On my honor, I pledge that I have neither received nor provided improper assistance in the completion of this assignment.
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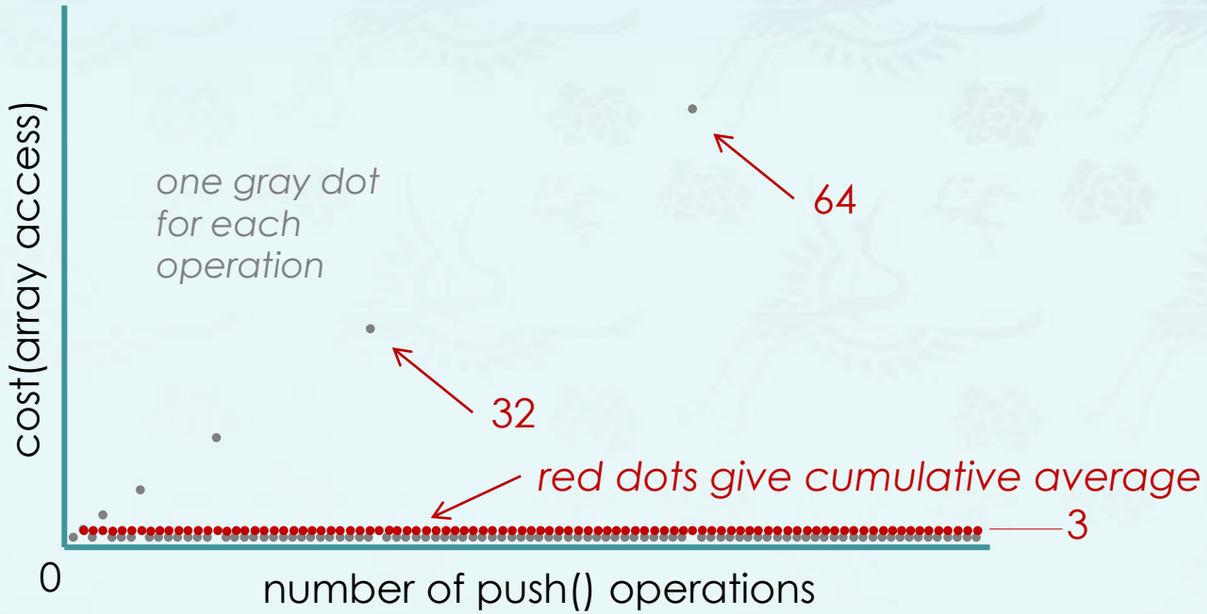
Stack: Quiz

- 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.
  - $T(N) = 3N\ - 1$ (closed form)



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

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

$Let, N = 2^k,$

$$T(N) = N + \left(1 + 2 + 4 + \cdots + 2^k\right)$$
$$= N + \left(2^{k+1} - 1\right)$$
$$= N + 2 * 2^{\log_2 k} - 1$$
$$= 3N\ - 1$$

Therefore, $\mathrm{T(N)} = N + (1 + 2 + 4 + \cdots + N)$
$= ?$

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