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Sortieralgorithmen

Einführung

SS 2012

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Beispiel:

Array

3
5
7
11
17
19
23
29
31
34
37
57

Sortierte Menge

Eingabegröße:

n = Anzahl der sortierte Zahlen

Berechnungsschritt:

Vergleichsoperation

Komplexitätsanalyse:

T(n) = Anzahl der Berechnungsschritte, um eine Zahl zu finden.

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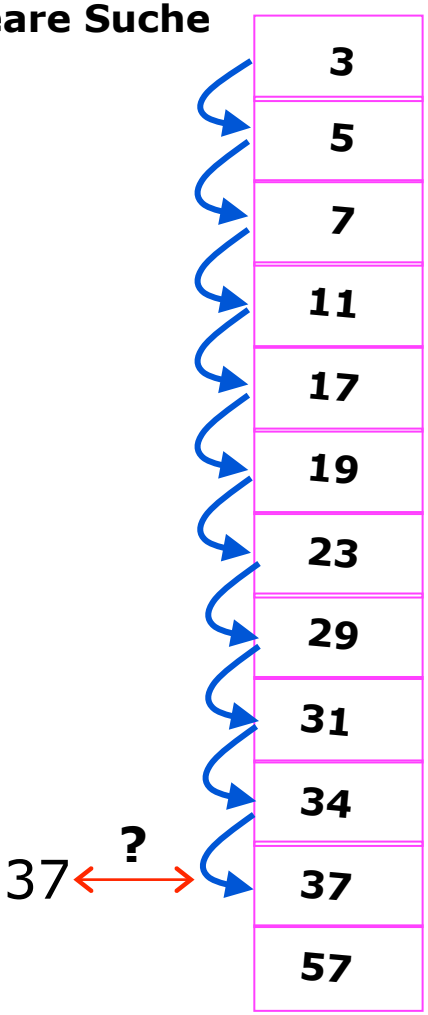
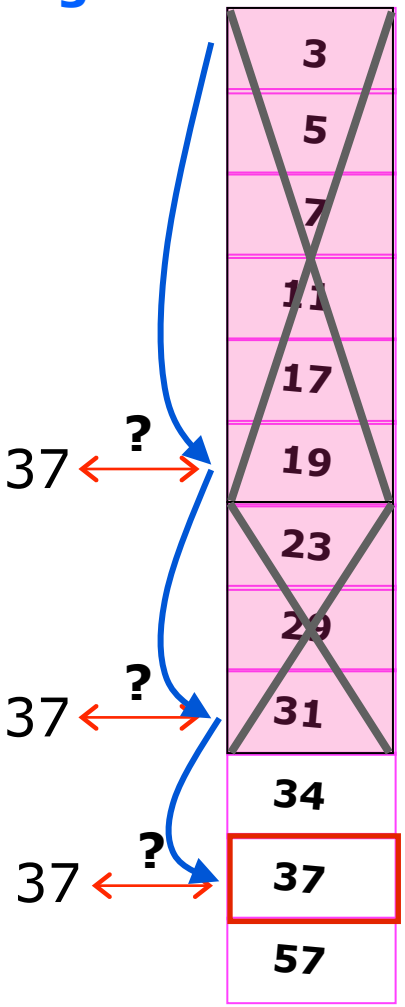
Sortierte Menge

Lineare Suche



Im schlimmsten Fall **n** Schritte



nur **3** Schritte

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Maximale Schrittanzahl

$128 = 2^7$

$64 = 2^6$

$32 = 2^5$

$16 = 2^4$

$8 = 2^3$

$4 = 2^2$

$2 = 2^1$

$1 = 2^0$

$7 = \log_2 (128)$

Im schlimmsten Fall

$\log_2(n)$ Schritte

Lineare Suche

```
def linear_search(key, seq ):
    for i in seq:
        if i==key:
            return True
    return False
```

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Binäre Suche

Rekursiv

```
def binary_search( key, seq, first, last ):
    if first<last:
        m = (first+last)//2
        if seq[m]==key:
            return True
        elif key<seq[m]:
            return binary_search(key,seq,first,m-1)
        else:
            return binary_search(key,seq,m+1,last)
    elif first==last:
        return seq[first]==key
    else:
        return False
```

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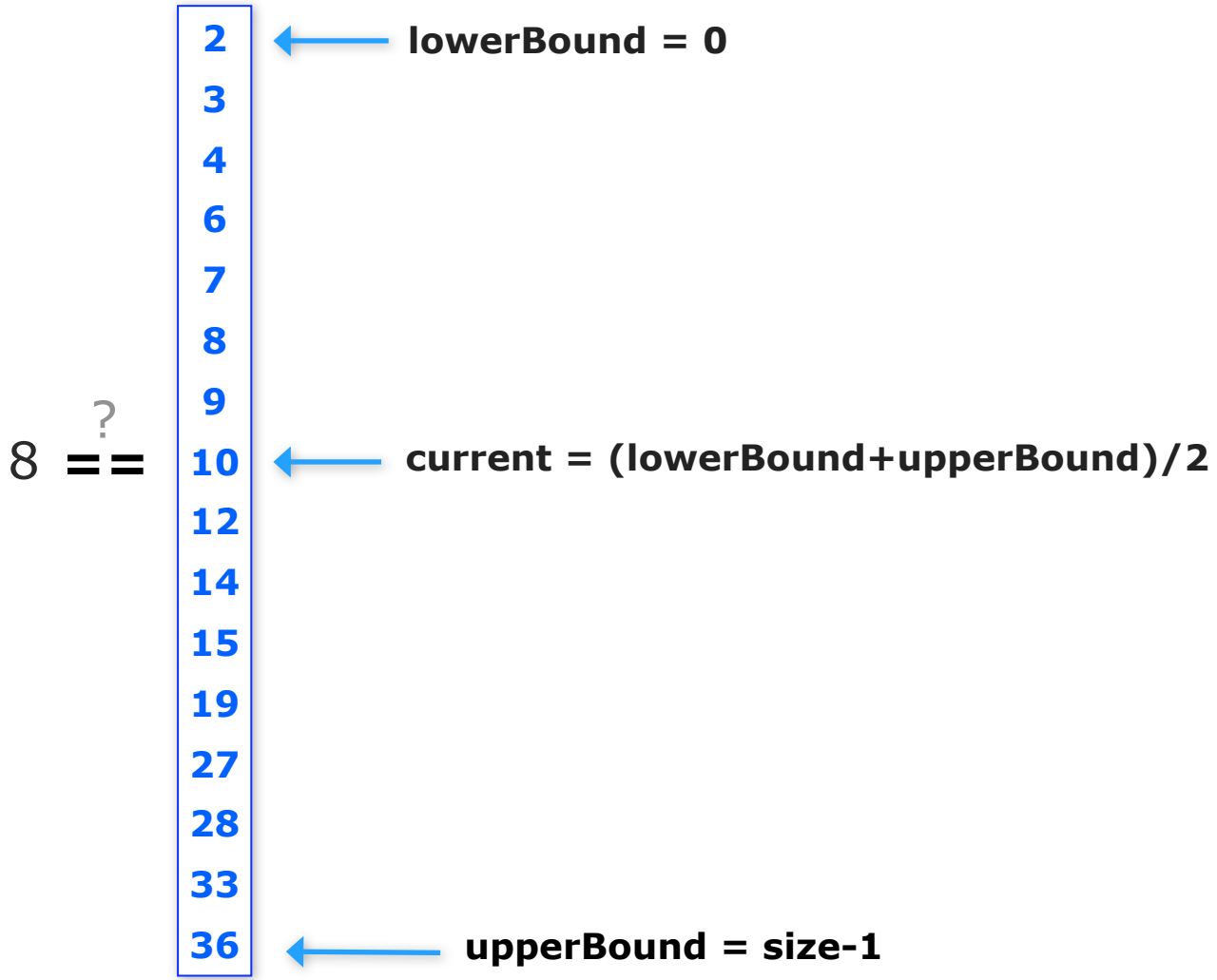
Iterativ



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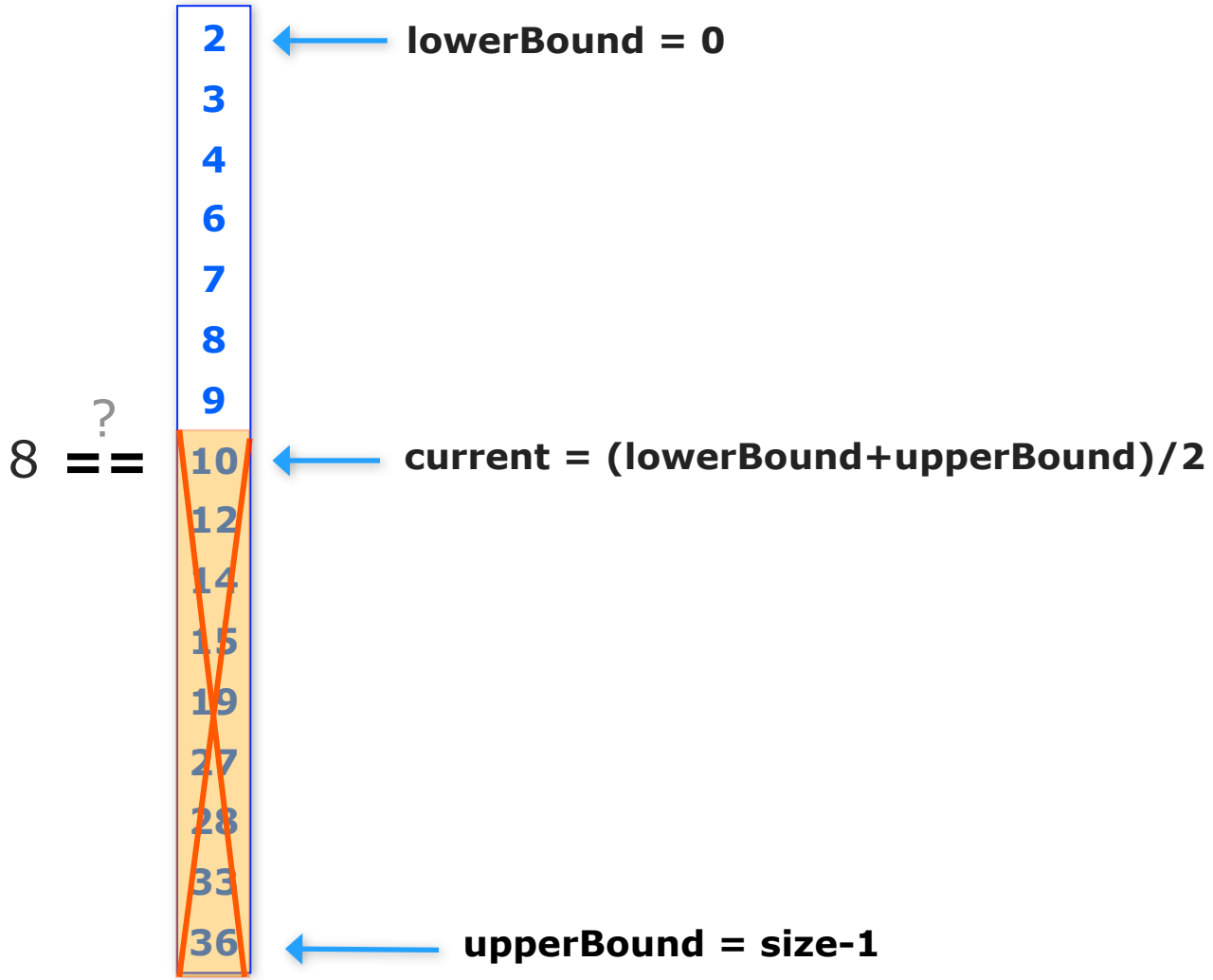
Iterativ



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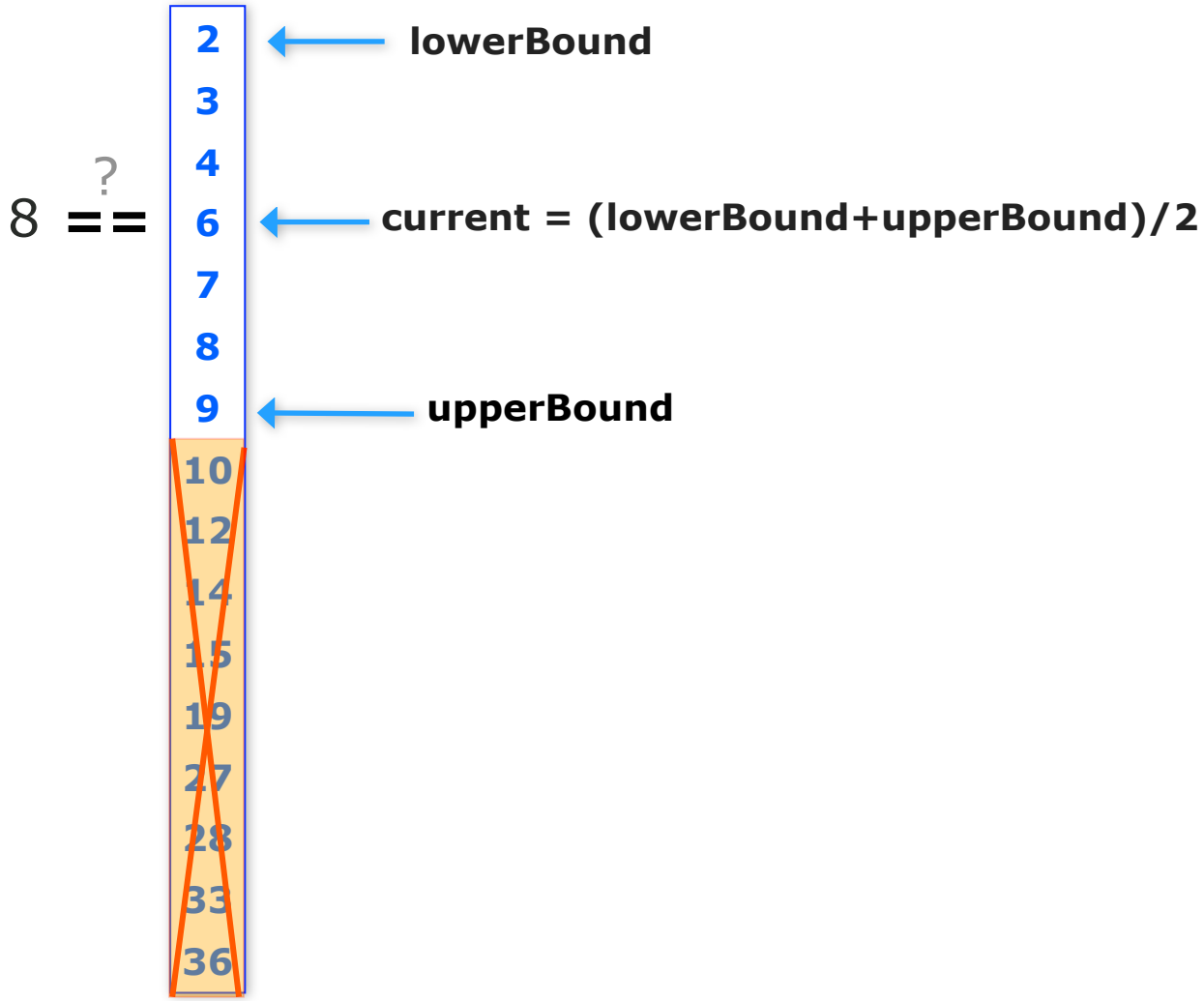
Iterativ



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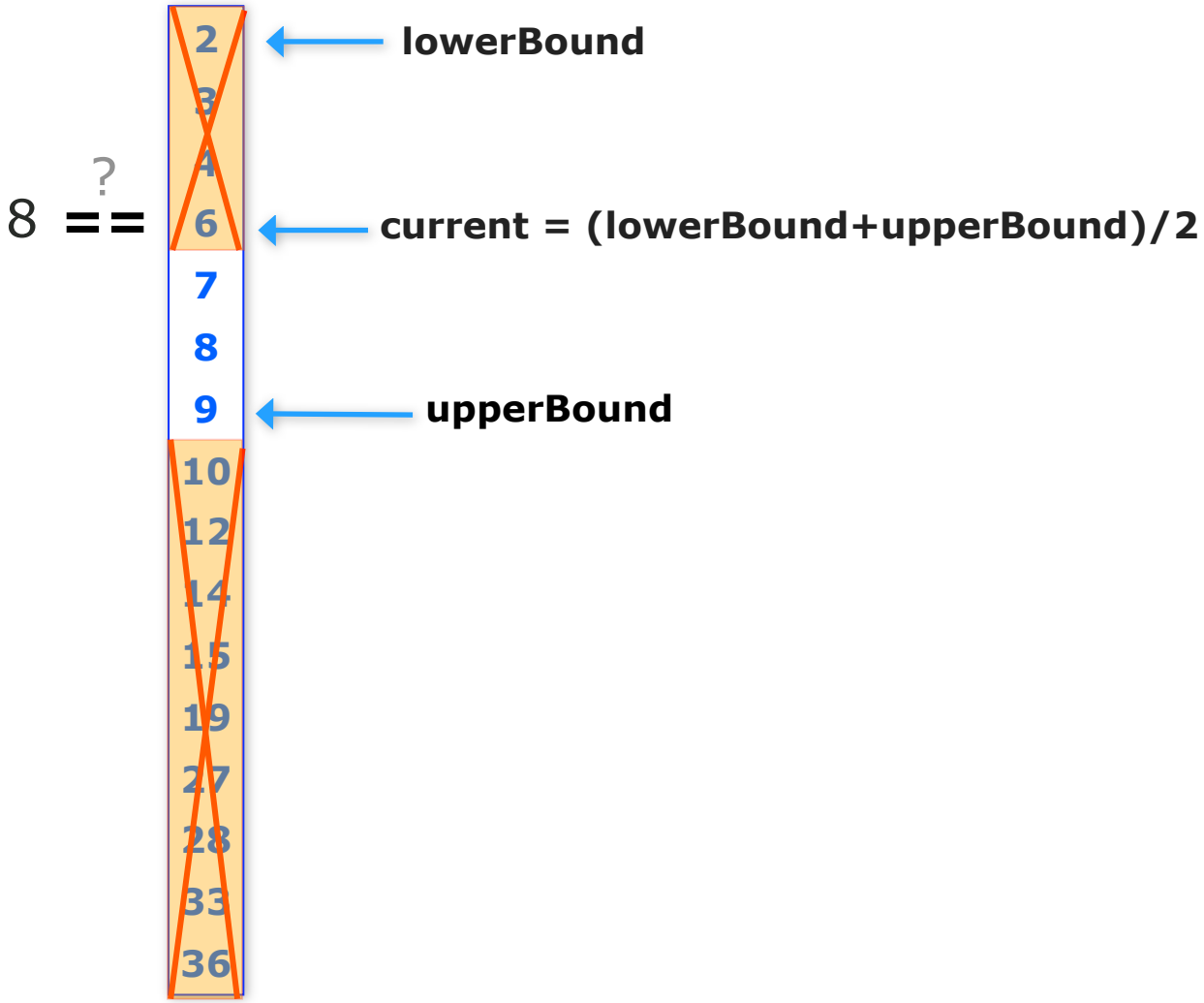
Iterativ



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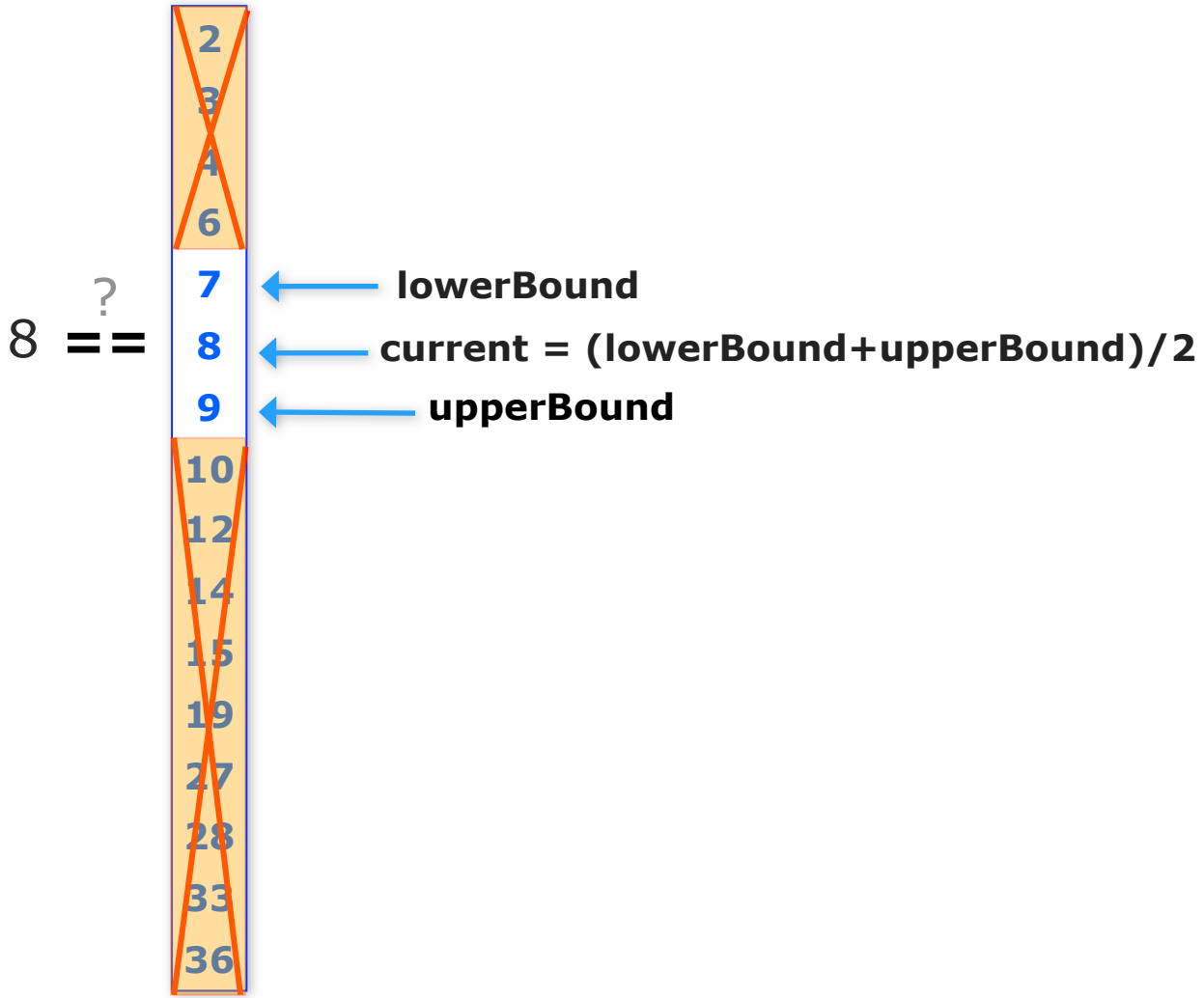
Iterativ



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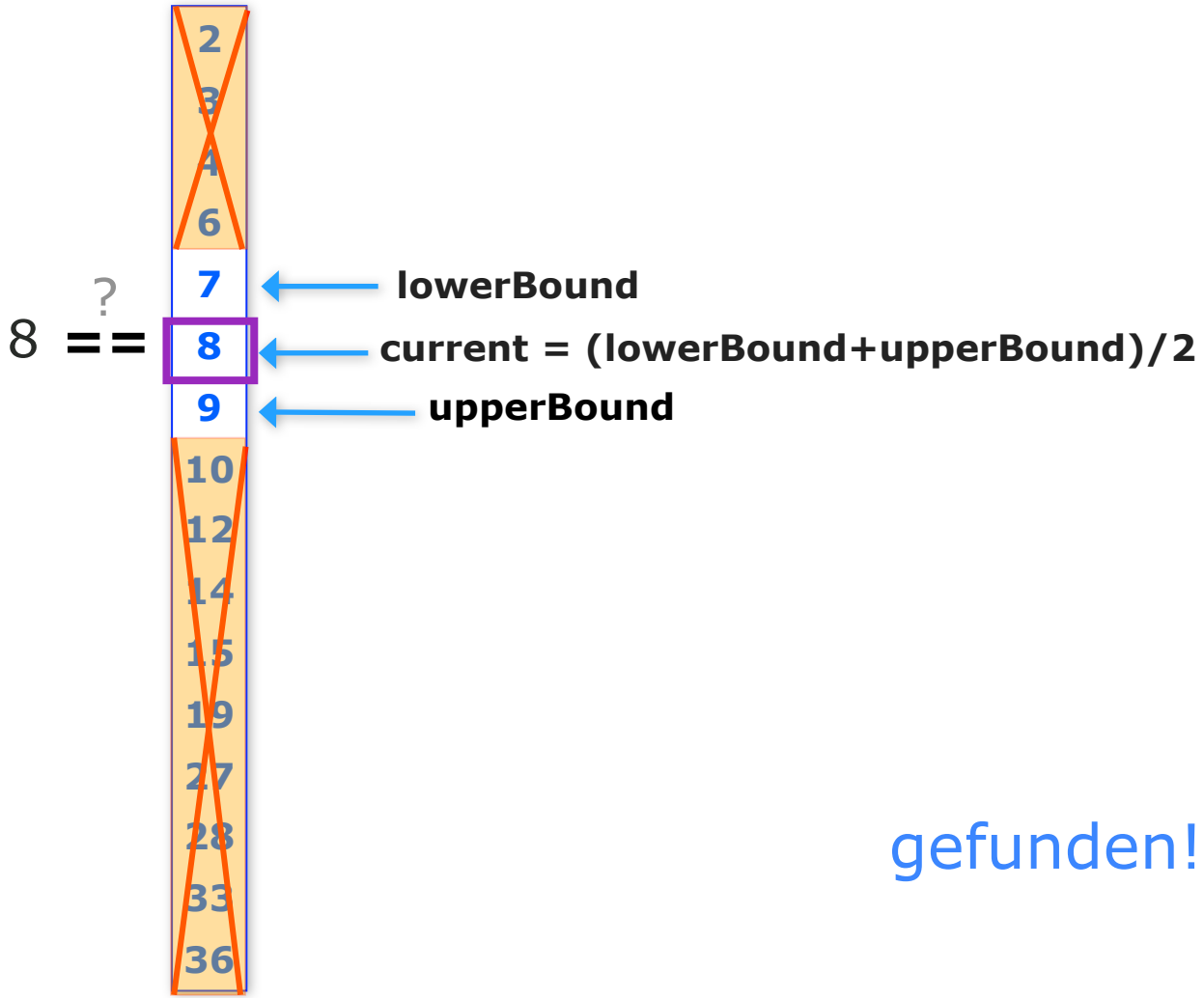
Iterativ



gefunden!

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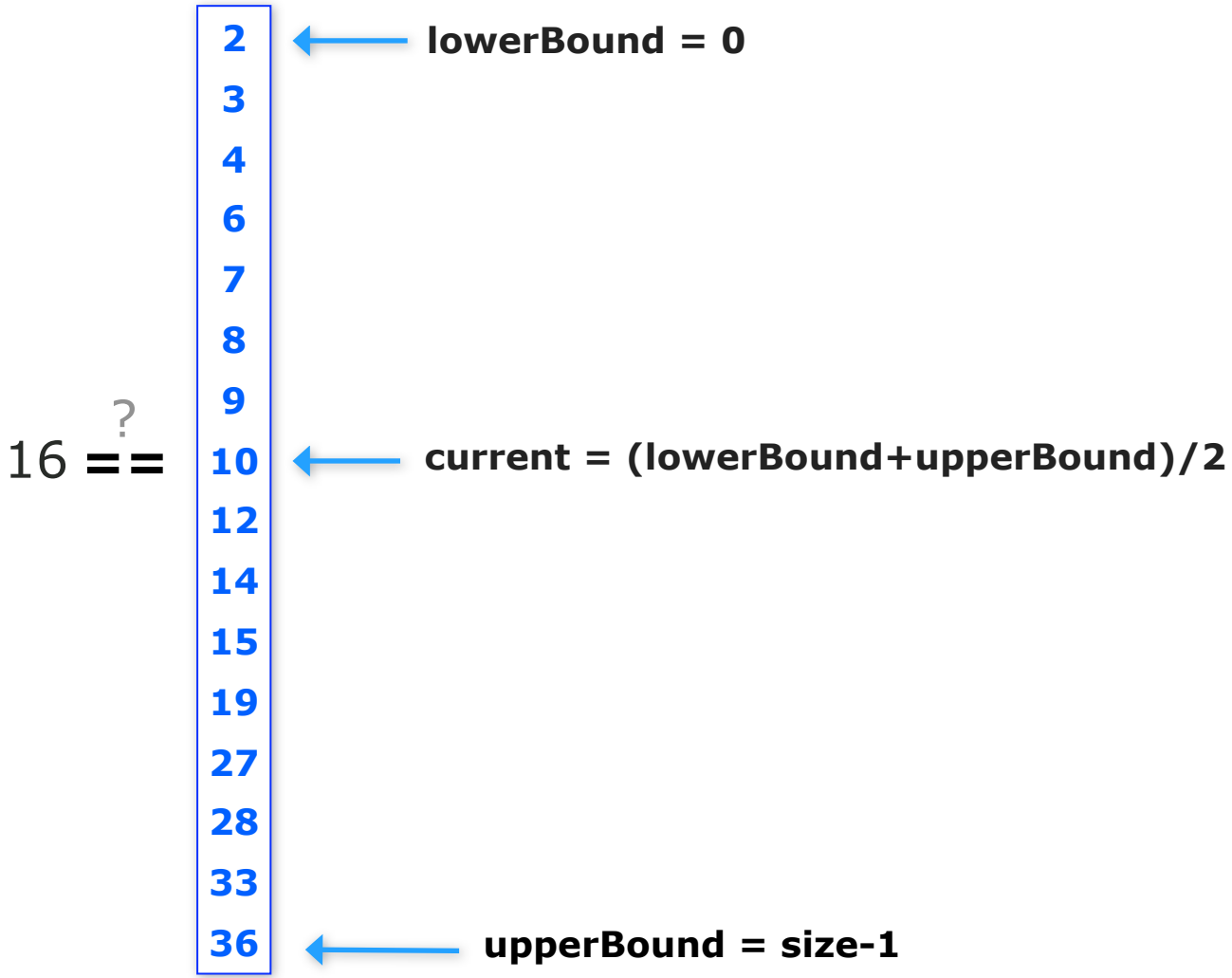
Iterativ



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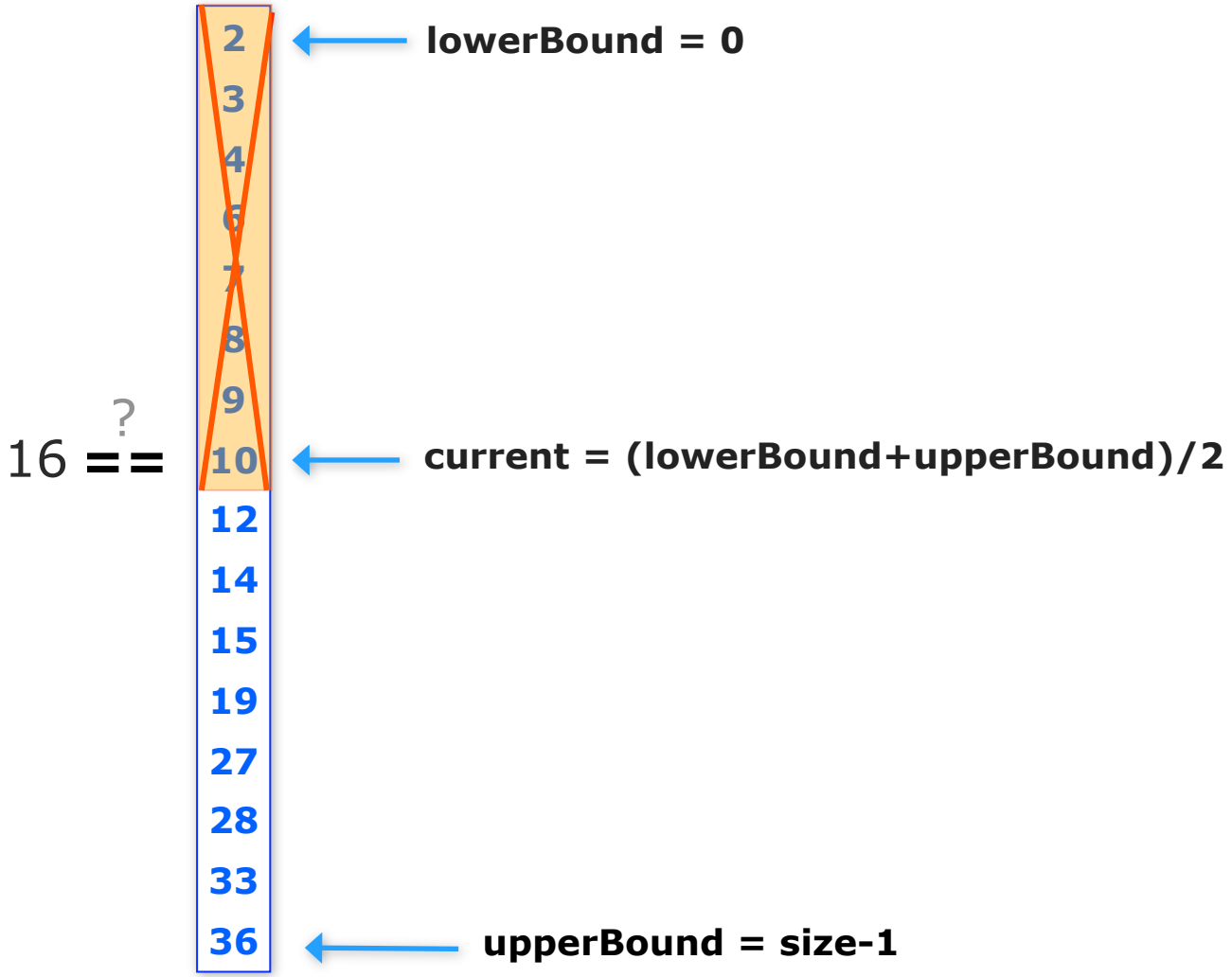
Iterativ



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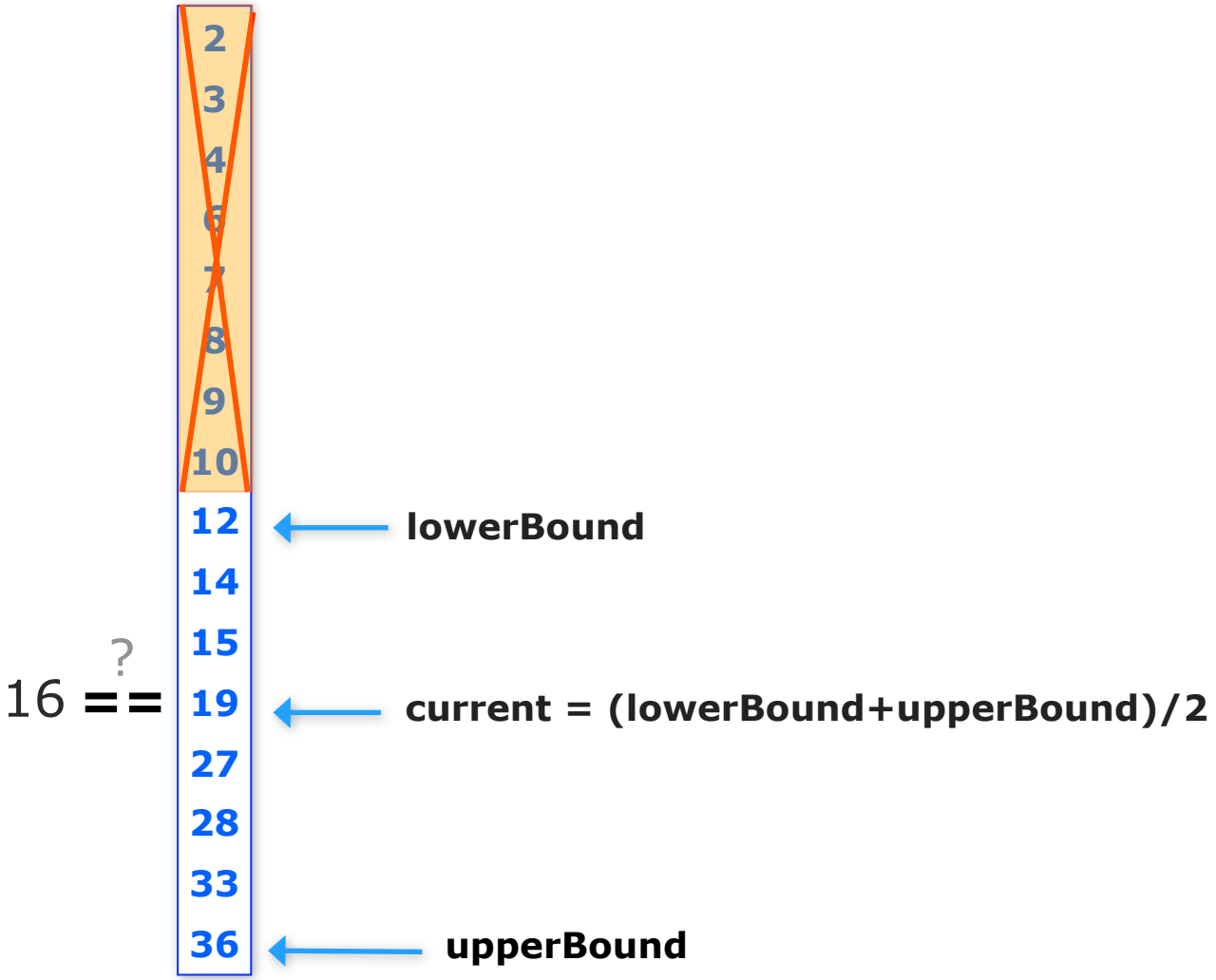

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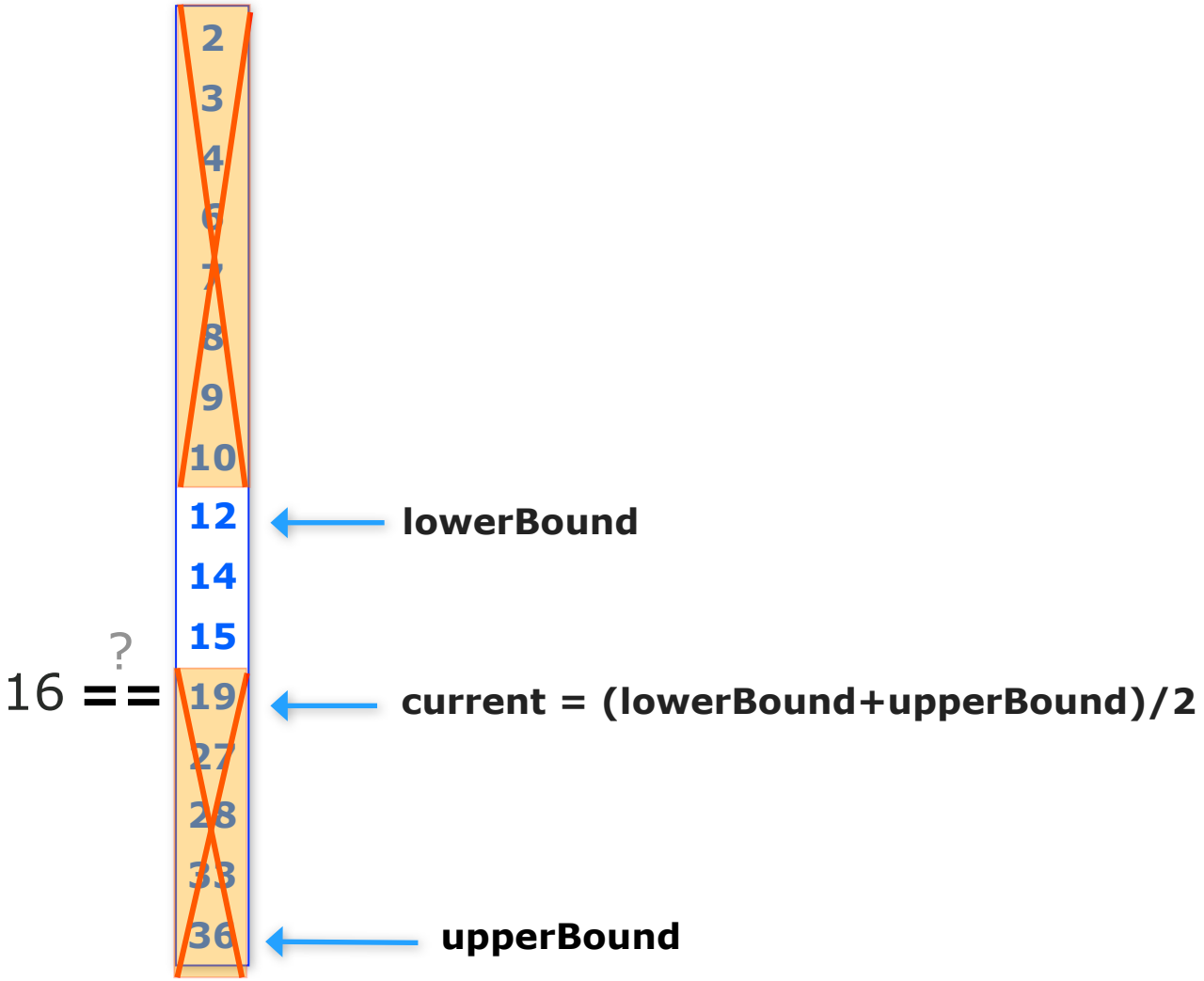

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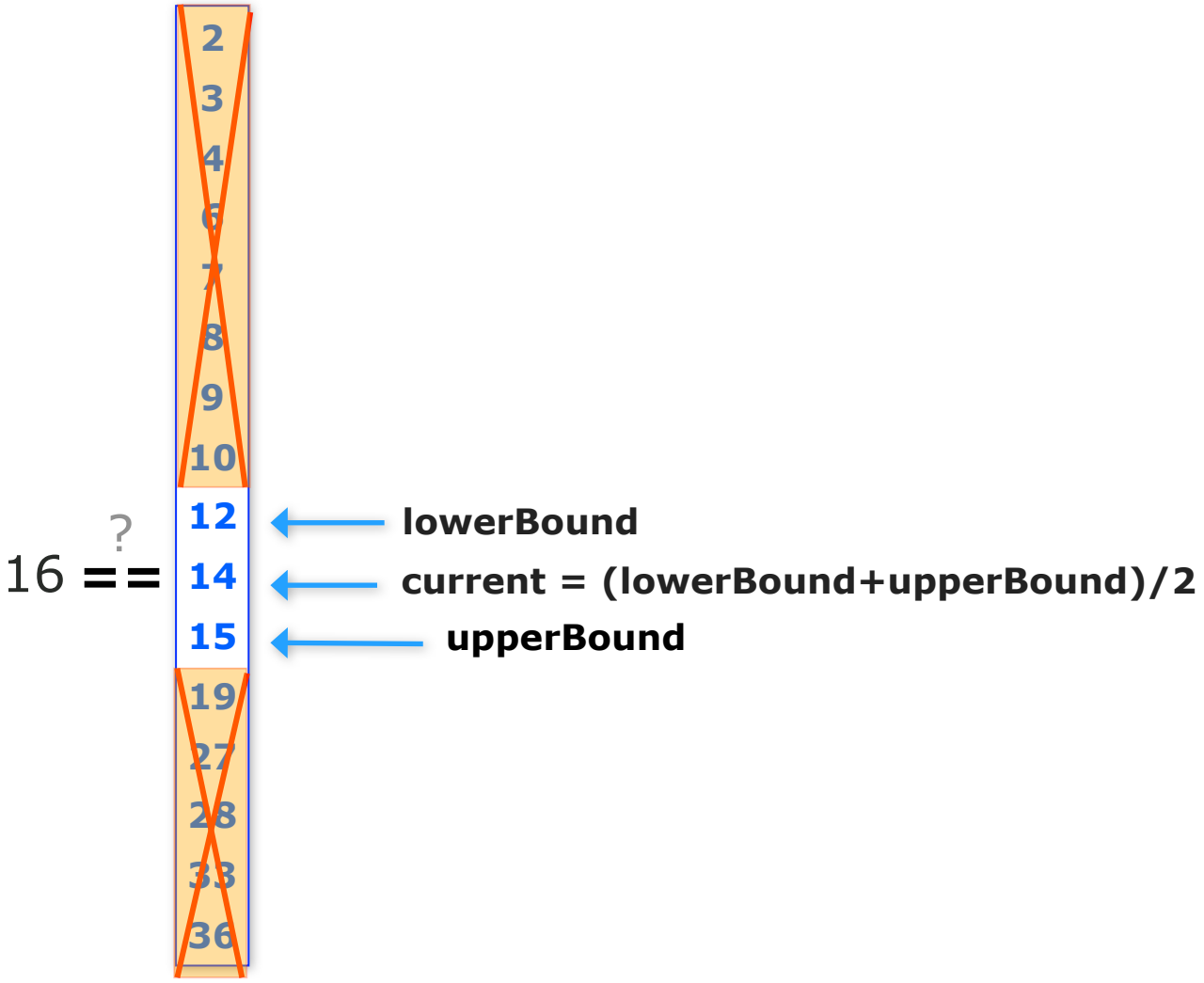

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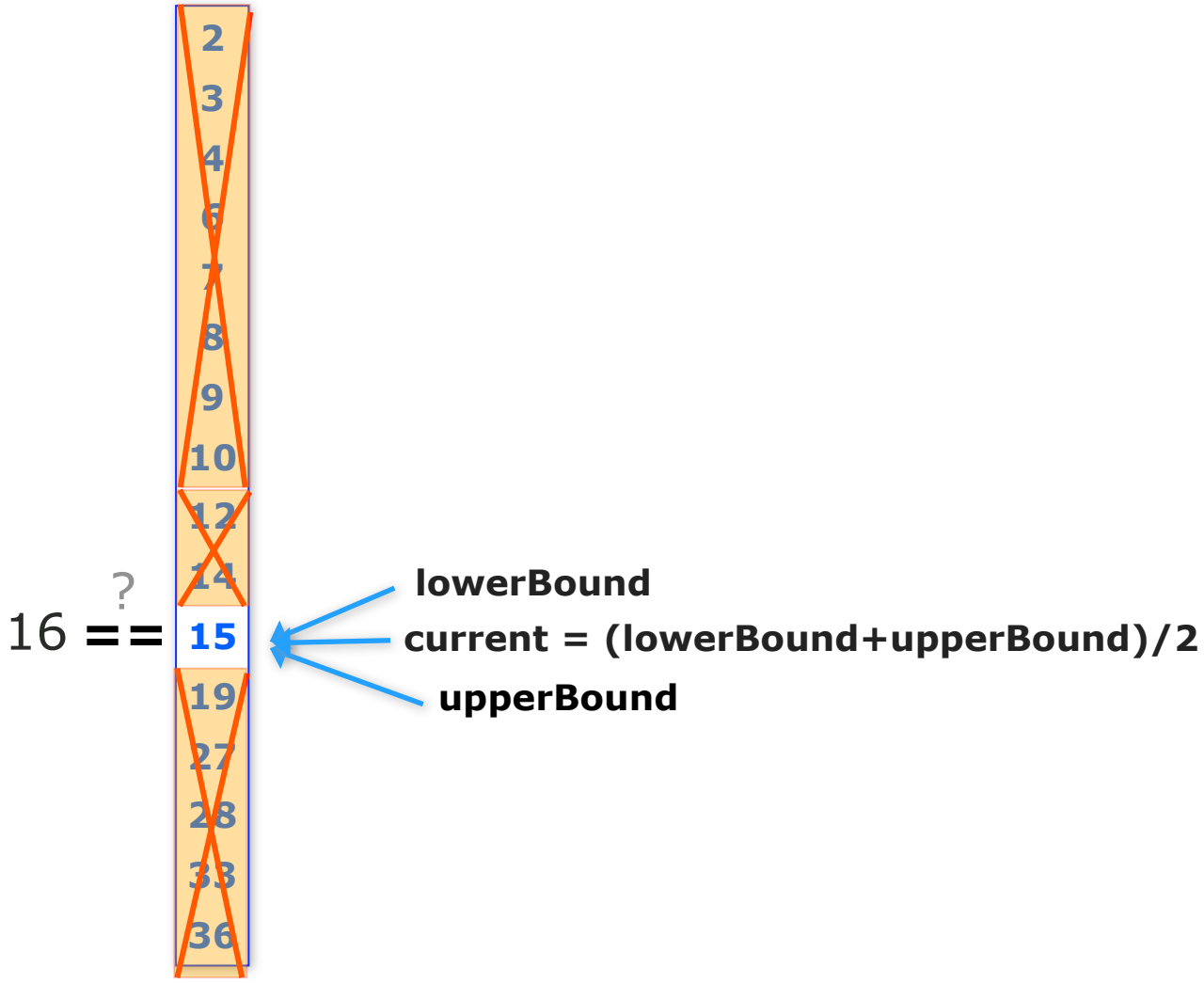
Iterativ



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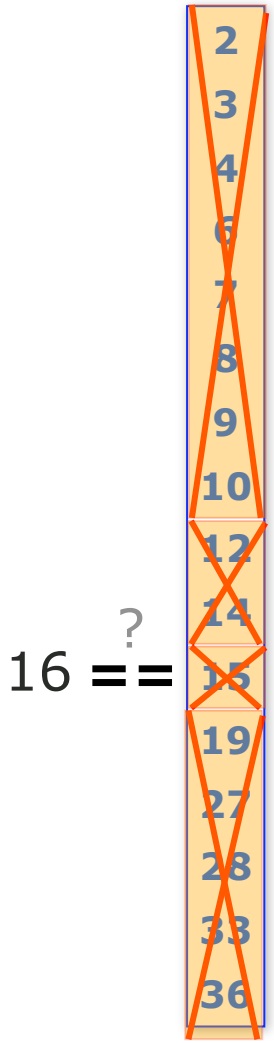
Iterativ



upperBound

lowerBound

Wenn **lowerBound>upperBound**

ist die Zahl **nicht** gefunden worden!

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Binärsuche in einem Feld

Iterativ

```
def binary_search (nums, key):

    lowerBound = 0
    upperBound = len(nums) - 1

    while  lowerBound <= upperBound:
            current = (lowerBound + upperBound)//2
            if   nums[current] == key:
                    return True
            else:
                    if  nums[current] < key:
                            lowerBound = current + 1
                    else:
                            upperBound = current - 1
    return False
```