# Shell sort

Shell sort is an extension of Insertion Sort.

Pseudocode:

1. Find the gap/difference
2. Compare the element with the difference/gap
3. Reduce the gap by 2 (Gap/2).
4. After some iterations, gap/difference will be 1 so that can apply insertion sort.

7 4 5 2 6 3 8 1

Gap = Number of Element / 2
= 8 / 2
= 4

Iteration 1
Gap = 4

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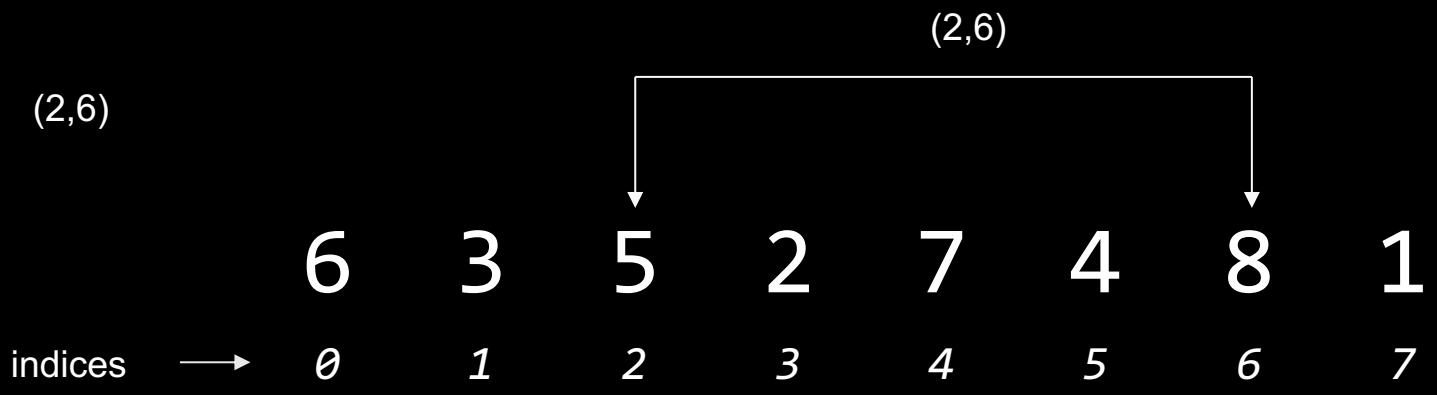
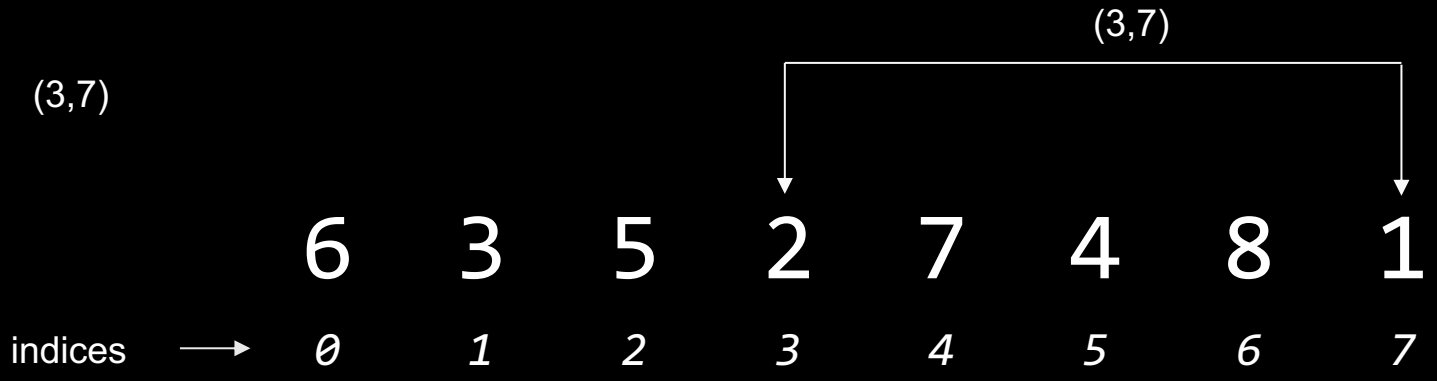
Gap = 4

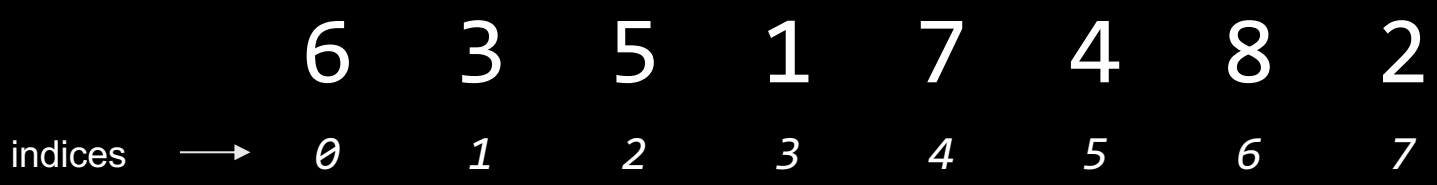
Iteration 1
Gap = 4



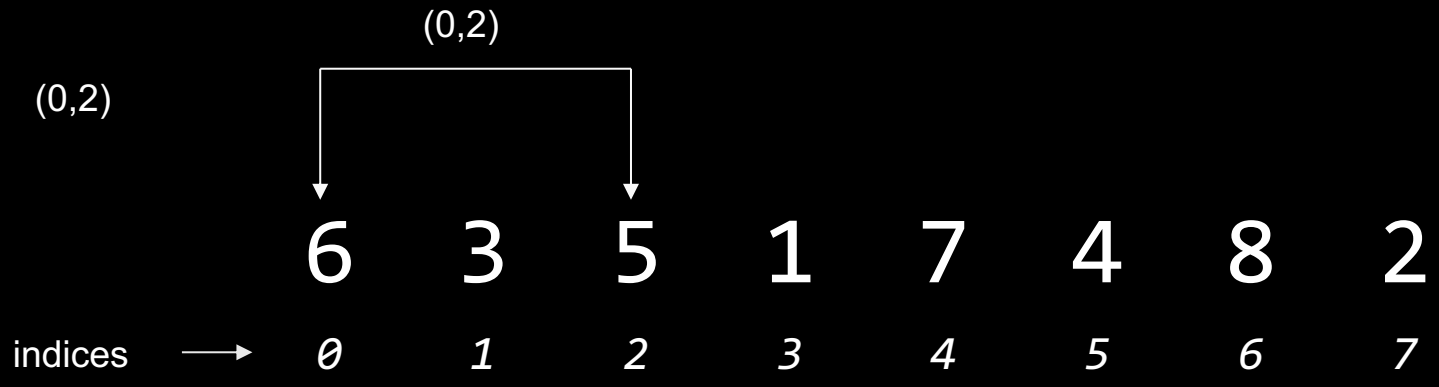
Iteration 1
Gap = 4



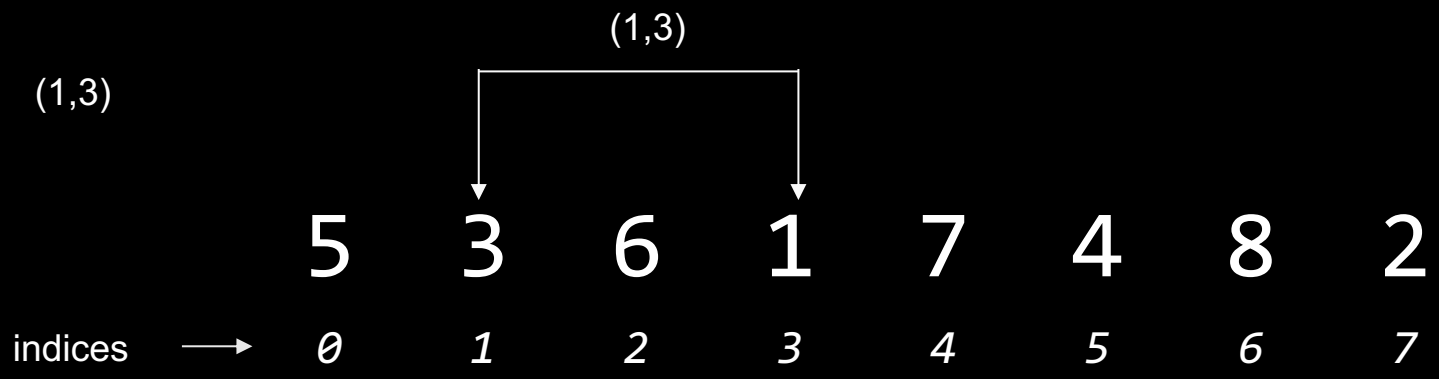
End of Iteration 1
Gap = 4



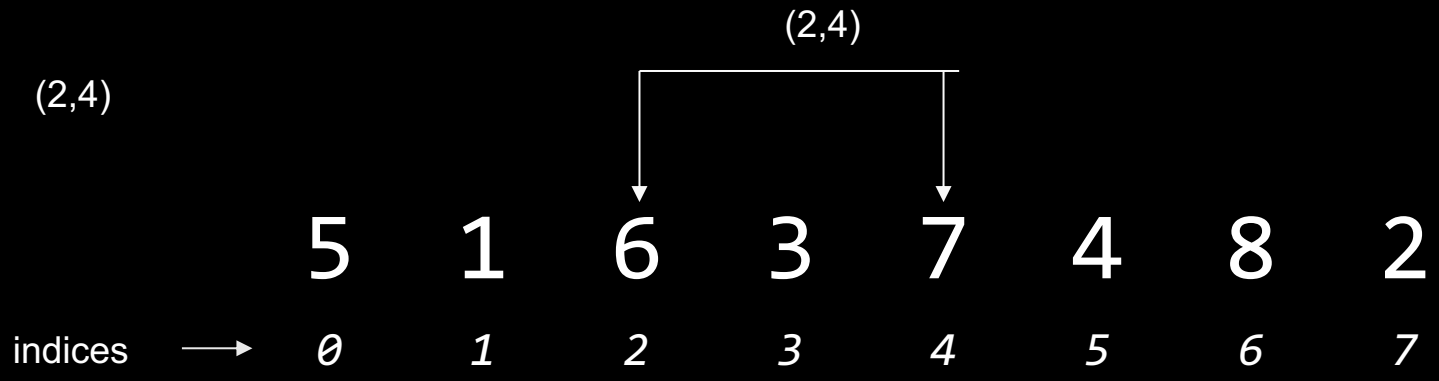
Iteration 2
Gap = 4/2
= 2



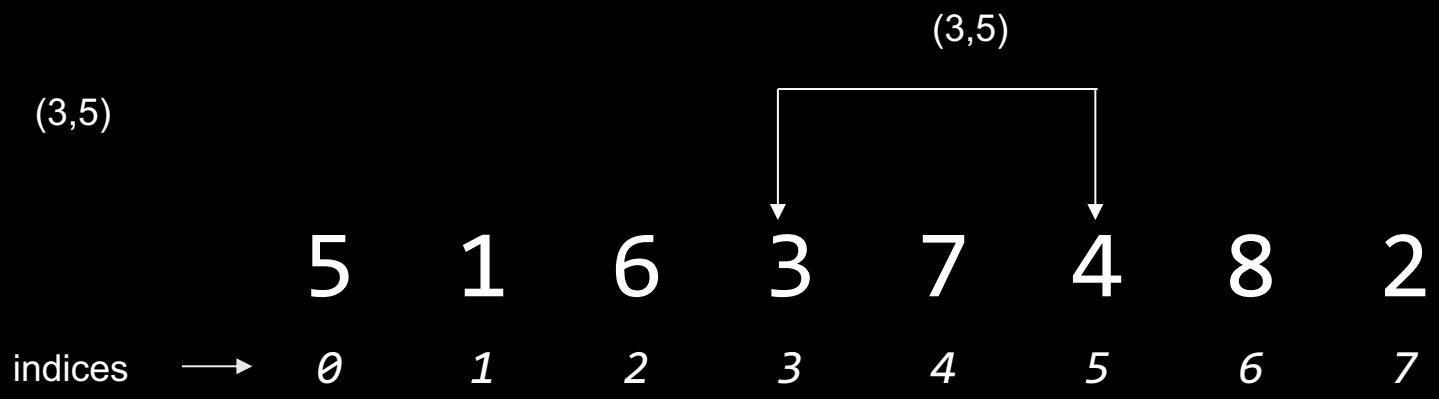
Iteration 2
Gap = 2



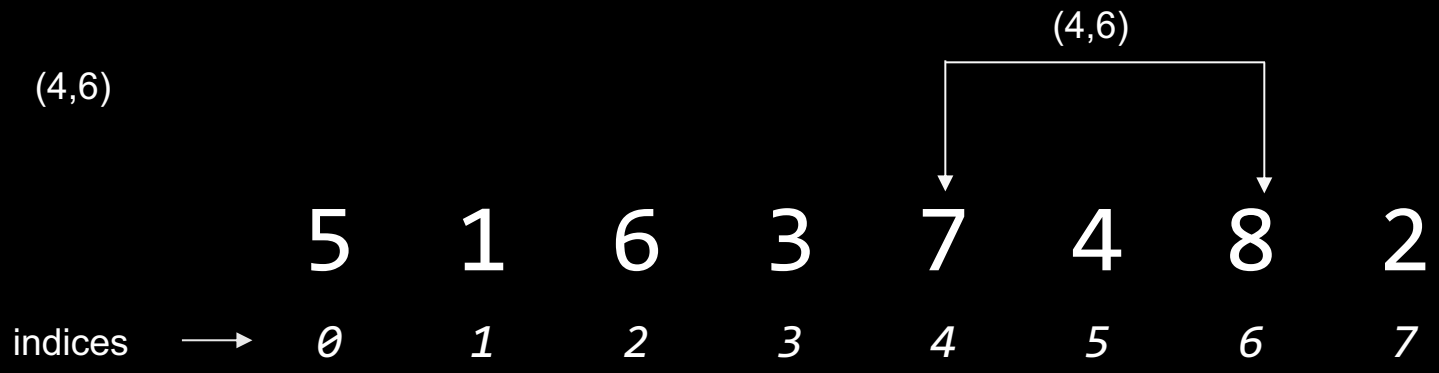
Iteration 2
Gap = 2



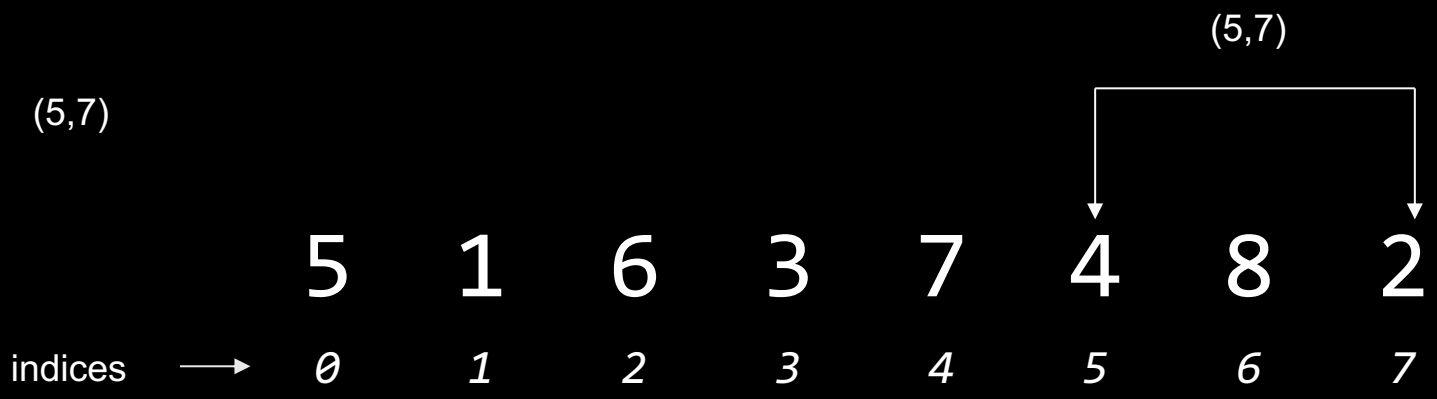
Iteration 2
Gap = 2



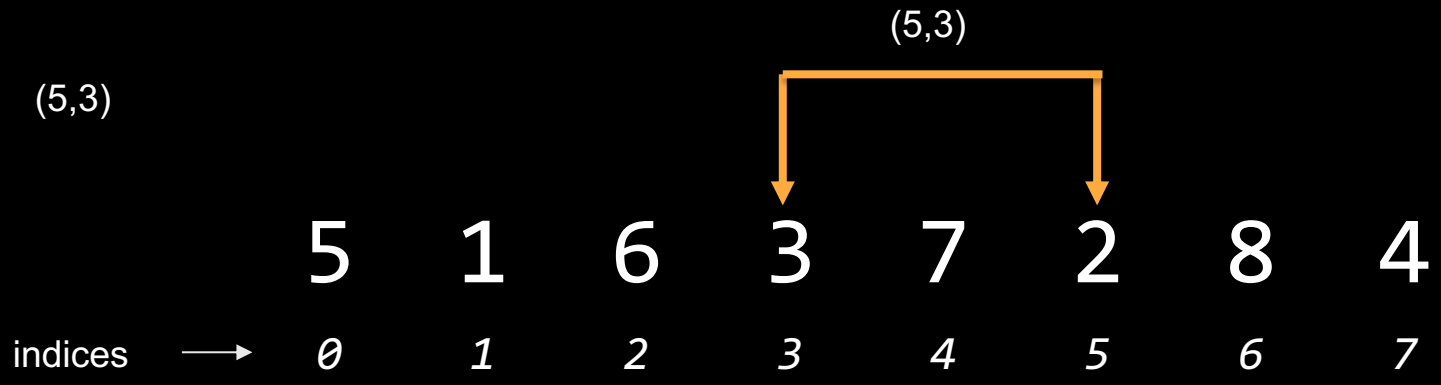
Iteration 2
Gap = 2



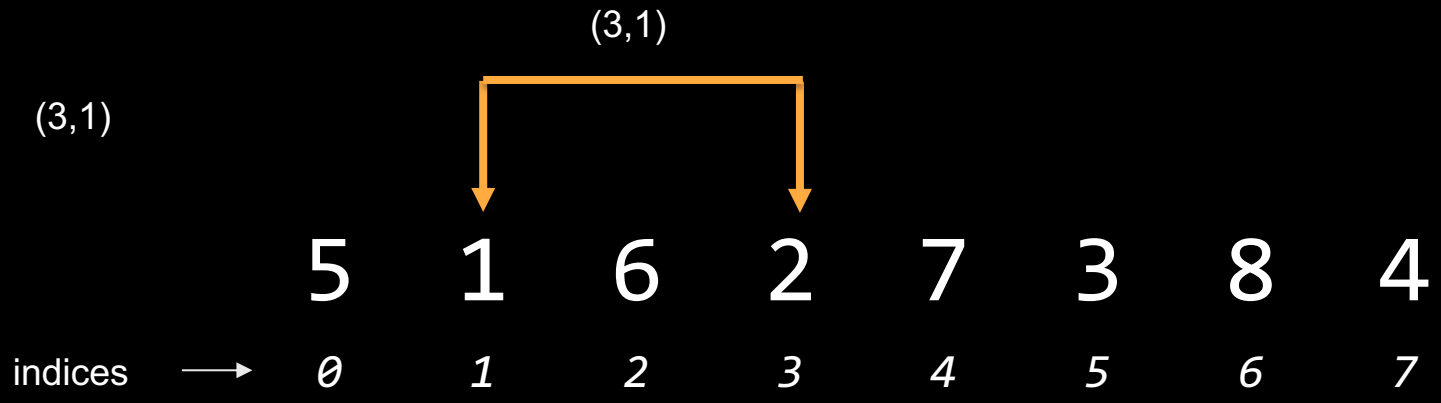
Iteration 2
Gap = 2



Iteration 2
Gap = 2

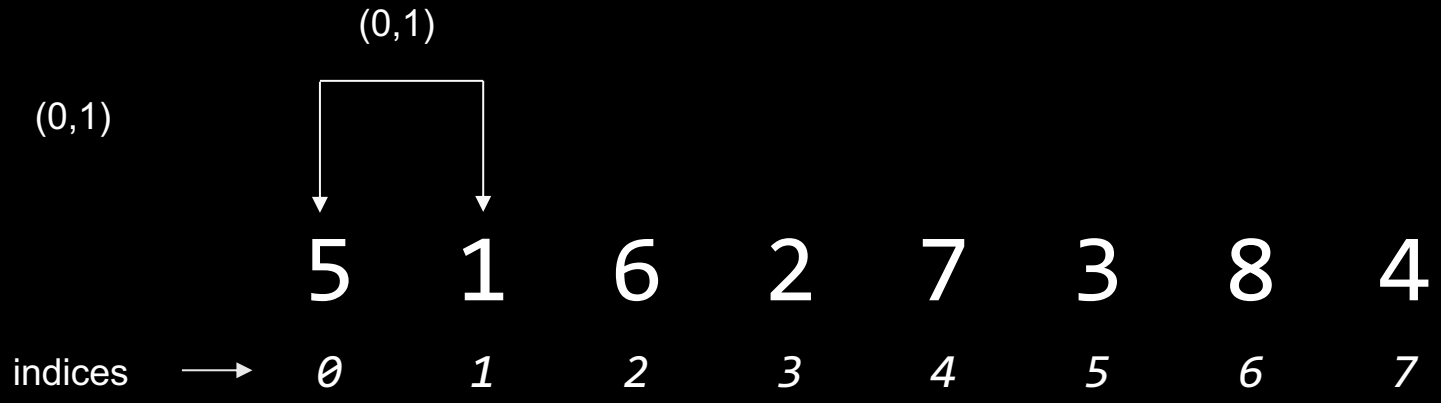


Iteration 2
Gap = 2

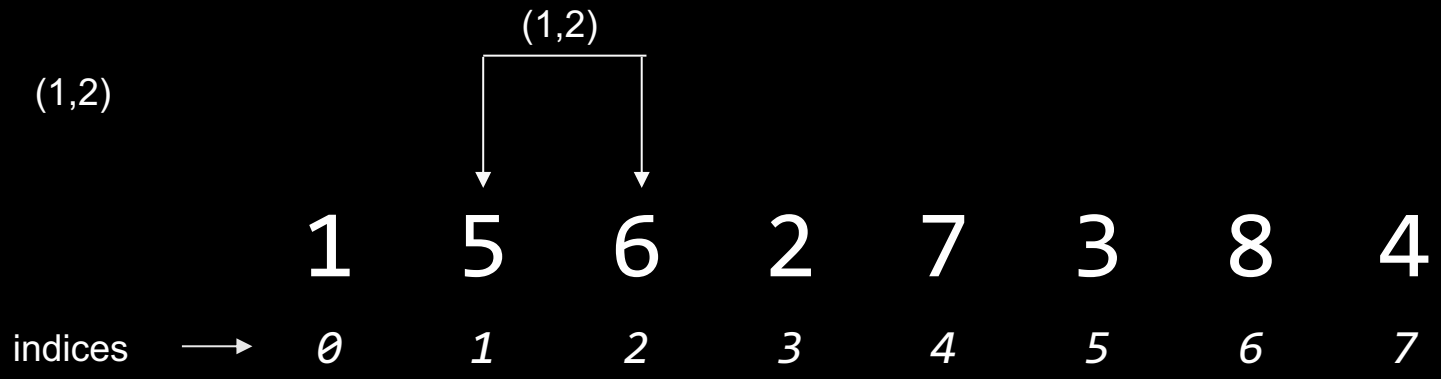


# End of iteration 2

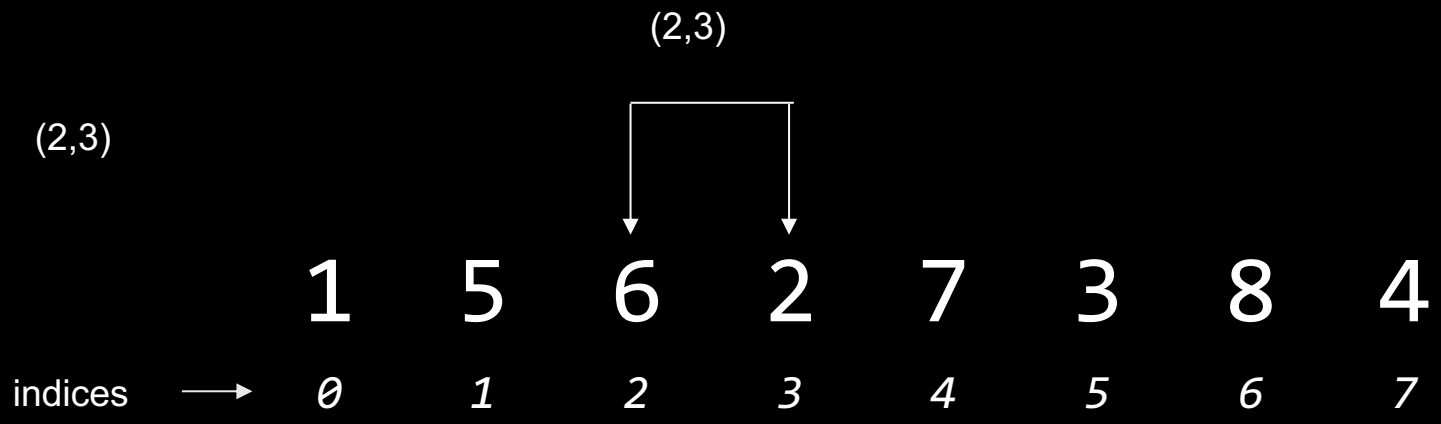
Iteration 3
Gap = 2 /2
= 1



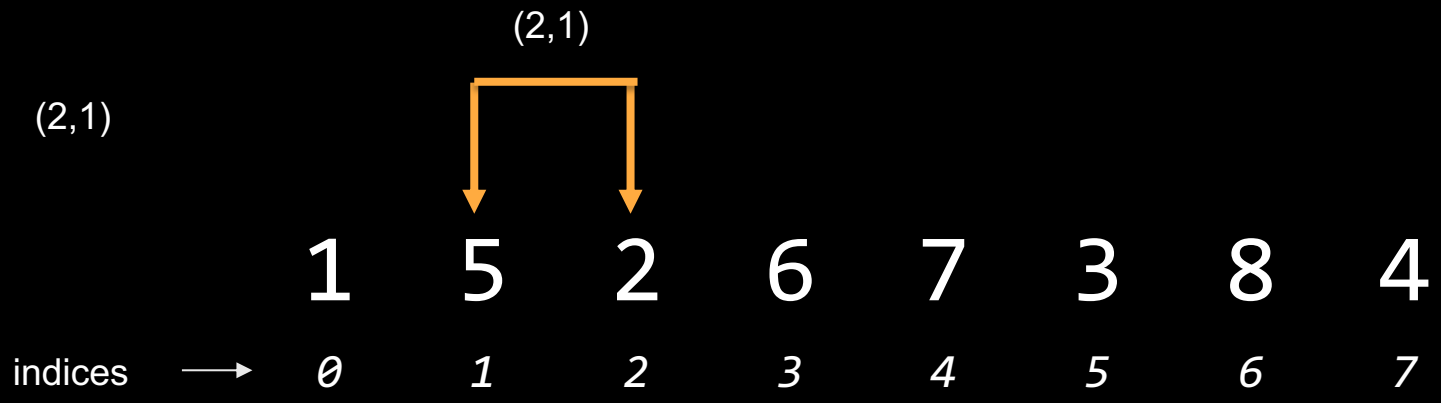
Iteration 3
Gap = 1



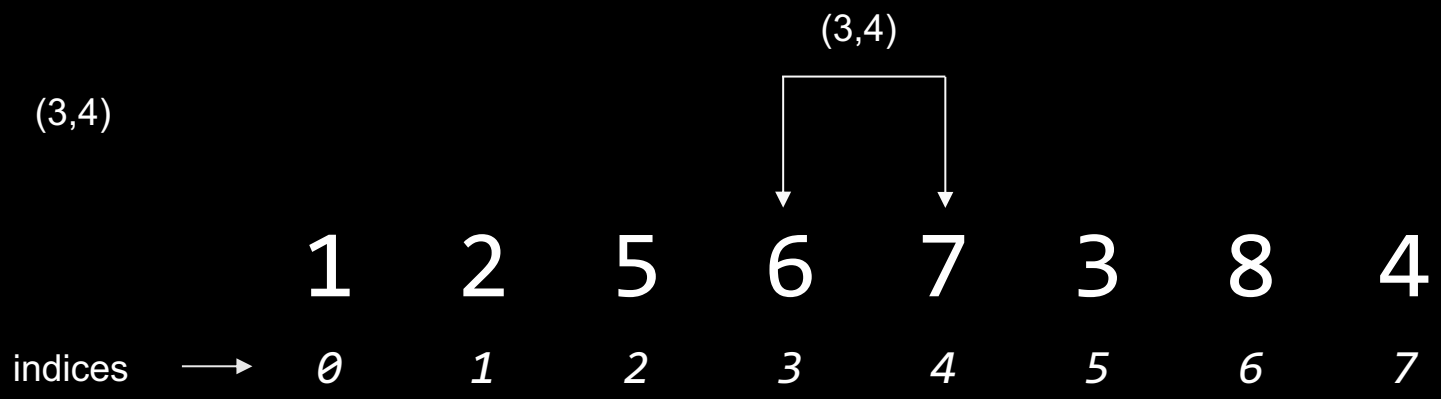
# Iteration 3
# Gap = 1



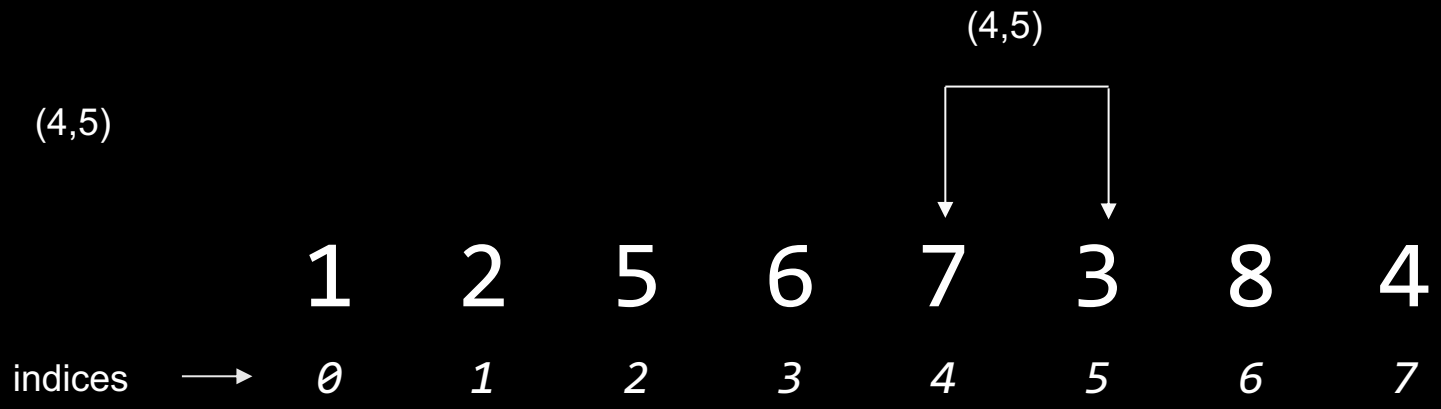
Iteration 3
Gap = 1



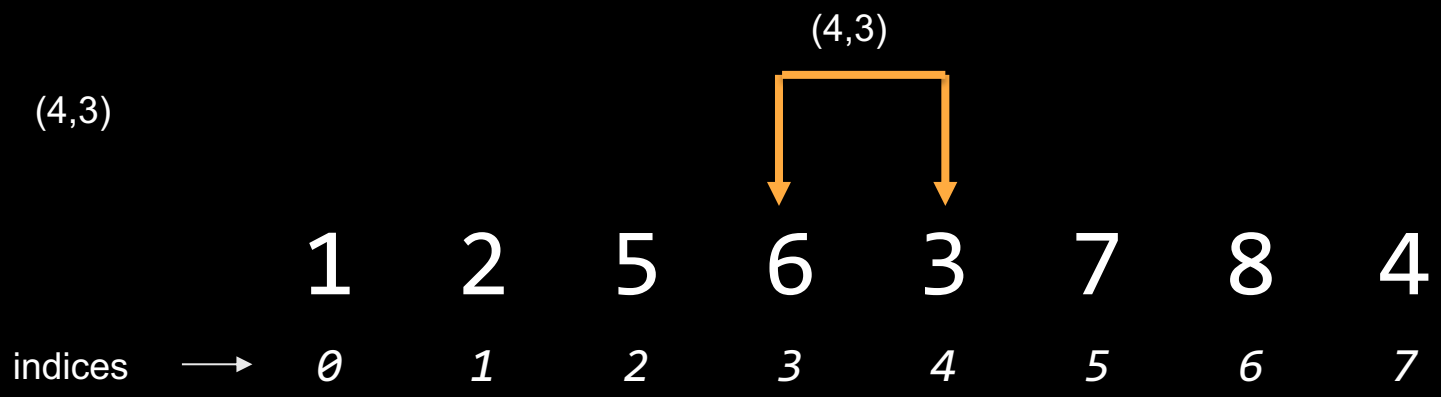
Iteration 3
Gap = 1



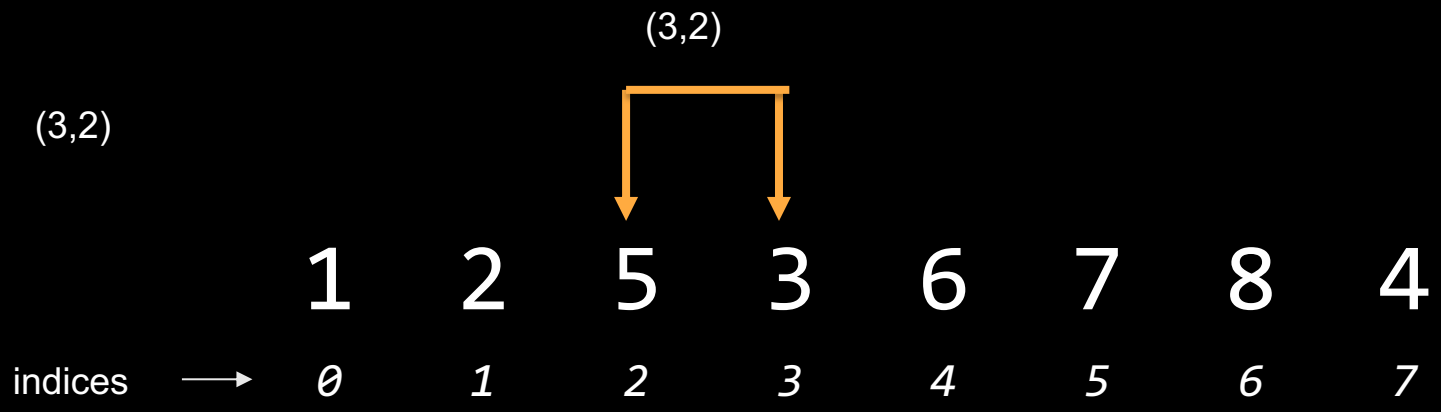
Iteration 3
Gap = 1



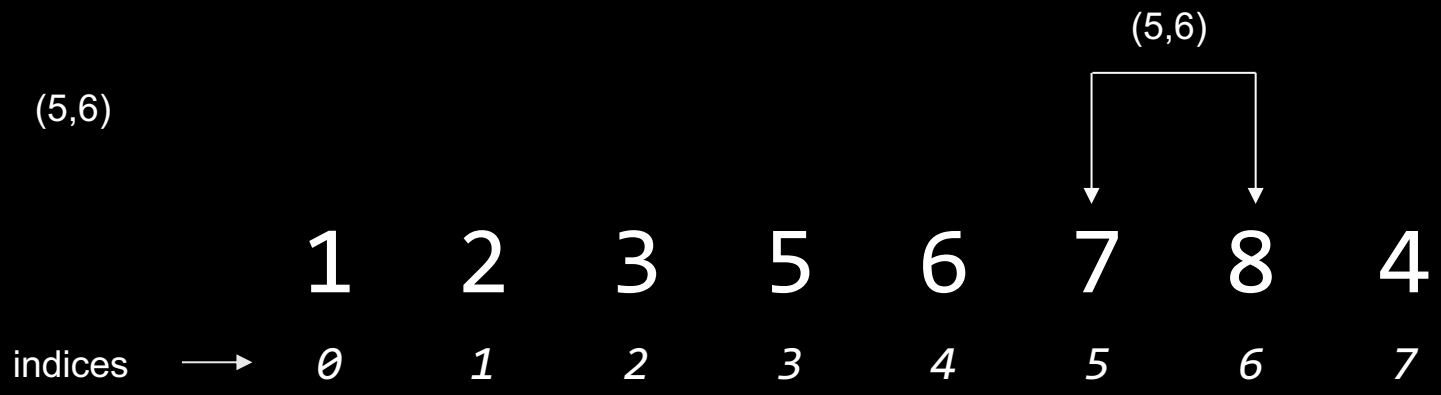
Iteration 3
Gap = 1



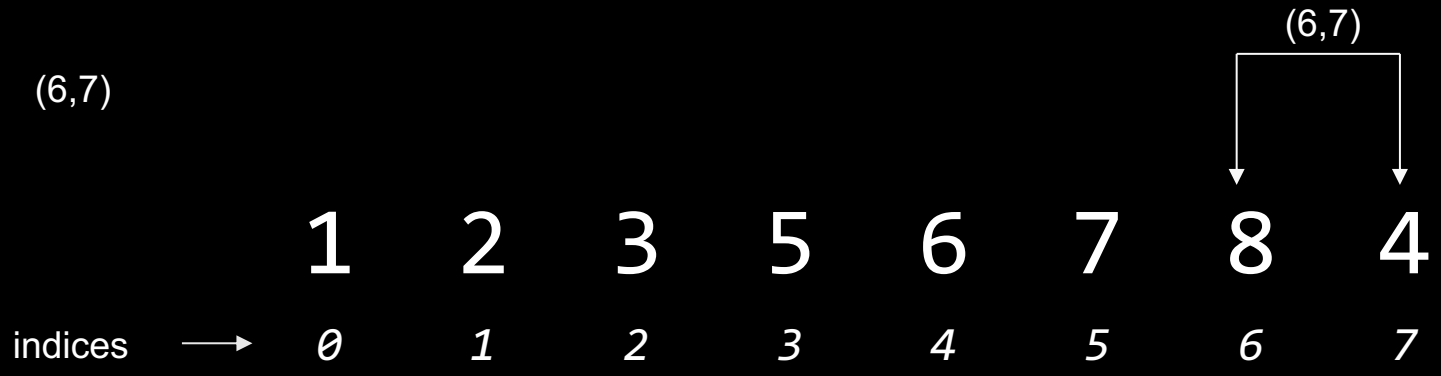
Iteration 3
Gap = 1



Iteration 3
Gap = 1



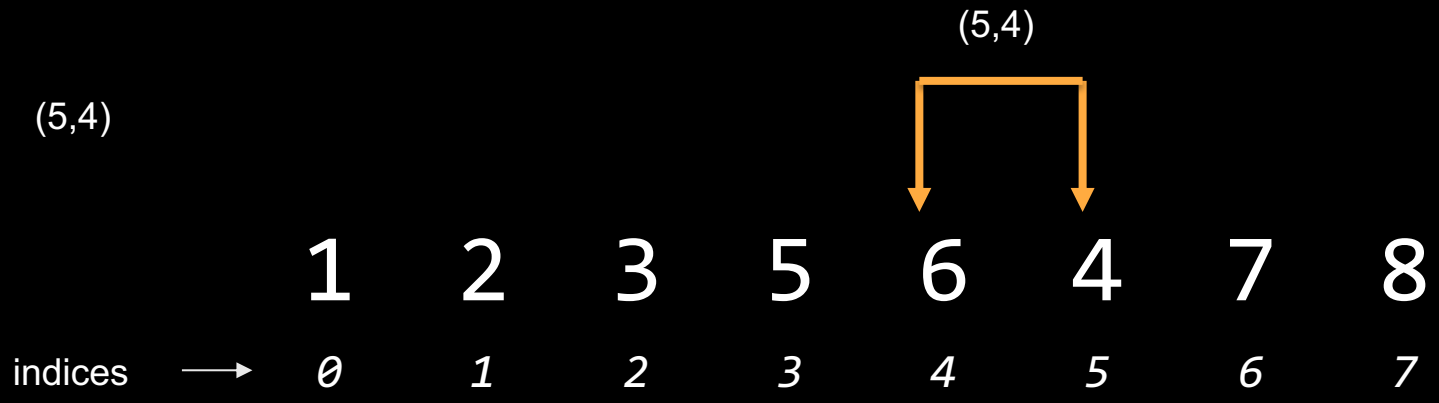
Iteration 3
Gap = 1



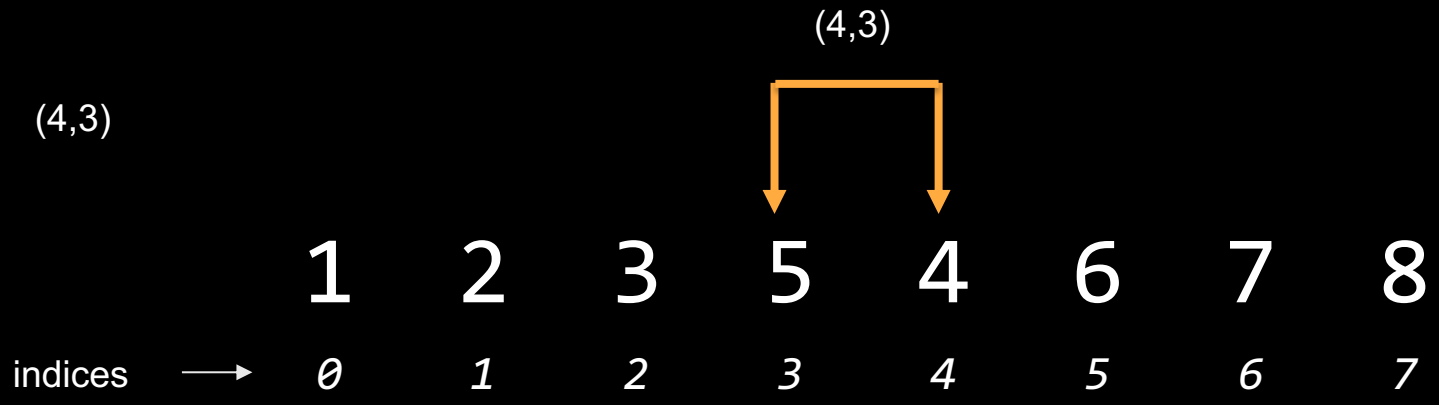
Iteration 3
Gap = 1

(6,5)

Iteration 3
Gap = 1



Iteration 3
Gap = 1



# End of Iteration 3: Sorted Array

| | |
|---|---|
| $O(n^2)$ | selection sort, bubble sort, insertion sort, shell sort |
| $O(n \log n)$ | |
| $O(n)$ | linear search |
| $O(\log n)$ | binary search |
| $O(1)$ | |

| | |
|---|---|
| $\Omega(n^2)$ | selection sort |
| $\Omega(n \log n)$ | shell sort |
| $\Omega(n)$ | bubble sort, insertion sort |
| $\Omega(\log n)$ | |
| $\Omega(1)$ | linear search, binary search |