NUMBER THEORY

1.Regular number: A regular number is an integer of the from $2^i 3^j 5^k$ where i,j,k is non negative integer. The regular number are also called 5-smooth indicating that there greatest prime facor is at most 5.

*Example:*1,2,3,4,5,6,8,9,10,12,15,16,18..

2.Complex number: A complex number is a number of form a+ib where a & b are real number and i is the imaginary unit satisfying i^2=-1.Here a is the real part and b is the imaginary part.

Example:3+4i,-5+3i

3.Real Number: A real number include all rational numbers such as the integers 5 and the fraction 4/3 and all the irrational numbers such as$\sqrt{2}$.

Trauscendental numbers such as π(pi)=3.141592..

Type equation here.

4.Prime Number: Prime number is a natural number that have no positive divisor other than 1 and itself. That means it's can have exactly two positive divisor 1 and the number itself.

Example:2,3,5,7,11,13,17,19,23,29,31,

5.Composite Number: Composite number is positive integer that can be formed by multiplying together two smaller positive integer.

Example:4,6,8,9,10,12,14,15,16,18,20

6.Powerful Number: A powerful number is a product of a square and root that is number m=$a^2 b^3$ here a & b is a positive integer.

Example:1,4,8,9,16,25,27,32,36

7.Friendly Number: Friendly Number are two or more natural numbers with a common abandancy the ratio between sum of divisors of the number and the number itself. A number n is friendly number if they exist m≠n such that

$\frac{\partial(m)}{m} = \frac{\partial(n)}{n}$ the smallest friendly number is 6 and friendly pair(6,28) with abandancy.

$$\frac{\partial(6)}{6} = \frac{(1+2+3+6)}{6} = 2 \; the \; same \; as$$

$$\frac{\partial(28)}{28} = \frac{(1+2+4+7+14+28)}{28} = 2$$

Example:(6,120),(12,28),(24,60),(56,120),(102,216)

8.Solitary Number: A number that is not a part of any friendly pair is called solitary number.

*Example:(*18,39),(45,78),(49,26),(130,370)

9.Amicable Number: Amicable number are two different number as related that the sum of the proper divisor of each is equal the other number.

The Smallest pair of (220,284)

220=1=2+4+5+10+11+20+22+44+51+110 of which the sum is 284.

And 284=1+4+71+141 of which the sum is 220.

Other example (6232,6268)

10.Perfect Number: A perfect number is a positive integer that is equal to the sum of that's proper positive divisor .the formula of even perfect number is $2^{p-1}(2^p - 1)$ Where p is the prime number

Example:

p=2: $2^{2-1}(2^2 - 1) = 6$

P=3:$2^{3-1}(2^3 - 1) = 28$

$p = 5: 2^{5-1}(2^5-1) = 496$

Fibonacci Number: The Fibonacci number are the number in the following integer sequence called the Fibonacci number and the characteristic by the fact that every number after the first two number is the sum of the two preceding ones.

In mathematics term the sequence F_n of fibonacci number is defined by the recurrence relation.

$F_n = F_{n-1} + F_{n-2}$ where F1=1, F2=1

Example:1,1,2,3,5,8,13,21,34,55,89,144

12.Lucas number: Like the Fibonacci number lucas number is defined to be sum of it's two intermediate previous term thereby forming a Fibonacci sequence . First two lucas numbers are $L_0 = 2 \; and \; L_1 = 1$.

The lucas number may be defined as follows

$$L_n = \begin{cases} 2 \; if \; n = 0 \\ 1 \; if n = 1 \\ L_{n-1} + L_{n-2} \; if \; n > 1 \end{cases}$$

The sequences of Lucas number is 2,1,3,4,7,11,18,29,47,76,123

13.Octagonal Number: A Octagonal number is figurate number that represent an octagon . The Octagon number for n is given by the formula $3n^2 - 2n$

$$where \; n > 0$$

Example:1,8,21,40,65,96,133,176,225

14.Central Octagonal Number: A Octagonal number is centred figurate number that represent an octagon with a dot in the centre and all others dots surrounding the centre dots in successive octagonal layers as the figure

Thus the nth centred orginal number is given by formula

$$(2n - 1)^2 = 4n^2 - 4n + 1$$

Example:1,9,25,49,81,121..

15.Smooth Number: A smooth number is a integer which factor completely into small prime number . A positive integer called B-smooth .if none of its prime

factorization $2^2 3^4 5$ therefore 1620 is 5 smooth because none of it prime factor are greater than 5.

16.rough Number: A K-rough number is a positive integer whose prime factors are all greater than or equal to k . K roughness has alternately been defined as requiring all prime factor to strictly exceed.

Example:

- Every Odd positive integer(1,3,5) is 3 rough
- Every positive integer that is congrucent to 1 or 5 mod 6 is 5 rough.
- Every positive integer is 2-rough since all it's positive factors being prime number exceed 1.

17.Sphenic number: A sphenic number is a positive integer that has the product of three distinct prime numbers. Sphenic number is the product of pqr where p,q,&r three distinct prime number.

The smallest sphenic prime number is 30=2.3.5

The product of three smallest prime.

Others Example:30,42,66,70,78,102,105,110

18.Pronic Number: A pronic number is a number which is the product of two consietive integers that is a number of the form n(n+1) they are also called along numbers.

Heteromcie Numbers or rectangular number

Example: 0,2,6,12,20,30,42,56,72..

19.Automoephic Number: An automorphic number is a number where square "ends" in the same digit as the number itself

Example:

$$5^2=25$$

$$6^2 = 36$$

$$25^2 = 625$$

$$76^2 = 5776$$

$$890625^2=793212890625$$

20.Kaprekar Number: A Kapreker number for a given base is a non-negative integer the representation of whose square in that base can be split into two parts that's add upto orginal number again.

297 is a kaprekar numbe for base 10.

Because 297^2=88209 which can be split into 88 and 209 and 88+209=297

Others Example:1,9,45,55,99,297,703,999

21.Cabtaxi Number: In mathematics the nth cabtaxi number typically denoted cabtaxi(n)is defined as the smallest positive integer that can be written as the sum of two positive or negative or o in n ways. such kind of number are exist for all n.

Example:

cabtaxi(+1)=1=$1^3 \mp 0^3$

Cabtaxi(2)=91=$3^3 + 4^3 = 6^3 - 5^3$

Cabtaxi(3)=728=$6^3 + 8^3 = 9^3 - 1^3$

22. Square Number: In mathematics a square number is a integer that is the square of an integer. The number m is square number if and only if one can compose a square of m equal square.

***Example:*** $0^2 = 0, 1^2 = 1, 5^2 = 25, 6^2 = 36, 10^2 = 100, 19^2 = 361, 31^2 = 961$

23.Polit number: Polite number is a positive integer that can be written as the sum of two or more consecutive positive integers. Polite number have also been called staircase numbers.

Example: 3,5,7,9,10,11,12,13,14,15,17

24.perfect cube number: a cube number or a perfect cube number which is the cube of an integer.

Example: $1^3 = 1, 2^3 = 8, 6^3 = 125, 7^3 = 343, 15^3 = 3375, 24^3 = 13824, 30^3 = 27000$

25.Triangular Number: A triangularnumber counts the object that can form an equilateral triangle .as the diagram of the figure

   T1=1   T2=3   T3=6
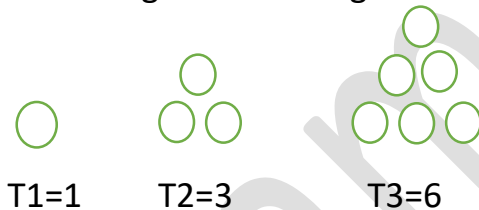
The nth triangular number is the number is the number os dots composing a triangle with the n dots m a side and is equal to the sum of the n natural number from 1 to n.

The triangular number are given lay following explicit formular :

$$T_n = \sum_{k=1}^{n} K = 1 + 2 + 3 + \cdots .. + n = \frac{n(n+1)}{2} = \frac{n+1}{2}$$

$$Here \begin{pmatrix} n+1 \\ 2 \end{pmatrix} is\ a\ bionomial\ coeffiecient$$

Example:0,1,3,6,10,15,21,28,36

26.tetrahedral Number: A Tetrahedral number is a figarate number that represents a pyramid with the triangular base and three sides called a tetrahedral

The nth tetrahedral number is the sum of 1st n^{th} triangular number.

The formular for the nth tetrahedral number is

$$T_n = \frac{n(n+1)(n+2)}{6} = \frac{n^3}{3!}$$

Example:1,4,10,20,35,56,84,120,165 ..

(Armstrong ,Factorial ,palindrome ,ugly)Number