ISTE Questions on Time & Space complexity

1) b) $O(\log n)$

2) c) $O(1)$

3) d) 500

If input size $n = 500$, then

$(500)^2 = 250000$ which is less than 10^8 but greater than 10^4

$[\because O(N^2) \longrightarrow N \leq 10^4]$

4) Let the time taken for operation be 't' (constant)

↓

array[i] + array[j]

Let length(array) be N,

$\therefore O(N * Nt)$

$\Rightarrow O(N^2 t)$

$\Rightarrow O(N^2)$ [As 't' is constant]

Space complexity ⇒ O(1)

5) Time complexity = O(N)

Space complexity = O(1)

6) Time complexity = O(N)

Space " = O(1)

7) * Couldn't solve

8) $i = 1, 2, 4, 8, \ldots, N$ [At N, $i < N$ becomes false]

$\Rightarrow 2^0, 2^1, 2^2, 2^3, \ldots, 2^x$

[$x \rightarrow$ no. of times loop is running]

$N = 2^x$

$\Rightarrow \log N = x \log 2$

$N = 2^x$

$\log N = x \log 2$

$\log N = x$ [Ignore constants]

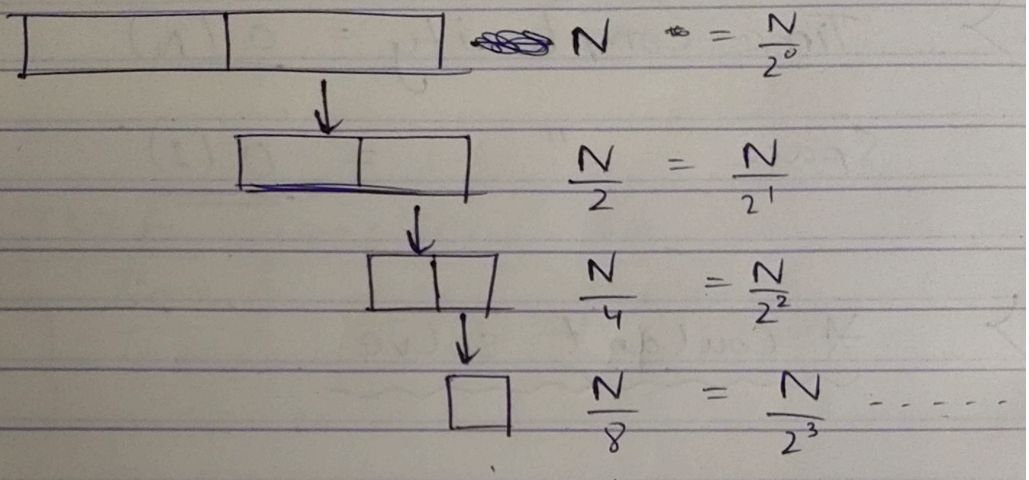
$\therefore$ Time complexity = $O(\log N)$

Space complexity = $O(1)$

9) Time complexity = $O(N)$

Space " = $O(1)$

10) We know in Binary search,



Let x be the no. of times the loop is running.

$\therefore \quad 1 = \frac{N}{2^x}$

$\Rightarrow \quad 2^x = N$

Taking log on both sides,

$x \log 2 = \log N$

$x = \log N$

$\therefore$ Time complexity = $O(\log N)$

$\therefore$ Space complexity = $O(1)$

11) ⊛ Recursion not done

12) Let length [array] be x

$\therefore$ $O(kx)$ → Time complexity

Space complexity → $O(1)$

13) Let length [array] be x

Observe the values of i & j.

i	j
0	1
1	

13) ⊛ Couldn't understand

14) ⊛ Recursion not done

15) Let length [array] be N

i	j
1	1
2	1, 2
3	1, 2, 3
...	
N	1, 2, 3, ..., N

→ P.T.O

$1+2+3+\ldots+n$

$= \frac{n(n+1)}{2}$ [Sum of 'n' natural nos. algo]

$= \frac{n^2+n}{2}$

$= n^2$ [We ignore the less dominating terms and constants]

∴ Time complexity = $O(N^2)$

∴ Space complexity = $O(1)$

16> Time complexity = $O(2N) = O(N)$

Space " = $O(1)$

17> ⊛ Recursion not done

18> ⊛ Couldn't solve

19>

i	j	k
1	1	1
2	1, 2	1, 1, 2
3	1, 2, 3	1, 1, 2, 1, 2, 3
..	- - -	- - - -
..	- - -	- - - -
..		- - - -

22) $O(n * n) = \underline{O(n^2)}$ → Time complexity

Space complexity = $O(1)$

23) Time complexity = $\underline{O(n^2)}$

Space " = $\underline{O(1)}$

24) Time complexity = $O(\frac{N}{2}) = \underline{O(N)}$
(Ignore constants)

Space complexity = $O(1)$