Time (omplexty - lec) Today Content? G Time Complexity & Space Complexity S Asymptotic analysis y Big O > TLE > Time Limit Exceeded Today: How to calculate No of iterations 9.1 + Sum of N natural no. = N(N+1) Q2: [3,10] C- for a given range celc no. al values it b/w $\begin{bmatrix} a,b \end{bmatrix} \begin{bmatrix} a,b \end{bmatrix} \begin{pmatrix} a,b \end{pmatrix}$ $\begin{bmatrix} a,b \end{bmatrix} \begin{bmatrix} a,b \end{pmatrix} \begin{pmatrix} a,b \end{pmatrix}$ b-a-1 b-a-1 0,a+1,a+2,b-1 a,a+1,a+2,b-1 $Q.3 \qquad N \rightarrow \frac{1}{2} \rightarrow \frac{N}{4} \rightarrow \frac{N}{8} \cdots \qquad 1 \rightarrow 0: \log \frac{N}{2}$

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A.P => Arithmetic Progression. -> Difference Series: 4,7,10,13,16,19,.... Sum of N term in $A.P = \frac{n}{2} \left(2a + (n-1)d\right)$ loga a = x G.P =) Geometric progression $\frac{6}{3} = \frac{12}{6} = \frac{24}{12} \cdot \frac{18}{24}$ Series: 3, 6, 12, 24, 48, 3, 8, 8, 8, 12, 12, 12, 14Sum of N berns in G.P. = a.(8"-1)

x'is common ratio

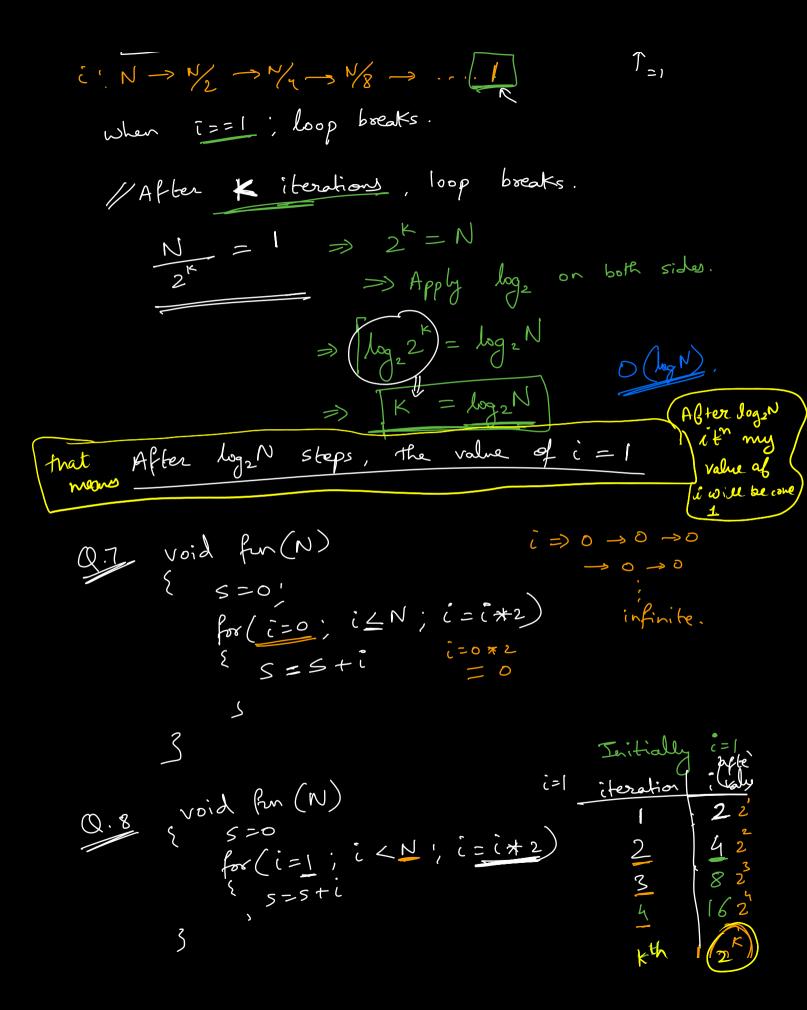
(8-1)

Q.1 void fur (int N) $for(i=1;i\leq N;i+t) \Rightarrow i=[] \rightarrow N$ N iteration. 5 = 5 t [°] ? return 5; Q.2. void finc (int N, int M) for (i = 1; i \le N; i++) => N Total

print (i) => N+M

iterations. for $(j=1,j \leq M,j+1)$ print (j)S 5 = 5 + c return 3 i:[1,N] 1,3,5,7,9,... odd numbers => 5 => (10+1) => 12 => 5 NSIO := 1,3,5,7,9

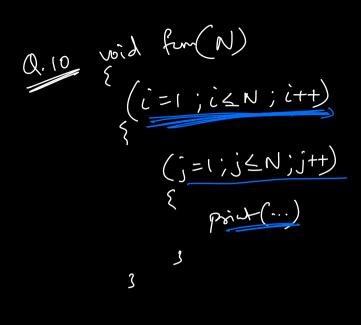
N = 13 $i = 1, 3, 5, 7, 9, 11, 13 \Rightarrow 7 \Rightarrow \frac{13+1}{2}$ # Iterat" = No. of odd numbers from [I,N] = (N+) O(N). Q.y. int func (int N) S = 0;[: [0,100] = 100-0+1=)101 for (i=0; i≤100; i++) 5 = 5 + i + i 2) Constant iteration Independent of input(N) retin 5; 0.5. void fm (N) for (i=1; i*i \(N', i+t \) i SIN [N -1+1 >> [N iterations i (value of ber) void fin (N) $N_2 \Rightarrow N_2$ $N_{4} \Rightarrow N_{2}^{2}$ while (i>1 $\frac{N/8}{N/2} \Rightarrow \frac{N/2^3}{N/2}$ $\xi = \frac{1}{2}$

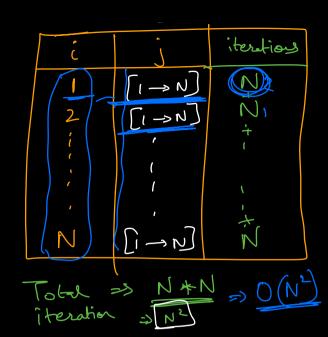


(N*01)

Total

iterations, loop breaks. log, N ハッパ O (log 2 N) K = log2N (i=1), i < NIterations void for (N) [13N] N [I -> N] for (j=1; j < N; j++) [, > N] 10





Q.11 void func(N) (i=0; i <n; i+t)<="" th=""></n;>
$\begin{cases} (j=0), (2,i), \\ (j=0), (3,i), \end{cases}$ $\begin{cases} p_{i}(1,i), \\ p_{i}(1,i), \end{cases}$
3 3 pontitus

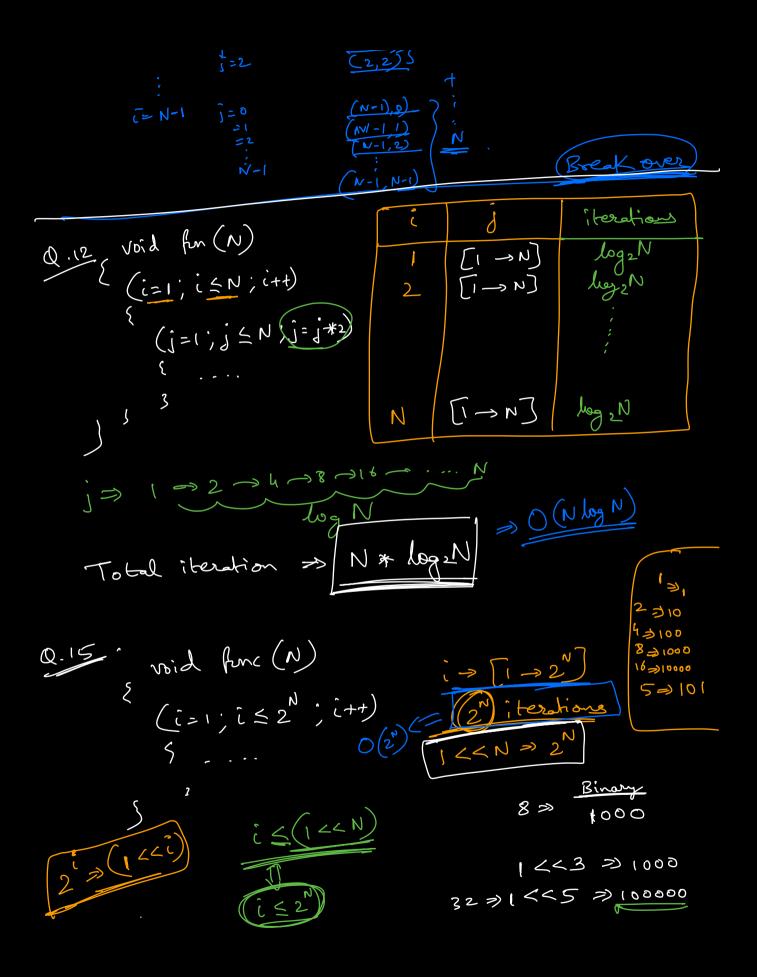
i	Ĵ	iteration
0	6000	ſ 2 3
2	[0 -> 2]	, ,
: N-1	([0 → N -]	N

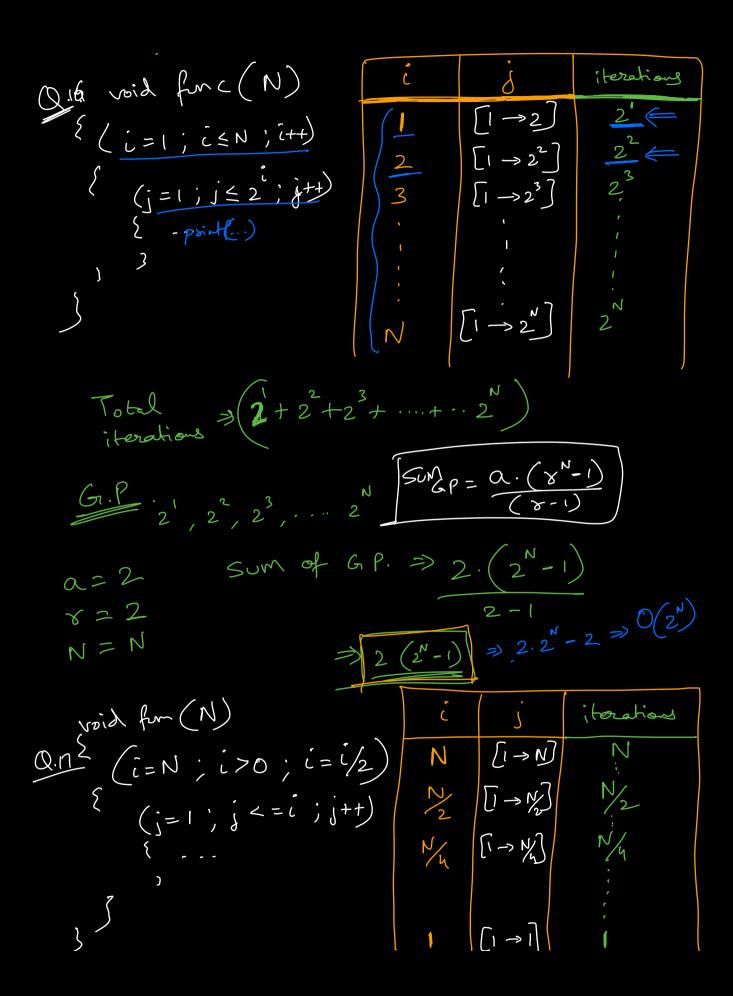
$$\frac{\text{Total}}{2}(+2+3+\cdots+N)$$

$$\Rightarrow N(N+1) \Rightarrow (N^2+N)$$

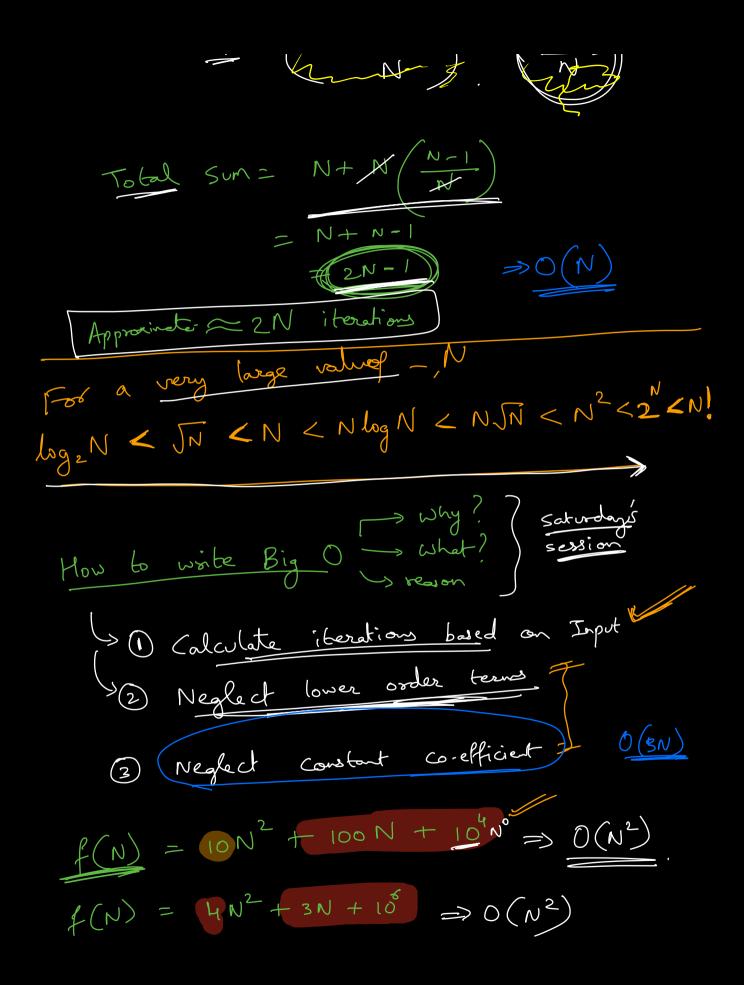
$$\geq 2$$

Break: 10:25 pm





Total iterations =) N+N+N+N+... \Rightarrow N+ $\frac{N}{2} + \frac{N}{2^{2}} + \frac{N}{2^{3}} + \frac{N}{2^{4}} + \cdots$ > N + N $= \frac{1}{2!} + \frac{1}{2^2} + \frac{1}{2^3} + \dots + \frac{1}{2^k}$ $= \log_1 N$ $1 = \frac{N}{2^{\kappa}} \Rightarrow \frac{2^{\kappa} = N}{\left[\kappa = \log_2 N\right]}$ $0 = \frac{1}{2}$, $8 = \frac{1}{2}$, terms = $\log_2 N$ 8/21 Sum Gp = a. (8 terms) (8 - I) $=\frac{1}{2}\left(1-\left(\frac{1}{2}\right)^{\log N}\right)=\frac{1}{2}\left($ $\left(1-\frac{1}{2}\right)$ $SUM_{GP} = \left(1 - \frac{1}{N}\right)$ <u>N-1</u>



$$f(N) = 4N + 3N \log N + 10^6 \Rightarrow O(N \log N)$$

$$f(N) = 4N \log N + 3N \leq q \times t(N) + 10^6 \Rightarrow O(N \sqrt{N})$$

$$N \sqrt{N} > N \log N$$

Doubts

AP.

S = a, a+d, a+2d, a+3d, ... a+(n-1)d

S = a+(n-1)d a+(n-2)d ... a+d + a

2S = 2a+(n-1)d) 2a+(n-1)d

2S = $\frac{2a+(n-1)d}{2a+(n-1)d}$

$$S(x-1) = \alpha(x^{n}-1)$$

 $S = \alpha(x^{n}-1)$

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