

1. NUMBER SYSTEM

Digit: Collection of certain symbols (or) figures is called Digit. The name "digit" comes from the fact that the 10 digits (ancient Latin *digiti* meaning fingers) of the hands correspond to the 10 symbols of the common base 10 number system.

Ex: The ten digits of the numerals are.. 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Numbers: A number is a mathematical object used to count, label and measure. Numbers are formed with the digits. The numbers include such as 0, negative numbers, rational numbers, irrational numbers, and complex numbers.

Ex: 23, 47, 86, 154, 542, 620, 3540, 8692, 5682, etc....

Facevalue: The value of digit itself is called face value.

Ex: In 8,642 The face value of '2' is 2, face value of '6' is 6

Place value: The place value of a given digit in a given number begins from the extreme right.

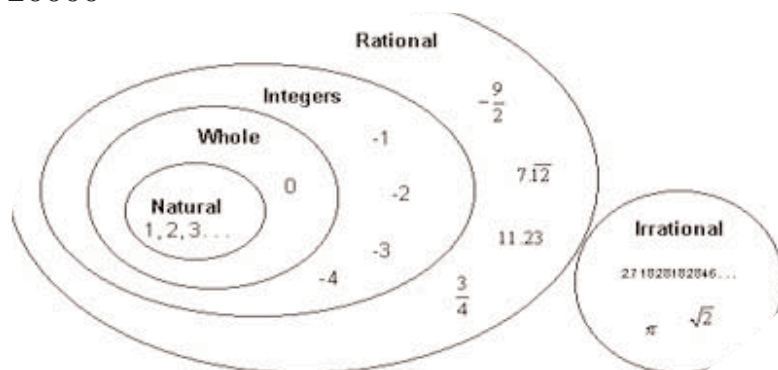
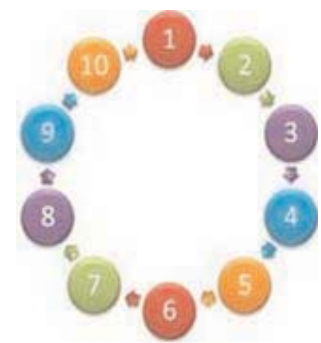
Ex: The number 987654321 is represented as shown below.

| 10 Crore | Crore | 10-L | Lakh | 10-Th | Thousands | Hundreds | Ten's | Units place |
|----------|--------|--------|--------|--------|-----------|----------|--------|-------------|
| 10^8 | 10^7 | 10^6 | 10^5 | 10^4 | 10^3 | 10^2 | 10^1 | 10^0 |
| 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

Ex: Place value of 5 is $5 \times 10^4 = 50000$

Place value of 2 is $2 \times 10^4 = 20000$

- * 10 lakh = 1 million
- * 10 million = 1 crore
- * 100 million = 10 crore
- * 100 crore = 1 billion
- * 1 google = 10^{100}
- * 1 google plex = $10^{10^{100}}$
- * Mahasamudram = 10^{52}



7. Odd numbers: Integers not divisible by 2 are called odd numbers.

Ex. { -7, -5, -3, -1, -0, -1, 3, 5, 7 }

General formula = $2N + D$

8. Prime numbers: A number which has '1' and itself only as factors is called prime number.

Ex: 2, 3, 5, 7, 11, 13, 17.....

Primes in 100 Natural numbers

| Code | Natural numbers | Primes | No.of primes |
|------|-----------------|----------------|--------------|
| D | 1-10 | 2, 3, 5, 7 | 4 |
| D | 11-20 | 11, 13, 17, 19 | 4 |
| B | 21-30 | 23, 29 | 2 |
| B | 31-40 | 31, 37 | 2 |
| C | 41-50 | 41, 43, 47 | 3 |
| B | 51-60 | 53, 59 | 2 |
| B | 61-70 | 61, 67 | 2 |
| C | 71-80 | 71, 73, 79 | 3 |
| B | 81-90 | 83, 89 | 2 |
| A | 91-100 | 97 | 1 |
| | | | Total 25 |

Number of primes can be found with the help of the code "DD BBC BBC BA"

DD Delhi Doordarshan

BBC British Broad Costing Company

BA Bachelor of Arts

Ex: 1. How many primes are there in less than 100 natural numbers? **Ans: (b)**

- a) 20 b) 25 c) 28 d) 30

2. How many numbers of primes between natural numbers 11 to 80? **Ans: (c)**

- a) 16 b) 17 c) 18 d) 19

$D + B + B + C + B + B + C = 4 + 2 + 2 + 3 + 2 + 2 + 3 = 18$

3. How many primes between the natural numbers 61 to 80? Ans: (d)

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

$$C + B \quad 2 + 3 = 5$$

4. The least prime number is? Ans: (b)

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

5. Which one of the following only prime numbers which is even also? Ans: (b)

- a) 1 b) 2 c) 4 d) 6

Test for checking primes greater than "100" natural numbers

Let, x = given number,

" k " be an integer very near to \sqrt{x} such that $k > \sqrt{x}$

If ' x ' is not divisible by any of the numbers less than k , then ' x ' is prime otherwise it is not a prime.

Ex: Test 191 is prime (or) not..

Ans: let, $x = 191$

$$k = \sqrt{196} = 14$$

$$14 > \sqrt{191}$$

The primes less than 14 are.. 2, 3, 5, 7, 11, 13

191 is not divisible by any of the above. So 191 is a prime number.

Ex: Test 104 is Prime or not..

Ans: Let $x = 104$

$$k = \sqrt{121} = 11$$

$$11 > \sqrt{104}$$

Primes less than 11 are..2, 3, 5, 7. '104' is divisible by '2'. So 104 is not a prime number.

* The largest prime number known so far is $(2^{2281}-1)$ which is a number of about 700 digits.

Formulae related to prime numbers

I. Euclidians formula: If one is added to the product of consecutive primes starting from 2 then the resultant number is a prime number.

Ex: i. $2 \times 3 + 1 = 7$ (prime number)

ii. $2 \times 3 \times 5 + 1 = 31$ (prime number)

iii. $2 \times 3 \times 5 \times 7 + 1 = 211$ (prime number)

II. Leonards formula (or) Eulers formula: If $n < 40$ then $(n^2 - n + 41)$ is a prime number.

III. Fermat's formula: The numbers in the form of $(2^{2^n} + 1)$ are prime numbers but it is true for $n = 1, 2, 3, 4$

Note: All prime numbers other than 2 are odd numbers but all odd numbers are not prime numbers.

9. Composite numbers: "The natural numbers which have factors other than "1" and themselves are called composite number.

Ex: 4, 6, 9, 10, 12, 15,

$9 = 3 \times 3$ other than 1 and 9

$10 = 2 \times 5$ other than 1 and 10

* "1" is neither prime nor composite number.

* A composite number may be even (or) odd.

* Prime number has two factors.

* Composite number has minimum three factors.

10. Twin primes: If the difference of two prime numbers is 2 then they are called twin primes

Ex: (3, 5); (5, 7); (11, 13); (17, 19); (29, 31),

11. Co-primes: "If two numbers have only 1 as common factor then the numbers are called co-primes. (or) If h.c.f of two numbers is "1" then they are called co-primes.

Ex: (3,15), (4,19)....

12. Perfect numbers: "If the sum of factors of number except itself is equal to the same number then the number is called perfect number".

Ex: 6, 28, 496...

6 1, 2, 3 $1 + 2 + 3 = 6$

28 1, 2, 4, 7, 14 $1 + 2 + 4 + 7 + 14 = 28$

* **Successor of a number is** - One more than the number

Ex: The successor of 99 is 100

The successor of 999 is 1000

The successor of 40299 is 40300

* **Predecessor of a number:** One less than the number

Ex: The predecessor of 40,300 is 40,299

* Two smallest 3-digit number formed by using the digits 6, 3 & 8 is..

Ans: The required number is 3,689

* The smallest 3 digit number formed by using the digits 0, 3 & 5 is..

Ans: The required number is "305"

* Write the greatest three digit number formed by using the digits 7, 6 & 4 is..

Ans: Required numbers is "764"

* The smallest four digit number formed by using the digits 1, 3 & 8 and repeating 8 is twice.

Ans: Required number is 1388

* Write the smallest four digit number of four different digits.

Ans: Required number is 1023

* Write the greatest four digit number of four different digits.

Ans: The greatest four different digits are 9, 8, 7 & 6. The required number = 9876

Ex: 1. What is the difference between the largest numbers and the least number written with the figures 3, 4, 7, 0, & 3 ?

- a) 70983 b) 43893 c) 43983 d) 43883

Ans: Largest number = 74330

Least numbers = 30347

Difference = $74330 - 30347 = 43983$

2. What is the difference between the largest number and few least number ... with the figures 3, 4, 1, 7...

- a) 6084 b) 6184 c) 5084 d) 6048

Ans: $7431 - 1347 = 6084$

3. Find the difference of the place value and face value of 9 in 29735?

- a) 8881 b) 8991 c) 9001 d) 8899

Ans: Place value of 9 = 9000 Face value of 9 = 9 Difference = 8991

4. Evaluate $\sum_{x=50}^{x=80} x$ where 'x' is a prime number

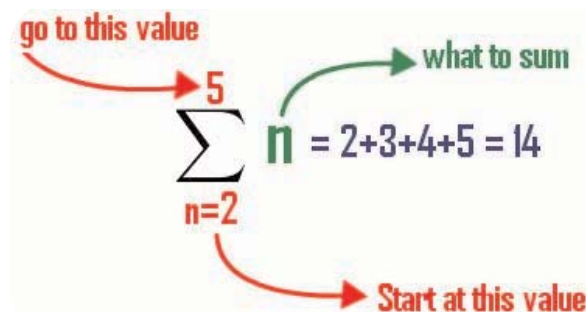
- a) 450 b) 600 c) 463 d) 468

Ans: $\left[\sum_{x=n_1}^{x=n_2} x \right]$ This symbol is called Sigma. It means sum of numbers from n_1 to n_2
 sum of prime numbers between 50 and 80.

Sum = 53 + 59 + 61 + 67 + 71 + 73 + 79 = 463

5. If 'x' is a composite number find the value of

$$\sum_{x=30}^{x=40} x$$



- a) 240 b) 245 c) 247 d) 250

Ans: Composite numbers between 30 and 40 are.. 32, 33, 34, 35, 36, 38, 39

Sum = 247