

## **Rational Numbers**

- 1. Natural numbers: Counting numbers 1, 2, 3, 4 ..... etc are called natural numbers. The collection of natural numbers is denoted by N. That is, N = {1, 2, 3, 4, ...}
- 2. Whole numbers: All natural numbers together with zero are called whole numbers. The collection of whole numbers is denoted by W. That is, W = {0, 1, 2, 3, 4, ...}
- 3. Integers: Whole numbers together with negative natural numbers are called integers. The collection of integers is denoted by Z. That is,  $Z = \{..., -4, -3, -2, -1, 0, 1, 2, 3, 4, ...\}$
- 4. The numbers of the form  $\frac{p}{q}$ , where p and q are integers and  $q \neq 0$  are called rational numbers. For example  $\frac{-3}{5}, \frac{7}{-11}, \frac{-13}{-213}$  etc.
- 5. Rational numbers are closed under the operations of addition, subtraction and multiplication.
- 6. Rational numbers are commutative under the operations addition and multiplication.
- 7. Rational numbers are associative under the operations addition and multiplication.
- 8. The number 0 is the additive identity for rational numbers.
- 9. The number 1 is the multiplicative identity for rational numbers.
- 10. The additive inverse of the rational number  $\stackrel{a}{\underset{b}{=}} = \stackrel{a}{\underset{b}{=}}$  and vice-versa.
- 11. The reciprocal or multiplicative inverse of the rational number  $\stackrel{a}{=}$  is  $\stackrel{c}{=}$  if  $\stackrel{a}{=}$   $\stackrel{c}{=}$  1.
- 12. Multiplication is distributive over addition and subtraction of rational numbers. That is, for any three rational numbers a, b and c,

$$a \times (b + c) = a \times b + a \times c$$
 and  $a \times (b - c) = a \times b - a \times c$ 

- 13. Rational numbers can be represented on a number line.
- 14. Between any two given rational numbers there are countless rational numbers.
- 15. There are two methods of finding rational numbers between the two given rational numbers:



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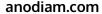
## First Method:

- a. Add the two rational numbers and divide the sum by 2 to get a new rational number. The rational number so obtained will lie between the given ones. (Note that here we get three consecutive rational numbers).
- b. To get another new rational number, divide the sum of any two consecutive rational numbers (obtained in above step) by 2.
- c. Repeat the above step as many times as per requirement of finding rational numbers between two rational numbers.

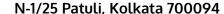
## Second Method:

- a. Convert the denominator of both the fractions into the same denominator by taking LCM.
- b. Find the different values of integers which lie between the numerators of the two rational numbers having same denominator.
- c. The required rational numbers are obtained by taking the integers found in step 2 as numerator and keeping the denominator same as the LCM.
- d. If the new fractions do not have any number in between the given numerator, then multiply numerator as well as denominator of both the fractions by a suitable number and then find the rational numbers between them.











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