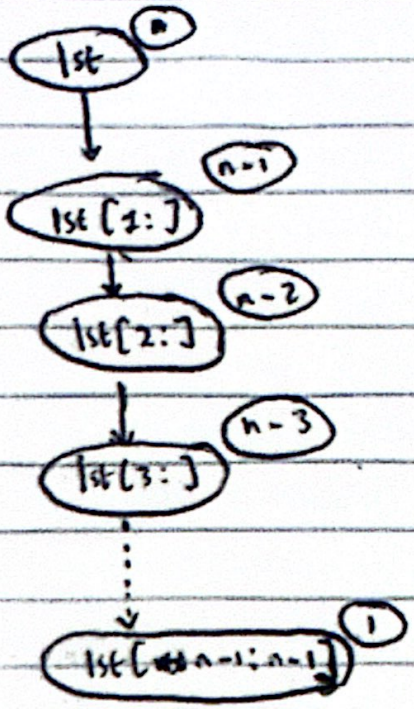
Q1. a.

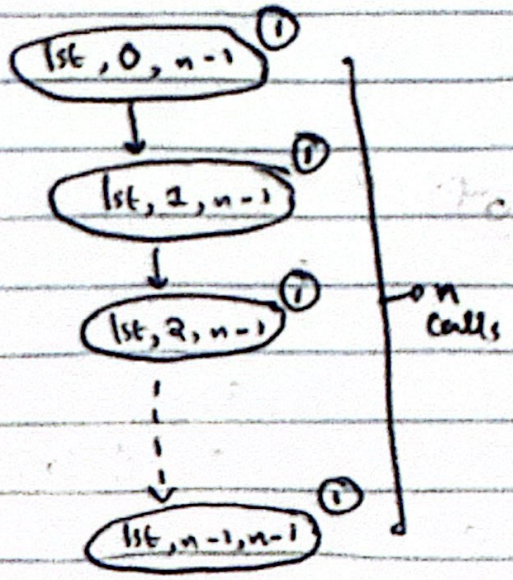


$T_n = n + (n-1) + (n-2) + \dots + 1$

$T_n = \frac{n(n+1)}{2}$

$T_n = \Theta(n^2)$ //

Q1 b.

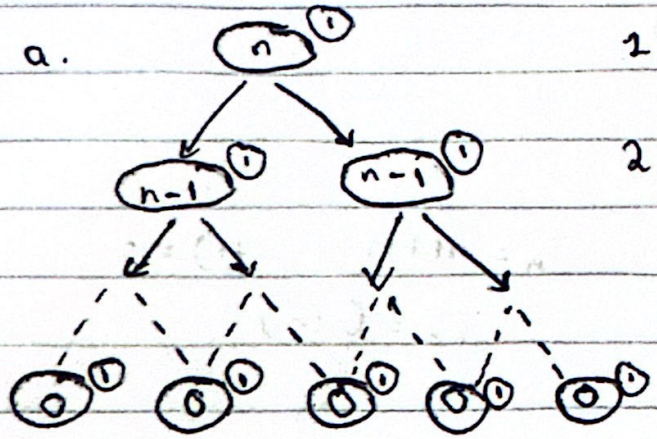


$T_n = n(1+1+1 \dots +1) = n$

$T_n = \Theta(n)$

- Conclusion: version 2 is asymptotically faster because $\Theta(n) < \Theta(n^2)$.

Q2 a.



1 call

2 calls

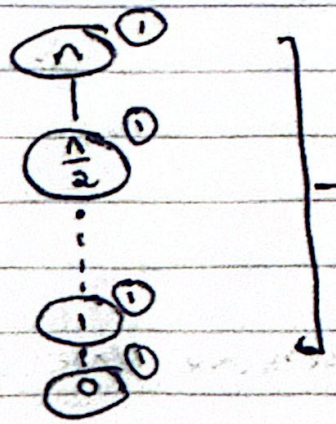
2^n calls

$\therefore T_n = 1 + 2 + 4 + \dots + 2^n$

$T_n = 2^{n+1} - 1$

$T_n = \Theta(2^n)$ //

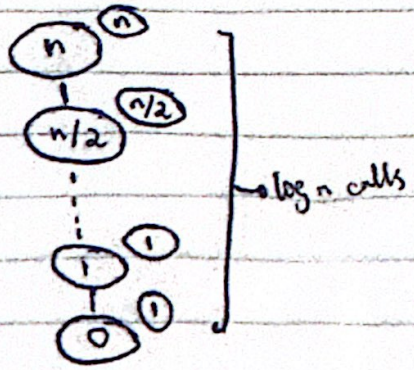
Q2b.



$\therefore T_n = \log n (1 + 1 + 1 + 1 \dots + 1)$

$T_n = \Theta(\log n)$ //

Q2c.



$\therefore T_n = \underbrace{1 + 2 + 4 + \dots + n}_{\log n \text{ calls}} = 2n - 1$

$T_n = \Theta(n)$ //