

Fractions

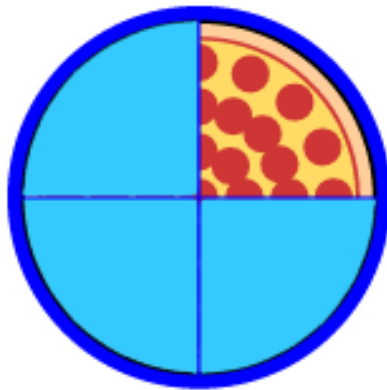
Chapter - VII

Introduction

- In this chapter we shall learn about a new kind of numbers, called **fractions**.
- Fractions are number that represent a part of the whole.
- Imagine you have a pizza and you want to divide it amongst 4 friends. So how much would each of you get?
- Each of you would get a part of the whole pizza, and adding all of it together would give you back the pizza.

Fractions and Pizzas

- To represent such numbers we use fractions. In this case each of you would get $\frac{1}{4}$ of the whole pizza. This is called one-fourth.
- Denominator represents the total available entities, whereas numerator represents the entity that is selected !



Notation

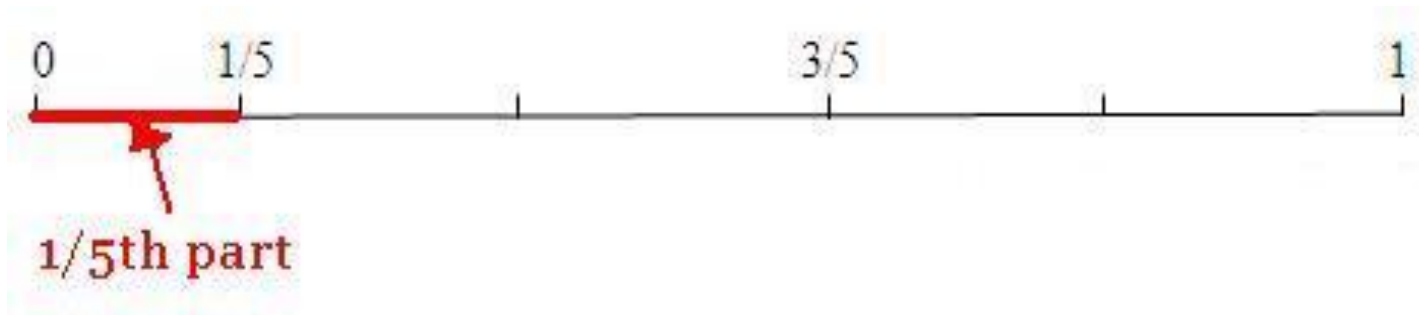
- A fraction is usually denoted as ' $\mathbf{a/b}$ ', where ' $\mathbf{a}$ ' and ' $\mathbf{b}$ ' are integers and ' $\mathbf{a}$ ' is called the **numerator** and ' $\mathbf{b}$ ' is called the **denominator**.
- So $2/5$ means a thing that is divided into 5 parts and we take 2 out of those 5 parts.
- Similarly $9/23$ means a thing has been divided into 23 parts and we take 9 parts out of those 23 parts.

Number Line representation

- Like integers we can represent fractions also in terms of a number line.
- For example to show $\frac{1}{5}$ in a number line, we first divide the portion between 0 and 1 into five parts and then take the first part as $\frac{1}{5}$.
- Similarly we can show the other fractions.

Number line Representation

- Picture :



Proper and Improper fractions

- A fraction whose value is **less than 1** is called a **proper fraction**. e.g. $\frac{2}{3}$, $\frac{5}{6}$, etc.
- In a proper fraction, the **numerator** is always **less than** the **denominator**.
- A fraction which is greater than 1 is called an **improper fraction**. e.g. $\frac{15}{11}$, $\frac{3}{2}$, etc.
- In an improper fraction, the **denominator** is always **less than** the **numerator**.

Why is improper fraction's value > 1

- When you perform the act of distributing, 15 Pizzas among 11 people , then , the Pizza each member will receive is denoted using the fraction $15/11$.
- As $15 > 11$, each person can be given a whole pizza , this means that 4 pizzas remaining after each person get one whole pizza.
- These 4 pizzas are shared amongst 11 people equally will mean that each get $4/11$ (four-elevenths) of a pizza !

Mixed Fraction

- A combination of a whole and a part is called a **mixed fraction**.
- Imagine you have three pizzas and you need to divide it amongst 2 of you.
- Then you each get a pizza and then half of the 3rd pizza.
- This is written as $1\frac{1}{2}$, and is called a **mixed fraction**.

Simplest form

- . A fraction is said to be in its **simplest form** if there are no **common factors** amongst the denominator and the numerator of the fraction.
- . The easiest way to take a fraction into its simplest form is to **cancel the common factors** from the numerator and denominator one after the other.

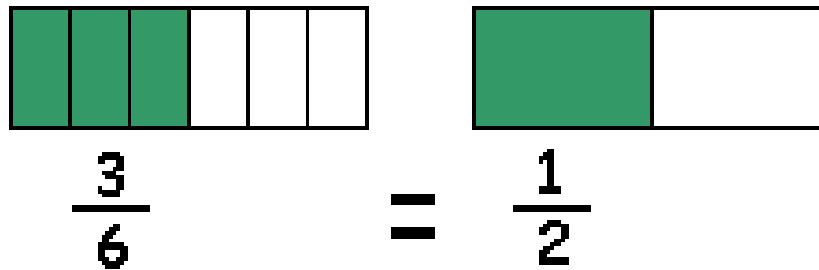
Simplest form

- Example : The simplest form of 12/60 is 1/5 .

$$\frac{12}{60} = \frac{1 \cdot \cancel{12}}{5 \cdot \cancel{12}} = \frac{1}{5}$$

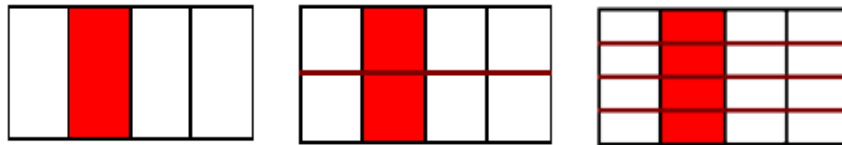
Simplest form

- These simplest forms are actually equivalent , they represent the same quantity . For example $3/6=1/2$. In each case we exactly get the same quantity, i.e. "half".



Equal fractions

- If we multiply the numerator and denominator of a fraction with the **same** number, we get equal fractions .
- E.g. $\frac{1}{4} = (1 \times 2) / (4 \times 2) = \frac{2}{8}$.
- As simplest form, they too represent the same quantity.



$$\frac{1}{4} = \frac{2}{8} = \frac{4}{16}$$

Like and Unlike fractions

- Fractions with the same denominators are called like fractions, else they are called **like fractions**.
- For example $\frac{1}{7}$, $\frac{2}{7}$, $\frac{4}{7}$ etc are **like fractions**, whereas $\frac{22}{7}$, $\frac{12}{24}$, $\frac{2}{3}$ etc are **unlike fractions**.

Comparing Fractions

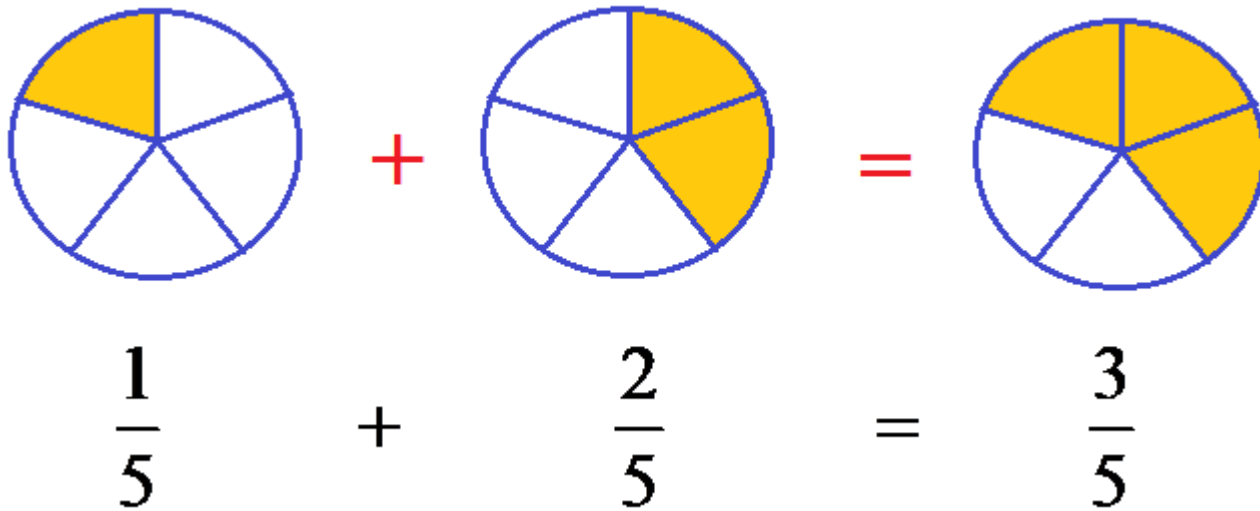
- We can compare fractions just like we compare integers.
- To compare like fractions, we just need to **check the numerator**.
- So $\frac{2}{3} < \frac{3}{3}$ etc.
- To compare **unlike fractions**, we need to make the denominators of the fractions equal. We do this, by taking the **L.C.M. of the denominators** as the common denominator and then adjust the numerators.

Addition and Subtraction

- Just like we add and subtract integers, we can add and subtract fractions also.
- To do so, we need to take the fractions into their equivalent forms, that is make their denominators equal.
- Thus the fractions would be reduced to like fractions and then we can just or subtract the numerators.
- We shall learn how to multiply and divide fractions later on.

Addition of fractions having same denominator !

- **Adding two fractions with same denominator is just like adding the numerators of both fractions .**



Addition of fractions having different denominator !

- **Find the L.C.M of the denominators**



Convert each fraction into equal fractions by multiplying denominator and numerator by the remainder obtained by dividing the L.C.M with denominator



Now both the fractions will end up having same denominator, hence add the numerators directly !

Addition of fractions having different denominator !

- Example :

6 is a common multiple of 2 and 3.

$$\frac{1}{2} + \frac{1}{3}$$

Change fraction #1 to an equivalent fraction with a denominator of 6 - multiply top and bottom by 3.

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

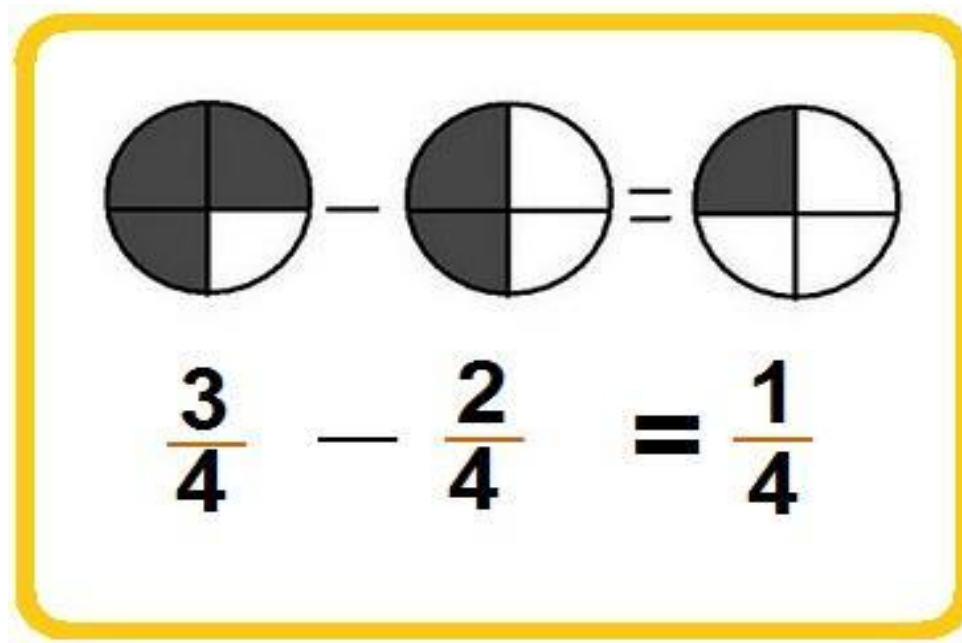
Change fraction #2 to an equivalent fraction with the same denominator of 6 - multiply top and bottom by 2.

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


$$\mathbf{3/6 + 2/6 = 5/6}$$

Subtraction of fractions having same denominator !

- **Subtracting two fractions with same denominator is just like subtracting the numerators of both fractions .**



Subtraction of fractions having different denominator !

- **Find the L.C.M of the denominators**



Convert each fraction into equal fractions by multiplying denominator and numerator by the remainder obtained by dividing the L.C.M with denominator



Now both the fractions will end up having same denominator, hence Subtract the numerators directly !

Subtraction of fractions having different denominator !

- Example :

21 is a common multiple of 7 and 3.

$$\frac{5}{7} - \frac{2}{3}$$

Change fraction #1 to an equivalent fraction with a denominator of 21 - multiply top and bottom by 3.

$$\frac{5 \times 3}{7 \times 3} = \frac{15}{21} \longrightarrow 15/21 - 14/21 = (15-14)/21 = 1/21$$

Change fraction #2 to an equivalent fraction with the same denominator of 21 - multiply top and bottom by 7.

$$\frac{2 \times 7}{3 \times 7} = \frac{14}{21}$$

This has introduced you to the key concepts in chapter-VI, you are now encouraged to read the text book in detail and solve the problems there !

Thank you !