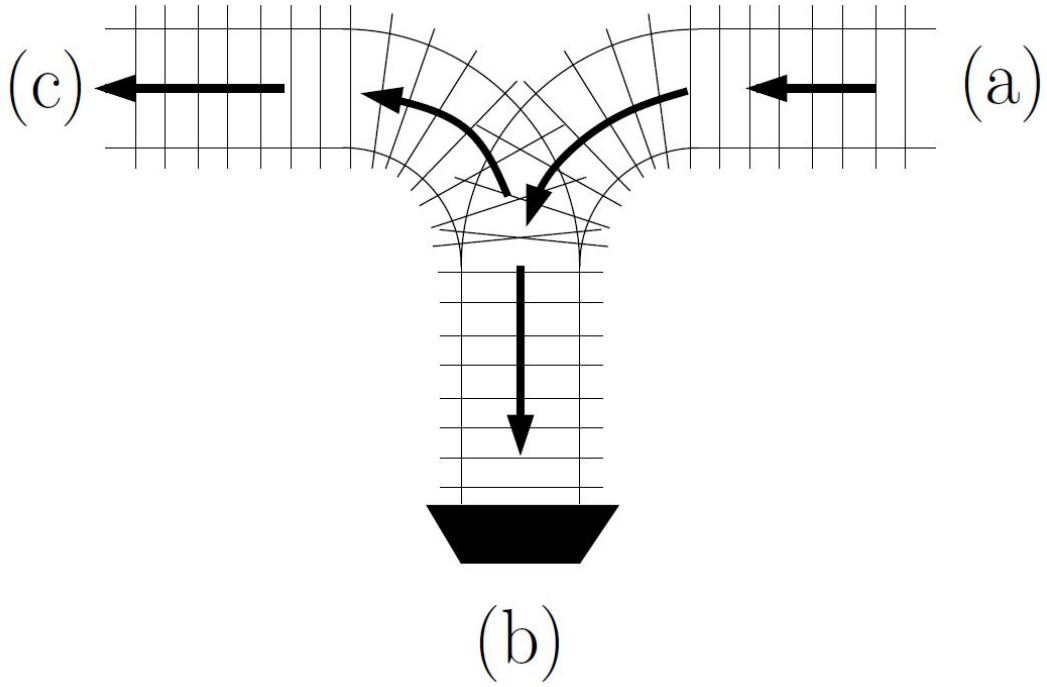
Problem Solving Practice
HW Problem #4

CSE4152
Sogang University

Train Rearrangement

There is a T-shaped railroad. Imagine that trains coming from (a), passing by (b), going to (c). We want to re-order the trains. For example, The order of coming trains is 3214. Rearranging the sequence of trains to 1234 is possible by following sequence of operations.

1. No. 3 train to (b).
2. No. 2 train to (b).
3. No. 1 train to (b).
4. No. 1 train to (c).
5. No. 2 train to (c).
6. No. 3 train to (c).
7. No. 4 train to (b).
8. No. 4 train to (c).



Train Rearrangement (cont'd)

1. Is it possible to rearranging N trains coming from (a) in arbitrary order to increasing order like 123 · · ·N?

2. Please propose a method that figure out whether the given train order could be rearranged in increasing order after passing the T-railroad.

Train Example

5 1 2 3 4 5 // 5 trains coming in the following order: 1 2 3 4 5

4 3 2 1 4 // 4 trains coming in the following order: 3 2 1 4

5 3 2 5 4 1 // 5 trains coming in the following order: 3 2 5 4 1

Agony of Engineer

Two extremely tall buildings A and B are very far apart from each other. There are N electrical lines connecting these buildings such that one terminal (end point) of each line is in building A while the other is in building B. All N terminals in each building are in a control box on the top of the building. You may assume that N is greater than two. Unfortunately, there are no elevators available in both buildings. An engineer wants to figure out how the terminals in one building are connected to the others by the electrical lines. He/she may use a light bulb, a battery, and electrical wires to check the connectivity among two or more lines. Suggest an algorithm for finding the connectivity between terminals while minimizing the number of travels between buildings. The engineer has to work alone in control boxes and is not allowed to install any additional electrical lines between buildings. Your answer should contain

- the minimum number of travel and
- Detailed description on how the engineer can do it.

Agony of Engineer (cont'd)