

## Master Lesson Plan

For

### Fractions

| Board | Standard | Subject     | Chapter   | Language | Reference Link            | Creation date          |
|-------|----------|-------------|-----------|----------|---------------------------|------------------------|
| CBSE  | STD VI   | Mathematics | Fractions | English  | <a href="#">Fractions</a> | 2019-08-30<br>21:41:16 |

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## Fractions

### 1. MS\_Objectives\_Fractions

**Notes to the teacher:**

This asset lays down the proposed plan for transacting this chapter

It states the asset objectives of the MLP. This asset is for teacher's reference and need not be taught to the students

Students will be able

- 1) To identify the number of fractions for a given denominator.
- 2) To explain fractions with examples.
- 3) To describe how fractions can be plotted on a Number Line.
- 4) To choose the answers for the objective questions and to draw the number line for the given fractions.
- 5) To classify the different types of Fractions with examples.
- 6) To solve the questions by applying the concept of different types of fractions.
- 7) To justify the answers for the questions given.
- 8) To explain the method of reducing the fraction to its simplest form.
- 9) To define the different methods of equivalent fractions.
- 10) To demonstrate the activity based on the concept of Equivalent and Proper fractions.
- 11) To determine the solution for the questions with the knowledge of equivalent fractions.
- 12) To explain how to carry addition and subtraction of like and unlike fractions.
- 13) To explain the concept of addition and subtraction for Mixed fractions with examples.
- 14) To explain how to compare and arrange them in order when they are like fractions and unlike fractions.
- 15) To take a delight about any fraction can be expressed as a unit fraction.
- 16) To relate the situations of fractions in daily life.
- 17) To solve the questions using all the concepts of the fractions.
- 18) To develop the habit of sharing among everyone.

| Time to teach | Asset Type  | Theme     | SubTheme                                                |
|---------------|-------------|-----------|---------------------------------------------------------|
| 3 Minutes     | Main Script | Fractions | Part of a whole - fraction,<br>Part of a whole fraction |

## 2. IQ\_How many fractions are there with 1005 as denominator?

1. Write

- all the fractions with 2 as denominator.
- all the fractions with 3 as denominator.
- all the fractions with 4 as denominator.
- all the fractions with 5 as denominator.

How many fractions can you form with 1005 as denominator?

Is there anything you observe?

(Ask the students to avoid fractions like  $0/2$ ,  $3/3$  etc.)

Answer:

(a)  $1/2$

(b)  $1/3$ ,  $2/3$

(c)  $1/4$ ,  $2/4$ ,  $3/4$

(d)  $1/5$ ,  $2/5$ ,  $3/5$ ,  $4/5$

There is 1 fraction with 2 as denominator.

There are 2 fractions with 3 as denominator.

There are 3 fractions with 4 as denominator.

There are 4 fractions with 5 as denominator.

So, number of fractions is one less than the denominator.

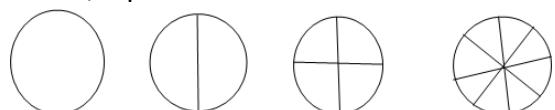
Hence, 1004 fractions can be formed with 1005 as denominator.

| Time to teach | Asset Type            | Theme     | SubTheme                                                |
|---------------|-----------------------|-----------|---------------------------------------------------------|
| 5 Minutes     | Inquisitive Questions | Fractions | Part of a whole - fraction,<br>Part of a whole fraction |

## 3. MS\_Introduction of Fractions

We have seen things which we have observed in our daily life, where we talk about part of something but not whole, like half, one third, three fourth.

If something is whole, say two books, three pencils and five coins, then we can write the above as 2 books, 3 pencils and 5 coins. We use whole numbers to represent something whole.



**Observe the diagram drawn on the board**

The first figure shows a full circle. The second circle is divided into 2 equal parts; the third is divided into 4 equal parts and the last into 8 equal parts. So, in the first figure, we see a whole circle and in the second, each is half of the circle; in the third, each part is one fourth of the circle and in the last, each is one eighth of the circle.

If there are two apples and two children in a home, each child will get one apple. If two of their friends join them, each will get half apple, a part of the whole.

**How to represent the above using numbers?**

A **fraction** represents a part of a whole.

A fraction is written in the form  $p/q$  where  $p$  and  $q$  are whole numbers in which  $q$  is non zero.

The number **p** is known as the **numerator** and **q** is called **denominator**.

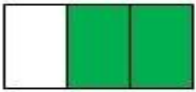
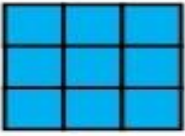
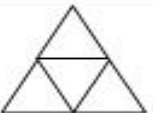
**p** gives the number of equal parts which are taken and **q** is the number of equal parts into which the whole is being divided.

**Special cases**

1.  $p = 0$ . Then no part is taken. So  $p/q = 0/q = 0$ .
2.  $p = q$  and  $p \neq 0$ . All the parts are taken. So  $p/q = p/p = 1$ .

Note: In general, when we write fractions, we don't consider the special cases.

Now look at the chart.

| Figure                                                                             | p = No. of equal parts taken(shaded) | q = Total number of equal parts | Fractions |
|------------------------------------------------------------------------------------|--------------------------------------|---------------------------------|-----------|
|   | 1                                    | 3                               | $1/3$     |
|   | 2                                    | 3                               | $2/3$     |
|   | 5                                    | 9                               | $5/9$     |
|   | 9                                    | 9                               | $9/9=1$   |
|   | 2                                    | 4                               | $2/4$     |
|  | 0                                    | 4                               | $0/4=0$   |

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| Time to teach | Asset Type  | Theme     | SubTheme                                                |
|---------------|-------------|-----------|---------------------------------------------------------|
| 15 Minutes    | Main Script | Fractions | Part of a whole - fraction,<br>Part of a whole fraction |

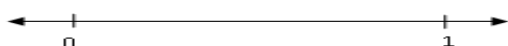
#### 4. MS\_Represent Fractions on Number Line

You would have learnt to show the whole numbers like 0, 1 and 2 on a number line. Suppose I have a ribbon and I want to make a bow. I need only  $\frac{1}{2}$  of it.

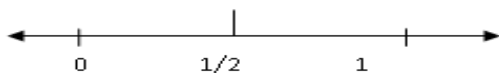
Therefore, we cut it into two equal pieces. Fractions can be represented on number line.

I. To represent the fraction  $\frac{1}{2}$  on a number line, we have to follow the steps given below:

1. Draw a line with points '0' and '1' marked on it.

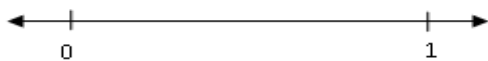


2. As  $\frac{1}{2}$  lies in between 0 and 1 and equal distance from 0 and 1, we will mark the half of the line between zero and 1.
3. This mark indicates the required fraction.

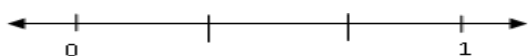


II. Suppose we want to represent  $\frac{1}{3}$  on the number line.

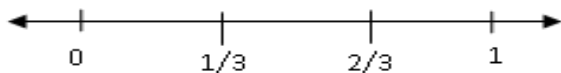
1. Draw a line with points '0' and '1' marked on it.



2. As the fraction is  $\frac{1}{3}$ , the distance between 0 and 1 is divided into 3 equal parts

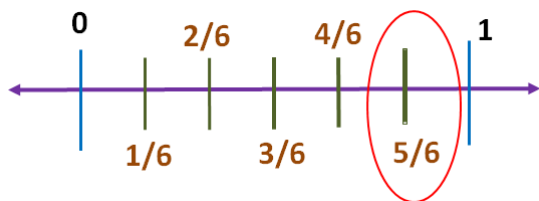


3. Now there are 4 markings and 3 parts. We start the markings from 0 at the left most and end with 1 at the right most. [When there is no part, then it is 0. So 0 is zero part of 3. Hence the first marking is  $0/3 = 0$ .] The second marking is  $\frac{1}{3}$  and the third marking is  $\frac{2}{3}$  and the last is  $\frac{3}{3} = 1$ .

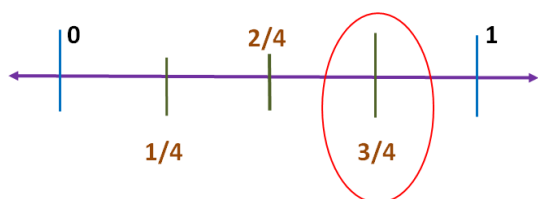


1. Draw the number line to represent: (i)  $\frac{5}{6}$  (ii)  $\frac{3}{4}$ .

i)



ii)



#### Note:

Since fractions are part of whole, on the number line they lie between 0 and 1, inclusive of 0 and 1.

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| Time to teach | Asset Type  | Theme     | SubTheme                                           |
|---------------|-------------|-----------|----------------------------------------------------|
| 20 Minutes    | Main Script | Fractions | Fractions on number line, Fractions on number line |

## 5. QA\_Practice Questions on Fractions

**Answer the following:**

**1 Assume that the natural numbers are from 2 to 35, answer the**

**questions given below:**

- What fraction of them is even numbers?
- What fraction of them is odd numbers?
- What fraction of them is prime numbers?
- What fraction of them is ending with 8?
- What fraction of them is greater than 10 and multiple of 3?

**2. Fill in the Blanks:**

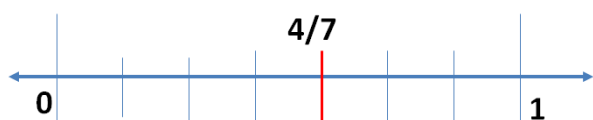
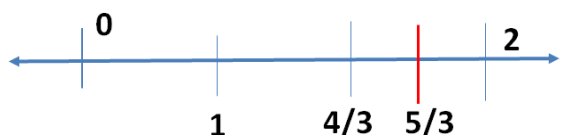
- What is the numerator of this fraction  $8/11$ ? -----
- How many markings will be there in a number line for the fraction  $2/5$ ? -----
- For a fraction  $a/b$  what can you say about  $b$ ? -----
- If the number in the denominator is 4, how many fractions can be represented? -----

**3. Draw the number line for the fractions given below.**

- a)  $4/7$  (b)  $5/3$ .

**Ans:**

- $17/35$  (2,4,...,34)(17 out of 35)
  - $17$  (3,5,...,35)(17 out of 35)
  - $11/35$  (2,3,5,7,11,13,17,19,23,29,31)
  - $3/35$  (8,18,28)
  - $8/35$  (12,15,18,21,24,27,30, 33)
- a. 8 (b) 6 (c) b is non zero ( $b \neq 0$ ) (d) 3
-

**(a)  $\frac{4}{7}$** **(b)  $\frac{5}{3} = 1$  and  $\frac{2}{3}$  so between 1 and 2**

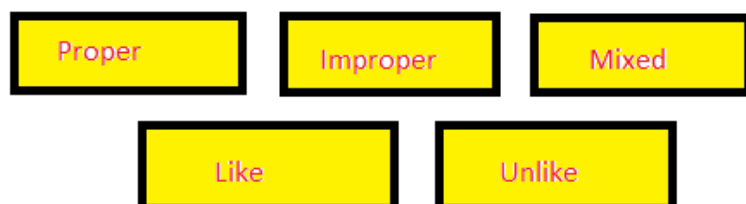
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| Time to teach | Asset Type  | Theme     | SubTheme                                                |
|---------------|-------------|-----------|---------------------------------------------------------|
| 10 Minutes    | Assessments | Fractions | Part of a whole - fraction,<br>Part of a whole fraction |

## 6. MS\_Types of Fractions

### Types of Fractions

a) Proper Fractions (b) Improper Fractions (c) Mixed Fractions (d) Like Fractions (e) Unlike Fractions.

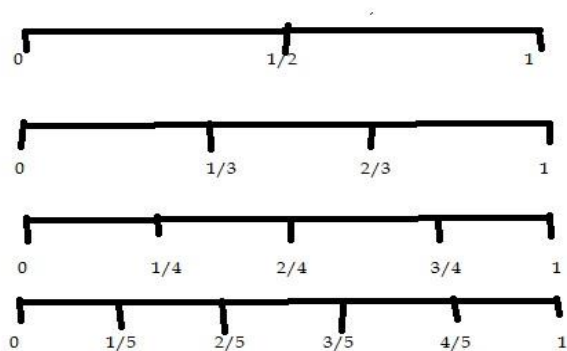


### Proper Fractions

When the numerator of a fraction is strictly less than the denominator of a fraction then the fraction is called **Proper Fraction**. These fractions will always lie between 0 and 1

For example,  $\frac{3}{5}$ ,  $\frac{6}{7}$ ,  $\frac{2}{11}$ . In all these fractions, the value of the numerator are less than the value of the denominator.

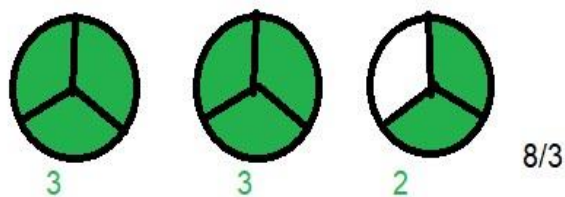
In a proper fraction, the denominator shows the number of parts into which the whole is divided and the numerator shows the number of parts we have taken out.



### Improper Fractions

In a basket, there are five apples. They should be divided among 4 children. So first we give one full apple to each child. Now, one apple is left out; which is cut into four pieces and distributed one to each child. Therefore, each child got an equal share of apples. If we consider the pieces of the apple, we come to know that each one has 5 pieces of  $\frac{1}{4}$ . Since each has got five of  $\frac{1}{4}$ ; we can represent it in the fraction form as  $\frac{5}{4}$ .

For example  $\frac{8}{3}$  can be represented as



Improper fractions are fractions having the numerator  $>$  denominator.

### Steps to represent improper fraction on a number line

- i. divide the numerator by the denominator and write the quotient and remainder separately.
- ii. The quotient will be the whole number. The remainder will be less than the denominator.
- iii. Draw the number line. The first marking will be the quotient number and the last marking will be the successor of the quotient.
- iv. Divide the number line into that many parts of the denominator number.

Example  $\frac{8}{3}$

1. Divide  $8/3$  . (Quotient = 2 ,Remainder = 2)

2. The fraction is 2 and  $2/3$  .



### c. Mixed Fractions.

We can even write the share  $5/4$  as “1 and  $\frac{1}{4}$ ” i.e.  $1\frac{1}{4}$ . This form of writing a whole number along with a fraction is called as “mixed fraction”.

In the  $1\frac{1}{4}$  form; the number 1 signifies the whole part of the fraction and the  $\frac{1}{4}$  form represents the proper fraction. Hence we can even say the mixed fraction as the consisting of a whole number and a proper fraction.



But how do we get a mixed fraction?

#### Writing Improper Fractions as Mixed Numbers

To write an improper fraction as a mixed number, divide the numerator (top part) by the denominator (bottom part). The quotient is the whole number, and the remainder is the numerator.

How would you express  $17/4$  as a mixed number?

Divide the numerator by the denominator:

$$17 \div 4 = 4, \text{ with a remainder of } 1$$

The quotient, 4, is the whole number. The remainder 1, is the numerator. The denominator remains 4.

$$17/4 = 1\frac{1}{4}$$

#### Examples

1.  $14/9 = ?$

Solution:

Divide the numerator by the denominator:

$$14 \div 9 = 1, \text{ with a remainder of } 5$$

The quotient, 1, is the whole number. The remainder, 5, is the numerator. The denominator remains 9.

$$14/9 = 1\frac{5}{9}$$

#### Covert Improper Fraction to Mixed Fraction

2. Express  $11/3$  as a mixed fraction.

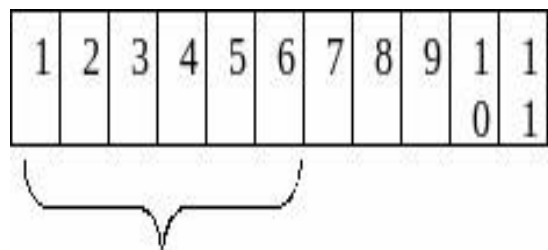
Solution: First we need to divide the number 11 with 3.

Here, 3-quotient, 2-remainder and 3-divisor.

So, we write the fraction  $3\frac{2}{3}$

The teachers can explain the same concept by taking other improper fractions.

Let us consider  $11/6$ . Here we take whole consists of 6 parts. Then we check how many whole is there in 11.



In 11, there is one whole and 5 parts of the whole. In other words, 1 and  $5/6$ .

Equivalently, let us divide 11 by 6.

$$\begin{array}{r} 1 \\ 6 \overline{) 11} \\ \underline{-6} \\ 5 \end{array}$$

Here quotient = 1, remainder = 5 and divisor = 6.

So the number is  $1\frac{5}{6}$ . Thus we get a number which contains both whole and part. Therefore it is a mixed fraction.

**Convert Mixed Fraction to Improper Fraction**

Consider  $1\frac{5}{6}$ ,  $6\frac{2}{3}$  and  $1\frac{1}{3}$ . They are combination of whole and part of it. So they are mixed fractions.

Take the mixed fraction  $6\frac{2}{3}$ . It contains 6 whole and 2 parts of 3.

Now  $6\frac{2}{3} = \frac{20}{3}$  an improper fraction. Similarly the other mixed fractions  $1\frac{5}{6}$  and  $1\frac{1}{3}$  can be converted to improper fractions.

Thus mixed fractions  $\longleftrightarrow$  Improper fractions.

In other words one can be obtained from the other.

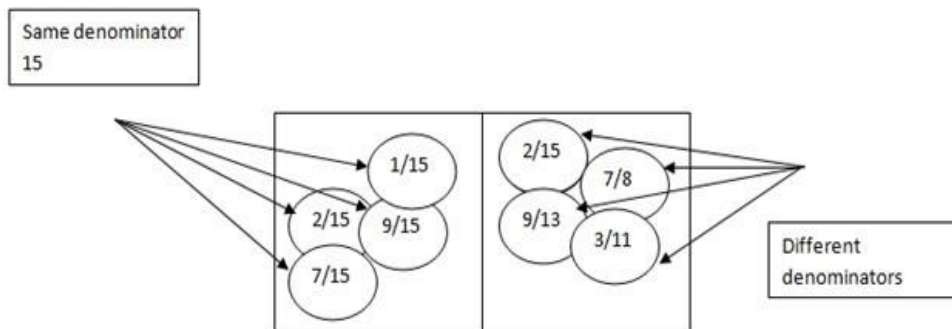
### Like Fractions and Unlike Fractions

Fractions with same denominators are called as **Like**

fractions. E.g.  $1/15$ ,  $5/15$ ,  $8/15$ .

Fractions with different denominators are called as **unlike** fractions.

E.g.  $1/14$ ,  $2/16$ ,  $7/29$ .



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| Time to teach | Asset Type  | Theme     | SubTheme                                                                   |
|---------------|-------------|-----------|----------------------------------------------------------------------------|
| 20 Minutes    | Main Script | Fractions | Proper, improper and mixed fractions, Proper, improper and mixed fractions |

## 7. QA\_Assessments on Types of Fractions

1. Which of the following are proper fractions?

a)  $\frac{1}{2}$  (b)  $\frac{5}{9}$  (c)  $\frac{9}{17}$  (d)  $\frac{18}{5}$

2. Classify the following as mixed or improper fraction:

a.  $7\frac{2}{3}$  (b)  $1\frac{1}{4}$  (c)  $\frac{44}{14}$  (d)  $3\frac{2}{5}$  (e)  $\frac{21}{6}$

3. Write 3 improper fractions with denominator 5.

4. Convert the following as improper fractions:

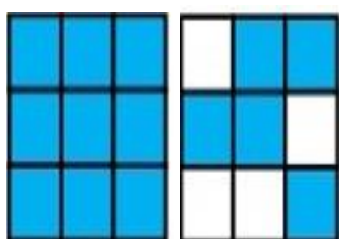
(a)  $2\frac{1}{7}$  (b)  $16\frac{3}{5}$  (c)  $8\frac{8}{9}$  (d)  $13\frac{14}{15}$  (e)  $11\frac{9}{100}$

5. Express the following as mixed fractions:

a)  $\frac{47}{4}$  (b)  $\frac{33}{2}$  (c)  $\frac{89}{13}$  (d)  $\frac{117}{20}$  (e)  $-\frac{17}{5}$

6. Write the mixed fraction that represents the shaded part:

a)





Solutions:

1. a, b, c are proper fractions.
2. a, b, d are mixed fractions. c and e are improper fractions.
3.  $9/5$ ,  $11/5$ ,  $14/5$  (It can be any number in the numerator which is greater than 5)
4. (a)  $15/7$  (b)  $83/5$  (c)  $80/9$  (d)  $209/15$  (e)  $1109/100$
5. (a)  $11\frac{3}{4}$  (b)  $16\frac{1}{2}$  (c)  $6\frac{11}{13}$  (d)  $5\frac{17}{20}$  (e)  $-3\frac{2}{5}$
6. (a)  $1\frac{5}{9}$  (b)  $2\frac{1}{2}$

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| Time to teach | Asset Type  | Theme     | SubTheme                                                                   |
|---------------|-------------|-----------|----------------------------------------------------------------------------|
| 15 Minutes    | Assessments | Fractions | Proper, improper and mixed fractions, Proper, improper and mixed fractions |

## 8. IQ Find the Simplest form of Fractions

1. Suppose you have a proper fraction in which both the numerator and the denominator are prime numbers. Is it in simplest form? Give reason.
2. Is the statement, "If a fraction is in simplest form, then its numerator and denominators are prime numbers." True or False? Give reason.
3. If the fraction  $p/q$  is in simplest form, which of the following statements is not true. Give reason and examples for each.
  - (a) Both  $p$  and  $q$  are prime
  - (b) Both  $p$  and  $q$  are odd numbers
  - (c) Both  $p$  and  $q$  are even numbers
  - (d) If  $p$  is even,  $q$  is odd or  $p$  is odd  $q$  is even.

**Answers:**

1. If  $p$  and  $q$  are prime numbers, then  $p/q$  is in a simplest form. Since for 2 prime numbers 1 is the only common factor. Example:  $2/5$ ,  $7/13$ ,  $5/11$

2. False.  $\frac{8}{15}$  is a fraction in the simplest form as for 8 and 15, 1 is the only common factor. But 8 and 15 are not prime numbers.

3. c is not true because if both p and q are even numbers, then they have a common factor other than 1. Hence, it is not in the simplest form.

Examples of (a)  $\frac{2}{7}$  (b)  $\frac{3}{11}$  (c)  $\frac{2}{6}$  (d)  $\frac{3}{8}$  or  $\frac{4}{7}$

Therefore, the simplest form of fractions are those fractions having only 1 as the common factor for both numerator and denominator.

| Time to teach | Asset Type            | Theme     | SubTheme                                                |
|---------------|-----------------------|-----------|---------------------------------------------------------|
| 5 Minutes     | Inquisitive Questions | Fractions | Fraction in simplest form,<br>Fraction in simplest form |

## 9. MS\_How to reduce fraction to its Simplest form

### How to reduce the fraction to simplest form?

“A fraction is said to be in the simplest or the lowest form, if its numerator and denominator have no common factor other than 1”.

The simplest and the shortest way to do this is to find the H.C.F of the numerator and the denominator and then divide both of them by the H.C.F.

Example 1: Find the simplest form of  $\frac{15}{75}$ .

Solution:

$$15 = 3 \times 5 \text{ and } 75 = 3 \times 25 = 3 \times 5 \times 5$$

Hence, the HCF of 15 and 75 is 15.

Therefore, divide both numerator and denominator by 15.

$$\frac{15}{75} = \frac{15 \div 15}{75 \div 15} = \frac{1}{5}$$

Thus, the simplest form of  $\frac{15}{75}$  is  $\frac{1}{5}$ .

Example 2: Find the simplest form of  $\frac{21}{56}$ .

Solution:

$$21 = 3 \times 7 \text{ and } 56 = 2 \times 28 = 2 \times 4 \times 7 \text{ The HCF of}$$

21 and 56 is 7.

Therefore, divide both numerator and denominator by 7.

$$\frac{21}{56} = \frac{21 \div 7}{56 \div 7} = \frac{3}{8}$$

Thus, the simplest form of  $\frac{21}{56}$  is  $\frac{3}{8}$ .

Example 3: Reduce 16/36 into simplest form

Solution:  $\frac{16}{36} = \frac{16 \div 4}{36 \div 4} = \frac{4}{9}$

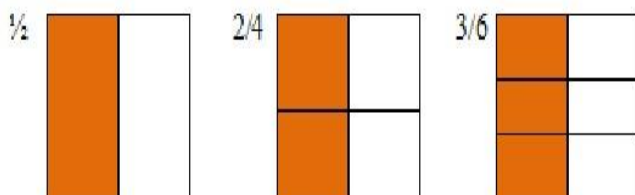
Note: Teacher can give more examples.

| Time to teach | Asset Type  | Theme     | SubTheme                                                |
|---------------|-------------|-----------|---------------------------------------------------------|
| 10 Minutes    | Main Script | Fractions | Fraction in simplest form,<br>Fraction in simplest form |

## 10. MS\_Finding the equivalent fractions of a given fraction

### EQUIVALENT FRACTIONS

Now let us observe the following figures.



We see that the brown coloured part remains the same even though the methods of division are different.

“Equivalent fraction represents the same part of the whole.”

[The teacher can give a figure of her own and explain the same concept to the class]

### Finding the equivalent fractions of a given fraction:

#### Method 1

#### Method of Multiplication

Multiply the numerator and the denominator with the same number. The new fraction is an equivalent fraction.

Example: Let us find an equivalent fraction of  $\frac{2}{5}$ . Choose the number to be multiplied to

be 3. Then  $\frac{2}{5} = \frac{2 \times 3}{5 \times 3} = \frac{6}{15}$  Is equivalent fraction unique?

By changing the number, which is multiplied by the same number to the numerator and the denominator, we get different equivalent fractions.

Instead of 3, let us multiply by 4 and 5.

$$\frac{2}{5} = \frac{2 \times 4}{5 \times 4} = \frac{8}{20}$$

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

In this way we can find any number of equivalent fractions for a given fraction.

Therefore, equivalent fractions are not unique.

Note: By the method of multiplication, we get infinite number of equivalent fractions.

## Method 2

### Method of Division

Find the divisors of both the numerator and the denominator. Choose any common divisor and divide the numerator and the denominator by the same number. The new fraction is an equivalent fraction (If there are more factors common to the numerator and denominator then each reduced fraction is an equivalent fraction. If not it is like a simplest form).

Example: Let us find an equivalent fraction of  $\frac{10}{35}$ . For 10, the divisors are 2 and 5. For 35, the divisors are 7 and 5. There is only one common divisor, namely 5. Let us divide the numerator and the denominator by 5.

$$\text{Then } \frac{10}{35} = \frac{10 \div 5}{35 \div 5} = \frac{2}{7}$$

Can we find any other equivalent fraction by division?

No because there is no other common divisor.

Note:

The number of equivalent fractions obtained by division = The number of divisors common to numerator and denominator.

By changing the number, which is multiplied by the numerator and the denominator, we get different equivalent fractions.

Instead of 3, let us multiply by 4 and 5.

$$\frac{2}{5} = \frac{2 \times 4}{5 \times 4} = \frac{8}{20}$$

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

### Method 3

#### Method of cross multiplication:

$$\frac{a}{b} = \frac{c}{d} \text{ then } a \times d = c \times b$$

The above method is useful when we have to find an equivalent fraction

1. For a given denominator
2. For a given numerator

1. To find the denominator of an equivalent fraction for a given numerator:

$$\frac{8}{26} = \frac{4}{D} : 8 \times D = 4 \times 26. \text{ Hence } D = \frac{4 \times 26}{8} = 13$$

2. To find the numerator of an equivalent fraction for a given denominator:

$$\frac{4}{9} = \frac{N}{45} : \frac{4 \times 45}{9} = N. \text{ Hence } N = 20.$$

Example:

1. Find 4 equivalent fractions for  $\frac{3}{5}$ .

$\frac{3}{5}$ ,  $\frac{6}{10}$ ,  $\frac{9}{15}$  and  $\frac{12}{20}$ .

2. Fill in the blank:

1.  $\frac{2}{3} = \frac{X}{15} : X = \frac{2 \times 15}{3} = X. \text{ Hence } X = 10.$
2.  $\frac{3}{8} = \frac{12}{X} : X = \frac{12 \times 8}{3}. \text{ Hence } X = 32.$

All images are original (girijashankaran@gmail.com)

| Time to teach | Asset Type  | Theme     | SubTheme                                      |
|---------------|-------------|-----------|-----------------------------------------------|
| 20 Minutes    | Main Script | Fractions | Equivalent fractions,<br>Equivalent fractions |

## 11. SA\_Learning through Activity

**Aim:** To make the students identify equivalent fractions using number lines.

**Type of Activity:** Individual

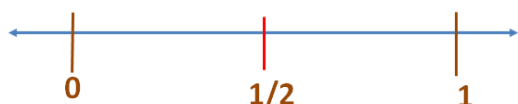
**Setting of Activity:** Classroom

**Material required:** Paper, pencil, scale

**Step 1:** Ask the students to draw a line and mark 0 on the left end and 1 on the right end of the line.



**Step 2:** Ask them to mark  $\frac{1}{2}$  in the middle of the line (dividing into 2 equal parts).



**Step 3:** Ask them to measure the distance between 0 and  $\frac{1}{2}$ .

**Step 4:** Ask the students to draw a 2nd line and mark 0 and 1.

**Step 5:** Ask them to mark  $\frac{1}{4}$ ,  $\frac{2}{4}$  and  $\frac{3}{4}$ .

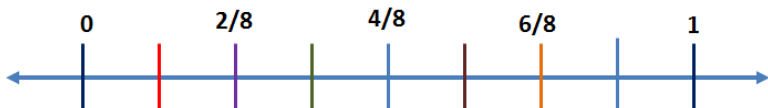
Example:



**Step 6:** Ask them to measure the distances between 0 and  $\frac{1}{4}$ , 0 and  $\frac{2}{4}$  and 0 and  $\frac{3}{4}$ .

**Step 7:** Ask the students to draw a 3rd line and mark 0 and 1.

**Step 8:** Ask them to mark  $\frac{1}{8}$ ,  $\frac{2}{8}$ ,  $\frac{3}{8}$ ,  $\frac{4}{8}$ ,  $\frac{5}{8}$ ,  $\frac{6}{8}$ ,  $\frac{7}{8}$ .



**Step 9:** Ask them to measure the distance between 0 and  $\frac{2}{8}$ , 0 and  $\frac{4}{8}$  and 0 and  $\frac{6}{8}$

**Step 10:** Ask them to compare the distances between

1. 0 and  $\frac{1}{2}$ , 0 and  $\frac{2}{8}$  and 0 and  $\frac{4}{8}$ .
2. 0 and  $\frac{1}{4}$  and 0 and  $\frac{2}{8}$ .
3. 0 and  $\frac{3}{4}$  and 0 and  $\frac{6}{8}$ .

**Step 11:** Since, the answers must be “equal”, write on the board,

1.  $\frac{1}{2}$  ,  $\frac{2}{4}$  ,  $\frac{4}{8}$  are equivalent fractions
2.  $\frac{1}{4}$  ,  $\frac{2}{8}$  are equivalent fractions
3.  $\frac{3}{4}$  ,  $\frac{6}{8}$  are equivalent fractions

**Conclusion:** Equivalent fractions are recognized using number line.

## Activity 2

**Aim:** To make the students distinguish proper fractions, improper fractions, mixed fractions.

**Type of Activity:** Group

**Setting of Activity:** Classroom

**Materials Needed:** Paper and pen.

**Step 1:** Give the numbers 1, 2, 3, 5, 7.

**Step 2:** Ask each group to form proper fractions, improper fractions, mixed fractions using these numbers. In each fraction numbers should not be repeated.

**Step 3:** Ask them to write the answers on the board after 5 minutes.

**Conclusion:** Different types of fractions are identified.

Image Source: All are original girijashankaran@gmail.com

| Time to teach | Asset Type         | Theme     | SubTheme                                      |
|---------------|--------------------|-----------|-----------------------------------------------|
| 20 Minutes    | Suggested Activity | Fractions | Equivalent fractions,<br>Equivalent fractions |

## 12. QA\_Test on Equivalent Fractions

1. Write any 3 equivalent fractions for the following numbers:

(a)  $\frac{1}{6}$       (b)  $\frac{3}{7}$       (c)  $\frac{5}{6}$       (d)  $\frac{7}{9}$

2. Which of the following pairs is an equivalent fraction:

(a)  $\frac{1}{3}, \frac{9}{27}$       (b)  $\frac{6}{5}, \frac{28}{35}$       (c)  $\frac{3}{5}, \frac{24}{40}$       (d)  $\frac{2}{3}, \frac{36}{45}$

3. Reduce each of the following fractions to its simplest form :

a)  $\frac{18}{54} = \underline{\hspace{2cm}}$       c)  $\frac{16}{20} = \underline{\hspace{2cm}}$       e)  $\frac{108}{120} = \underline{\hspace{2cm}}$   
 b)  $\frac{13}{52} = \underline{\hspace{2cm}}$       d)  $\frac{79}{158} = \underline{\hspace{2cm}}$

4. Write the equivalent fraction of:

i)  $\frac{8}{7} = \frac{N}{35}$       (ii)  $\frac{4}{5} = \frac{60}{D}$

5. How many equivalent fractions can you obtain for  $\frac{21}{35}$  by division? Give reason.

6. Obtain 4 equivalent fractions of  $\frac{4}{5}$ , by multiplication. Choose the numbers to be prime numbers which are greater than 2. For  $\frac{4}{5}$ , can you find equivalent fractions by division? Justify.

7. A box contains 50 ceramic coasters. If 10 were broken, what fraction of the coasters were broken? What fraction of the coasters were not broken? Write an equivalent fraction using the denominator of 100 for each answer.

**Answers:**

1. (a)  $\frac{1}{6} = \frac{2}{12}, \frac{3}{18}, \frac{4}{24}$       (b)  $\frac{3}{7} = \frac{6}{14}, \frac{9}{21}, \frac{12}{28}$   
 (c)  $\frac{5}{6} = \frac{10}{12}, \frac{15}{18}, \frac{20}{24}$       (d)  $\frac{7}{9} = \frac{14}{18}, \frac{21}{27}, \frac{28}{36}$

2. a and c are equivalent fractions.

3. (a)  $\frac{1}{3}$       (b)  $\frac{1}{4}$       (c)  $\frac{4}{5}$       (d)  $\frac{1}{2}$       (e)  $\frac{9}{10}$

4. i)  $N = \frac{8 \times 35}{7} = 40$       (ii)  $N = \frac{5 \times 60}{4} = 75$

5.  $21 = 3 \times 7$ ,  $35 = 5 \times 7$ . The only common divisor is 7. So, there is only one equivalent fraction that can be obtained by division.

6. First four prime numbers which are greater than 2 are 3, 5, 7, 11. The equivalent fractions are  $\frac{12}{15}, \frac{20}{25}, \frac{28}{35}, \frac{44}{55}$ . (Students have an infinite choice). By division equivalent fractions of  $\frac{4}{5}$  cannot be obtained. Since, 4 and 5 have no common divisor other than 1.

7. Fraction of coasters broken =  $\frac{10}{50} = \frac{1}{5}$ .

Fraction of coasters not broken  $\frac{40}{50} = \frac{4}{5}$

$\frac{1 \times 20}{5 \times 20} = \frac{20}{100}, \frac{4 \times 20}{5 \times 20} = \frac{80}{100}$

| Time to teach | Asset Type  | Theme     | SubTheme                                      |
|---------------|-------------|-----------|-----------------------------------------------|
| 20 Minutes    | Assessments | Fractions | Equivalent fractions,<br>Equivalent fractions |

### 13. MS\_To Compare and arrange the Fractions in order

#### Arranging fractions

When we arrange numbers in increasing order or in decreasing order, we compare the numbers.

In the similar fashion, when we arrange fractions we compare them and arrange.

**Arrange the following in increasing order.**

$$\frac{4}{25}, \frac{24}{25}, \frac{7}{25}, \frac{19}{25}, \frac{20}{25}$$

**Solution:**

Here all are having same denominator 25. Therefore, they are like fractions.

The numerators are 4, 24, 7, 19, 20.

Arrange them in increasing order.

4, 7, 19, 20, 24.

Therefore, the increasing order of fractions is  $\frac{4}{25}, \frac{7}{25}, \frac{19}{25}, \frac{20}{25}, \frac{24}{25}$ .

Unlike fractions are those fractions which have different denominators.

In the unlike fractions also we do have two varieties:

i) With same numerator and different denominators.

ii) With different numerators and denominators.

Example 1:

**Arrange the following in increasing order.**

$$\frac{4}{21}, \frac{4}{17}, \frac{4}{11}, \frac{4}{35}, \frac{4}{12}$$

Here the denominators are different but they have same numerators.

**Write the denominators.**

21, 17, 11, 35, 12

**Arrange them in decreasing order.**

35, 21, 17, 12, 11

**Now write the fractions**

$$\frac{4}{35}, \frac{4}{21}, \frac{4}{17}, \frac{4}{12}, \frac{4}{11}$$

(The greater the denominator the smaller the number, provided the numerators are same) They are in the increasing order.

**(ii) Different Numerators and Different Denominators**

Example 2:

**Arrange these fractions in ascending order:**

$$\frac{4}{5}, \frac{1}{4}, \frac{2}{3}, \frac{3}{8}$$

- i) First take the LCM of all the denominators.
- ii) Find the factor of each denominator with the LCM.
- iii) Multiply with the same factor to each of the numerator.
- iv) Now compare the numerators and arrange in the respective order.

LCM of 5, 3, 4, 8

$$\begin{array}{l} 4 \overline{) 5, 4, 3, 8} \\ \underline{5, 1, 3, 2} \end{array}$$

Hence, L.C.M is  $4 \times 5 \times 1 \times 3 \times 2 = 120$

Hence, now compare with the numerators 96, 30, 80, 45.

The ascending order is  $\frac{1}{4}, \frac{3}{8}, \frac{2}{3}, \frac{4}{5}$ .

Example:

Compare which fraction is greater or smaller.

$$1. \frac{6}{7}, \frac{3}{7} : \frac{6}{7} > \frac{3}{7}$$

$$2. \frac{3}{8}, \frac{5}{12}. \text{ The denominators are different.}$$

Find LCM of 8 and 12. LCM of 8 and 12 is 24.

Hence the numerators are 9 and 10.

$$\frac{3}{8} \text{ is smaller than } \frac{5}{12}. \quad \frac{3}{8} < \frac{5}{12}$$

(Note: Teacher can give some more examples and ask the children to do it on the board)

All images are original (girijashankaran@gmail.com)

| Time to teach | Asset Type  | Theme     | SubTheme                                                |
|---------------|-------------|-----------|---------------------------------------------------------|
| 25 Minutes    | Main Script | Fractions | Like and unlike fractions,<br>Like and unlike fractions |

## 14. MS\_Addition and subtraction of Like and Unlike Fractions

### Addition and subtraction of fractions

#### 1. Adding like fractions

They have same denominators.

Sum of the fractions =  $\frac{\text{sum of the numerators}}{\text{denominator}}$

#### Example 1

Find  $\frac{1}{15} + \frac{7}{15}$ .

$$\frac{1}{15} + \frac{7}{15} = \frac{1+7}{15}.$$

#### 2. Subtracting like fractions

Here we subtract the 2nd numerator from the 1st.

Fraction 1 – fraction 2 =  $\frac{\text{numerator 1} - \text{numerator 2}}{\text{denominator}}$

#### Example 2

$$\frac{7}{15} - \frac{4}{15} = \frac{7-4}{15} = \frac{3}{15}$$

#### 3. Adding unlike fractions

Unlike fractions implies denominators are different.

First find equivalent fractions having the denominator = LCM of the denominators.

Second add the equivalent fractions.

Find  $\frac{6}{15} + \frac{8}{9}$ .

LCM of 15 and 9 = 45

$$\frac{6}{15} = \frac{N}{45}$$

$$N = \frac{6 \times 45}{15} \\ = 18$$

$$\frac{6}{15} = \frac{18}{45}$$

$$\frac{8}{9} = \frac{N}{45}$$

$$N = \frac{8 \times 45}{9} = 40$$

$$\text{Hence } \frac{8}{9} = \frac{40}{45}$$

$$\frac{18}{45} = \frac{40}{45} = \frac{18 + 40}{45} = \frac{58}{45}$$

#### 4. Subtracting unlike fractions

Find  $\frac{15}{26} - \frac{10}{39}$ .

LCM of 26 and 39 = 78

$$\frac{15}{26} = \frac{N}{78} \quad N = \frac{15 \times 78}{26} = 45$$

$$\text{Hence } \frac{15}{26} = \frac{45}{78}$$

$$\frac{10}{39} = \frac{15 \times 78}{26} = N = \frac{10 \times 78}{39} = 20$$

$$\text{Hence } \frac{10}{39} = \frac{20}{78}$$

$$\frac{15}{26} - \frac{10}{39} = \frac{45-20}{78} = \frac{25}{78}$$

Note: Teacher can show some more examples.

| Time to teach | Asset Type  | Theme     | SubTheme                                                                                                     |
|---------------|-------------|-----------|--------------------------------------------------------------------------------------------------------------|
| 20 Minutes    | Main Script | Fractions | Addition and subtraction of fractions(like and mixed), Addition and subtraction of fractions(like and mixed) |

## 15. MS\_How to Add and Subtract for Mixed Fractions

### Addition and subtraction of Mixed fractions

To do addition and subtraction with mixed fraction we first convert them into improper fractions and then perform the operations.

1) Add  $2\frac{3}{4} + 5\frac{1}{2}$

Solution: First step is to convert the mixed fraction into improper fraction

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

$$5\frac{1}{2} = \frac{(5 \times 2) + 1}{2} = \frac{10+1}{2} = \frac{11}{2}$$

$$\frac{3}{4} + 5\frac{1}{2} = \frac{11}{4} + \frac{11}{2}$$

$$2\frac{3}{4} + 5\frac{1}{2} = \frac{11}{4} + \frac{11}{2}$$

The LCM of 4 and 2 is 4. Now convert the improper fractions into fractions with same denominator.

$$2\frac{3}{4} + 5\frac{1}{2} = \frac{11 \times 1}{4 \times 1} + \frac{11 \times 2}{2 \times 2}$$

$$2\frac{3}{4} + 5\frac{1}{2} = \frac{11}{4} + \frac{22}{4}$$

$$2\frac{3}{4} + 5\frac{1}{2} = \frac{11+22}{4}$$

$$2\frac{3}{4} + 5\frac{1}{2} = \frac{33}{4}$$

2) Subtract:  $3\frac{4}{7} - 2\frac{1}{2}$

Solution: First step is to convert the mixed fraction into improper fraction:

$$3\frac{4}{7} = \frac{(3 \times 7) + 4}{7} = \frac{21 + 4}{7} = \frac{25}{7}$$

$$2\frac{1}{2} = \frac{(2 \times 2) + 1}{2} = \frac{4 + 1}{2} = \frac{5}{2}$$

The LCM of 7 and 2 is 14.

$$3\frac{4}{7} - 2\frac{1}{2} = \frac{25 \times 2}{7 \times 2} - \frac{5 \times 7}{2 \times 7}$$

$$\frac{4}{7} - 2\frac{1}{2} = \frac{50}{14} - \frac{35}{14}$$

$$3\frac{4}{7} - 2\frac{1}{2} = \frac{50 - 35}{14}$$

$$3\frac{4}{7} - 2\frac{1}{2} = \frac{15}{14}$$

Example 1.  $2\frac{3}{4} + 1\frac{1}{5}$

Solution:

$$2\frac{3}{4} + 1\frac{1}{5} = \frac{(4 \times 2) + 3}{4} + \frac{(5 \times 1) + 1}{5} = \frac{11}{4} + \frac{6}{5}$$

LCM of 4 and 5 is 20.

$$2\frac{3}{4} + 1\frac{1}{5} = \frac{11 \times 5}{4 \times 5} + \frac{6 \times 4}{5 \times 4} = \frac{55}{20} + \frac{24}{20} = \frac{79}{20} = 3\frac{19}{20}$$

Example 2.

$$3\frac{2}{3} - 2\frac{1}{4} = \frac{(3 \times 3) + 2}{3} - \frac{(2 \times 4) + 1}{4} = \frac{11}{3} - \frac{9}{4}$$

LCM of 3 and 4 is 12.

$$\frac{11}{3} - \frac{9}{4} = \frac{11 \times 4}{3 \times 4} - \frac{9 \times 3}{4 \times 3} = \frac{44}{12} - \frac{27}{12} = \frac{17}{12} = 1\frac{5}{12}$$

Note: Teacher can give some more examples.

| Time to teach | Asset Type  | Theme     | SubTheme                                                                                                     |
|---------------|-------------|-----------|--------------------------------------------------------------------------------------------------------------|
| 20 Minutes    | Main Script | Fractions | Addition and subtraction of fractions(like and mixed), Addition and subtraction of fractions(like and mixed) |

## 16. IA\_Expressing Any Fraction as a Unit Fraction

**The Egyptians of 3000 BC had an interesting way to represent fractions.**

Although they had a notation for  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$  and so on (these are called reciprocals or unit fractions since they are  $\frac{1}{n}$  for some number  $n$ ), their notation did not allow them to write  $\frac{2}{5}$  or  $\frac{3}{4}$  or  $\frac{4}{7}$  as we would do today.

A **unit fraction** is a rational number written as a fraction where the numerator is one and the denominator is a positive integer. A unit fraction is therefore the reciprocal of a positive integer,  $\frac{1}{n}$ . Examples are  $\frac{1}{1}$ ,  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ , etc.

Instead, they were able to write any fraction as a sum of unit fractions where all the unit fractions were different.

For example,

$$\frac{3}{4} = \frac{1}{2} + \frac{1}{4}$$

$$\frac{6}{7} = \frac{1}{2} + \frac{1}{3} + \frac{1}{42}$$

### A practical use of Egyptian Fractions

Suppose Fatima has 5 loaves of bread to share among 8 workers who have helped dig her fields this week and clear the irrigation channels. Pause for a minute and decide how you would **you** solve this problem before reading on.....



First Fatima sees that they all get at least half a loaf. So, she gives all 8 of them half a loaf each, with one whole loaf left.

Now it is easy to divide one loaf into 8, so they get an extra eighth of a loaf each and all the loaves are divided equally between the 5 workers. Each receives one half part ( $\frac{1}{2}$  a loaf) and one eighth part ( $\frac{1}{8}$  of a loaf). That amounts to  $\frac{1}{2} + \frac{1}{8} = \frac{5}{8}$ .

Any positive rational number can be written as the sum of unit fractions, in multiple ways.

For example we can write,

$$\frac{4}{5} = \frac{1}{2} + \frac{1}{4} + \frac{1}{20}$$

What an interesting information about **unit fractions**!

## Image of Bread: SSSVV Gallery – Keyword – Slices of Bread

| Time to teach | Asset Type         | Theme     | SubTheme                                                |
|---------------|--------------------|-----------|---------------------------------------------------------|
| 5 Minutes     | Interesting Asides | Fractions | Part of a whole - fraction,<br>Part of a whole fraction |

## 17. DD\_Applications of fractions in everyday life.

## Applications of Fractions in our daily life

- We see half moon twice a month in the sky.



- When the children are below 6, we buy half tickets for them in trains.
- Children spend one third of the day in school.
- In a school bag, three fourth of the weight is due to books.
- Head is a part of the body.
- Each chapter is a part of the whole book.



Image of half moon -

<https://www.publicdomainpictures.net/en/viewimage.php?image=199445&picture=half-moon-in-blue-sky>

Image of book - <https://pixabay.com/vectors/books-open-book-bookmarker-pages-36966/>

| Time to teach | Asset Type           | Theme     | SubTheme                                                |
|---------------|----------------------|-----------|---------------------------------------------------------|
| 5 Minutes     | Day-to-day Relevance | Fractions | Part of a whole - fraction,<br>Part of a whole fraction |

## 18. QA\_Work Sheet on Fractions

- There are three bags weighing  $5\frac{2}{3}$  kg;  $4\frac{5}{6}$  and  $3\frac{5}{9}$  kg. What is the total weight of the three bags?
- Sheela devotes daily  $2\frac{1}{4}$  hours in the morning time,  $3\frac{2}{5}$  hours in the evening time and  $1\frac{1}{4}$  hours in the night for her studies. How much time does she devote daily to study?
- A drum with rice weighs  $95\frac{5}{9}$  kg. If the weight of the drum is  $6\frac{5}{12}$  kg, find the weight of the rice.
- The length of the sides of a triangle are  $6\frac{2}{5}$  cm, 4 cm and  $3\frac{1}{3}$  cm. Find the sum of the three sides.
- You get  $\frac{1}{5}$  bottle of juice and your sister gets  $\frac{1}{3}$  of the same bottle of juice. Who gets more?
- Teacher gave homework problems. Ram did  $\frac{11}{24}$  of the problems and Varun did  $\frac{3}{8}$  of the problems. Who did less work?
- My elder sister cut and divided the water melon into 16 parts. I ate 7 of them and my friend ate 4 of them.
  - How much did we eat together?
  - How much did I eat more than my friend?
  - How much portion is left out?

Answers:

1. Total weight of the three bags

$$5\frac{2}{3} + 4\frac{5}{6} + 3\frac{5}{9} = 17/3 + 29/6 + 32/9$$

$$\text{LCM is 18. Hence } 102/18 + 87/18 + 64/18 = 253/18 = 14\frac{1}{18}$$

2. Total time of study :

$$2\frac{1}{4} + 3\frac{2}{5} + 1\frac{1}{4} = 9/4 + 17/5 + 5/4 = 45/20 + 68/20 + 25/20 = 138/20 = 6\frac{18}{20}$$

3. Weight of the Rice

$$95\frac{5}{9} - 6\frac{5}{12} = \frac{860}{9} - \frac{77}{12}.$$

LCM is 36.

$$\frac{3440}{36} - \frac{231}{36} = \frac{3209}{36} = 89\frac{5}{36}$$

4. The sum of 3 sides of a triangle is  $206/15 = 13\frac{11}{15}$

5. Sister gets more.  $1/5$  and  $1/3$  are unlike fractions and having same denominator. (Since 3 is smaller than 5)

6. Varun did less work  $3/8 = (3 \times 3)/(8 \times 3) = 9/24 < 11/24$

7. (a)  $11/16$  (b)  $3/16$  (c)  $5/16$

| Time to teach | Asset Type  | Theme     | Subtheme                                                                                                     |
|---------------|-------------|-----------|--------------------------------------------------------------------------------------------------------------|
| 20 Minutes    | Assessments | Fractions | Addition and subtraction of fractions(like and mixed), Addition and subtraction of fractions(like and mixed) |

## 19. VC\_Way of sharing from the Whole

We just learnt that a fraction is a number representing a part of a whole. For e.g. when one whole Biscuit is broken into two parts to be shared between two children equally, the resultant fraction is  $\frac{1}{2}$ .

In real life, there will always be situations when one has to share what he has got with others who do not have it. In fact sharing is a process of building bridges between those who have and those who don't have.

To be able to share, one has to be a 'whole' person. A whole person is one who is kind, generous and sensitive towards other fellow human beings.

A whole person knows the joy in sharing his resources with other needy people.

One such commonly known act of sharing is charity by money or commodities like food, clothes, toys etc. with the needy. But one can also share his knowledge or special skills in any field with others. One can share even his happiness.

Leonard Nimoy, a famous American film artiste; said – ““The miracle is this: the more we share the more we have”.

Song: To care, To share

<http://sssbpt.org/audio/EHV/Track3.mp3>

**Lyrics of the song:**

To care, to share,

## Forgiving and giving

Is how we should feel

To make life worth living.

Children, constantly measure yourself to see how much of a “whole” person you are. As you grow, you should become more & more of a “whole” person so that you can give away more & more parts (Fractions) of yourself. Please make a habit of sharing what you have with others who don’t have it. It will fulfil their needs and give you lot of joy.

| Time to teach | Value Type | Value Sub Type | Value Attribute |
|---------------|------------|----------------|-----------------|
| 3 Minutes     | Love       | Sharing        | Songs           |

## 20. MS\_Summary\_Fractions

- Define Fractions with examples.
- How to plot fractions on number line.
- Explain different types of fractions with examples.
- Method to simplify the fractions to its simplest form.
- Find equivalent fractions for a given fraction.
- Addition and Subtraction of like and unlike fractions.
- Conversion of mixed fractions and improper fractions and then to find their sum or difference of fractions.
- Compare and arrange them in ascending and descending order of fractions.
- Knowledge of any fraction can be expressed as a unit fraction.
- How to develop the habit of sharing among everyone by means of the concept fraction.
- Exercise and practice questions on the concept, types and operations of fractions.

| Time to teach | Asset Type  | Theme     | Sub Theme |
|---------------|-------------|-----------|-----------|
| 5 Minutes     | Main Script | Fractions |           |