

# Fractions

## Introduction to Fractions

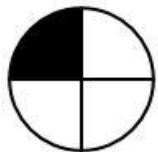
In previous class we learnt following things about fractions.

- a) Meaning of Fractions
- b) Meaning of Numerator and denominator
- c) Equivalent Fractions
- d) Comparison of fractions
- e) Addition of fractions
- f) Subtraction of fractions

A fraction represents a part of the whole. For example,  $\frac{1}{2}$  is a fraction, that means 1 part out of 2 equal parts.



$\frac{1}{4}$  is a fraction, it denotes 1 part out of 4 equal parts.



$\frac{3}{8}$  is a fraction, it denotes 3 equal parts out of 8 equal parts. Here 3 is numerator and 8 is denominator.



## **Type of Fractions**

There are 4 types of fractions and they are mentioned below.

- a) Unit Fractions
- b) Proper fractions
- c) Improper fractions
- d) Mixed fractions

### ***Unit Fractions***

Fractions which have 1 in their numerator are known as unit fractions. Few examples are given below.

$\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ ,  $\frac{1}{9}$ ,  $\frac{1}{21}$ , etc.

### ***Proper Fractions***

Fractions whose numerator is smaller than the denominator are known as proper fractions. Few examples are given below.

$\frac{2}{5}$ ,  $\frac{5}{7}$ ,  $\frac{3}{7}$ ,  $\frac{7}{12}$ , etc.

### ***Improper Fractions***

Fractions whose numerator is greater than or equal to the denominator are known as improper fractions. Few examples are given below.

$\frac{5}{2}$ ,  $\frac{7}{4}$ ,  $\frac{25}{27}$ ,  $\frac{43}{21}$ , etc.

### ***Mixed Fractions***

This type of fractions are combination of a whole number and a proper fraction. Few examples are given below.

$1\frac{1}{2}$ ,  $2\frac{2}{3}$ ,  $3\frac{5}{7}$ ,  $5\frac{1}{5}$ , etc.

### Conversion of Fractions

We can convert improper fractions to mixed fractions and vice versa. Let's have a look at some examples provided below.

### ***Conversion of Improper Fractions to Mixed Fractions***

Improper fractions can be converted into mixed fractions by dividing the numerator by the denominator. The quotient gives the whole number part of the mixed fractions, and the remainder placed over the denominator gives the fractional part.

**Example 1.** Convert  $10\frac{1}{3}$  into a mixed fraction.

**Solution.**

$$\begin{array}{r} 3 \overline{) 10} \\ \underline{9} \phantom{0} \\ 1 \phantom{0} \end{array}$$

3 → Quotient will go to the whole part  
1 → Remainder will go to the numerator of the fraction  
3 → Divisor will go to the denominator of the fraction

So, the answer will be  $3\frac{1}{3}$ .

**Example 2.** Convert  $11\frac{2}{20}$  into a mixed fraction.

**Solution.**

$$\begin{array}{r} 5 \phantom{0} \\ 20 \overline{) 112} \\ \underline{100} \phantom{0} \\ 12 \phantom{0} \\ \underline{10} \phantom{0} \\ 2 \phantom{0} \end{array}$$

Quotient 5 will be treated as whole number of mixed fraction.

Fraction part of the mixed fraction =  $\frac{12}{20} = \frac{3}{5}$

So, the mixed fraction will be  $5\frac{3}{5}$ .

### ***Conversion of Mixed Fractions into Improper Fractions***

A mixed fraction can be changed into an improper fraction by multiplying the whole number by the denominator of the fraction and adding the product to numerator of the fraction.

Example 1. Convert  $5\frac{2}{5}$  into improper fraction.

$$\text{Solution. } 5\frac{2}{5} = \frac{(5 \times 5) + 2}{5} = \frac{25 + 2}{5} = \frac{27}{5}$$

So,  $5\frac{2}{5}$  improper fraction is  $\frac{27}{5}$

Example 2. Convert  $9\frac{7}{11}$  into improper fraction.

$$\text{Solution. } 9\frac{7}{11} = \frac{(11 \times 9) + 7}{11} = \frac{99 + 7}{11} = \frac{106}{11}$$

So,  $9\frac{7}{11}$  improper fraction is  $\frac{106}{11}$ .

## **Comparison of Fractions**

### ***Comparison of Like Fractions***

If both the fractions denominators are same, then we compare the numerators of both the fractions. The fraction which has bigger numerator is the bigger fraction.

**Example 1.** Which of the fraction is smaller  $\frac{3}{5}$  or  $\frac{2}{5}$  ?

**Solution.** As both the fractions have same denominator, we must compare

the numerators.

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

**Example 2.** Which of the fraction is smaller  $\frac{106}{11}$  or  $\frac{123}{11}$  ?

**Solution.** Both fractions numerator are same, that is 11. Now we need to compare the numerators.

$123 > 106$ . So,  $\frac{123}{11} > \frac{106}{11}$ .

### ***Comparison of Unlike Fraction with Same Numerator***

When the numerator of both the fractions are same, then the fraction which is having smaller denominator is the bigger fraction.

**Example 1.** Which of the following fraction is greater,  $\frac{25}{7}$  or  $\frac{25}{17}$  ?

**Solution.** In this comparison both the fractions are having same numerator that is 25. Now, we need to compare the denominators of both the fractions. Here  $7 < 17$ , that means  $\frac{25}{7} > \frac{25}{17}$ .

**Example 2.** Which of the following fraction is greater,  $\frac{105}{109}$  or  $\frac{105}{89}$  ?

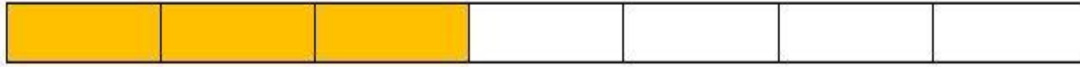
**Solution.** Both the fractions are having same numerator that is 105. Now, time to compare the denominators of both the fractions,  $89 > 109$ .

So,  $\frac{105}{89} > \frac{105}{109}$ .

### ***Comparison of Unlike Fractions with Different Numerator and Different Denominator***

When both the numerator and denominator of both fractions are different, then to find greater fraction we need to do following things. Let's consider  $\frac{3}{7}$  and  $\frac{2}{5}$  for comparison.

$$\frac{3}{7}$$



$$\frac{2}{5}$$



### Step-1

we multiply 1st fraction's denominator with both the numerator and denominator of the 2nd fraction. 1st fraction denominator is 7, we have to multiply it to both numerator and denominator of  $\frac{2}{5}$ .

$$\frac{2 \times 7}{5 \times 7} = \frac{14}{35}$$

### Step-2

Similarly, we need to multiply 2nd fraction's denominator 5 with both numerator and denominator  $\frac{3}{7}$ .

$$\frac{3 \times 5}{7 \times 5} = \frac{15}{35}$$

### Step-3

Now comparing  $\frac{14}{35}$  and  $\frac{15}{35}$  became easy as both fractions denominator became same. So,  $\frac{14}{35} < \frac{15}{35}$  or

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

### **Comparison of Mixed Fractions**

For comparing mixed fractions, we have to check the whole numbers first, if the whole numbers are same then we have to compare the fractions.

**Example 1.** Compare  $5\frac{2}{5}$  and  $4\frac{1}{3}$ .

**Solution.** Whole number of  $5\frac{2}{5}$  is 5 and the whole number of  $4\frac{1}{3}$  is 4.  
 $5 > 4$ . So,  $5\frac{2}{5} > 4\frac{1}{3}$ .

**Example 2.** Compare  $1\frac{2}{3}$  and  $1\frac{2}{5}$ .

**Solution.** Whole number of both the fractions are same here. We can not decide which fraction is bigger considering the whole number. Now, we need to check the fraction part,  $\frac{2}{3}$  and  $\frac{2}{5}$ . Among these two fractions,  $\frac{2}{3}$  is bigger than  $\frac{2}{5}$ .



So,  $1\frac{2}{3} > 1\frac{2}{5}$ .

### **Addition of Fractions**

In our previous class we learnt the basics of fraction addition. Here we will learn various types of fraction addition.

#### ***Addition of Fractions with Same Denominator***

When both the fractions have same denominator, we first add the numerators and then place the sum over the common denominator. We simplify further if

needed.

Example 1. Add  $\frac{2}{5}$  and  $\frac{3}{5}$ .

$$\text{Solution. } \frac{2}{5} + \frac{3}{5} = \frac{2+3}{5} = \frac{5}{5} = 1$$

Example 2. Add  $\frac{3}{8}$  and  $\frac{7}{8}$ .

$$\text{Solution. } \frac{3}{8} + \frac{7}{8} = \frac{3+7}{8} = \frac{10}{8} = \frac{5}{4}$$

### ***Addition of Fractions with different Denominators***

In this kind of addition, we first find the LCM of all the denominators. Then convert all the fractions into equivalent fractions having common denominators as LCM. Then we add all the equivalent fractions. Let's have a look at some examples

**Example 1.** Add  $\frac{3}{8}$  and  $\frac{2}{6}$ .

**Solution.** LCM of 8 and 6 is 24.

To get the equivalent fraction of  $\frac{3}{8}$  whose denominator should be 24, we need to do the following.

$$\frac{3 \times 3}{8 \times 3} = \frac{9}{24}$$

Similarly, to get the equivalent fraction of  $\frac{2}{6}$  whose denominator should be 24, we need to do the following.

$$\frac{2 \times 4}{6 \times 4} = \frac{8}{24}$$

Add both the equivalent fractions.

$$\frac{9}{24} + \frac{8}{24} = \frac{9+8}{24} = \frac{17}{24}$$

So, the answer is  $\frac{17}{24}$ .



## Addition of Mixed Fractions

**Example 1.** Add  $2\frac{3}{5}$  and  $3\frac{2}{3}$ .

**Solution.**  $2\frac{3}{5}$  is equal to  $1\frac{8}{5}$ .

$3\frac{2}{3}$  is equal to  $1\frac{1}{3}$ .

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

Now, we have to follow the addition procedure by taking out the LCM of the denominators 5 and 3.

LCM of 5 and 3 = 15

$$\frac{13}{5} + \frac{11}{3} = \frac{(13 \times 3) + (11 \times 5)}{15} = \frac{39 + 55}{15} = \frac{94}{15} = 6\frac{4}{15}$$

This can be done in another method.

First add the whole numbers, that is,  $2 + 3 = 5$  and keep it on the left side.

Now add the fractions  $\frac{3}{5}$  and  $\frac{2}{3} =$

$$\frac{3}{5} + \frac{2}{3}$$

Now, we have to follow the addition procedure by taking out the LCM of the denominators 5 and 3.

LCM of 5 and 3 = 15

$$\frac{3}{5} + \frac{2}{3} = \frac{(3 \times 3) + (2 \times 5)}{15} = \frac{9 + 10}{15} = \frac{19}{15}$$

We can further simplify  $\frac{19}{15}$  to mixed fraction =  $1\frac{4}{15} = 1\frac{4}{15}$

We have whole numbers 5 which came from earlier whole numbers addition.

So, the total sum =

$$5 + 1\frac{4}{15} = 6\frac{4}{15}$$

Please visit below mentioned links for more fraction addition examples and worksheet.

[Fraction Addition](#)

## Subtraction of Fractions

In our previous class we learnt the basics of fraction subtraction. Here we will learn various types of fraction subtraction.

### ***Subtraction of Fractions with Equal Denominator***

To subtract fractions having equal denominator, we first subtract the numerators. Then we have to place the answer over the denominator. Let's have a look at some examples.

**Example 1.** Subtract  $\frac{2}{5}$  from  $\frac{4}{5}$ .

**Solution.**

$$\frac{4}{5} - \frac{2}{5} = \frac{4-2}{5} = \frac{2}{5}$$

**Example 2.** Subtract  $\frac{25}{7}$  from  $\frac{35}{7}$ .

**Solution.**

$$\frac{35}{7} - \frac{25}{7} = \frac{35-25}{7} = \frac{10}{7}$$

### ***Subtraction of Fractions with Different Denominators***

To subtract fractions having different denominators, we first take out the LCM of the denominators. Then convert all the fractions into equivalent fractions having common denominators as LCM. Then we subtract equivalent fractions. Let's have a look at some examples.

**Example 1.** Subtract  $\frac{3}{4}$  from  $\frac{7}{8}$ .

**Solution.** LCM of 4 and 8 is 8.

$$\frac{7}{8} - \frac{3}{4} = \frac{7-6}{8} = \frac{1}{8}$$

**Example 2.** Subtract  $\frac{5}{25}$  from  $\frac{3}{5}$ .

**Solution.** LCM of 5 and 25 is 25.

$$\frac{3}{5} - \frac{5}{25} = \frac{(3 \times 5) - (5 \times 1)}{25} = \frac{15 - 5}{25} = \frac{10}{25}$$

$\frac{10}{25}$  can be simplified further, that is,  $\frac{2}{5}$ .

So,  $\frac{2}{5}$  is the answer.

### ***Subtraction of Mixed Fractions***

In this kind of subtraction, first convert the mixed fractions into improper fractions and then subtract them as normal fractions rule. Let's have a look at some examples.

**Example 1.** Subtract  $2\frac{2}{5}$  from  $3\frac{2}{3}$ .

**Solution.** Improper fraction of  $2\frac{2}{5} =$

$$\frac{(5 \times 2) + 2}{5} = \frac{12}{5}$$

Improper fraction of  $3\frac{2}{3} =$

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

$$\frac{11}{3} - \frac{12}{5}$$

LCM of 3 and 5 is 15

$$\frac{(11 \times 5) - (12 \times 3)}{15} = \frac{55 - 36}{15} = \frac{19}{15} = 1\frac{4}{15}$$

So, the answer is  $1\frac{4}{15}$ .

### ***Subtraction from a Whole number***

When we subtract a fraction from a whole number, we must convert the whole number to its fraction format. Then do the subtraction as per normal rules we learnt till now.

**Example 1.** Subtract  $\frac{6}{7}$  from 2.

**Solution.** Fraction format of 2 is  $\frac{2}{1}$ . Now, subtract  $\frac{6}{7}$  from  $\frac{2}{1}$ .

$$\frac{2}{1} - \frac{6}{7} = \frac{(2 \times 7) - 6}{7} = \frac{14 - 6}{7} = \frac{8}{7} = 1 \frac{1}{7}$$

So, the answer is  $1\frac{1}{7}$ .

## Multiplication of Fractions

### *Multiplication of Fraction by a Whole Number*

To multiply a fraction by a whole number, we multiply the numerator of the fraction by the whole number and denominator of the fraction by 1. Let's have a look at some examples.

**Example 1.** Multiply  $\frac{4}{7}$  by 5.

**Solution.**

$$\frac{4}{7} \times 5 = \frac{4 \times 5}{7 \times 1} = \frac{20}{7} = 2 \frac{6}{7}$$

So, the answer is  $2\frac{6}{7}$ .

### *Multiplication of Two Fractions*

To multiply two fractions, we multiply the numerators of both the fractions and the product becomes numerator. Then, we multiply denominators of both the fractions and the product becomes denominator of the result. Let's have a look at some examples.

**Example 1.** Multiply  $\frac{4}{5}$  by  $\frac{1}{2}$ .

**Solution.**

$$\frac{4}{5} \times \frac{1}{2} = \frac{4 \times 1}{5 \times 2} = \frac{4}{10}$$

If we simplify  $\frac{4}{10}$  further, then it will become  $\frac{2}{5}$ .

So, the answer is  $\frac{2}{5}$ .

**Example 2.** Multiply  $2\frac{2}{5}$  by  $3\frac{2}{3}$ .

**Solution.** Here, we have two mixed fractions. First, we must convert them to improper fractions, then we do the multiplication.

Improper fraction of  $2\frac{2}{5} = \frac{12}{5}$

Improper fraction of  $3\frac{2}{3} = \frac{11}{3}$

Now multiply

$$\frac{12}{5} \text{ by } \frac{11}{3} = \frac{12}{5} \times \frac{11}{3} = \frac{12 \times 11}{5 \times 3} = \frac{132}{15} = 8\frac{12}{15}$$

So, the answer is  $8\frac{12}{15}$ .

### Reciprocal of Fractions

Two fractions whose product is 1 are called reciprocals. For example,  $\frac{2}{3}$  reciprocal is  $\frac{3}{2}$ . If the product of two fractions is equal to 1 then we can say  $\frac{2}{3}$  and  $\frac{3}{2}$  are reciprocals.

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

In other words, if we want to find out the reciprocal of a fraction then interchange its numerator to denominator and denominator to numerator.

$$\frac{2}{3} \longleftrightarrow \frac{3}{2}$$

**Example 1.** What is the reciprocal of  $\frac{5}{7}$ ?

**Solution.** Reciprocal of  $\frac{5}{7}$  is  $\frac{7}{5}$ .

### Division of Fractions

In the division of fraction, we must find out the reciprocal of divisor and multiply it with the dividend. Let's have a look at some example.

**Example 1.** Divide  $\frac{5}{8}$  by  $\frac{1}{2}$ .

**Solution.**  $\frac{5}{8} \div \frac{1}{2}$

Here,  $\frac{5}{8}$  is the dividend and  $\frac{1}{2}$  is divisor. Reciprocal of  $\frac{1}{2}$  is  $\frac{2}{1}$ .

$$\frac{5}{8} \times \frac{2}{1} = \frac{5 \times 2}{8 \times 1} = \frac{10}{8} = \frac{5}{4}$$

So, the answer is  $\frac{5}{4}$ .

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