21

Knowledge Checkpoint

a) Which is smaller: $\frac{4}{9}$ or $\frac{5}{12}$?

b) Put these in ascending order: $\frac{3}{5}, \frac{3}{8}, \frac{3}{4}$.

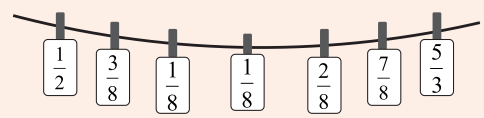
c) Is $\frac{6}{10}$ greater than $\frac{3}{5}$?

Key Terms

- **Like Fractions:** Fractions with the same denominator.
- **Unlike Fractions:** Fractions with different denominators.
- **Least Common Multiple (LCM):** The smallest number that is a multiple of two or more numbers.
- **Ascending Order:** Arranged from smallest to largest.
- **Descending Order:** Arranged from greatest to smallest.

Activity

Fraction Clothesline



- **Objective:** To physically order fractions on a number line.
- **Materials:** A long piece of string (the clothesline), paper clips, and cards with various fractions written on them $\left(e.g., \frac{1}{2}, \frac{3}{4}, \frac{1}{8}, \frac{5}{4}, \frac{2}{3}, \frac{7}{8}, \frac{1}{3}\right)$.
- **Steps:**
    - ♦ Stretch the string across the classroom. Mark the left end as '0', the middle as '1', and the right end as '2'.
    - ♦ Give a small group of students a set of fraction cards.
    - ♦ Their task is to discuss and decide where each fraction should be placed on the number line.
    - ♦ They use paper clips to hang their fraction cards on the string in the correct order.
    - ♦ The class can then review and discuss the placement.

Facts Flash

- When comparing two unit fractions (numerator is 1), the one with the smaller denominator is always the larger fraction! For example, $\frac{1}{2}$ is much bigger than $\frac{1}{100}$.
- The cross-multiplication method is sometimes called the "**butterfly method**" because when you draw the loops for multiplication, it can look like a butterfly's wings.

Do It Yourself

If you have a set of fractions that all have the same numerator, like $\frac{3}{4}, \frac{3}{5}, \frac{3}{7}, \frac{3}{10}$, what is the rule for ordering them? Is it easier or harder than ordering fractions with the same denominator? Why?

Mental Mathematics

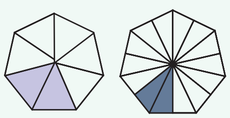
- **Strategy:** Comparing to Benchmarks $\left(0, \frac{1}{2}, 1\right)$.
  - To compare $\frac{2}{9}$ and $\frac{7}{8}$: $\frac{2}{9}$ is close to 0. $\frac{7}{8}$ is very close to 1. So $\frac{7}{8}$ is much bigger.
  - To compare $\frac{3}{7}$ and $\frac{5}{9}$: Think about $\frac{1}{2}$. Half of 7 is 3.5, so $\frac{3}{7}$ is slightly less than $\frac{1}{2}$. Half of 9 is 4.5, so $\frac{5}{9}$ is slightly more than $\frac{1}{2}$. So $\frac{5}{9}$ is bigger.
- **Practice:** Using this method compare: a) $\frac{1}{6}$ and $\frac{5}{8}$ b) $\frac{3}{5}$ and $\frac{8}{15}$

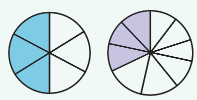
Gap Analyzer™ Homework

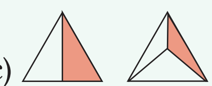
Watch Remedial

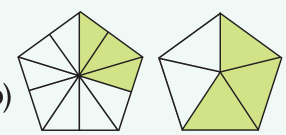
Exercise 7.4

1. Write the fraction denoted by the figures and cross out the greatest fraction.

a) 

b) 

c) 

b) 

2. Arrange the following fractions in ascending order:

a) $\frac{5}{9}, \frac{4}{7}, \frac{9}{12}$ b) $\frac{4}{7}, \frac{1}{2}, \frac{4}{6}$ c) $\frac{2}{3}, \frac{5}{9}, \frac{7}{10}$ d) $\frac{3}{5}, \frac{7}{8}, \frac{9}{12}$

e) $\frac{5}{6}, \frac{3}{5}, \frac{2}{3}$ f) $\frac{1}{2}, \frac{4}{7}, \frac{3}{8}$ g) $\frac{5}{9}, \frac{6}{10}, \frac{7}{12}$ h) $\frac{2}{5}, \frac{7}{9}, \frac{3}{8}$

3. Arrange the following fractions in descending order:

a) $\frac{3}{5}, \frac{7}{10}, \frac{4}{9}$ b) $\frac{5}{8}, \frac{2}{3}, \frac{7}{12}$ c) $\frac{1}{2}, \frac{3}{7}, \frac{5}{9}$ d) $\frac{3}{4}, \frac{2}{5}, \frac{7}{8}$

e) $\frac{4}{7}, \frac{1}{2}, \frac{5}{6}$ f) $\frac{2}{3}, \frac{5}{8}, \frac{3}{5}$ g) $\frac{6}{10}, \frac{7}{12}, \frac{3}{4}$ h) $\frac{8}{9}, \frac{5}{6}, \frac{4}{5}$

4. Compare two fractions and determine which is greater:

a) $\frac{2}{10}$ or $\frac{3}{5}$ b) $\frac{5}{8}$ or $\frac{3}{4}$ c) $\frac{2}{3}$ or $\frac{5}{9}$ d) $\frac{4}{7}$ or $\frac{6}{10}$

e) $\frac{9}{12}$ or $\frac{7}{8}$ f) $\frac{3}{5}$ or $\frac{2}{4}$ g) $\frac{5}{6}$ or $\frac{4}{7}$ h) $\frac{8}{9}$ or $\frac{7}{10}$

5. Using the symbols <, >, and = for comparing fractions:

a) $\frac{3}{5}$ .... $\frac{4}{7}$ b) $\frac{5}{6}$ .... $\frac{7}{8}$ c) $\frac{2}{3}$ .... $\frac{3}{4}$

d) $\frac{1}{2}$ .... $\frac{2}{5}$ e) $\frac{7}{10}$ .... $\frac{5}{8}$ f) $\frac{3}{6}$ .... $\frac{1}{2}$

6. Neha, Karan, and Ritu shared a 1-liter bottle of water. Neha drank $\frac{2}{5}$ liter, Karan drank $\frac{3}{10}$ liter, and Ritu drank $\frac{1}{2}$ liter. Arrange the amounts of water they drank in order from least to greatest.

7. Write the following fractions on the number line and then compare them and arrange in descending order.

$\frac{1}{2}, \frac{3}{4}, \frac{4}{5}, \frac{2}{5}, \frac{2}{4}$

8. On Monday, Arjun read $\frac{10}{7}$ of his book. On Tuesday, he read $\frac{10}{9}$ of the book. On which day did Arjun read more pages?

9. **You and your cousin are sharing two identical medium-sized pizzas.**
   - Your pizza is cut into 6 large, equal slices. You eat 1 slice.
   - our cousin's pizza is cut into 8 smaller, equal slices. They eat 1 slice.

   a) Write the fraction of the pizza you ate and the fraction your cousin ate.

   b) Without doing any calculations, and by just thinking about the size of the slices, who ate more pizza?

   c) What does this tell you about comparing fractions when the numerators are the same, but the denominators are different?

Addition and Subtraction of Fractions

Now that we know how to identify, compare, and order fractions, it's time to start calculating with them!

This section is all about addition and subtraction. What happens when you combine $\frac{1}{4}$ of a cup of milk with $\frac{3}{4}$ of a cup? What if you have $\frac{1}{2}$ of a pizza and you eat $\frac{1}{8}$ of it? Learning how to add and subtract fractions is a key skill for solving countless real-world problems, from adjusting a recipe to calculating distances.

Adding and subtracting fractions is like combining or taking away parts of a whole. The most important rule is that you can only add or subtract fractions if they are of the same kind—that is, if they have the same denominator. If they don't, we must first make them the same by finding equivalent fractions. Once the denominators are the same, the process is simple: we just add or subtract the numerators.

Sub-concepts to be covered

1. **Addition and Subtraction of Like Fractions:** Add or subtract the numerators and keep the common denominator.
2. **Addition and Subtraction of Unlike Fractions:** Find the LCM of the denominators, convert to equivalent like fractions, then add or subtract the numerators.
3. **Addition and Subtraction involving Mixed Fractions:** Convert the mixed fractions to improper fractions first, then follow the rules for adding or subtracting unlike fractions.

Mathematical Explanation

Addition of Like Fractions (Fractions with the Same Denominator)

When we have to add fractions with the same denominator, such as $\frac{3}{7}$ and $\frac{2}{7}$, the process becomes straightforward. The general steps to follow for adding like fractions are:

Step 1: Identify the given like fractions.

Step 2: Add the numerators of the fractions.

Step 3: The denominator remains the same, and we write the sum of the numerators over the common denominator.

For example, $\frac{3}{7}+\frac{2}{7}=\frac{5}{7}$

It can be seen clearly through diagram as well:

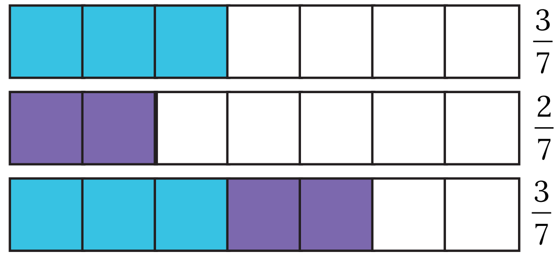


Fig. 7.22

Subtraction of Like Fractions (Fractions with the Same Denominator)

When we have two fractions with the same denominator, we can subtract them easily. For example, if we have the fractions $\frac{2}{6}$ and $\frac{4}{6}$, and we want to subtract $\frac{2}{6}$ from $\frac{4}{6}$, we follow these steps:

Step 1: Identify the two fractions you need to subtract.

Step 2: Subtract the numerators (the top numbers) while keeping the denominator (the bottom number) the same.

Step 3: Write the new fraction with the result from step 2 as the numerator and the common denominator as the denominator.

For example: $\frac{4}{6}-\frac{2}{6}=\frac{4-2}{6}=\frac{2}{6}$.

It can be seen clearly through diagram as well:

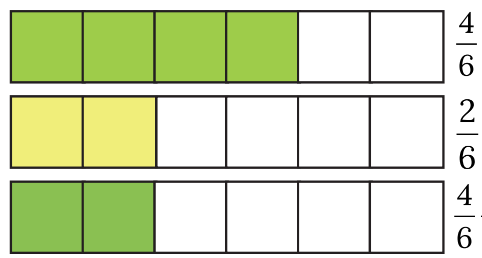


Fig. 7.23

Example 23 : Subtract $\frac{3}{8}$ from $\frac{7}{8}$

Solution: Since the denominators are the same (8), we subtract the numerators:

$$\frac{7}{8}-\frac{3}{8}=7-\frac{3}{8}=\frac{4}{8}$$

Simplify $\frac{4}{8}$

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

Subtraction of Unlike Fractions (Fractions with Different Denominators)

When the fractions have different denominators, we need to make the denominators the same before we can subtract. Here's how:

Step 1: Identify the fractions you need to subtract.

Step 2: Find the Least Common Multiple (LCM) of the denominators.

Step 3: Convert each fraction to an equivalent fraction with the common denominator found in step 2.

Step 4: Once the fractions have the same denominator, subtract the numerators (the top numbers) and keep the common denominator.

Example: To subtract $\frac{1}{4}$ and $\frac{1}{6}$, we first find the LCM of 4 and 6, which is 12. We then convert the fractions: $\frac{1}{4}=\frac{3}{12}$ and $\frac{1}{6}=\frac{2}{12}$.

Now, subtract: $\frac{3}{12}-\frac{2}{12}=\frac{1}{12}$.

Example 24 : Subtract $\frac{2}{5}$ from $\frac{3}{4}$.

Solution: First, find the LCM of 5 and 4, which is 20.

Now, convert both fractions to have a denominator of 20: $\frac{3}{4}=\frac{15}{20}$ and $\frac{2}{5}=\frac{8}{20}$

Now subtract the numerators: $\frac{15}{20}-\frac{8}{20}=\frac{15-8}{20}=\frac{7}{20}$

Example 25 : Subtract $\frac{7}{18}$ from $\frac{5}{12}$.

Solution: First, find the LCM of 12 and 18, which is 36.

Convert both fractions to have a denominator of 36:

$\frac{7}{18}=\frac{14}{36}$ and $\frac{5}{12}=\frac{15}{36}$

Now subtract the numerators: $\frac{15}{36}-\frac{14}{36}=\frac{15-14}{36}=\frac{1}{36}$

Knowledge Checkpoint

a) What is $\frac{2}{7}+\frac{3}{14}$?

b) What is $3-\frac{1}{3}$?

c) Solve: $2\frac{1}{8}-1\frac{1}{2}$.

Activity

Recipe Redesign

- **Objective:** To apply fraction addition and subtraction in a real-world context.
- **Materials:** A simple recipe for cookies or a smoothie (e.g., $1\frac{1}{2}$ cups flour, $\frac{3}{4}$ cup sugar, $\frac{1}{2}$ tsp baking soda).
- **Steps:**
  - Give the recipe to groups of students.
  - **Task 1 (Addition):** Ask them to calculate the total amount of dry ingredients. They will need to add the fractions $\left(1\frac{1}{2}+\frac{3}{4}\right)$.
  - **Task 2 (Subtraction/Multiplication):** Ask them to "hall" the recipe to make a smaller batch. They will need to figure out half of each fractional amount.
  - **Task 3 (Addition):** Ask them to "double" the recipe. They will need to add each fraction to itself.
  - Groups can present their new, adjusted recipes to the class.

Key Terms

- **Sum:** The result of an addition.
- **Difference:** The result of a subtraction.
- **Common Denominator:** A shared multiple of the denominators of several fractions.

Facts Flash

- The ancient Egyptians' method of using only unit fractions made subtraction very tricky! They had to use complex tables to figure out problems like $\frac{1}{2}-\frac{1}{5}$. Our modern method using LCM is much more powerful!
- Adding fractions with the same denominator is like adding measurements in the same unit (e.g., 3 cm + 4 cm = 7 cm). Adding fractions with different denominators is like trying to add 3 cm and 4 inches—you have to convert to a common unit first!

Do It Yourself

Look at the sum: $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+...$ If you keep adding the next fraction in the pattern forever, do you think the sum will become infinitely large, or will it get closer and closer to a specific number? What number might that be? (Hint: Draw a square and shade the fractions).

Mental Mathematics

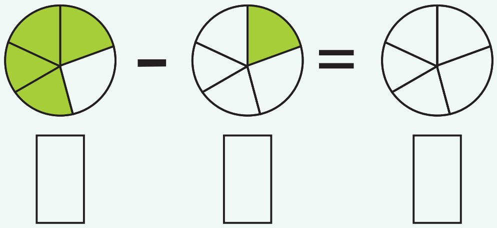
- **Strategy: Adding to Whole Numbers.**
  - To calculate $5+\frac{2}{3}$, the answer is simply $5\frac{2}{3}$. No calculation needed!
  - Practice: $6+\frac{1}{5}$
- **Strategy: Subtracting from Whole Numbers.**
  - To calculate $4-\frac{3}{5}$: Think of 4 as 3 + 1. Then calculate $1-\frac{3}{5}$, which is $\frac{2}{5}$. The answer is $3\frac{2}{5}$.
  - Practice: $6-\frac{5}{8}$
- **Strategy: Making a Whole.**
  - **To calculate** $\frac{3}{8}+\frac{7}{8}$: **Notice that** $\frac{3}{8}+\frac{5}{8}=1$. **So,** $\frac{3}{8}+\frac{7}{8}$ is $=1+\frac{2}{8}=1\frac{2}{8}=1\frac{1}{4}$.
  - Practice: $\frac{6}{13}+\frac{9}{13}$

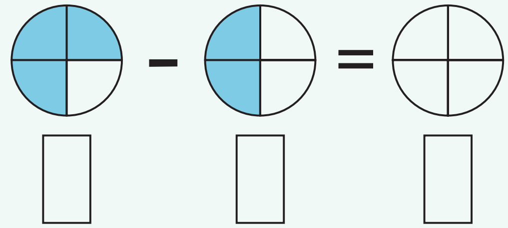
Gap Analyzer™ Homework

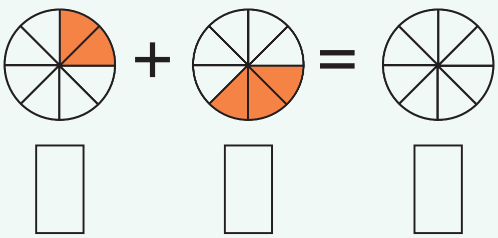
Watch Remedial

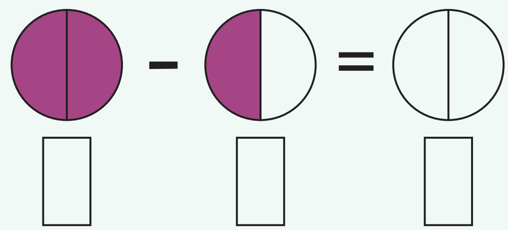
Exercise 7.5

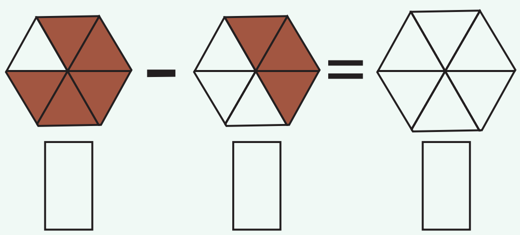
1. **Simplify the following:**

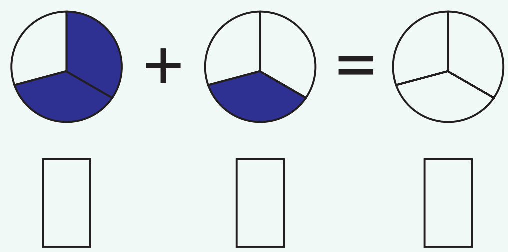
a) 

b) 

c) 

d) 

e) 

f) 

2. **Simplify the unlike fractions:**

a) $\frac{2}{5}+\frac{3}{10}$ b) $\frac{7}{8}+\frac{1}{4}$ c) $\frac{3}{4}+\frac{5}{6}$ d) $\frac{2}{3}+\frac{4}{9}$ e) $\frac{5}{12}+\frac{7}{18}$ f) $\frac{3}{5}+\frac{4}{15}$

3. **Add the mixed fractions and simplify:**

a) $2\frac{1}{4}+3\frac{2}{5}$ b) $5\frac{3}{8}+2\frac{1}{4}$ c) $7\frac{2}{3}+4\frac{1}{6}$ d) $3\frac{5}{12}+2\frac{7}{8}$ e) $6\frac{1}{2}+3\frac{3}{4}$ f) $4\frac{2}{5}+2\frac{3}{10}$

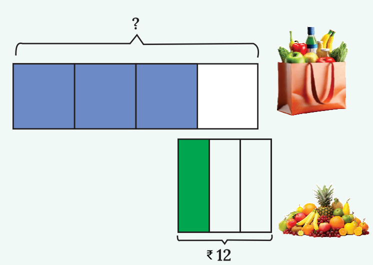
4. **Subtract the following;**

a) $4\frac{1}{2}-2\frac{1}{2}$ b) $5\frac{3}{4}-2\frac{1}{4}$ c) $7\frac{2}{5}-3\frac{1}{5}$ d) $6\frac{5}{6}-2\frac{2}{6}$ e) $9\frac{1}{3}-4\frac{2}{3}$ f) $8\frac{4}{7}-3\frac{2}{7}$

5. **Provide the missing information in the blanks:**

a) $\frac{2}{5}+\frac{3}{5}=\frac{\_\_\_}{5}$ b) $\frac{7}{8}+\frac{5}{8}=\frac{\_\_\_}{8}$ c) $\frac{1}{6}+3\frac{5}{6}=7\frac{\_\_\_}{6}$

d) $5\frac{2}{3}-2\frac{1}{3}=$ .... e) $8\frac{4}{7}-3\frac{1}{7}=$ .... f) $7\frac{5}{8}-3\frac{2}{8}=$ ....



6. Mom spent $\frac{3}{4}$ of her money on groceries and $\frac{1}{3}$ of the remainder on fruits. She spent ₹12 on fruits. How much money did Mom have at first?

7. A gardener planted $2\frac{3}{4}$ meters of flowers in the garden and $3\frac{1}{2}$ meters in the backyard. How much area did the gardener plant in total?

8. A driver drove $7\frac{7}{8}$ kilometers on the first day and $4\frac{5}{8}$ kilometers on the second day. How much distance did the driver travel in total?

9. One evening, four friends — Aditi, Kabir, Meena, and Raj — ordered two large pizzas, each cut into eight equal slices. Aditi enjoyed $\frac{3}{8}$ of the first pizza, while Kabir had $\frac{1}{4}$ of it. From the second pizza, Meena ate $\frac{5}{8}$. Raj then ate whatever slices were left. After everyone had eaten, a few slices still remained. The friends decided to share these leftover slices equally among themselves.

a) How many slices did Aditi and Kabir eat together from the first pizza?
b) How many slices were left from the first pizza?
c) How many slices did Raj eat in total?
d) What fraction of all the pizzas did Meena eat?
e) If the leftover slices were shared equally, how many did each friend get?

10. A shopkeeper had $12\frac{1}{2}$ kilograms of rice. He sold $4\frac{1}{3}$ kilograms. How much rice does the shopkeeper have left?

11. John had $15\frac{5}{8}$ meters of rope. He used $7\frac{1}{4}$ meters to tie his luggage. How much rope does John have left?

Common Misconceptions

Misconception: When adding or subtracting fractions, you add/subtract both the numerators and the denominators.

Example: $\frac{1}{2}+\frac{1}{3}=\frac{2}{5}$.

Correction: This is incorrect! You cannot add pieces of different sizes. You must find a common denominator first. $\frac{1}{2}+\frac{1}{3}=\frac{3}{6}+\frac{2}{6}=\frac{5}{6}$. Think of it like adding apples and oranges; you can't say you have "2 apple-oranges." You must find a common unit.

Misconception: A fraction with a larger numerator and denominator is always a larger fraction.

Example: Thinking $\frac{7}{15}$ is larger than $\frac{3}{5}$ because 7 and 15 are larger numbers than 3 and 5.

Correction: The size of a fraction depends on the ratio between the numerator and denominator. To compare, find a common denominator: $\frac{3}{5}=\frac{9}{15}$. Now it's clear that $\frac{9}{15}$ is larger than $\frac{7}{15}$. So, $\frac{3}{5}>\frac{7}{15}$.

Misconception: To convert a mixed number like $3\frac{1}{2}$ to an improper fraction, you just put the whole number and numerator together, like $\frac{31}{2}$.

Correction: This confuses place value with fractional parts. You must calculate how many "halves" there are in total. In 3 wholes, there are 3 × 2 = 6 halves. Add the extra 1 half to get 7 halves in total. So, $3\frac{1}{2}=\frac{7}{2}$.

Real-Life Applications: Fractions

Here's how we use fractions—the language of parts and shares—in our daily lives:

- **Cooking and Recipes:** Baking is all about fractions! A recipe might ask for $\frac{1}{2}$ a cup of sugar or $\frac{3}{4}$ of a teaspoon of salt. Getting the fractions right is the secret to a tasty result.
- **Sharing Fairly:** Whether it's dividing a pizza into 8 equal slices $\left(\frac{1}{8}\text{ each}\right)$ or sharing a chocolate bar, fractions ensure everyone gets their fair portion.
- **Telling Time:** We constantly use fractions to talk about time. "Half past four" $\left(4\frac{1}{2}\right)$ and "a quarter to nine" $\left(8\frac{3}{4}\right)$ are common phrases that rely on fractional understanding.
- **Shopping for Deals:** Discounts are often shown as fractions. A "half-price" sale means you pay only $\frac{1}{2}$ the price, helping you understand exactly how much you are saving.

Gap Analyzer™
Take an Exam

EXERCISE

A. Multiple Choice Questions (MCQs)

1. Which of the following fractions is equivalent to $\frac{3}{5}$?

   a) $\frac{6}{8}$ ☐ b) $\frac{9}{12}$ ☐ c) $\frac{12}{20}$ ☐ d) $\frac{15}{30}$ ☐

2. The sum of $\frac{2}{7}$ and $\frac{3}{14}$ is:

   a) $\frac{5}{14}$ ☐ b) $\frac{1}{2}$ ☐ c) $\frac{5}{21}$ ☐ d) $\frac{1}{7}$ ☐

3. Which fraction is the largest: $\frac{2}{3}, \frac{3}{4}, \frac{5}{8}$?

   a) $\frac{2}{3}$ ☐ b) $\frac{3}{4}$ ☐ c) $\frac{5}{8}$ ☐ d) They are equal ☐

4. The improper fraction for $4\frac{2}{5}$ is:

a) $\frac{42}{5}$ ☐ b) $\frac{20}{5}$ ☐ c) $\frac{22}{5}$ ☐ d) $\frac{11}{5}$ ☐

5. What is $3-\frac{5}{6}$?

a) $2\frac{1}{6}$ ☐ b) $2\frac{5}{6}$ ☐ c) $\frac{19}{6}$ ☐ d) $1\frac{1}{6}$ ☐

Assertion & Reason

Instructions: In the following questions, a statement of Assertion (A) is given, followed by a corresponding statement of Reason (R). Choose the correct option.

A: Both A and R are true, and R is the correct explanation of A.

B: Both A and R are true, but R is not the correct explanation of A.

C: A is true, but R is false.

D: A is false, but R is true.

1. **Assertion (A):** $\frac{3}{4}$ is greater than $\frac{2}{3}$.

Reason (R): To compare unlike fractions, we can cross-multiply. $3 \times 3 = 9$ and $4 \times 2 = 8$. Since $9 > 8$, the first fraction is greater.

2. **Assertion (A):** The fraction $\frac{13}{19}$ is in its simplest form.

Reason (R): A fraction is in its simplest form if its numerator and denominator are prime numbers.

3. **Assertion (A):** The fraction $\frac{7}{5}$ is an improper fraction.

Reason (R): In an improper fraction, the numerator is greater than or equal to the denominator.

4. **Assertion (A):**To compare $\frac{1}{2}$ and $\frac{1}{3}$, we can compare their numerators directly.

Reason (R): Fractions with different denominators must be converted to like fractions before comparison.

Case Study

The Community Garden: A rectangular community garden is divided for different vegetables. $\frac{1}{4}$ of the garden is for tomatoes. $\frac{1}{6}$ is for carrots. $\frac{1}{3}$ is for lettuce. The rest is for herbs.

1. What fraction of the garden is used for tomatoes, carrots, and lettuce combined?
2. What fraction of the garden is left for herbs?
3. Which vegetable takes up the most space? Which takes up the least?
4. If the total area of the garden is 240 square meters, find the area for each type of plant.

Project

Plan a "Fraction Feast" Party

- **Objective:** To use all your fraction skills (addition, subtraction, comparison, conversion) to plan a realistic party.
- **Your Task:** You are planning a party for 8 people. You need to create a menu and a shopping list.
  1. The Menu: Choose three items for your party (e.g., Pizza, Juice, Cake).
  2. The Recipes: Find simple recipes for each item. The recipes will be for a certain number of people (e.g., a pizza recipe for 4 people, a cake recipe for 6).
  3. **The Math:**

  Adjust the Recipes: You must adjust each recipe to make enough for exactly 8 people. This will involve working with fractions. For example, if a recipe for 4 people needs $1\frac{1}{2}$ cups of flour, you will need to double it for 8 people. If a cake recipe for 6 people needs $\frac{2}{3}$ cup of sugar, you'll need to figure out how much is needed for 8 people (**Hint:** find the amount for 1 person first, then multiply by 8).

  - **Create a Shopping List:** List all the ingredients from your adjusted recipes.
  - **Combine Ingredients:** Add up the total amount of common ingredients you need. For example, if the pizza needs $2\frac{1}{4}$ cups of flour and the cake needs $1\frac{3}{4}$ cups, what is the total amount of flour you need to buy?
  - **Present Your Plan:** Create a "Party Plan" document that shows:
  - Your menu.
  - The original recipes.
  - Your calculations for adjusting the recipes (show your work!).
  - Your final, combined shopping list with the total amounts of each ingredient.

Source-Based Question

Tiger Census 2022 Result – Tiger Status 2022

On the completion of 50 years of Project Tiger, India's prime minister Narendra Modi released a survey of the Tiger population in India. As per the tiger census 2022 the population of Bengal Tigers in India is 3,682, as compared to 2967 from the previous census in the year 2018. There is a whooping 24% rise in the population of Tigers as compared to the last Tiger Census Continue reading this article for the detailed analysis of Tiger Census 2022 and the Status of Tigers in India.

Three top Tiger States of India (by Tiger population)

Following the result of Tiger Census 2022, Madhya Pradesh has retained the status of the Tiger state of India with 785 Tigers whereas Karnataka holds the second position with 563 Royal Bengal Tiger population and Uttrakhand is third with 560 Tigers in the wild.

State Name	Number of Tigers
Madhya Pradesh	785 Tigers
Karnataka	563 Tigers
Uttarakhand	560 Tigers

How do they do Tiger Census?

How do they do Tiger Census? or How to Count Tigers in the Forest?
So far the tiger census was conducted using the doubling sample technique in which the first phase includes sending the forest official, guards and forest rangers to collect raw data based on pugmarks, scat, and leftover prey.

While the 2nd phase includes the data and images from camera traps. Once both the data is in place, the data is then used to identify tigers individually

Use of technology and digital techniques in Tiger Census

With the new Digital Tiger census technique the doubling sample technique will remain the same. Along with it, an Android application has been introduced to make the tiger count more accurate.

It will be the first time since 2006, The forest officials are making use of so much technology. Back in 2006 During the first census, there were only 1411 tigers counted adding another 295 to make the count to 1706 Tigers in 2010 and 2226 Tigers in 2014.

However, there was 560 Tiger deaths have been reported between 2012 & 2017 Out of which 308 were a natural deaths, 123 were the poaching cases, 90 were the cases of seizures, And 39 death were the part of road and train mishaps.

2018 tiger census in India is also more important because we will be having a most accurate count of tigers in the wild as this will be the first time Bhutan, Bangladesh, and Nepal are the part of India's Tiger census to jointly estimate the number of big cats In the region of shared border areas.

Source Text: **Adapted from Big Cats India's "Tiger Census 2022 Report – Tiger Population in 2022"**

Questions on the data

1. What fraction of the 2022 population were **newly added tigers** compared to 2018?
2. What fraction of the top three states' total tiger population belongs to Madhya Pradesh?
3. Madhya Pradesh (785) and Uttarakhand (560) together have a certain number of tigers. What fraction of this combined total belongs to Uttarakhand?
4. What fraction of the total deaths were due to **poaching**?
5. Out of 560 deaths, how many deaths were **not natural**? Write your answer as both a number and a fraction of the total.

Mind Map

Fractions

Introduction to Fractions

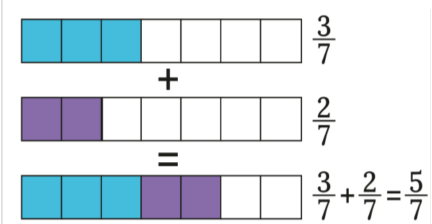
- Numerator and Denominator
- Fractional Units and Equal Shares.
- Fractional Units as Parts of a Whole.

Marking Fraction Lengths on the Number Line

- Dividing number line into equal parts
- Locating fractions on the line

Addition and Subtraction of Fractions

- Addition and Subtraction of Like Fractions
- Addition and Subtraction of Unlike Fractions
- Addition and Subtraction involving Mixed Fractions



Types of Fractions

- Proper fractions
- Improper fractions
- Mixed fractions
- Equivalent fractions
- Converting mixed fractions to improper fraction
- Converting improper fractions to mixed fractions

Comparing and Ordering of Fractions

- Comparing Like Fractions.
- Comparing Unlike Fractions.
  - Method 1: Finding a Common Denominator (LCM Method)
  - Method 2: Cross-Multiplication
- Ordering Fractions