SOME USEFUL INFORMATIONS

Arithmetic Sequence Size

1, 2, 3, 4, 5, 6, ... , N $\leq$ O(N)
1, 3, 5, 7, ... , N $\leq$ N/2 i.e O(N)
1, 4, 7, 10, ... , N $\leq$ N/3 i.e. O(N)
1, 1+k, 1+2k, 1+3k, 1+4k, 1+5k, ... , N $\leq$ N/k i.e. O(N) if k is a constant

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Arithmetic Series *Applications of* ***1+2+3+4+...+N =*** $\frac{N(N+1)}{2}$

1+2+3+4+5+6+ ....N-3+ N-2+ N-1+ N $\leq$ O(N^2)
1+2+3+4+5+6+ ....(N/2-3)+ (N/2-2)+ (N/2-1)+ N/2 $\leq$ O(N^2)
1+2+3+4+5+6+ ....(N/3-3)+ (N/3-2)+ (N/3-1)+ N/3 $\leq$ O(N^2)
1+2+3+4+5+6+ .... +$\sqrt{N}$ <= O($(\sqrt{N})^2$) $\leq$ O(N)
1+2+3+4+5+6+ .... + N^2 $\leq$ O(N^4)
1+2+3+4+5+6+ .... + N^3 $\leq$ O(N^6)
1+2+3+4+5+6+ .... +N^k <= O(N^kxN^k)
1+2^2+3^2+4^2+5^2+6^2+ .... + N^2 $\leq$ O(N^3)
1+2^3+3^3+4^3+5^3+6^3+ .... + N^3 $\leq$ O(N^4)
1^k+2^k+3^k+4^k+5^k+6^k+ .... +N^k <= O(N^{k+1})

Geometric Sequence Size

N, N/2, N/4, N/8, N/2^4, N/2^5 , N/2^6, ...8, 4 , 2 , 1 <= \log$_2$ N
N, N/3, N/9, N/27, N/3^4, N/3^5 , N/3^6, ... , 3^3, 9, 3 , 1 <= \log$_3$ N
N, N/5, N/25, N/125, N/5^4, N/5^5 , N/5^6, ..., 5^3, 5^2, 5 , 1 <= \log$_5$ N
N, N/k, N/k^2, N/k^3, N/k^4, N/k^5 , N/k^6, ... , k^3, k^2, k, 1 <= \log$_k$ N

O(logN)

Application

$\sqrt{N} * \sqrt{N} = N$

for(int i=1; i*i<=N; i++) Complexity of this loop is **O($\sqrt{N}$)**
Sum++;

N x N = N^2

for(int i=1; i*i<=N*N; i++) Complexity of this loop is **O(N)**
Sum++;

GEOMETRIC SERIES

N < 1+2+4+8+16+32+... +N/4+N/2+N < 2N

O(N)

N < 1+3+9+3^3+3^4+3^5+... +N/3^2+N/3+N < 2N

N < 1+5+2^5+5^3+5^4+5^5+... +N/5^2+N/5+N < 2N

For any constant - ratio(multiplication factor greater than 2 the above inequality is valid).