# Problem 3 – Message Sharing

A **social network** consists of **people** and some of them are **friends**. Initially a **message** is shared with some of the people. At each step, each person who knows the message, shares it with all of his friends. Calculate the **number of steps** needed for the message **reach all the people** in the network or find that some people are **unreachable**.

### Input

* The input data should be read from the console. It consists of exactly 3 lines, described below.
* **Line #1** holds the people names in format “**People: person1, person2, person3, …**”
* **Line #2** holds the people’s connections in format “**Connections: personA - personB, personC - personD, personE - personF, …**”.
* **Line #3** holds the people who initially receive the message in format “**Start: person1, person2, …**”.
* Line #2 and Line #3 can hold only persons mentioned at Line #1. Person names are unique (no duplicates).

### Output

* In case all people are **reachable**
  1. Print at the first line at the console the **minimum number of steps** needed to reach all people in format “**All people reached in X steps**”, where **X** is the number of steps.
  2. Print at the next line at the console the **people who received the message at the last step** in alphabetical order in format “**People at last step: person1, person2, …**”.
* In case some people are **unreachable**, print them at the console in **alphabetical order** in format “**Cannot reach: person1, person2, …**”.

### Constraints

* The number of **people** is in range [**1 … 500**].
* The number of **connections** is in the range [**1 … 10 000**].
* The number of **initial people** who receive the message is in the range [**1 … 500**].
* **Person names** consist of Latin letters and digits and are case-sensitive. Examples of **valid** names: “**Nakov**”, “**SoftUni**”, “**nakov**”, “**nak2**”. Examples of **invalid** names: “**Svetlin Nakov**”, “**bat\_pesho**”, “**one,two**”.
* Time limit: **150 ms**. Allowed memory: **24 MB**.

### Examples

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| **Input** | **The Network** | **Explanation** |
| People: Pesho, Maria, Ivan, Gosho  Connections: Pesho - Gosho, Maria - Ivan, Ivan - Gosho, Pesho - Maria, Maria - Gosho  Start: Maria |  | At step #0 Maria receives the message.  At step #1 Maria tells the message to her direct friends Ivan, Pesho and Gosho.  The message reaches the entire network in just 1 step. |
| **Output** |
| All people reached in 1 steps  People at last step: Gosho, Ivan, Pesho |

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| **Input** | **The Network** | **Explanation** |
| People: Pesho, Maria, Ivan, Gosho  Connections: Pesho - Gosho, Maria - Ivan, Ivan - Gosho, Pesho - Maria  Start: Pesho |  | At step #1 Pesho tells the message to his friends Maria and Gosho.  At step #2 Maria and Gosho tell the message to Ivan.  The message reaches the entire network in just 2 steps. |
| **Output** |
| All people reached in 2 steps  People at last step: Ivan |

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| **Input** | **The Network** | **Explanation** |
| People: Kiril, Stefan, Ivan, Mridul, Arif, Sahil, Steve, Prakash, Misho, Didi, Maria, Diana, Petya, Katya  Connections: Mridul - Arif, Steve - Prakash, Steve - Kiril, Kiril - Stefan, Stefan - Ivan, Misho - Ivan, Didi - Misho, Stefan - Didi, Maria - Didi, Petya - Katya, Katya - Didi, Petya - Didi, Diana - Petya, Diana - Maria, Maria - Stefan, Diana - Didi  Start: Petya, Arif, Sahil, Steve |  | Step #0: Petya, Arif, Sahil and Steve receive the message.  Step #1: Arif tells to Mridul; Steve tells to Prakash and Kiril; Petya tells to Diana, Katya and Didi.  Step #2: Diana and Didi tell to Maria, Kiril and Didi tell to Stefan; Didi tells to Misho.  Step #3: Stefan and Misho tell the message to Ivan.  Ivan is alone at the last step. |
| **Output** |
| All people reached in 3 steps  People at last step: Ivan |

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| **Input** | **The Network** | **Explanation** |
| People: Pesho, Ivan, Maria  Connections: Ivan - Maria  Start: Maria |  | At step #1 Maria tells the message to Ivan. Maria and Ivan have no more friends to share the message with.  Pesho cannot be reached. |
| **Output** |
| Cannot reach: Pesho |

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| **Input** | **The Network** | **Explanation** |
| People: Pesho2, Ivan, Maria  Connections: Maria - Ivan  Start: Pesho2 |  | At step #0 Pesho2 receives the message. He has no friends and the message is not shared at all.  Ivan and Maria cannot be reached. |
| **Output** |
| Cannot reach: Ivan, Maria |

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| **Input** | **The Network** | **Explanation** |
| People: Pesho, Ivan, Maria  Connections: Maria - Ivan  Start: Maria, Pesho, Ivan |  | All people in the network initially receive the message. There is no need to share the message, everyone have it.  The message reaches all people in the network in 0 steps. |
| **Output** |
| All people reached in 0 steps  People at last step: Ivan, Maria, Pesho |