

Master Lesson Plan

For

Rational Numbers

Board	Standard	Subject	Chapter	Language	Reference Link	Creation date
CBSE	STD VII	Mathematics	Rational Numbers	English	Rational Numbers	2020-04-28 23:56:10

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Rational Numbers

1. MS_Objectives_Rational numbers

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 to

- appreciate Pythagoras and his work on discovery of rational numbers
- explain rational numbers with simple examples
- identify uses of rational numbers in daily life
- describe equivalent rational numbers with suitable examples
- locate rational numbers on a number line
- describe standard form of a rational numbers
- explain comparison of rational numbers with suitable examples
- identify the largest and smallest rational numbers
- determine the smallest rational number in a given set of numbers
- describe existence of rational numbers between two rational numbers
- solve problems based on rational numbers
- explain addition of rational numbers with suitable examples
- explain subtraction of rational numbers with suitable examples
- explain multiplication of rational numbers with suitable examples
- explain division of rational numbers with suitable examples
- solve problems involving operation on rational numbers
- appreciate the need for love and kindness towards each other within and outside the family

Time to teach	Asset Type	Theme	SubTheme
3 Minutes	Main Script	Rational Numbers	

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2. IA_Pythagorean School-Discovery of rational numbers

- Pythagoras (580 – 500 BC) was born in a Greek island in the eastern Aegean Sea called Samos.
- Due to continual conflicts in a tyrant system in Samos, he moved to a peaceful place called Croton, which was safe and was just right for him.
- He formed a society for ethical and religious purposes.
- It was known as Pythagorean School.
- The Pythagorean School was a strict society.
- The school was governed by a set of rules.
- The members recognized one another by means of secret signs; simplicity of personal attire and certain restrictions in matter of diet were required.
- The Pythagoreans considered whole numbers to be their rulers and that all quantities could be explained by whole numbers and their ratios (rational numbers).
- The Pythagorean School gained considerable influence in Croton and became politically active on the side of aristocracy.

- Probably because of this, after a time the citizens turned against him and his followers burning his house.
- As a result he moved to Southern Italy and there he died at the age of eighty.
- Unfortunately, very little is known about Pythagoreans due to their very secretive ways.
- Pythagoras left no written works, but his ideas were carried on by his eager disciples.

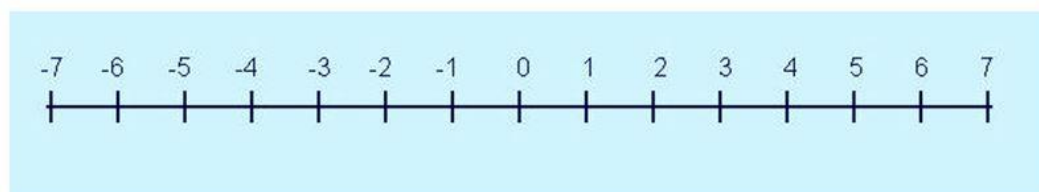
Time to teach	Asset Type	Theme	SubTheme
3 Minutes	Interesting Aside	Rational Numbers	

3. MS_Introduction to Rational Numbers

The number system consists of

- Natural numbers N (1, 2, 3,...)
- Whole numbers W (0, 1, 2, 3,...)
- Integers Z (..., -2, -1, 0, 1, 2,...)

All the above set of numbers can be located on a number line.



Rational numbers

We know that operations on integers are closed under addition, subtraction and multiplication.

Addition of integers results in an integer.

$$-1 + (-2) = -3$$

Subtraction of integers results in an integer

$$-5 - (-3) = -5 + 3 = -2$$

Multiplication of integers results in an integer

$$4 \times -2 = -8$$

Consider the operation division of integers

$$\frac{48}{6} = 8, \frac{39}{13} = 3, \frac{-25}{5} = -5 \text{ are integers}$$

However consider the following cases

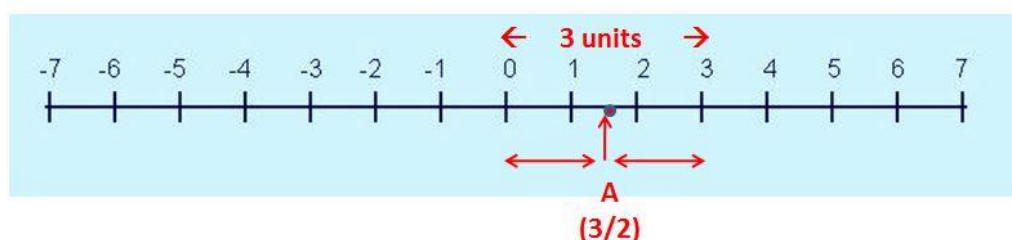
$$\frac{-5}{2} = ?, \frac{-9}{13} = ?, \frac{3}{2} = ? \dots$$

The answers to the above divisions are not in the set of integers

I.e. the quotient is not an integer

Location of $\frac{3}{2}$ on number line

Consider a number line



- Consider a line segment 3 units long extending from 0 to 3
- $\frac{3}{2}$ means that it is exactly half the distance from 0 to 3
- Locate the midpoint between 0 to 3 and name the midpoint as A
- Point A represents the number $\frac{3}{2}$ on the number line
- Point A is not an element in the set of integers
- Hence a new system of numbers is to be introduced in order to name the numbers such as $\frac{3}{2}$, $\frac{-4}{5}$etc

We extend the number system by introducing quotient of integers called Rational numbers

Definition

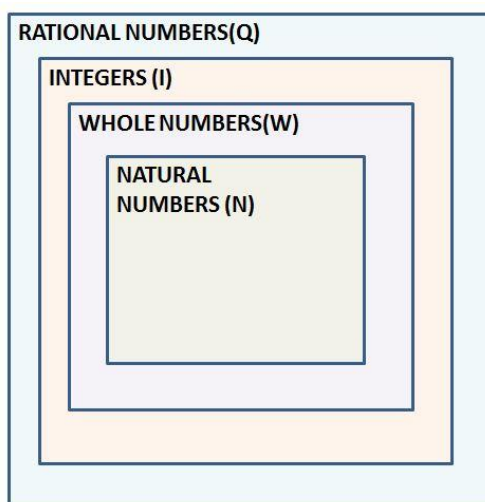
Rational number is a number of the form $\frac{p}{q}$ where p and q are integers and $q \neq 0$

Examples: $\frac{-2}{5}$, $\frac{4}{7}$, $\frac{3}{-8}$,

Rational number gets its name from the root word 'Ratios'

Set of Rational numbers is denoted by letter 'Q'

The following chart clearly explains the number system including rational numbers



From the above chart it is clear that

- Every natural number n is a rational number as it can be expressed as $\frac{n}{1}$. Example $3 = \frac{3}{1}$ is of the form $\frac{p}{q}$
- Every whole number w is a rational number as it can be expressed as $\frac{w}{1}$. Example $0 = \frac{0}{1}$ is of the form $\frac{p}{q}$
- Every integer z is a rational number as it can be expressed as $\frac{z}{1}$. Example $-7 = \frac{-7}{1}$ is of the form $\frac{p}{q}$
- However, all rational numbers are not natural numbers or whole numbers or integers.

All fractions are rational numbers

Fractions are ratios of the form $\frac{a}{b}$ where a and b are natural numbers. Examples are $\frac{3}{4}$,

$\frac{9}{5}$, $\frac{1}{7}$... etc.

Note that all fractions are of the form $\frac{p}{q}$. Hence, all fractions are rational numbers but all rational numbers need not be fractions

Types of rational numbers

The rational numbers are either positive or negative.

Positive rational number

A rational number $\frac{p}{q}$ is said to be positive if both p and q are positive integers or both are negative integers.

Examples are $\frac{1}{4}$, $\frac{-2}{-3}$, $\frac{-6}{-7}$, $\frac{3}{8}$etc

Observe that a rational number is positive if both numerator and denominator are of the same sign.

Note

Every natural number is a positive rational number.

Every whole number is a positive rational number except 0 which is neither positive nor negative.

Every positive integer is a positive rational number.

Negative rational number

A rational number $\frac{p}{q}$ is said to be negative if its numerator and denominator are of opposite signs such that one of them is a positive integer and other is a negative integer.

Examples are $\frac{-5}{3}$, $\frac{1}{-2}$, $\frac{-4}{7}$, $\frac{-3}{4}$etc

Observe that a rational number is negative if numerator and denominator are of opposite signs.

Note

Every negative integer is a negative rational number.

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Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Main Script	Rational Numbers	

4. DD_Rational numbers in Daily Life

Rational Numbers in Daily Life

We observe that rational numbers are used extensively in many real life situations.

1) Whenever a bar of chocolate or a cake or fruit is to be shared among people, rational numbers are involved.



When a bar of chocolate is divided among four friends, each one gets $\frac{1}{4}$ th of the chocolate. $\frac{1}{4}$ is a rational number.

2) Rational numbers are involved in banking transactions. Interest rates on loans or deposits in banks are expressed as percentage.



Example:

The rate of interest on a loan could be 7 percent. I.e. $\frac{7}{100}$, which is a rational number.

3) Test scores in exams are expressed as rational numbers.



Example:

Mohan scored $\frac{17}{20}$ in Mathematics unit test.

4) Reporting of Statistics involves use of rational numbers.



Examples

$\frac{3}{4}$ of the total class strength consists of boys.

$\frac{2}{3}$ of the population of the constituency cast their votes on election day.

5) In purchase of fruits, vegetables, grocery in daily life we take the help of rational numbers.



Examples:

The price of $\frac{1}{4}$ kg of tomato is Rs. 10.

Ram purchased 1 and a half kilogram of apples at the stall.

Sita bought 3 and a half kilogram of wheat at the grocery shop.

6) Mathematical formulae also contain rational numbers.

Examples:

$$\text{Area of semicircle} = \frac{1}{2} \pi r^2$$

$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$

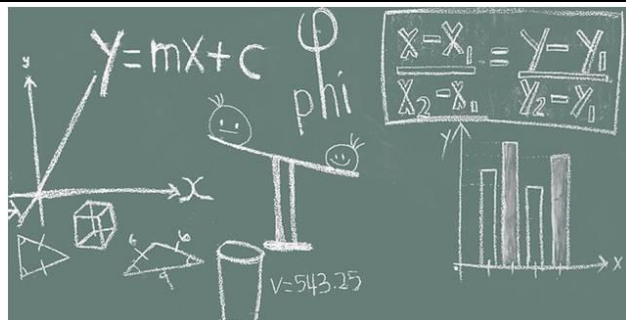


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Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Day-to-day Relevance	Rational Numbers	

5. MS_Equivalent Rational Numbers

Introduction

Equivalent means 'equal in value'. Any two rational numbers are said to be equivalent if they have the same value.

Examples:

Consider a rational number $\frac{2}{3}$

Multiplying both the numerator and denominator by 2 we get,

$$\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$$

From the above operations, it is clear that $\frac{2}{3}$ and $\frac{4}{6}$ are equivalent rational numbers

Note: By multiplying the numerator and denominator by the same integer, the value of the rational number does not change

Consider a rational number $\frac{16}{28}$

Dividing the numerator and denominator by 4 we get,

$$\frac{16}{28} = \frac{16 \div 4}{28 \div 4} = \frac{4}{7}$$

From the above operations, it is clear that $\frac{16}{28}$ and $\frac{4}{7}$ are equivalent rational numbers

Note: By dividing the numerator and denominator by the same integer, the value of the rational number does not change

From the above examples it is clear that equivalent rational numbers can be obtained by operation of multiplication or division.

Equivalent rational numbers by multiplication

Definition

If $\frac{p}{q}$ is a rational number and 'a' is a non-zero integer, then,

$\frac{p \times a}{q \times a}$ is a rational number equivalent to $\frac{p}{q}$

Examples:

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

$$\frac{2}{3} = \frac{2 \times (-2)}{3 \times (-2)} = \frac{-4}{-6}$$

$$\frac{2}{3} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15}$$

Thus, the rational numbers $\frac{8}{12}$, $\frac{-4}{-6}$, $\frac{10}{15}$ are equivalent to rational number $\frac{2}{3}$

Check if the rational numbers $\frac{4}{5}$ and $\frac{24}{30}$ are equivalent

Try to multiply numerator and denominator by a common factor

$$\frac{4}{5} = \frac{4 \times 6}{5 \times 6} = \frac{24}{30}$$

The rational numbers $\frac{4}{5}$ and $\frac{24}{30}$ are equivalent as the numerator 24 and denominator 30 of the rational number $\frac{24}{30}$ are obtained by multiplying the numerator and denominator of $\frac{4}{5}$ by 6

Equivalent rational numbers by division

Definition

If $\frac{p}{q}$ is a rational number and 'a' is a non-zero integer then $\frac{p \div a}{q \div a}$ is a rational number equivalent to $\frac{p}{q}$

Examples:

$$\frac{15}{25} = \frac{15 \div 5}{25 \div 5} = \frac{3}{5}$$

$$\frac{-9}{-15} = \frac{-9 \div (-3)}{-15 \div (-3)} = \frac{3}{5}$$

$$\frac{12}{20} = \frac{12 \div 4}{20 \div 4} = \frac{3}{5}$$

Thus, the rational numbers $\frac{15}{25}, \frac{-9}{-15}, \frac{12}{20}$ are equivalent to rational number $\frac{3}{5}$

Check if the rational numbers $\frac{-3}{8}$ and $\frac{-27}{72}$ are equivalent

Try to divide numerator and denominator by a common factor

$$\frac{-27}{72} = \frac{-27 \div 9}{72 \div 9} = \frac{-3}{8}$$

The rational numbers $\frac{-3}{8}$ and $\frac{-27}{72}$ are equivalent as the numerator -3 and denominator 8 of the rational number $\frac{-3}{8}$ are obtained by dividing the numerator and denominator of $\frac{-27}{72}$ by 9

ILLUSTRATION

Find 'x' if the two fractions are equivalent

$$\frac{5}{7} = \frac{15}{x} \dots\dots \text{eqn 1}$$

As the two rational numbers are equivalent, we try to obtain the common factor for multiplication. The numerators will be equal on multiplying by 3. Hence, **we multiply the numerator and denominator of the rational number $\frac{5}{7}$ by 3**

$$\frac{5}{7} = \frac{5 \times 3}{7 \times 3} = \frac{15}{21} \dots\dots \text{eqn 2}$$

Comparing **eqn 1** and **eqn 2** we get,

$$\frac{15}{x} = \frac{15}{21}$$

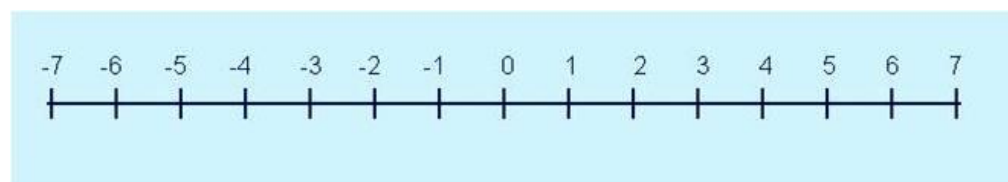
$$x = 21$$

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Main Script	Rational Numbers	

6. MS_Rational Numbers on a Number Line

Introduction

Consider the number line shown below



Observe that the positive integers are represented to the right of zero and negative integers are represented to the left of zero.

Representation of rational numbers on the number line also follows the same rules. A positive rational number is represented to the right of zero and a negative rational number is represented to the left of zero.

Steps for plotting

1) Check if the rational number is positive or negative number.

If positive, the rational number is plotted to the right of zero.

If negative, the rational number is plotted to the left of zero.

2) Consider the denominator of the rational number. Divide each unit length on the number line into as many equal parts as in the denominator of the rational number.

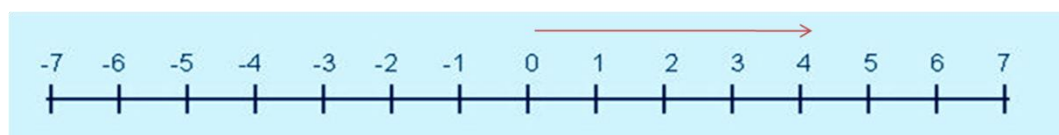
3) Now, plot the rational number by counting the number of parts as in the numerator.

ILLUSTRATIONS

To plot a rational number $\frac{4}{5}$ on the number line

Step 1

$\frac{4}{5}$ is a positive rational number. Hence it would be located to the right of zero.

**Step 2**

$\frac{4}{5}$ is less than 1, so the rational number lies between 0 and 1. In the rational number $\frac{4}{5}$, the denominator is 5. Hence divide each unit length into 5 equal parts.

**Step 3**

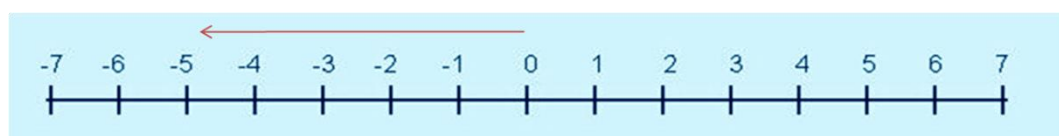
In the rational number $\frac{4}{5}$, the numerator is 4. Hence count 4 places to the right of zero to locate the rational number $\frac{4}{5}$ on the number line.



To plot a rational number $\frac{-3}{2}$ on the number line

Step 1

$\frac{-3}{2}$ is a negative rational number. Hence it would be located to the left of zero.

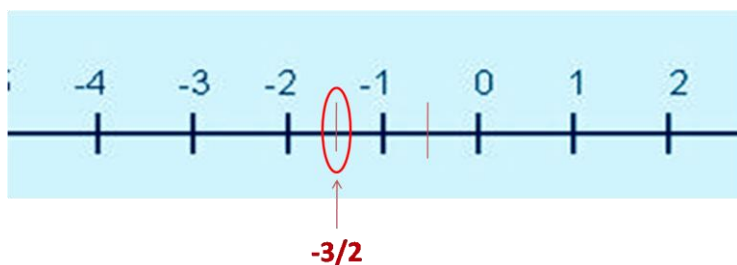
**Step 2**

$-\frac{3}{2}$ is less than -1 and lies between -1 and -2. In the rational number, the denominator is 2. Hence divide each unit length into 2 equal parts.



Step 3

In the rational number $-\frac{3}{2}$, the numerator is 3. Hence count 3 places to the left of zero to locate the rational number $-\frac{3}{2}$ on the number line.



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Time to teach	Asset Type	Theme	SubTheme
8 Minutes	Main Script	Rational Numbers	Representation on number lines, Representation on number lines

7. MS_Standard form of Rational Numbers

Introduction

Consider a rational number $\frac{21}{49}$.

Observe that both the numerator 21 and denominator 49 are composite numbers. They can be expressed as a product of prime numbers.

$$21 = 3 \times 7$$

$$49 = 7 \times 7$$

Hence,

$$\frac{21}{49} = \frac{3 \times 7}{7 \times 7} = \frac{3}{7}$$

Note that $\frac{3}{7}$ is an equivalent rational number of $\frac{21}{49}$

Observe that $\frac{3}{7}$ consists of numerator 3 and denominator 7, both of which are prime numbers. Hence, $\frac{3}{7}$ cannot be simplified any further.

$\frac{3}{7}$ is called the Standard form of the rational number $\frac{21}{49}$.

Definition

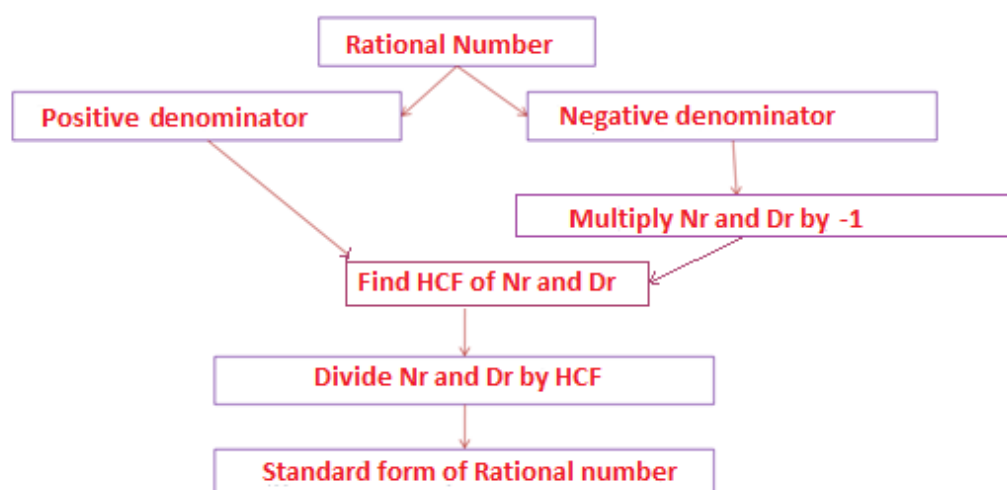
A rational number $\frac{p}{q}$ is said to be in standard form if q is positive and integers p and q have no common divisor other than 1.

Converting a rational number into its standard form

The steps to be followed are:

- 1) Consider the given rational number.
- 2) Check if the denominator of the rational number is positive. If the denominator is negative, multiply both numerator and denominator by -1 so that the denominator becomes positive.
- 3) Find the HCF of the numerator and denominator.
- 4) Divide the numerator and denominator of the given rational number by the HCF.
- 5) The rational number obtained is the standard form of the rational number.

The steps are depicted in the flow chart given below:

**Illustration**

Express $\frac{18}{-30}$ in standard form

- 1) Consider the rational number $\frac{18}{-30}$
- 2) As the denominator is negative, it should be converted into positive denominator.

$$\frac{18}{-30} = \frac{18 \times (-1)}{-30 \times (-1)} = \frac{-18}{30}$$

- 3) HCF of 18 and 30 is 6
- 4) Divide the numerator and denominator of the given rational number by 6

$$\frac{-18}{30} = \frac{-18 \div 6}{30 \div 6} = \frac{-3}{5}$$

- 5) Standard form of the rational number $\frac{18}{-30}$ is $\frac{-3}{5}$

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Time to teach	Asset Type	Theme	SubTheme
6 Minutes	Main Script	Rational Numbers	

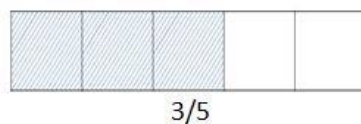
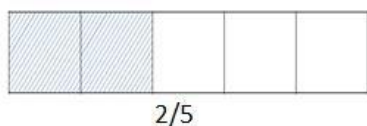
8. MS_Comparison of Rational Numbers

Introduction

Comparison of rational numbers is similar to comparison of integers and fractions

The general rules for comparison are

- 1) Every positive integer is greater than zero
- 2) Every negative integer is less than zero
- 3) Every positive integer is greater than every negative integer
- 4) On a number line, every integer represented by a point is greater than every integer represented by points on its left
- 5) On a number line, every integer represented by a point is less than every integer represented by points on its right
- 6) In fractions such as $\frac{2}{5}$ and $\frac{3}{5}$, the fraction with greater numerator is greater than the one with smaller numerator.



$\frac{2}{5}$ represents two parts of the 5 equal parts of one unit and $\frac{3}{5}$ represents three parts of the 5 equal parts of a unit.

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

The comparison of rational numbers also follows the above rules.

Comparison of Rational numbers having same denominator

If the denominator of two rational numbers is same, the rational number having greater numerator is greater than the other rational number

Examples

$$\frac{4}{5} > \frac{2}{5} \text{ (as } 4 > 2 \text{)}$$

$$\frac{-7}{9} > \frac{-11}{9} \text{ (as } -7 > -11 \text{)}$$

Comparison of Rational numbers having different denominators

If the denominators of two rational numbers are different, then, their denominators are made the same and the rational numbers are compared.

Example

Consider the rational numbers $\frac{3}{4}$ and $\frac{5}{6}$

LCM of the denominators 4 and 6 is 12.

Expressing the two rational numbers with the LCM i.e. 12 as the common denominator, we get

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

$$\frac{5}{6} = \frac{5 \times 2}{6 \times 2} = \frac{10}{12}$$

Comparing the two rational numbers $\frac{9}{12}$ and $\frac{10}{12}$ we get,

$$\frac{10}{12} > \frac{9}{12} \text{ (As } 10 > 9 \text{)}$$

$$\text{i.e. } \frac{5}{6} > \frac{3}{4}$$

Illustrations

Which is greater $\frac{1}{3}$ or $\frac{-1}{3}$?

Solution

Positive rational number is always greater than the negative rational number

$$\frac{1}{3} > \frac{-1}{3}$$

Which is greater $\frac{3}{-4}$ or $\frac{-2}{5}$?

Solution

Rewrite the rational number $\frac{3}{-4}$ with a positive denominator.

$$\frac{3}{-4} = \frac{3 \times (-1)}{-4 \times (-1)} = \frac{-3}{4}$$

As the denominators of the two rational numbers $\frac{-3}{4}$ and $\frac{-2}{5}$ are different, we take LCM of the denominators 4 and 5.

$$\text{LCM (4,5)}=20$$

Expressing $\frac{-3}{4}$ and $\frac{-2}{5}$ with LCM as common denominator we get,

$$\frac{-3}{4} = \frac{-3 \times 5}{4 \times 5} = \frac{-15}{20}$$

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

Comparing the two rational numbers we get,

$$\frac{-8}{20} > \frac{-15}{20}$$

$$\frac{-2}{5} > \frac{-3}{4}$$

I.e. $\frac{-2}{5} > \frac{-3}{4}$

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Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Main Script	Rational Numbers	

9. IQ_Think and solve

THINK AND ANSWER

Let 'p' and 'q' be two different integers taken from 1 to 100

1. What is the largest value that $\frac{p-q}{p+q}$ have?
2. What is the largest value that $\frac{p+q}{p-q}$ have?
3. What is the smallest value that $\frac{p-q}{p+q}$ have?
4. What is the smallest value that $\frac{p+q}{p-q}$ have?

Solution:

Try with different pairs of integers for p and q. Concentrate on the fact that a greater number in the numerator gives a larger value and a greater number in the denominator gives smaller value. You can convert the rational number into decimals to compare.

1. Let p be 100 and q is 1. Then,

$$p-q = 100 - 1 = 99$$

$$p+q = 100 + 1 = 101$$

$$\frac{p-q}{p+q} = \frac{99}{101} = 0.9801...$$

This is the largest value. All the other choices of p and q will give a rational number less than $\frac{99}{101}$.

2. Let p be 100 and q is 99

$$p+q = 100 + 99 = 199$$

$$p-q = 100-99 = 1$$

$$\text{The largest value of } \frac{p+q}{p-q} = \frac{199}{1} = 199$$

3. Let p be 100 and q is 99.

$$p-q = 100 - 99 = 1$$

$$p+q = 100 + 99 = 199$$

The smallest value that $\frac{p-q}{p+q}$ can take is $\frac{1}{199} = 0.00502...$

4. Let p be 100 and q be 1

$$p+q = 100+1 = 101$$

$$p-q = 100-1 = 99$$

Hence, the smallest value that $\frac{p+q}{p-q}$ can take is $\frac{101}{99} = 1.020202...$

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Inquisitive Questions	Rational Numbers	Comparing Rational numbers, Comparing Rational numbers

10. SA_Find the number closest to zero

Aim: To compare rational numbers.

Materials Required

- Set of 18 chits (9 chits with numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 9 chits with number -1, -2, -3, -4, -5, -6, -7, -8, -9) - one set per team.



- A sheet of paper (one per team)
- A pen (one per team)
- A container to hold chits (one per team)

Setting of Activity - Indoor.

Type of Activity

Group activity, Experiment by students

Instructions to teacher

- Teacher should prepare the chits prior to the experiment.

2) Teacher should draw observation table and score card on the black board on the day of activity. Each group draws the same on its sheet.

Observation Table					
Rounds	Rational Numbers obtained by students				Rational Number closest to Zero
	Student 1	Student 2	Student 3	Student 4	
1					
2					
3					
4					
5					

Score Card						
Rounds →	Score in each round					Cumulative Score
	1	2	3	4	5	
Student 1						
Student 2						
Student 3						
Student 4						

- 3) Teacher explains the activity as given in the procedure.
- 4) Teacher should visit each team to check if they are playing the game correctly.
- 5) Observation tables of each team should be verified by the teacher before the results are declared.
- 6) Teacher begins the activity with questions to recall.

Questions to recall

- 1) How do you compare two rational numbers with same denominator?

Expected Answer: The rational number with greater numerator is greater than the other.

- 2) Which is greater: positive rational number or negative rational number?

Expected Answer: A positive rational number is always greater than a negative rational number.

- 3) How do you compare two rational numbers with different denominators?

Expected Answer: We find LCM of the denominators. We express each rational number in its equivalent form with the LCM as denominator and then compare the numerators. The number with least numerator is the smallest rational number.

4) Which is closer to zero between $-\frac{3}{4}$ and $\frac{3}{4}$?

Expected Answer: Both are equidistant from zero.

5) Which is closer to zero between $-\frac{1}{2}$ and $+\frac{1}{4}$?

Expected Answer: $\frac{1}{4}$ is closer to zero.

Procedure

- 1) Teacher divides the class into small groups of 4 students each.
- 2) Teacher gives a container with 18 chits to each group.
- 3) Each student in the team gets to pick two chits.
- 4) Each student creates a rational number close to zero with the chits he /she has picked. For example: If the chits picked are - 6 and 7, the student can create a rational number $\frac{7}{-6}$ or $-\frac{6}{7}$, but as the rational number should be close to zero, it is best to always have the numerator lesser than the denominator i.e. choose $-\frac{6}{7}$. Rational numbers created could be reduced to simplest form before comparing.
- 5) In each round, a student enters the rational numbers of all the students in the observation table and identifies the number closest to zero. Each student takes turn to do this in subsequent rounds.
- 6) In each round, the student who obtained the rational number closest to zero gets to score 2 points. If two students are tied with rational numbers equidistant from zero, then each student gets to score 1 point. Scores are recorded in the score card.
- 7) The chits are folded and shuffled again and the game continues.
- 8) At the end of 5 rounds, the scores are added.
- 9) For each team, the teacher checks the result and the student with maximum score is declared the winner of the game.

If there is a tie in final score, the game is repeated between the two students alone and the result obtained determines the winner.

Observation

The rational number closest to zero is identified. The score obtained is recorded in score card.

Conclusion

The rational numbers are compared.

Image Source:

Original contribution by sailakshmi1973@gmail.com

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Suggested Activity	Rational Numbers	

11. MS_Rational Numbers Between Two Rational Numbers

Introduction

Case of Integers

We know that between two integers -5 and +5, there are 9 integers -4,-3,-2,-1, 0, 1, 2, 3, 4.

However between -5 and -4 there are no integers.

Case of Rational numbers

Consider the number line as shown below



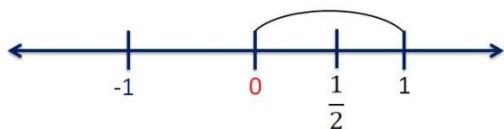
There exists a rational number between 0 and 1 i.e. $\frac{1}{2}$

Find the average of 0 and 1.

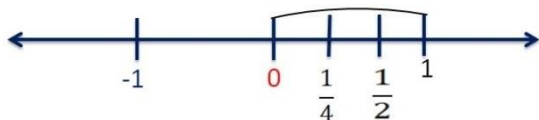
$$\frac{0+1}{2} = \frac{1}{2}$$

Hence, $\frac{1}{2}$ lies in between 0 and 1.

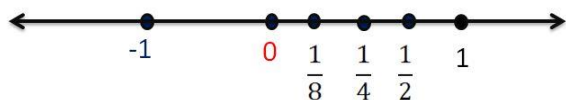
Note that the average of any two numbers lies in between the numbers.



There exists a rational number between 0 and $\frac{1}{2}$, i.e. $\frac{1}{4}$



There exists a rational number between 0 and $\frac{1}{4}$ i.e. $\frac{1}{8}$



Proceeding in the same manner, we can get infinitely many rational numbers between 0 and 1

Thus, there exist infinitely many rational numbers between any two rational numbers

Rational numbers between any two rational numbers having same denominator

To find rational numbers between -5 and -4

Step 1

Express -5 and -4 as rational numbers

$$-5 = \frac{-5}{1}$$

$$-4 = \frac{-4}{1}$$

Step 2

Start by multiplying and dividing by 3 with $\frac{-5}{1}$ and $\frac{-4}{1}$.

$$\frac{-5}{1} = \frac{-5 \times 3}{1 \times 3} = \frac{-15}{3}$$

$$\frac{-4}{1} = \frac{-4 \times 3}{1 \times 3} = \frac{-12}{3}$$

When multiplied and divided by 3 there exist 2 rational numbers.

$$\frac{-5}{1} = \frac{-5 \times 5}{1 \times 5} = \frac{-25}{5}$$

$$\frac{-4}{1} = \frac{-4 \times 5}{1 \times 5} = \frac{-20}{5}$$

When multiplied and divided by 5, there exist 4 rational numbers.

Since we need 6 rational numbers, we multiply and divide by 7.

Multiply and divide both rational numbers by 7.

$$\frac{-5}{1} = \frac{-5 \times 7}{1 \times 7} = \frac{-35}{7}$$

$$\frac{-4}{1} = \frac{-4 \times 7}{1 \times 7} = \frac{-28}{7}$$

Step 3

The numerators of the two rational numbers $\frac{-35}{7}$ and $\frac{-28}{7}$ are -35 and -28. Between -35 and -28 there exist numbers -34, -33, -32, -31, -30, -29.

Hence, between $\frac{-35}{7}$ and $\frac{-28}{7}$, we get the following rational numbers.

$$\frac{-35}{7} < \frac{-34}{7} < \frac{-33}{7} < \frac{-32}{7} < \frac{-31}{7} < \frac{-30}{7} < \frac{-29}{7} < \frac{-28}{7}$$

Note

In order to get more rational numbers between $\frac{-5}{1}$ and $\frac{-4}{1}$ we multiply and divide $\frac{-5}{1}$ and $\frac{-4}{1}$ by larger numerals.

If 7 is multiplied, you can write 6 rational numbers. Similarly, if you multiply and divide by 12, you can write 11 rational numbers. The pattern continues similarly.

On multiplying and dividing by 15 we get,

$$\frac{-5}{1} = \frac{-5 \times 15}{1 \times 15} = \frac{-75}{15}$$

$$\frac{-4}{1} = \frac{-4 \times 15}{1 \times 15} = \frac{-60}{15}$$

We obtain the following rational numbers between $\frac{-75}{15}$ and $\frac{-60}{15}$

$$\frac{-75}{15} < \frac{-74}{15} < \frac{-73}{15} < \dots < \frac{-63}{15} < \frac{-62}{15} < \frac{-61}{15} < \frac{-60}{15}$$

There are 14 rational numbers between $\frac{-75}{15}$ and $\frac{-60}{15}$

Rational numbers between any two rational numbers having different denominators

Consider two rational numbers $\frac{4}{7}$ and $\frac{5}{8}$

Step 1

Find the LCM of the denominators 7 and 8.

$$\text{LCM}(7, 8) = 56$$

Step 2

Multiply the numerator and denominator of each rational number such that both rational numbers have the LCM as denominator.

$$\frac{4}{7} = \frac{4 \times 8}{7 \times 8} = \frac{32}{56}$$

$$\frac{5}{8} = \frac{5 \times 7}{8 \times 7} = \frac{35}{56}$$

Step 3

The rational numbers between $\frac{32}{56}$ and $\frac{35}{56}$ are

$$\frac{32}{56} < \frac{33}{56} < \frac{34}{56} < \frac{35}{56}$$

Image Source: Original Contribution by vallisairam9@gmail.com

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Main Script	Rational Numbers	Rational number between two Rational numbers, Rational number between two Rational numbers

12. QA_Solve the following

I. Choose the correct answer

1) In the following, the positive rational number is

a) $\frac{-1}{3}$ b) $\frac{6}{-7}$ c) $\frac{0}{-7}$ d) $\frac{-6}{-7}$

2) The smallest rational number is

a) $\frac{-5}{7}$ b) $\frac{-3}{14}$ c) $\frac{4}{7}$ d) $\frac{-6}{7}$

3) Which of the following is true?

- a) All integers are not rational numbers.
- b) All rational numbers are fractions.
- c) Every fraction is a rational number.
- d) Zero is a positive rational number.

4) How many rational numbers are there between two rational numbers?

- a) 0 b) 1 c) 100 d) infinite

5) To reduce a rational number to its standard form, we divide its numerator and denominator by their

- a) HCF b) LCM c) product d) quotient

Solutions:

- 1) d
- 2) d
- 3) c
- 4) d
- 5) a

II. Answer the following

1) Represent the following rational numbers on the number line

$$\frac{-3}{4}, \frac{-1}{4}, \frac{5}{4}, \frac{-7}{4}$$

2) Express the rational number in standard form $\frac{81}{-135}$

3) Write 2 more rational numbers in pattern given

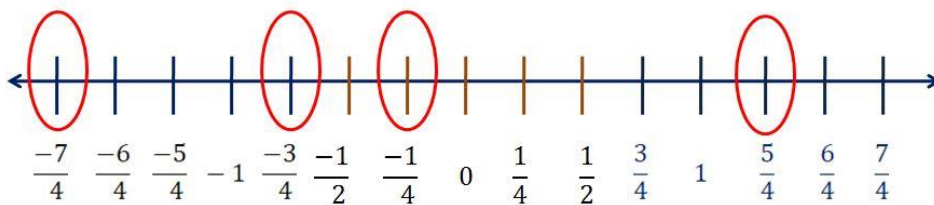
$$\frac{-4}{5}, \frac{-8}{10}, \frac{-12}{15}, \frac{-16}{20}$$

4) Does $\frac{-9}{27}$ and $\frac{5}{-15}$ represent the same rational number?

5) Find 4 rational numbers between $\frac{-3}{4}$ and $\frac{-4}{5}$

Solutions:

1) Divide each unit length into 4 equal parts. Count the numerator from zero to locate the rational number on the number line.



2) Convert the rational number such that denominator is positive

$$\frac{81}{-135} = \frac{81 \times (-1)}{-135 \times (-1)} = \frac{-81}{135}$$

Dividing numerator and denominator by 9, we get

$$\frac{-81}{135} = \frac{-9}{15}$$

Further dividing numerator and denominator by 3, we get,

$$\frac{-9}{15} = \frac{-3}{5}$$

Standard form of $\frac{81}{-135}$ is $\frac{-3}{5}$

3) The pattern represents equivalent fractions of the first rational number in the series.

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

$$\frac{-4}{5} \times \frac{3}{3} = \frac{-12}{15}$$

$$\frac{-4}{5} \times \frac{4}{4} = \frac{-16}{20}$$

Next two rational numbers would be

$$\frac{-4}{5} \times \frac{5}{5} = \frac{-20}{25}$$

$$\frac{-4}{5} \times \frac{6}{6} = \frac{-24}{30}$$

4) Reduce each rational number to standard form and compare.

$$\frac{-9}{27} = \frac{-1}{3}$$

$$\frac{5}{-15} = \frac{-5}{15} = \frac{-1}{3}$$

The two rational numbers $\frac{-9}{27}$ and $\frac{5}{-15}$ are equivalent.

Hence, they represent same rational number.

5) Express both rational numbers with same denominator.

$$\text{LCM}(4, 5) = 20$$

$$\frac{-3}{4} \times \frac{5}{5} = \frac{-15}{20}$$

$$\frac{-4}{5} \times \frac{4}{4} = \frac{-16}{20}$$

We need to find 4 rational numbers between $\frac{-15}{20}$ and $\frac{-16}{20}$

Multiply and divide both rational numbers by 5 we get,

$$\frac{-15}{20} \times \frac{5}{5} = \frac{-75}{100}$$

$$\frac{-16}{20} \times \frac{5}{5} = \frac{-80}{100}$$

Thus, we get 4 rational numbers between $\frac{-75}{100}$ and $\frac{-80}{100}$

$$\frac{-75}{100} > \frac{-76}{100} > \frac{-77}{100} > \frac{-78}{100} > \frac{-79}{100} > \frac{-80}{100}$$

$$\frac{-3}{4} > \frac{-76}{100} > \frac{-77}{100} > \frac{-78}{100} > \frac{-79}{100} > \frac{-4}{5}$$

Extra questions

1) Fill in the blanks with correct symbol ($=, >, <$)

a) $\frac{-3}{5} \dots \frac{-5}{3}$

b) $\frac{-11}{15} \dots \frac{22}{-30}$

c) $\frac{-9}{32} \dots \frac{7}{-96}$

Solutions:

a) Convert into equivalent fractions with LCM as denominator and then compare.

Ans: $\frac{-3}{5} > \frac{-5}{3}$

b) Reduce to standard form and compare.

Ans: $\frac{-11}{15} = \frac{22}{-30}$

c) Reduce to standard form and compare.

Ans: $\frac{-9}{32} < \frac{7}{-96}$

2) Write the following in ascending order

$$\frac{1}{2}, \frac{2}{3}, \frac{-1}{3}, \frac{-5}{6}$$

Find LCM of denominators

$$\text{LCM}(2,3,6) = 6$$

Express each rational number with denominator 6.

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

$$\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$$

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

$$\frac{-5}{6} \times \frac{1}{1} = \frac{-5}{6}$$

Arranging the above in ascending order, we get,

$$\frac{-5}{6} < \frac{-2}{6} < \frac{3}{6} < \frac{4}{6}$$

Thus, $\frac{-5}{6} < \frac{-1}{3} < \frac{1}{2} < \frac{2}{3}$

Image Source: Original contribution by vallisairam9@gmail.com

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Assessments	Rational Numbers	Standard form of Rational numbers, Representation on number lines, Rational number between two Rational numbers, Properties of Rational numbers, Definition of Rational numbers, Comparing Rational

		numbers, Standard form of Rational numbers, Representation on number lines, Rational number between two Rational numbers, Properties of Rational numbers, Definition of Rational numbers, Comparing Rational numbers
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13. MS_Addition of Rational Numbers

Introduction

Addition of rational numbers is similar to addition of integers and fractions.

Just like in the case of fractions with same denominator, we add the numerators to find the sum and in case of fractions having different denominators, the LCM of the denominators is determined after which the fractions are rewritten with the LCM as common denominator. The fractions now have same denominator and hence, their sum is found by adding up the numerators.

Addition of rational numbers also follows the same rules as above.

Case 1 - Addition of rational numbers having same denominator

If $\frac{a}{c}$ and $\frac{b}{c}$ are two rational numbers where a, b, c are integers and $c \neq 0$ then

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

When the denominators are the same, the sum of two rational numbers is obtained by adding up the numerators.

Example Add $\frac{7}{15}$ and $\frac{-11}{15}$

$$\frac{7}{15} + \frac{-11}{15}$$

$$\frac{7+(-11)}{15}$$

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

Case 2-Addition of rational numbers having different denominators

When two rational numbers have different denominators then the LCM of the denominators is taken. Equivalent fractions of both the rational numbers with same denominator is obtained. The two rational numbers are added as in case-1.

Example Add $\frac{5}{12}$ and $\frac{7}{18}$

Step 1

Find the LCM of the denominators 12 and 18.

LCM (12, 18)=36

Step 2

The equivalent fractions of $\frac{5}{12}$ and $\frac{7}{18}$ is obtained such that their common denominator is 36.

$$\frac{5}{12} \times \frac{3}{3} = \frac{15}{36}$$

$$\frac{7}{18} \times \frac{2}{2} = \frac{14}{36}$$

Step 3

Add the two rational numbers as in case 1

$$\frac{15}{36} + \frac{14}{36} = \frac{29}{36}$$

ILLUSTRATIONS

1) Find the sum of $\frac{4}{7}$, $\frac{2}{9}$ and $\frac{1}{21}$

Solution

Step 1

Find LCM of the denominators 7,9,21.

LCM (7, 9, 21) = 63

Step 2

Find equivalent fractions of each rational number with same denominator 63.

$$\frac{4}{7} = \frac{4}{7} \times \frac{9}{9} = \frac{36}{63}$$

$$\frac{2}{9} = \frac{2}{9} \times \frac{7}{7} = \frac{14}{63}$$

$$\frac{1}{21} = \frac{1}{21} \times \frac{3}{3} = \frac{3}{63}$$

Step 3

Add all the 3 rational numbers

$$\frac{36}{63} + \frac{14}{63} + \frac{3}{63} = \frac{36+14+3}{63} = \frac{53}{63}$$

$$\frac{4}{7} + \frac{2}{9} + \frac{1}{21} = \frac{53}{63}$$

2) Radha is preparing for her exams. She studies $\frac{7}{2}$ hrs on Monday, $\frac{5}{2}$ hrs on Tuesday and $\frac{9}{4}$ hrs on Wednesday. How many total hours did she study?

Solution

Total hours of study = $\frac{7}{2} + \frac{5}{2} + \frac{9}{4}$

Step 1

Find LCM of the denominators 2, 2, 4

$$\text{LCM}(2,2,4)=4$$

Step 2

Find equivalent fractions of each rational number with denominator 4.

$$\frac{7}{2} = \frac{7}{2} \times \frac{2}{2} = \frac{14}{4}$$

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

$$\frac{9}{4} = \frac{9}{4} \times \frac{1}{1} = \frac{9}{4}$$

Step 3

Add all the 3 rational numbers

$$\frac{14}{4} + \frac{10}{4} + \frac{9}{4} = \frac{14+10+9}{4} = \frac{33}{4}$$

Radha studied totally for $\frac{33}{4}$ hrs = 8 and $\frac{1}{4}$ hours.

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Main Script	Rational Numbers	

14. MS_Subtraction of rational numbers

Introduction

Additive inverse of a number

Consider the following operation on integers.

$$12-12 = 0$$

$$-6+6 = 0$$

Observe that whenever an integer is added to its negative, the result is zero. The negative of the number is called its additive inverse.

In the above examples,

Additive inverse of +12 is -12.

Additive inverse of -6 is +6.

Similarly, additive inverse exists for rational numbers also.

$$\frac{1}{4} - \frac{1}{4} = 0$$

$$\frac{-3}{7} + \frac{3}{7} = 0$$

Sum of a rational number and its additive inverse is always zero.

In the above examples,

Additive inverse of $+\frac{1}{4}$ is $-\frac{1}{4}$.

Additive inverse of $-\frac{3}{7}$ is $\frac{3}{7}$.

Subtraction of Rational numbers

Consider the subtraction of two integers, 4 from 7.

$$7 - (4) = 7 + (-4)$$

Subtraction of two integers can also be considered as addition of an integer and the additive inverse of the other integer. Here, the additive inverse of 4 is -4.

Consider the subtraction of two integers, -8 from 11.

$$11 - (-8) = 11 + 8$$

Here again, we are adding an integer and the additive inverse of the other integer (additive inverse of -8 is +8).

The above operations hold good for rational numbers also.

Definition

If $\frac{a}{b}$ and $\frac{x}{y}$ are two rational numbers, then subtracting $\frac{x}{y}$ from $\frac{a}{b}$ means adding additive inverse (negative) of $\frac{x}{y}$ to $\frac{a}{b}$.

$$\frac{a}{b} - \frac{x}{y} = \frac{a}{b} + \left(-\frac{x}{y}\right)$$

Note that the additive inverse of $\frac{x}{y}$ is $-\frac{x}{y}$

Steps for subtraction of rational numbers

- 1) Consider the given rational numbers
- 2) Check if their denominators are the same. If denominators are same, subtract the terms in the numerator.
- 3) If denominators are different, find LCM of the denominators and convert each rational number into its equivalent fraction such that the denominator is the LCM.
- 4) Subtract the terms in the numerator to obtain the result.

Case 1- Subtraction of rational numbers with same denominator

Subtract $\frac{2}{3}$ from $\frac{7}{3}$

$$\frac{7}{3} + \frac{(-2)}{3} = \frac{7-2}{3} = \frac{5}{3}$$

Subtract $\frac{-4}{9}$ from $\frac{17}{9}$.

$$= \frac{17}{9} + \frac{4}{9}$$

$$= \frac{17+4}{9} = \frac{21}{9}$$

Case 2- Subtraction of rational numbers with different denominators

Subtract $\frac{-4}{5}$ from $\frac{-3}{2}$.

Step 1

As the denominators of $\frac{-4}{5}$ and $\frac{-3}{2}$ are different, we are required to find the LCM of the denominators.

$$\text{LCM}(5, 2) = 10$$

Step 2

Find the equivalent fractions of both the rational numbers with denominator 10.

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

$$\frac{-3}{2} = \frac{-3}{2} \times \frac{5}{5} = \frac{-15}{10}$$

Step 3

Subtract $\frac{-4}{5}$ from $\frac{-3}{2}$ by using the corresponding equivalent fractions.

$$\frac{-3}{2} + \frac{4}{5}$$

$$= \frac{-15}{10} + \frac{8}{10}$$

$$= \frac{-15+8}{10} = \frac{-7}{10}$$

Illustration

Sita has $\frac{17}{5}$ Kg of wheat flour and $\frac{7}{8}$ Kg of corn flour at home. How many more kilos of wheat flour does she have?

Solution

$$\text{Amount of wheat flour} = \frac{17}{5} \text{ Kg}$$

$$\text{Amount of corn flour} = \frac{7}{8} \text{ Kg}$$

$$\text{Excess of wheat flour} = \frac{17}{5} + \frac{-7}{8}$$

$$= \frac{17}{5} - \frac{7}{8}$$

$$\text{LCM}(5, 8) = 40$$

Expressing the above rational numbers in terms of equivalent fractions with common denominator 40 we get,

$$\text{Excess of wheat flour} = \frac{17}{5} - \frac{7}{8}$$

$$= \frac{136}{40} - \frac{35}{40} = \frac{101}{40}$$

Sita has $\frac{101}{40}$ Kg more of wheat flour.

Time to teach	Asset Type	Theme	SubTheme
13 Minutes	Main Script	Rational Numbers	

15. MS_ Multiplication of Rational Numbers

Introduction

Multiplication of rational numbers is similar to multiplication of fractions.

Product of two rational numbers = $\frac{\text{Product of their numerators}}{\text{Product of their denominators}}$

Definition

If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational numbers then,

$$\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$$

Examples:

1) Multiply $\frac{2}{3}$ by $\frac{3}{5}$

Solution

$$\frac{2}{3} \times \frac{3}{5} = \frac{2 \times 3}{3 \times 5} = \frac{2}{5}$$

2) Multiply $\frac{4}{7}$ by $\frac{-8}{3}$

Solution

$$\frac{4}{7} \times \frac{-8}{3} = \frac{4 \times (-8)}{7 \times 3} = \frac{-32}{21}$$

3) Gopal's truck gives him a mileage of $\frac{32}{5}$ miles/l. He fills the tank with $\frac{11}{2}$ l of petrol. How far can his truck go?

Solution

Distance covered per litre of petrol = $\frac{32}{5}$ miles (Mileage of the truck)

$$\begin{aligned} \text{Distance covered with } \frac{11}{2} \text{ litres of petrol} &= \frac{32}{5} \times \frac{11}{2} \\ &= \frac{32 \times 11}{5 \times 2} \\ &= \frac{176}{5} \text{ miles.} \end{aligned}$$

The truck will cover $\frac{176}{5}$ miles.

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Main Script	Rational Numbers	

16. MS_Division of Rational Numbers**Introduction****Multiplicative inverse of a number**

Consider the following operations

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

$$7 \times \frac{1}{7} = 1$$

Observe that

- Product of 3 and its reciprocal $\frac{1}{3}$ is 1.
- Product of 7 and its reciprocal $\frac{1}{7}$ is 1.

The product of a number and its reciprocal is always 1. Each of them is called the multiplicative inverse of the other.

'Multiplicative Inverse means 'Reciprocal'.

Multiplicative inverse of a rational number

Consider two rational numbers $\frac{2}{3}$ and $\frac{3}{2}$.

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

Hence, $\frac{3}{2}$ is the multiplicative inverse of $\frac{2}{3}$ and vice versa.

We can write it mathematically as

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

The above operation can be rewritten as

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

$$1 \div \left(\frac{2}{3}\right) = 1 \times \frac{3}{2}$$

Thus, we can generalize and say that **division is the inverse process of multiplication.**

Definition

Dividing any rational number by a rational number $\frac{a}{b}$ where $a, b \neq 0$ is equivalent to multiplying it by $\frac{b}{a}$.

Examples:

1) Divide $\frac{3}{4}$ by $\frac{2}{9}$

Solution

$$\frac{3}{4} \div \frac{2}{9} = \frac{3}{4} \times \frac{9}{2} = \frac{27}{8}$$

2) Divide $\frac{-9}{10}$ by $\frac{-3}{8}$

Solution

$$\begin{aligned} \frac{-9}{10} \div \frac{-3}{8} &= \frac{-9}{10} \times \frac{8}{-3} \\ &= \frac{-12}{-5} = \frac{12}{5} \end{aligned}$$

3) The product of two numbers is $-\frac{16}{27}$. If one number is $-\frac{4}{9}$, find the other.

Solution

Let the other number be p

$$P \times \frac{-4}{9} = \frac{-16}{27}$$

$$P = \frac{-16}{27} \div \frac{-4}{9}$$

$$= \frac{-16}{27} \times \frac{9}{-4}$$

$$P = \frac{4}{3}$$

The other number is $\frac{4}{3}$.

Time to teach	Asset Type	Theme	SubTheme
8 Minutes	Main Script	Rational Numbers	

17. QA_Operations on Rational Numbers

Assessment on Operations of Rational Numbers

I. Match the following

- | | |
|---|-----------|
| 1. $(-5/6) - (3/4) + (-9/12)$ | a) $4/9$ |
| 2. $\{93/(-75)\} \times (-2/3) \times (-150/155)$ | b) $1/10$ |
| 3. $\{4/(-7)\} \div (-9/7)$ | c) $-7/3$ |
| 4. $(-8/10) - (3/5) + (6/4)$ | d) $-4/5$ |

Solutions:

1-c, 2-d, 3-a, 4-b

II. Solve the following

- From a rope 10 m long, two pieces of length $\frac{13}{5}$ m and $\frac{33}{10}$ m are cut off. Find the length of the remaining rope.
- Find the area of a square garden whose side measures $\frac{17}{3}$ metres.
- Area of a room is $\frac{261}{2}$ sq. metre. If its breadth is $\frac{87}{8}$ metre, find its length.

Solutions:

- Total length of rope = 10 m

$$\begin{aligned} \text{Length of two pieces} &= \frac{13}{5} + \frac{33}{10} \\ &= \frac{26}{10} + \frac{33}{10} \end{aligned}$$

$$= \frac{26+33}{10} = \frac{59}{10}$$

Length of the remaining rope = $10 - \frac{59}{10} = \frac{41}{10}$ metre

2) Area of the square garden = side x side

$$= \frac{17}{3} \times \frac{17}{3}$$

$$= \frac{289}{9} \text{sq.metre}$$

3) Area of the room = l x b

$$\frac{261}{2} = l \times \frac{87}{8}$$

$$l = \frac{261}{2} \div \frac{87}{8}$$

$$l = 12 \text{ m}$$

Extra Questions

1) The sum of two rational numbers is $\frac{-4}{11}$. If one of the numbers is 6, find the other number.

Hint: $(6+x) = \frac{-4}{11}$ Ans: $\frac{-70}{11}$

2) Subtract the sum of $\frac{-5}{7}$ and $\frac{15}{14}$ from $\frac{9}{28}$.

Hint: $\frac{9}{28} - (\frac{-5}{7} + \frac{15}{14})$ Ans: $\frac{-1}{28}$

3) The difference of two rational numbers is $\frac{-6}{25}$. If the greater number is $\frac{-4}{9}$, what is the smaller number?

Hint: $\frac{-4}{9} - x = \frac{-6}{25}$ Ans: $\frac{-46}{225}$

4) A drum full of wheat weighs $\frac{241}{6}$ Kg. If the empty drum weighs $\frac{55}{4}$ Kg, what is the weight of wheat in the drum?

Ans: $\frac{317}{12}$ Kg

5) A bus is moving at an average speed of $\frac{202}{5}$ Km/hr. What would be the distance covered in $\frac{15}{2}$ hours?

Ans: 303 Km

Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Assessments	Rational Numbers	

18. VC_You and Your Family - A Rational Number

A rational number is defined as a number that can be expressed in the form p/q , where p and q are integers and q is not 0. Sometimes this is referred to as a simple fraction. So rational numbers include integers & fractions.

Take the analogy of a family. Imagine the denominator represents your entire family, and the numerator represents you, as a part of the family. Although there is a line demarcating the numerator and denominator, the fraction is one entire unit denoting strong stable support to the numerator. Hence the essential qualities of a family are:

- All the family members need to be attached to each other through mutual love, kindness, respect, team work, mutual loyalty and a positive sensitivity towards each other.
- They need to form a strong support system for every member of the family.

Now let us look at a story that explains how we can be kind, sensitive and supportive of other members of the family.

One cold winter night, a family of two children & their parents sat together for their dinner. Mother prepared the dinner after a very long & tiring day. She placed a plate of sabzi (Gravy of vegetables) & rotis (Indian flat bread) in front of the father but the rotis were burnt.



The children curiously looked at the reaction of their father who himself came back home from work after a long day. But the father quietly ate his rotis without any comment.



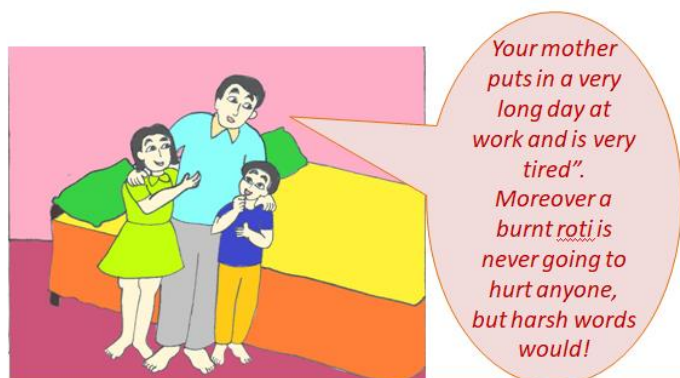
The mother apologized to their father for the burnt rotis.



But to the surprise of the children, father said, “Don’t worry dear, I love the burnt rotis”.

Later that night, just before going to sleep, the children mustered their courage, went to their father and asked him, “Dad! Do you really love burnt rotis?”

He put his arms around their shoulders and said, “Your mother puts in a very long day at work and is very tired. Moreover a burnt roti is never going to hurt anyone, but harsh words would!”



He continued to say “Life is full of imperfect things and imperfect people. I am myself hardly perfect.”

But what the children learnt from that incident got fixed on their minds over years. They learnt to accept one another’s faults and to celebrate each other’s differences. They understood that this is one of the most important keys for building a healthy, growing and lasting relationship.

So Children! Remember!

- Love the people who treat you right & show compassion towards people who don’t.
- This is true not only with your family members but also with everyone else in the society around you.
- Kindness towards others is most important in life.
- People may or may not remember what you do to them or they may forget what you said to them. But they will always remember the way you made them feel.

Image Source:

SSSVV Gallery

Time to teach	Value Type	Value Sub Type	Value Attribute
5 Minutes	Love		Stories

19. MS_Summary_Rational Numbers

- Rational number is a number of the form $\frac{p}{q}$ where p, q are integers, $q \neq 0$.

Example: $\frac{-2}{5}, \frac{4}{7}, \frac{3}{-8}$

- All integers and fractions are rational numbers
- Rational numbers can be either positive or negative

- A rational number $\frac{p}{q}$ is said to be positive if both numerator and denominator are of the same sign
- A rational number $\frac{p}{q}$ is said to be negative if both numerator and denominator are of opposite signs such that one of them is a positive integer and the other is negative integer
- Example: $\frac{-5}{3}, \frac{1}{-2}$
- Zero is neither positive nor negative rational number
- Rational numbers are extensively used in many real life situations
- By multiplying or dividing the numerator and denominator of a rational number by a non – zero integer we get a rational number equivalent to the given rational number
Example: $\frac{2}{3} = \frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$
 $\frac{2}{3}$ and $\frac{4}{6}$ are equivalent rational numbers
 $\frac{-27}{72} = \frac{-27 \div 9}{72 \div 9} = \frac{-3}{8}$
 $\frac{-3}{8}$ and $\frac{-27}{72}$ are equivalent rational numbers
- Any rational can be plotted on a number line. A positive rational number is represented to the right of zero and a negative rational number is represented to the left of zero
- A rational number $\frac{p}{q}$ is said to be in standard form if q is positive and integers p, q have no common factor other than 1
Example: $\frac{-3}{5}, \frac{4}{7}$
- There exist infinitely many rational numbers between any two rational numbers
- When the denominators are the same, the sum of two rational numbers is obtained by adding up the numerators. When the rational numbers have different denominators, then LCM of denominators is taken. Equivalent of both the rational numbers with same denominators is obtained. Then the two rational numbers are added
Example: $\frac{5}{12} + \frac{7}{18} = \frac{15}{36} + \frac{14}{36} = \frac{29}{36}$
Here LCM of 12 and 18 is 36
- While subtracting a rational number from another we add the additive inverse of the rational number to be subtracted to the other rational number
Example: $\frac{7}{3} - \frac{2}{3} = \frac{7}{3} + \text{additive inverse of } \frac{2}{3}$
 $\frac{7}{3} + \frac{-2}{3} = \frac{7+(-2)}{3} = \frac{5}{3}$
- Product of two rational numbers = $\frac{\text{Product of the numerators}}{\text{Product of the denominators}}$
- Dividing any rational number by another non-zero rational number is equivalent to multiplying the rational number by the reciprocal of the number
Example: $\frac{3}{4} \div \frac{2}{9} = \frac{3}{4} \times \text{Reciprocal of } \frac{2}{9}$
 $= \frac{3}{4} \times \frac{9}{2} = \frac{27}{8}$
- A rational number of the form $\frac{p}{q}$ denotes p parts out of q. Similarly, each of us is a part of our family. We are bound by the value of mutual love and kindness

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Main Script	Rational Numbers	