Basics Concepts of Number System

The number system is an important topic for various BBA & HM entrance exams. Here, we are going to help you with **Basic Concepts & Short Tricks on Number System.** We will be providing you with details of the topic to make the **Quant Section and calculation easier** for you all to understand. We hope you all will like the post.

Introduction

(1) Natural Numbers: Numbers starting from 1, 2, 3 and so on so forth are counted as Natural numbers. **They are 1, 2, 3, 4...**

Exceptions: Zero, negative and decimal numbers are not counted in this list.

(2) Whole numbers: Zero and all other natural numbers are known as natural numbers. **They are 0, 1, 2, 3, 4...**

(3) Integers: They are the numbers which include all the whole numbers and their negatives. **They are ...-4, -3, -2, -1, 0, 1, 2, 3, 4....**

(4) Rational Numbers: All the numbers which are terminating, repeating and can be written in the form p/q, where p and q are integers and q should not be equal to 0 are termed as rational numbers.

Example: 0.12121212....

(5) Irrational Numbers: All the numbers which are non-terminating, non-repeating and cannot be written in the form p/q, where p and q are integers and q should not be equal to 0 are termed as irrational numbers.

Example: pie, e

(6) Real numbers: All the numbers **existing on the number line** are real numbers. The group is made up of all rational and irrational numbers.

(7) Imaginary Numbers: Imaginary numbers are the numbers formed by the product of real numbers and imaginary unit 'i'.

This imaginary unit is defined as the following:

$i^2 = -1$, multiplication of this 'i' is calculated according to the above value. **Example: 8i**

(8) Complex Number: The numbers formed by the combination of real numbers and imaginary numbers are called the complex number. Every complex number is written in the following form:

A + iB, where A is the real part of the number and B is the imaginary part.

(9) Prime numbers: All the numbers having only two divisors, 1 and the number itself is called a prime number. Hence, a prime number can be written as the product of the number itself and 1.

Example: 2, 3, 5, 7 etc.

(10) Composite Numbers: All the numbers which are not prime are called composite numbers. This number has factors other than one and itself.

Example: 4, 10, 99, 105, 1782 etc.

(11) Even & Odd Numbers: All the numbers divided by 2 are even numbers. Whereas the ones not divisible by 2 are odd numbers.

Example: **4, 6, 64, 100, 10004 etc are all even** numbers.

3, 7, 11, 91, 99, 1003 are all odd numbers.

(12) Relative Prime Numbers/Co-prime Numbers: Numbers which do not have any common factor other than 1 are called co-prime numbers.

Example: **5 and 17 are co-primes.**

(13) Perfect Numbers: All the numbers are called perfect numbers if the sum of all the factors of that number, excluding the number itself and including 1, equalizes the to the number itself then the number is termed as a perfect number.

Example:**6 is a perfect number.** As the factors of 6 = 2 and 3.

As per the rule of perfect numbers, sum= 2+3+1 = 6. Hence, 6 is a perfect number.

Some important properties of Numbers:

1. The number 1 is neither prime nor composite.
2. The only number which is even is 2.
3. All the prime numbers greater than 3 can be written in the form of (6k+1) or (6k-1) where k is an integer.
4. Square of every natural number can be written in the form 3n or (3n+1) and 4n or (4n+1).
5. The tens digit of every perfect square is even unless the square is ending in 6 in which case the tens digit is odd.
6. The product of n consecutive natural numbers is always divisible by n!, where n!= 1 X 2 X 3 X 4 X ….X n (known as factorial n).

To test whether a given number is prime number or not

If you want to test whether any number is a prime number or not, take an integer larger than the approximate square root of that number. Let it be ‘x’. test the divisibility of the given number by every prime number less than ‘x’. if it is not divisible by any of them then it is prime number; otherwise it is a composite number (other than prime).

Example: Is 349 a prime number?

Solution:

The square root of 349 is approximate 19. The prime numbers less than 19 are 2, 3, 5, 7, 11, 13, 17.

Clearly, 349 is not divisible by any of them. Therefore, 349 is a prime number.

Rules of Simplification

(i) In simplifying an expression, first of all vinculum or bar must be removed. For example: we have known that – 8 – 10 = -18

But, = - (-2) = 2

(ii) After removing the bar, the brackets must be removed, strictly in the order (), {} and [].

(iii) After removing the brackets, we must use the following operations strictly in the order given below. (a) of (b) division (c) multiplication (d) addition and (e) subtraction.

Note: The rule is also known as the rule of **'VBODMAS'** where V, B, O, D, M, A and S stand for Vinculum, Brackets, Of, Division, Multiplication, Addition and Subtraction respectively.

Example: Simplify

Solution:

Ascending or Descending Order in Rational Numbers

Rule 1: When the numerator and the denominator of the fractions increase by a constant value, the last fraction is the biggest.

Example: Which of the following fractions is the greatest?

Solution:

We see that the numerators as well as denominators of the above fraction increase by 1, so the last fraction, i.e. is the greatest fraction.

Rule 2: The fraction whose numerator after cross-multiplication given the greater value is greater.

Example: Which is greater :

Solution:

Students generally solve these questions by changing the fractions into decimal values or by equating the denominators. But, we suggest you a better method for getting the answer more quickly.

Step 1: Cross –multiply the two given fractions.

We have, 5 × 14 = 70 and 8 ×9 =72

Step II. As 72 is grater than 70 and the numerator involved with the greater value is 9, the fraction is the greater of the two.

Example: Which is greater:

Solution:

Step I: 4 ×23 > 15 ×6

Step II: As the greater value has the numerator 4 involved with it,   is greater.

You can see how quickly this method works. After good practice, you won't need to calculate before answering the question.

The arrangement of fractions into the ascending or descending order becomes easier now. Choose two fractions at a time. See which one is grater. This way you may get a quick arrangement of fractions.

Note: Sometimes, when the values are smaller (i.e., less than 10), the conventional method, i.e., changing the values into decimals or equating the denominators after getting LCM, will prove more convenient for some of you.

Example: Arrange the following in ascending order.

Solution: Method I

The LCM of 7,5,9,2,5, is 630.

Now, to equate the denominators, we divide the LCM by the denominators and multiply the quotient by the respectively numerators.

Like for , 630 ÷ 7 = 90, so, multiply 3 by 90.

Thus, the fractions change to

The fraction which has larger numerator is naturally larger. So,

Method II:

Change the fractions into decimals like

= 0.428, = 0.8, = 0.777, = 0.5, = 0.6

Clearly,

Method III:

Rule of CM (cross-multiplication)

Step I: Take the first two fractions. Find the greater one by the rule of CM.

3 × 5< 7×4

Step II: Take the third fraction. Apply CM with the third fraction and the larger value obtained is step I.

4 × 9 > 5 × 7

Now we see that can lie after or between and .

Therefore, we apply CM with and see that .

Step III: Take the next fraction. Apply CM with and and see that . Next, we apply CM with and and see that .

Therefore,

Step IV: With similar applications, we get the final result as:

Note: This rule has some disadvantages also. But if you act fast, it gives faster results. Don't reject this method at once. This can prove to be the better method for you.

Formulas

1. **Sum of all the first n natural numbers =**

For example: 1+ 2 +3 +…..+105=

2. **Sum of first n odd numbers =**

For example: 1+3+5+7==16(as there are four odd numbers)

3. **Sum of first n even numbers = n (n+1)**

For example : 2+4+6+8+….+100 (or 50^{th} even number) = 50×(50+1)= 2550

4. **Sum of squares of first n natural numbers =**

For example:

5. **Sum of cubes of first n naturals numbers =**

For example :

__**Example:**__

(1) What is the total of all the even numbers from 1 to 400?

Solution:

From 1 to 400, there are 400 numbers. So, there are 400/2= 200 even numbers.

Hence, sum = 200(200+1) = 40200 (From Rule III)

(2) What is the total of all the even numbers from 1 to 361?

Solution:

From 1 to 361, there are 361, there are 361 numbers; so there are even numbers. Thus, sum = 180(180+1)=32580

(3) What is the total of all the odd numbers from 1 to 180?

Solution:

Therefore are 180/2 = 90 odd numbers between the given range. So, the sum =

(4) What is the total of all the odd numbers from 1 to 51?

Solution

There are odd numbers between the given range. So, the sum =

(5) Find the of all the odd numbers from 20 to 101.

Solution:

The required sum = Sum of all the odd numbers from 1 to 101.

Sum of all the odd numbers from 1 to 20

= Sum of first 51 odd numbers – Sum of first 10 odd numbers

=

Miscellaneous

1. In a division sum, we have four quantities – **Dividend, Divisor, Quotient and Remainder**. These are connected by the relation.

Dividend = (Divisor × Quotient) + Remainder

2. When the division is exact, the remainder is zero (0). In this case, the above relation becomes

Dividend = Divisor × Quotient

Example: 1: The quotient arising from the divisor of 24446 by a certain number is 79 and the remainder is 35; what is the divisor?

Solution:

Divisor × Quotient = Dividend - Remainder

79×Divisor = 24446 -35 =24411

Divisor = 24411 ÷ 79 = 309.

Example: 2: A number when divided by 12 leaves a remainder 7. What remainder will be obtained by dividing the same number by 7?

Solution:

We see that in the above example, the first divisor 12 is not a multiple of the second divisor 7. Now, we take the two numbers 139 and 151, which when divided by 12, leave 7 as the remainder. But when we divide the above two numbers by 7, we get the respective remainder as 6 and 4. Thus, we conclude that the question is wrong.