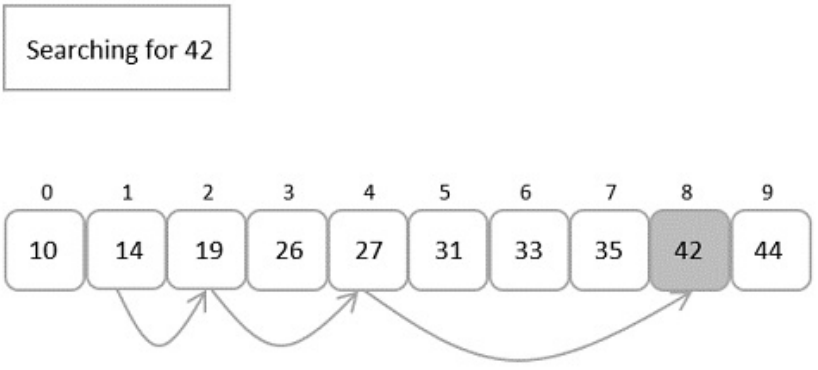
Exponential Search

💡 Exponential search algorithm targets a range of an input array in which it assumes that the required element must be present in and performs a binary search on that particular small range. This algorithm is also known as doubling search or finger search.



Algorithm Steps

In the exponential search algorithm, the jump starts from the 1st index of the array. So we manually compare the first element as the first step in the algorithm.

1. Compare the first element in the array with the key, if a match is found return the 0th index.
2. Initialize i = 1 and compare the ith element of the array with the key to be search. If it matches return the index.
3. If the element does not match, jump through the array exponentially in the powers of 2. Therefore, now the algorithm compares the element present in the incremental position.
4. If the match is found, the index is returned. Otherwise Step 2 is repeated iteratively until the element at the incremental position becomes greater than the key to be searched.
5. Since the next increment has the higher element than the key and the input is sorted, the algorithm applies binary search algorithm on the current block.
6. The index at which the key is present is returned if the match is found; otherwise it is determined as an unsuccessful search.

📌 Exponential search can be implemented only on a sorted list of items. If the elements are not sorted already, we need to sort them first.

Pseudocode

```
Begin
   m := pow(2, k) // m is the block size
   start := 1
   low := 0
   high := size – 1 // size is the size of input
```

```
   if array[0] == key
      return 0
   while array[m] <= key AND m < size do
      start := start + 1
      m := pow(2, start)
      while low <= high do:
         mid = low + (high - low) / 2
         if array[mid] == x
            return mid
         if array[mid] < x
            low = mid + 1
         else
            high = mid - 1
   done
   return invalid location
End
```

Analysis

- Time complexity : **O(log n)**

Java implementation can be found under Implementation_Java folder

📚 References

Exponential Search Algorithm

Exponential Search Algorithm - Exponential search algorithm targets a range of an input array in which it assumes that the required element must be present in and performs a binary

https://www.tutorialspoint.com/data_structures_algorithms/exponential_search.htm

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SerhatKumas - Overview

Computer engineering student who loves coding in different fields instead of focusing on a one spesific area. - SerhatKumas

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