Messy Cables

Problem Code: CABLE

Optimization Challenge

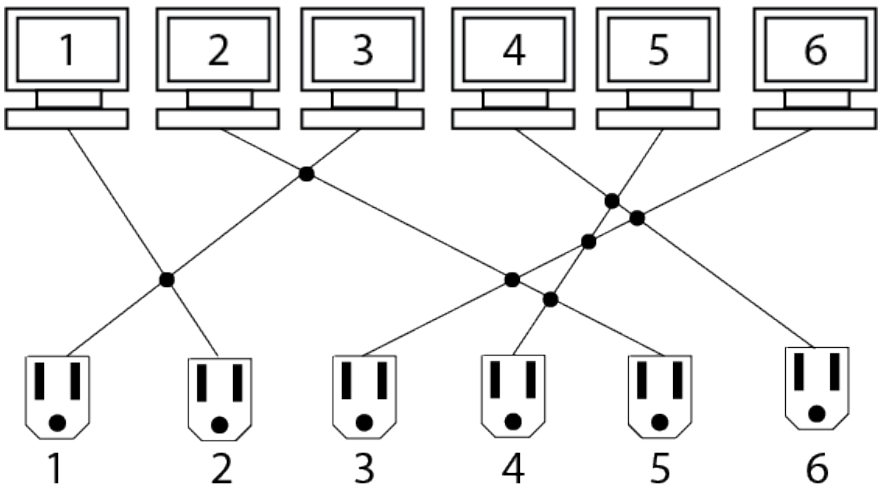
Note: This is a time complexity optimization challenge. There is no time complexity requirement. The fastest algorithm will receive points!

Task Description

Finding the best connection of cables is always a challenging problem! In your computer lab there are n machines in a row. Each has a cable that needs to be connected to a power plugin. There are n power plugin on the wall. Each machine is connected to one power plugin using a staright cable.

Now you look at this cable configuration and notice that the cables are messy. Many cable intersect with each other. As you are going to report the badness of the configuration to the lab manager, you would like to know how many cable intersections there are.

To describe the configuration, both the machines and the plugins are numbered 1 to n from left to right. The i-th machine will have a number p_i indicating the plugin it is connecting with. The cable configuration can thus be given as a permutation* of 1 to n.



In the example illustrated, we have $n = 6$ machines of configuration [2, 5, 1, 6, 4, 3], which means machine 1 is connected with plugin 2, machine 2 is connected with plugin 5,

machine 3 is connected with plugin 1, etc. The number of intersections is 7, as illustrated using black dots.

Note that two intersections are considered different only if the cables are different. If 3 cables intersect with each other, there are always 3 intersections (cannot be 1).

Examples

Case 1: [2, 5, 1, 6, 4, 3]

Answer: 7

As illustrated above.

Case 2: [3, 2, 1]

Answer: 3

Every cable intersects with all other cables.

Case 3: [1, 2, 3, 4]

Answer: 0

No cable intersection exist.

Case 4: [1, 4, 2, 5, 3, 6]

Answer: 3

Requirements

Time: N/A **Space:** $O(n)$

Appendix

* A permutation of n is a sequence of integers so that each integer among [1, n] appears exactly once in the sequence.