

binary Division ($m=2$)

function find-one-index (V , left, right):

if $right - left == 1$

return left

else:

$mid = left + (right - left) // 2$

$Sum_left = 0$

for i in range ($left, mid$):

$Sum_left += V[i]$

if $Sum_left == 1$:

return find-one-index (V , left, right)

else:

return find-one-index (V , mid, right)

($m > 2$)

function first-one-index (V , left, right, m):

If $right - left == 1$:

return left

$length = right - left$

$chunk_size = \lceil length / m \rceil$

$chunk_start = left$

for k in range (m)

$chunk_end = mid (left + (k+1) * chunk_size, right)$

if $chunk_start > right$:

break

$$S = 0$$

for i: ~~in~~ⁿ range (chunk-start, chunk-end):

$$S += \sqrt{[i]}$$

if $S - = 1$:

return find-one-index-m (\sqrt{v} , chunk-start, chunk-end
m)

return -1

$$\rightarrow m=2$$

$$T(n) = \frac{n}{2} + T\left(\frac{n}{2}\right), T(1) = 0$$

solve

$$T(n) = \frac{n}{2} + \frac{n/2}{2} + \frac{n/4}{2} + \dots$$

$$T(n) = \frac{n}{2} + \frac{n}{4} + \dots + 0$$

$$T(n) = n \left(\frac{1}{2} + \frac{1}{4} + \dots \right) = n \cdot \left(1 - \frac{1}{2^{m+1}} \right)$$

$$T(n) = n - 1$$

$$\rightarrow m=3$$

$$T(n) = \frac{2n}{3} + T\left(\frac{n}{3}\right)$$