1 Strongly Connected Components

Consider the directed graph below:

![Directed Graph Image]

How many strongly connected components does this graph have?

4

Correct

What is the minimum number of directed edges to add to this graph to make all the vertices strongly connected?

1

Correct

Assume you have two vertices $u$ and $v$ in a directed graph where there exists a path from $u$ to $v$. Which one of the following is incorrect about $u$ and $v$?

- $u$ and $v$ can be in the same SCC.
- $u$ and $v$ can be in different SCCs.
- If $u$’s DFS finish time is less than $v$’s DFS finish time then $u$ and $v$ are in the same SCC.
- $u$’s DFS finish time is always greater than $v$’s DFS finish time.

Correct

Assume you have two vertices $u$ and $v$ in a directed graph where $u$ and $v$ are in the same SCC. Which one of the following is incorrect about $u$ and $v$?

- There exists a DFS tree where $u$ is in $v$’s subtree (subtree rooted at $v$).
- There exists a DFS tree where $v$ is in $u$’s subtree (subtree rooted at $u$).
- There exists a DFS tree where $u$ is not in $v$’s subtree and $v$ is not in $u$’s subtree.
- There exists a BFS tree where $u$ is not in $v$’s subtree and $v$ is not in $u$’s subtree

Correct

2 Topological Sorting

Consider the DAG below:

![Directed Acyclic Graph Image]

How many different orderings of the vertices in the above graph (out of the $6!$ possible orderings) result in a topological sort? For instance $ABCDEF$ is an ordering that’s not topologically sorted, but $FDCEBA$ is an ordering that’s topologically sorted.

9

Correct

What is the lexicographically smallest topological ordering of the vertices?

CFBDEA

Correct

If we use a DFS algorithm that breaks ties lexicographically (always picks the node with lexicographically smallest letter possible to start or proceed), what is the resulting topological ordering of the nodes?

FDECBA

Correct