Average case complexity:

i_1 - all the arrays where I find the elem on pos. 1

i_2 - — " — — " — 2

⋮

i_m - — " — — " — m

i_{m+1} - the elem is not there.

$$\sum_{i \in D} p(i) \cdot e(i)$$

$$\frac{1}{m+1} \cdot 1 + \frac{1}{m+1} \cdot 2 + \frac{1}{m+1} \cdot 3 - \dots - + \frac{1}{m+1} \cdot m + \frac{1}{m+1} \cdot m$$

$$= \frac{1}{m+1} (\dots)$$

BC: $\Theta(1)$

WS: $\Theta(m)$

Total complexity: $O(m)$

Recursive binary search

$$T(n) = \begin{cases} T\left(\frac{n}{2}\right) + 1 & , n > 0 \\ 1 \end{cases}$$

We assume $n = 2^K \Rightarrow K = \log_2 n$

$$T(2^K) = T(2^{K-1}) + 1$$

$$T(2^{K-1}) = T(2^{K-2}) + 1$$

$$T(2^1) = T(2^0) + 1$$

$\Rightarrow 1$

(+)

$$T(2^K) = 1 + K$$

$$T(n) = 1 + \log_2 n$$

$$T(n) = O(\log_2 n)$$