Chapter- 9

Fractions

STUDY NOTES

This lesson will help you to :

- Know about the types of fractions
- State what equivalent fractions are, and check for equivalence.
- Simplify a fraction to its lowest terms.
- Convert improper fraction to mixed numbers and vice versa.
- Compare fractions and say which is greater.
- Add and subtract fractions same or different denominators.
- Multiplication of fractions.
- Division of fractions

Fractions

Fractions tell about **"a part of a whole"**.

Here the pizza is divided into 4 equal parts and there are 3 parts left with us.

We will write it in a fraction as 3/4, in which 3 is numerator which tells the number of parts we have and 4 is denominator which tells the total parts in a whole.

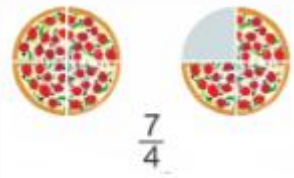
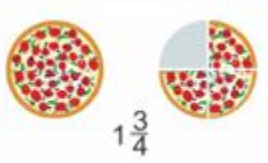
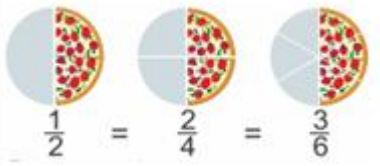
The General form of a Fraction

$$\text{Fraction} = \frac{Numerator}{Denominator}$$

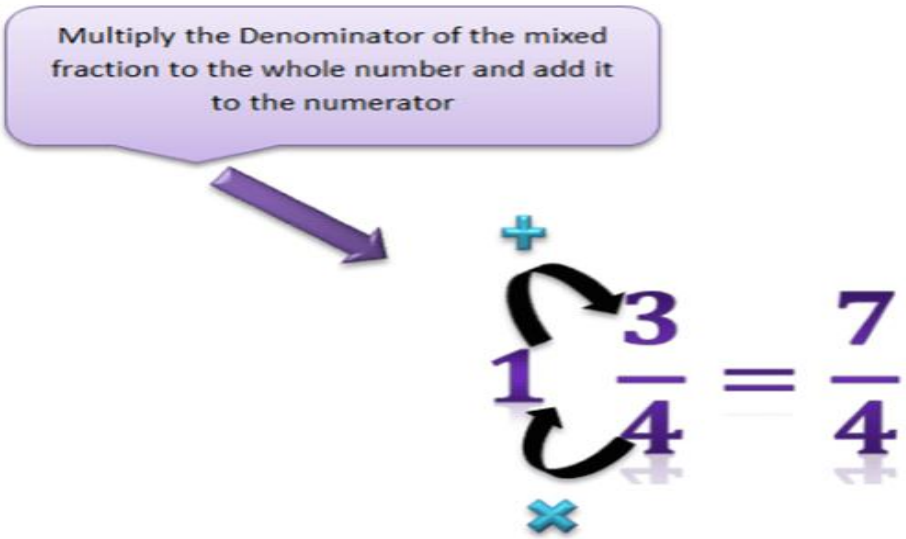
Where, denominator ≠ 0

If numerator = denominator then the fraction becomes a whole i.e. 1. This is called unity of fraction.

Types of Fraction

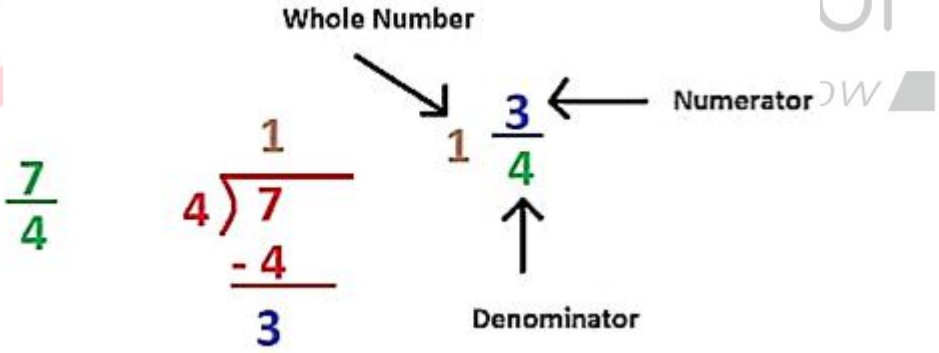
Type of Fraction	Meaning	Example
Proper fraction	The fractions whose numerator is always less than denominator are called proper fractions. Proper fractions are always equal to or greater than 0 but less than 1.	 $\frac{3}{4}$
Improper fraction	A fraction whose numerator is greater than or equal to the denominator is called an improper fraction. It represents the mixture of whole and a proper fraction.	 $\frac{7}{4}$
Mixed Fraction	The improper fraction can be written in the mixed form as it is the mixture of whole number and a fraction.	 $1\frac{3}{4}$
Like Fraction	The fractions with the same denominator are like fractions.	 $\frac{2}{6}$ $\frac{1}{6}$ $\frac{3}{6}$
Unlike Fraction	The fractions with different denominators are unlike fractions.	 $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$
Equivalent Fraction	Fractions which represent same or equal value are called equivalent fractions.	 $\frac{1}{2} = \frac{2}{4} = \frac{3}{6}$
Unit fractions	A fraction with numerator 1 is called unit fraction. All unit fractions are special type.	 $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{3}$

Converting a Mixed Fraction into an Improper Fraction



Converting an Improper Fraction into a Mixed Fraction

Divide the Numerator by the denominators that the quotient will be the whole number and remainder will be the numerator, while denominator will remain the same.

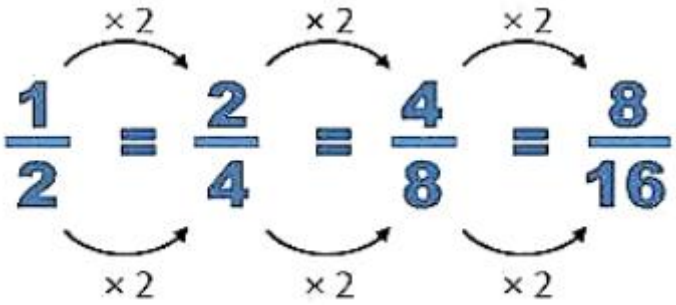


$$\text{Mixed Fraction} = \text{Quotient}\,\frac{\text{Remainder}}{\text{Divisor}}$$

How to find the equivalent fractions?

To find the equivalent fraction of proper and improper fraction, we have the multiply both the numerator and denominator with the same number.

Example



Comparision of like fractions

Compare the numerator. The fractions with the greater numerator is greater.

Let us consider the fractions $\frac{7}{10}, \frac{8}{10}$

$\frac{7}{10}$ and $\frac{8}{10}$ are like fractions.

Let us compare the numerator.

$8 > 7$

Therefore, $\frac{8}{10} > \frac{7}{10}$

Ordering of like fractions

Arrange the following fractions in ascending order:

$\frac{1}{7}, \frac{2}{7}, \frac{4}{7}, \frac{6}{7}$ and $\frac{5}{7}$.

Here 1, 2, 4, 6 and 5 are numerator of the fractions. Now comparing the numerator,

$6 > 5 > 4 > 4 > 2 > 1$

So, $\frac{1}{7} < \frac{2}{7} < \frac{4}{7} < \frac{5}{7} < \frac{6}{7}$

Therefore, ascending order of the fractions is $\frac{1}{7}, \frac{2}{7}, \frac{4}{7}, \frac{5}{7}$ and $\frac{6}{7}$.

Comparision of unlike fractions

To compare unlike fractions, convert into equivalent fractions with LCM as denominator. Then compare the like fractions.

Let us compare $\frac{7}{9}$ and $\frac{9}{10}$. LCM of 9 and 10 = 90

$\frac{7}{9} = \frac{70}{90}$ and $\frac{9}{10} = \frac{81}{90}$

So , $\frac{70}{90} < \frac{81}{90}$.

Therefore, $\frac{7}{9} < \frac{9}{10}$

Alternative method : Cross multiply method

$\frac{7}{9}$ $\frac{9}{10}$

$7 \times 10 , 9 \times 9$

$70 < 81$. Therefore $\frac{7}{9} < \frac{9}{10}$

Addition of like fractions :

All fractions cannot be added orally. We need to know how they can be added in different situations and learn the procedure for it.

The sum of two or more like fractions can be obtained as follows:

Step-1 Add the numerators.

Step-2 Retain the (common) denominator.

Let us add $\frac{3}{5}$ and $\frac{1}{5}$.

We have $\frac{3}{5} + \frac{1}{5} = \frac{3+1}{5} = \frac{4}{5}$

Subtraction of like fractions :

Thus, the difference of two like fractions can be obtained as follows :

Step-1 Subtract the smaller numerator from the bigger numerator.

Step-2 Retain the (common) denominator.

Let us subtract $\frac{3}{10}$ from $\frac{8}{10}$

We have $\frac{8}{10} - \frac{3}{10} = \frac{8-3}{10} = \frac{5}{10}$

Addition and subtraction of unlike fractions :

When we have to add or subtract unlike fractions, convert into equivalent fractions with LCM as denominator.

Important Rules :

i) **If the given fraction is a mixed fraction, convert it to improper fractions.**
ii) **Find the LCM of the denominators.**
iii) **Convert unlike fractions into like fractions with LCM as common denominator.**
iv) **Add or subtract as mentioned the like fractions obtained.**

Let us considers the fractions , $\frac{3}{5}$ and $\frac{6}{8}$ to be added

LCM of 5 and 8 = 40

$\frac{3}{5} = \frac{3\times 8}{5\times 8} = \frac{24}{40}$ and $\frac{6}{8} = \frac{6\times 5}{8\times 5} = \frac{30}{40}$

Now, $\frac{3}{5} + \frac{6}{8} = \frac{24}{40} + \frac{30}{40} = \frac{24+30}{40} = \frac{54}{40} = \frac{27}{20} = 1\frac{7}{20}$

Example: Subtract $\frac{5}{8}$ from $\frac{3}{4}$

Sol. $\frac{3}{4} - \frac{5}{8}$ (LCM of 8 and 4 = 8)

$= \frac{3\times 2}{4\times 2} - \frac{5\times 1}{8\times 1} = \frac{6}{8} - \frac{5}{8} = \frac{1}{4}$

Multiplication of fractions :

A. Multiplication of a Fractional Number by a whole number

Fraction × Whole number = $\frac{Numerator\ of\ the\ fraction \times whole\ number}{denominator\ of\ the\ fraction}$

B. Multiplication of a Fractional Number by another Fractional Number

Product of two fractions = $\frac{Numerator\ (1st\ fraction) \times Numerator\ (2nd fraction)}{denominator(1st\ fraction) \times denominator\ (2nd\ fraction)}$

C. Multiplication of a Fractional Number by another Fractional Number

Product of two or more fractions = $\frac{Product\ of\ all\ numerators\ of\ the\ fractions}{Product\ of\ all\ numerators\ of\ the\ fractions}$

Examples :

A. Multiply $\frac{4}{25}$ by 3

For every whole number, 1 is taken as the denominator e.g. $\frac{3}{1}$

Solution: $\frac{4}{25} \times 3 = \frac{4 \times 3}{25 \times 1} = \frac{12}{25}$

B. Find the product of the following fractions : $\frac{8}{16} \times \frac{2}{3}$

Divide the numerator and the denominator by the common factor

Solution: $\frac{8}{16} \times \frac{2}{3} = \frac{8 \times 2}{16 \times 3} = \frac{16}{48} = \frac{16 \div 16}{48 \div 16} = \frac{1}{3}$

Division of fractions :

Important Rules for division of fractions :

i) Replace the divisor by its reciprocal.

ii) Change the division sign (÷) to multiplication sign (×).

Examples :

A. Divide : $\frac{1}{3}$ by 2

Solution:

Step 1 : Reciprocal of 2 is $\frac{1}{2}$

Step 2 : Change the sign $\frac{1}{3} \div 2 = \frac{1}{3} \times \frac{1}{2}$

Step 3 : Simplify $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$ (Ans)

B. Write the quotient in its simplest form.

$$\frac{\frac{6}{7}}{\frac{18}{35}}$$

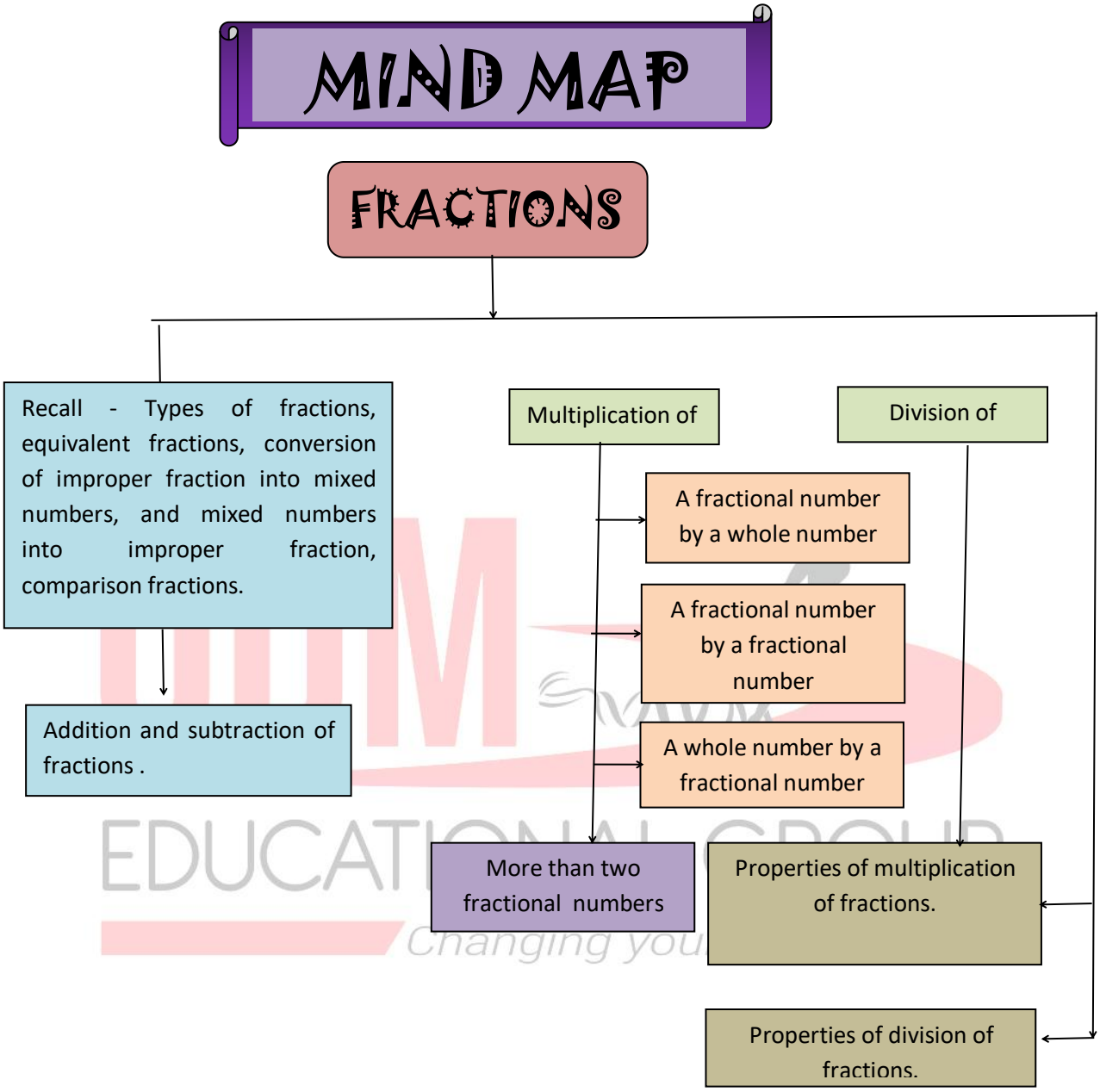
Solution: Here, divisor is $\frac{18}{35}$, reciprocal of $\frac{18}{35}$ is $\frac{35}{18}$

So, $\frac{6}{7} \times \frac{18}{35} = \frac{6}{7} \times \frac{35}{18} = \frac{210}{126}$

$= \frac{210 \div 7}{126 \div 7} = \frac{30 \div 6}{18 \div 6} = \frac{5}{3} = \mathbf{1\frac{2}{3}}$ **Ans.**

POINTS TO REMEMBER :

- A fraction is a part of a whole or collection of objects.
- Proper fractions are less than 1.
- Improper fractions are greater than 1.
- Improper fractions can be written as mixed numbers.
- Fractions with the same denominator are called like fractions.
- Fractions with different denominators are called unlike fractions.
- To add or subtract unlike fractions, first convert them into like fractions and then find the sum or difference of the numerators to be divided by the common denominator.
- The product of two or more fractional numbers is a fractional number whose numerator is the product of their numerator and whose denominator is the product of their denominators.
- For division of a fraction first replace the divisor by its reciprocal, change the division sign to multiplication sign, then simplify.


MIND MAP
FRACTIONS
Recall - Types of fractions, equivalent fractions, conversion of improper fraction into mixed numbers, and mixed numbers into improper fraction, comparison fractions.
Addition and subtraction of fractions .
Multiplication of
A fractional number by a whole number
A fractional number by a fractional number
A whole number by a fractional number
More than two fractional numbers
Division of
Properties of multiplication of fractions.
Properties of division of fractions.