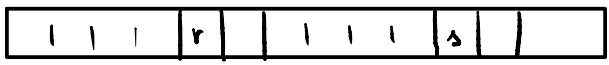
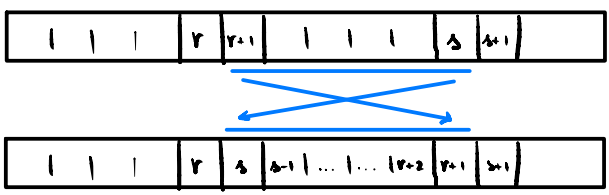
Suppose that at iteration t I find the first swap available at $i = r$, $j = s$.



This means that each pair (i, j), $i < r$ $\forall j$ and $i = r$ $\forall j \in [r+1, s-1]$ has already been checked and didn't have a swap needed

I then reverse $[r+1, s]$:



Consider $i < r$:

- if $j < r$ then the swap didn't change anything $\Rightarrow$ no new swaps
- if $j = r$:

  A swap occurs if $C_{i,i+1} + C_{j,j+1} > C_{ij} + C_{i+1,j+1}$

  $\Downarrow$

  $C_{i,i+1} + C_{r,s} > C_{ir} + C_{i+1,s}$

  ↳ need to check again

- if $j \in [r+1, s-1]$ I just reversed the order, so

each pair has already been checked ⇒ no new swap

- if $j = s$:

A swap occurs if $C_{i,i+1} + C_{j,j+1} > C_{ij} + C_{i+1,j+1}$

⇓

$C_{i,i+1} + C_{r+1,s+1} > C_{i,r+1} + C_{i+1,s+1}$

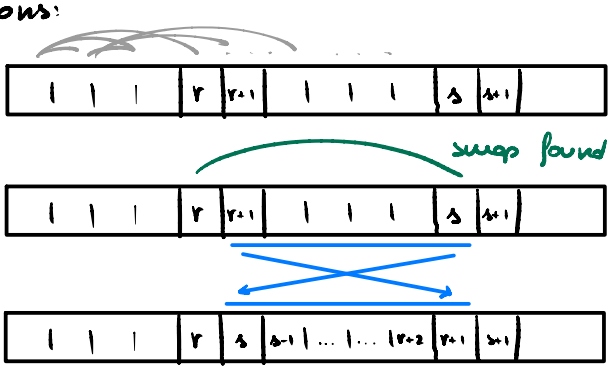
↳ Need to check again

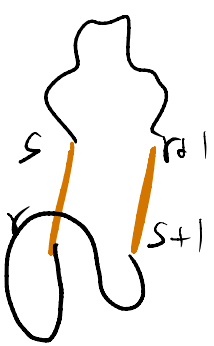
- if $j > s$ → nothing changed ⇒ no new swaps

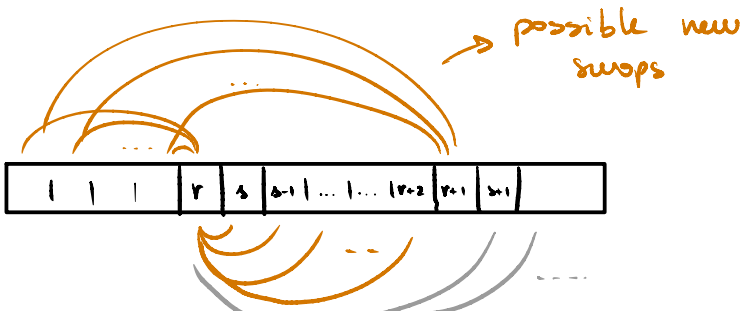
Consider $i = r$:

I will need to check again $\forall j \in [i+1, s-1]$ and then continue from where I stopped.

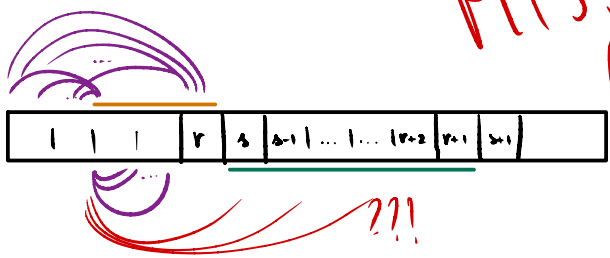
This means:







If I find a new swap before reaching the point I was at before (one of the orange arcs):



Thus: if I find a swap in the main cycle:

- reverse
- create a queue with all arcs to check before moving on
- if an arc in the queue finds a swap:
  - reverse
  - add to the start of the queue the new arcs to check
  - repeat
- if the queue is empty, continue with the main cycle

Repeat till no swaps found.