CBSE Class 8 Maths Notes Chapter 1: Chapter 1 of CBSE Class 8 Maths, titled Rational Numbers, introduces the concept of numbers that can be written in the form p/q. The chapter begins by reviewing integers and fractions before expanding into rational numbers.

Students learn how to represent rational numbers on a number line, find equivalent rational numbers, and express them in their standard form. CBSE Class 8 Maths Notes Chapter 1 also explains the operations of addition, subtraction, multiplication, and division of rational numbers, along with their properties such as closure, commutative, associative, and distributive properties.

CBSE Class 8 Maths Notes Chapter 1 Overview

Chapter 1 of CBSE Class 8 Maths focuses on Rational Numbers, which are numbers that can be expressed in the form of p/q, where p and q are integers. The chapter begins by revising the properties of whole numbers, integers, and fractions, then extends this understanding to rational numbers.

Key concepts covered include the representation of rational numbers on a number line, finding equivalent rational numbers, and the standard form of rational numbers. The chapter also delves into the **addition, subtraction, multiplication,** and **division** of rational numbers, emphasizing how to handle positive and negative values.

Students learn about the properties of rational numbers, such as **closure, commutative, associative,** and **distributive** properties under different operations. The concept of the **additive inverse** (negative of a rational number) and the **multiplicative inverse** (reciprocal) is also introduced.

CBSE Class 8 Maths Notes Chapter 1 Rational Numbers

Here we have provided CBSE Class 8 Maths Notes Chapter 1 Rational Numbers -

Rational numbers are those that are intrinsically closed in many mathematical operations and are used in a wide range of mathematical applications, including addition, subtraction, and multiplication.

Introduction to Rational Numbers

We will study rational numbers, their characteristics, how to depict rational numbers on a number line, and how to use examples to obtain rational numbers between any two rational numbers in the chapter Rational Numbers for Class 8.

Whole Numbers and Natural Numbers

A collection of numbers called natural numbers begins at 1 and goes all the way up to infinity. ′N′ stands for the set of natural numbers.
N is the Set of Natural Numbers = {1,2,3,... }

Whole numbers are collections of numbers that extend from 0 to infinity. In essence, the zero has been introduced to the set of natural numbers. The letter "W" stands for the set of whole numbers.
The whole numbers (W) are {0,1,2,3,...}

Properties of Natural Numbers and Whole Numbers

Closure Property

Property Closure When adding and multiplying whole numbers, closure property holds true; however, when subtracting and dividing, it does not. This also holds true for natural numbers.

Commutative Property

Equivalency of Properties When it comes to addition and multiplication, the commutative characteristic holds true for whole numbers and natural numbers, but not when it comes to subtraction and division.

Associative Property

Relationship-Building Assemblage When it comes to addition and multiplication, associative property holds true for whole numbers and natural numbers, but not when it comes to subtraction and division.

Integers

Simply put, natural numbers and their negatives are known as integers. The symbols "Z" or "I" stand for the set of integers.
Z: The Set of Integer Numbers = {3, 2, 3, 0, 1, 2, 3,... }

Properties of Integers

Closure Property - Property Closure Integers are subject to the closure property in addition, subtraction, and multiplication but not division.
Commutative Property- Equivalency of Properties Integers have the commutative property when it comes to addition and multiplication, but not subtraction or division.
Associative Property - Relationship-Building Assemblage When adding and multiplying numbers, the associative condition holds true; however, division and subtraction do not.

Rational Numbers

A rational number is one that has the form p/q, where q must not be 0, and may be expressed as a fraction of two integers. Q is the abbreviation for the set of rational numbers.

For instance, if -5 and 7 are integers, then -5/7 is a rational number. Given that it can be expressed as 2/1, where 2 and 1 are integers, even 2 is a rational number.

Properties of Rational Numbers

Closure Property of Rational Numbers

$a*b=c\in Q$ holds for any two rational numbers, a and b. The product of addition, subtraction, and multiplication of two rational integers, let's say a and b, yields a rational number. We can say that the closure property applies to rational numbers in the case of addition since the sum of two numbers is ultimately a rational number.

For instance, when 17 and 12 are integers, the addition of 2/3 + 3/4 = (8+9)/12 = 17/12 is likewise a rational number. A rational number is the difference of two rational numbers. Consequently, in the case of subtraction, the closure property holds true for rational numbers.

For instance, where 1 and 20 are integers, the difference between 4/5 – 3/4 = (16–15)/20 = 1/20 is likewise a rational number. A rational number is produced when two rational numbers are multiplied. As a result, we may state that the closure property also holds true for rational numbers when they are multiplied.

As an illustration, consider the rational number (-2/5) that results from multiplying 1/2 by (-4/5) = (-4/10) where -2 and 5 are integers. When two rational numbers are divided, we can observe that a rational number $a\cdot 0$ is not defined for that number a. Therefore, in the case of division, we can say that the closure property does not hold true for rational numbers.

Commutative Property of Rational Numbers

$A*b=b*a$ for any two rational numbers, a and b. To put it another way, a commutative property requires that an equation's solution hold true even if the operands' order changes. When two rational numbers, a and b, are given, (a+b) will always equal (b+a). Thus, for rational numbers, addition is commutative.

For example: 2/3 + 4/3 = 4/3 + 2/3
⇒ 6/3 = 6/3
⇒ 2 = 2

When comparing two rational numbers, a and b, it can be observed that (a−b) is never equal to (b−a). Consequently, for rational numbers, subtraction is not commutative.

For example: $2/3 – 4/3 = -2/3$
but $4/3 – 2/3 = 2/3$

The product of two rational numbers, a and b, is equal to ($b×a$) when considering ($a×b$). For rational numbers, multiplication is hence commutative.

For example: $2/3 × 4/3 = 8/9$
and
$4/3 × 2/3 = 8/9$

When two numbers, a and b, are divided, ($a÷b$) differs from ($b÷a$). Thus, for rational numbers, division is not commutative.

For example: 2/3 is definitely different from 3/2.

Associative Property of Rational Numbers

$(a*b)*c=a*(b*c)$ for any three rational numbers, a, b, and c. That is to say, an associative property requires that an equation's solution hold true even if the operators' order changes.

Given three rational numbers a,b and c, it can be said that :

$(a+b)+c = a+(b+c)$. Therefore **addition** is **associative**.

$(a−b)−c≠a−(b−c)$. Because $(a-b)-c = a-b-c$ whereas $a-(b-c) = a-b+c$. Therefore we can say that **subtraction** is **not associative**.

$(a×b)×c=a×(b×c)$. Therefore **multiplication** is **associative.**$(a÷b)÷c≠(a÷b)÷c$. Therefore **division** is **not associative**.

Example: $1/2 + (1/4 + 2/3) = (1/2 + 1/4) + 2/3$
$⇒ 17/12 = 17/12$

Also,
$1/2 x (1/4 x 2/3) = (1/2 x 1/4) x 2/3$

$⇒ 2/24 = 2/24$

$⇒1/12 = 1/12$

Distributive Property of Rational Numbers

Given three rational numbers a,b and c, the **distributivity** of **multiplication** over **addition** and **subtraction** is respectively given as :
$a(b+c)=ab+ac$
$a(b−c)=ab−ac$

Example: 1/2 x (1/2 + 1/4) = (1/2 x 1/2) + (1/2 x 1/4)
3/8 = 3/8

Negatives and Reciprocals

Negation of a Number

In the case of a rational number a/b, a/b+0 = a/b, meaning that any rational number multiplied by zero yields the same rational number. In this context, "0" denotes the additive identity for rational integers.

If (a/b) + (-a/b) = (-a/b) + (a/b) = 0, then it can be said that the **additive inverse** or **negative** of a rational number ab is −ab. Also, (−a/b) is the **additive inverse** or **negative** of a/b.
For example: The additive inverse of -21/8 is -(-21/8) = 21/8

Reciprocal of a Number

Any rational number multiplied by "1" yields the same rational number, hence for any given rational number a/b, a/b × 1 = a/b. Therefore, for rational numbers, '1' is referred to as the multiplicative identity.

It can be stated that c/d is the multiplicative inverse of a rational integer a/b, or reciprocal, if a/b × c/d = 1. Furthermore, a/b is the multiplicative inverse of a rational integer c/d, or reciprocal.

For example: The reciprocal of 2/3 is 3/2 as 2/3 × 3/2 = 1.

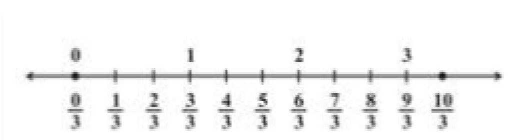
Representing on a Number Line

Representation of Rational Numbers on the Number Line

To represent a given rational number a/n on the number line, where a and n are integers:
Step 1: Split the distance in 'n' parts, the distance between two consecutive numbers.

For instance, we split the space between 0 and 1, 1 and 2, etc. into three pieces if we are given the rational number 2/3.

Step 2: indicate the rational numbers with labels until the number you need to indicate is included in the range.



Rational Numbers between Two Rational Numbers

Unlike whole numbers and natural numbers, the number of rational numbers that separate any two given rational numbers is not certain.

For instance, there are precisely seven natural numbers between 2 and 10, but there are an unlimited amount of possible numbers between 2 and 8/10.
Technique 1 Make sure the denominators of two rational numbers are the same. Any rational integer in between can be chosen once there is a common denominator.

Example: Find the rational numbers between ½ and ⅔.
LCM of denominators (2 and 3) = 6
½ × (3/3) = 3/6

⅔ × (2/2) = 4/6

We cannot find any number between 3 and 4. So will multiply each rational number 3/6 and 4/6 by 10/10.

3/6 × 10/10 = 30/60

4/6 × 10/10 = 40/60

Hence, the rational numbers between 1/2 and 2/3 are 31/60, 32/60, 33/60, 34/60, 35/60, 36/60, 37/60, 38/60 and 39/60.

Method 2

By computing the mean or midpoint of two rational numbers, we can always discover a rational number that falls between them.

Example: Find the rational numbers between 3 and 4.
Mean of 3 and 4 = (3+4)/2 = 7/2
Mean of 3 and 7/2 = 13/4

Hence, the two rational numbers between 3 and 4 are 7/2 and 13/4.

Benefits of CBSE Class 8 Maths Notes Chapter 1

The benefits of studying Chapter 1 of CBSE Class 8 Maths, Rational Numbers, include:

Strong Conceptual Foundation: Understanding rational numbers forms the basis for many advanced mathematical topics like algebra, geometry, and data handling in future classes.

Improved Arithmetic Skills: The chapter focuses on the addition, subtraction, multiplication, and division of rational numbers, enhancing basic arithmetic skills that are applicable in real-life situations.

Understanding Number Properties: Students learn important mathematical properties such as **closure, commutative, associative,** and **distributive**, which helps them solve problems more efficiently.

Problem-Solving Skills: The chapter includes exercises that challenge students to think logically and apply concepts, improving their analytical and problem-solving abilities.

Preparation for Higher Studies: Mastery of rational numbers prepares students for more complex mathematical topics like polynomials, linear equations, and functions in higher grades.