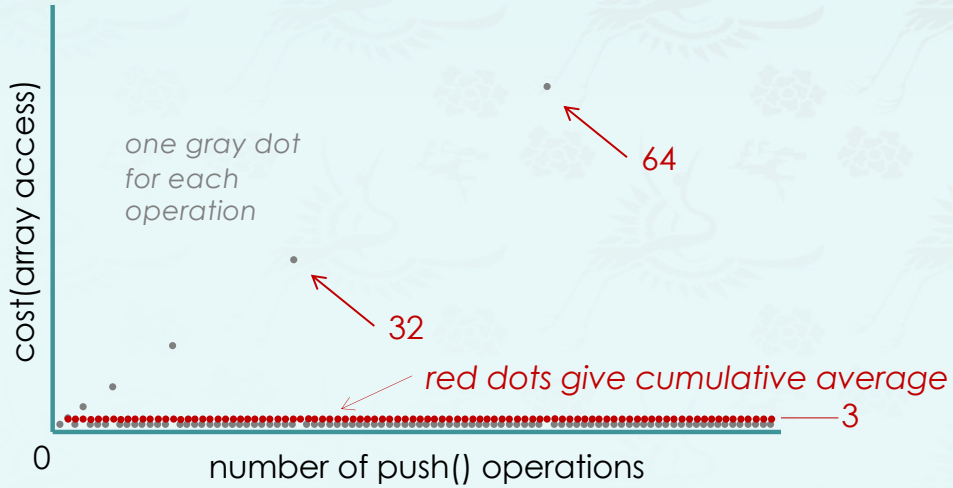
On my honor, I pledge that I have neither recieved nor provided improper assistance in the completion of this assignment. -2190012 강병인

Stack: Quiz

- The time complexity T(N) of inserting first N items by using resize(capacity * 2) may be expressed in an open form:

$$\mathbf{T(N) = N + (1 + 2 + 4 + 8 + \ ... + N)}$$

- Rewrite T(N) shown above in a closed form.



$$1 + a + a^2 + a^3 + \cdots + a^n = \frac{a^{n+1} - 1}{a - 1}$$

$$1 + 2 + 4 + \cdots + 2^n = \frac{2^{n+1} - 1}{2 - 1} = 2^{n+1} - 1$$

$2^n = N \quad \log_2 2^n = \log N \ , \ n = \log N$

$2^{n+1} = 2^{\log N + 1} = 2^{\log 2N} = 2N$

$\therefore 2^{n+1} - 1 = 2N - 1$

Therefore, $T(N) = N + (1 + 2 + 4 + \cdots + N)$

$= N + 2N - 1 = \boxed{3N - 1}$ (closed form)

The time complexity of the algorithm is O(n).