Quiz

(1)

for (int i = N; i <= 3N^2; i = i * 3) { $\longrightarrow \left\lceil \log_3\left(\frac{3N^2}{N}+1\right)\right\rceil+1 \Rightarrow \left\lceil \log_3(3N+1)\right\rceil+1 \Rightarrow \log_3(3N)$

$\Rightarrow \underline{\underline{\log_3(N)}}$

    for (int j = 1; j <= i; j = j + 3) {

    }

}

Sol/

i	N	3N	9N	27N	81N	......	$N^2/3$	N^2	$3N^2$
j	1	1	1	1	1		1	1	1
	N	3N	9N	27N	81N		$N^2/3$	N^2	$3N^2$

$\left\lceil\frac{N-1+1}{3}\right\rceil+1 \quad \left\lceil\frac{3N-1+1}{3}\right\rceil+1 \quad \left\lceil\frac{9N-1+1}{3}\right\rceil+1 \qquad\qquad \frac{N^2}{9}+1 \quad \frac{N^2}{3}+1 \quad N^2+1$

$\frac{N}{3}+1 \quad N+1 \quad 3N+1 \quad 9N+1 \quad 27N+1$

$\left[\frac{N}{3}, N, 3N, 9N, \ldots\ldots, N^2/9, N^2/3, N^2\right] + [1+1+1+1 \text{----} +1]$ separating ones

geometric series $\qquad\qquad 1 * \underline{\underline{\log_3(N)}}$

\# terms

$C * N^2 = CN^2$

$CN^2 + \log_3 N = CN^2$

$CN^2 + \log_3 N = \underline{\underline{O(N^2)}}$ Answer.

7) for (int i=3; i<=3N; i=i+3){ $\left\lceil \frac{3N-3+1}{3} \right\rceil + 1 = \left\lceil \frac{3N-2}{3} \right\rceil + 1 \Rightarrow 3N/3 \Rightarrow N$

for (int j=i; j<=3N; j=j*3){

}

}

i	3	6	9	12	15	18	-------	3N-6	3N-3	3N
j	3	6	9	12	15			3N-6	3N-3	3N
	3N	3N	3N	3N	3N			3N	3N	3N

$\left[\log_3\left(\frac{3N}{3}+1\right)\right]+1$ | $\left[\log_3\left(\frac{3N}{6}+1\right)\right]+1$ | $\left[\log_3\left(\frac{3N}{9}+1\right)\right]+1$ | $\left[\log_3\left(\frac{3N}{3N-6}+1\right)\right]+1$ | $\left[\log_3\left(\frac{3N}{3N-3}+1\right)\right]+1$ | $\left[\log_3\left(\frac{3N}{3N}+1\right)\right]+1$

$\left[\log_3\left(\frac{N}{2}+1\right)\right]+1$ | $\left[\log_3\left(\frac{N}{3}+1\right)\right]+1$ || $\underbrace{\log_3(2)+1}_{1+1}$

can't separate this! $\underline{\underline{\log_3(N+1)+1}}$

$\log_3(N)$ → Smaller change | but not same? // approximation

$\underline{N} * \log_3(N) = N\log_3 N$

#terms

$N\log_3 N + N = \underline{\underline{O(N\log_3 N)}}$

(3) for (int i = 4; i <= 2N; i = i * 4){ $\rightarrow \lceil \log_4(\frac{2N}{4}+1) \rceil + 1 \Rightarrow \lceil \log_4(\frac{N}{2}+1) \rceil + 1 \Rightarrow \log_4(\frac{N}{2})$

$\Rightarrow \log_4(N)$

for (int j = i; j <= 2N; j = j * 2) {

}

}

i	4	16	64	256	....	$\frac{N}{8}$	$\frac{N}{2}$	2N
j	4 ↓ 2N	16 ↓ 2N	64 ↓ 2N	256 ↓ 2N		N/8 ↓ 2N	$\frac{N}{2}$ ↓ 2N	2N ↓ 2N

$\lceil \log_2(\frac{2N}{4}+1) \rceil + 1$ $\quad \lceil \log_2(\frac{2N}{16}+1) \rceil + 1$ $\quad \lceil \log_2(\frac{2N}{64}+1) \rceil + 1$

$\lceil \log_2(\frac{N}{2}+1) \rceil + 1$ $\quad \lceil \log_2(\frac{N}{8}+1) \rceil + 1$ $\quad \lceil \log_2(\frac{N}{32}+1) \rceil + 1$

$\lceil \log_2(\frac{N+2}{2}) \rceil + 1$ $\quad \lceil \log_2(\frac{N+8}{8}) \rceil + 1$

$\lceil \log_2(\frac{2N}{N/8}+1) \rceil + 1$ $\quad \lceil \log_2(\frac{2N}{N/2}+1) \rceil + 1$

$\lceil \log_2(16+1) \rceil + 1$ $\quad \lceil \log_2(\frac{2N}{2N}+1) \rceil + 1$

$\lceil \log_2(4+1) \rceil + 1$

$\lceil \log_2(1+1) \rceil + 1$

$\log_2(65)+1$ $\quad \log_2(17)+1$ $\quad \log_2(5+1)+1$ $\quad \log_2(2)+1$

$\underline{\underline{9+1}}$ 10 $\quad \underline{\underline{7+1}}$ 8 $\quad \underline{\underline{5+1}}$ 6 $\quad \underline{\underline{3+1}}$ 4 $\quad \underline{\underline{1+1}}$ 2

* Seems like an arithmatic series

$\log_2(N) + ?$ complex work.

* Can be solved as approximation.

$$\Rightarrow \log_2(N) * \log_4 4 = \log_2 N * \log_4 N$$

$$\log_2 N \log_4 N + \log_4 N = O(\underline{\underline{\log_2 N \log_4 N}})$$