

# G: Garbled Garden

Problem author: Lucas Schwebler, Yidi Zang

## Problem

Given an array  $t_1, \dots, t_n$ , sort it by applying the minimum number of permutations which have only one cycle of length  $> 1$ .

# G: Garbled Garden

Problem author: Lucas Schwebler, Yidi Zang

## Problem

Given an array  $t_1, \dots, t_n$ , sort it by applying the minimum number of permutations which have only one cycle of length  $> 1$ .

## Solution

- Already sorted?  $\rightarrow$  answer 0

# G: Garbled Garden

Problem author: Lucas Schwebler, Yidi Zang

## Problem

Given an array  $t_1, \dots, t_n$ , sort it by applying the minimum number of permutations which have only one cycle of length  $> 1$ .

## Solution

- Already sorted?  $\rightarrow$  answer 0
- Check if one operation is sufficient:
  - Let  $s$  be the sorted version of  $t$ .
  - Build the graph  $G$  with directed edges  $s_i \rightarrow t_i$ .

# G: Garbled Garden

Problem author: Lucas Schwebler, Yidi Zang

## Problem

Given an array  $t_1, \dots, t_n$ , sort it by applying the minimum number of permutations which have only one cycle of length  $> 1$ .

## Solution

- Already sorted?  $\rightarrow$  answer 0
- Check if one operation is sufficient:
  - Let  $s$  be the sorted version of  $t$ .
  - Build the graph  $G$  with directed edges  $s_i \rightarrow t_i$ .
  - $G$  has multiple components (with  $> 0$  edges)?  $\rightarrow$  one operation is not sufficient.
  - Otherwise  $\rightarrow$  one operation suffices, construct Euler cycle

# G: Garbled Garden

Problem author: Lucas Schwebler, Yidi Zang

## Problem

Given an array  $t_1, \dots, t_n$ , sort it by applying the minimum number of permutations which have only one cycle of length  $> 1$ .

## Solution

- Already sorted?  $\rightarrow$  answer 0
- Check if one operation is sufficient:
  - Let  $s$  be the sorted version of  $t$ .
  - Build the graph  $G$  with directed edges  $s_i \rightarrow t_i$ .
  - $G$  has multiple components (with  $> 0$  edges)?  $\rightarrow$  one operation is not sufficient.
  - Otherwise  $\rightarrow$  one operation suffices, construct Euler cycle
- Two operations are always sufficient!

# G: Garbled Garden

Problem author: Lucas Schwebler, Yidi Zang

## Lemma

Every permutation is the composition of two cycles.

## Proof by picture



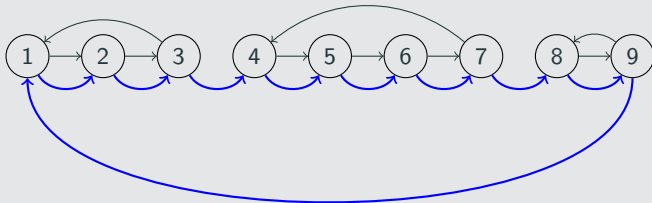
# G: Garbled Garden

Problem author: Lucas Schwebler, Yidi Zang

## Lemma

Every permutation is the composition of two cycles.

## Proof by picture



# G: Garbled Garden

Problem author: Lucas Schwebler, Yidi Zang

## Lemma

Every permutation is the composition of two cycles.

## Proof by picture

