Graph Algorithms: Deapth First Search(DFS)

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Department of Computer Science and Engineering
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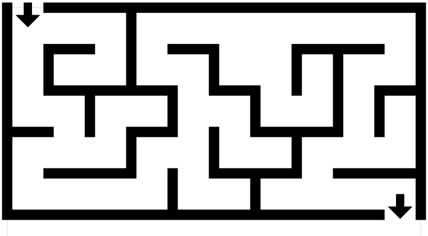
Outline

Outline

Introduction



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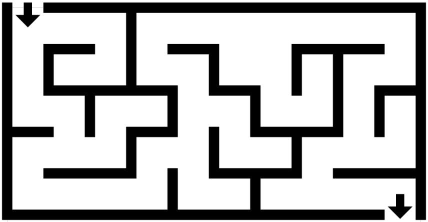

- **It's a maze!!!**

Deapth First Search(DFS)

Introduction

What is DFS?

- Algorithm for traversing graph data structures.
- Starts at the root node.
- Explores as far as possible along each branch before backtracking.

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Outline

Pseudocode

```
DFS(G)
for  each vertex u ∈G.V do
    u.color = WHITE
    u.π = NIL
end
time = 0
for each vertex u ∈G.V do
    if u.color == WHITE
    DFS-VISIT(G, u)
end
```

Pseudocode

```
DFS-VISIT(G, u)
time = time +1
u.d = time
u.color = GRAY
for each v ∈ G.Adj[u] do
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end
u.color = BLACK
time = time+1
u.f=time
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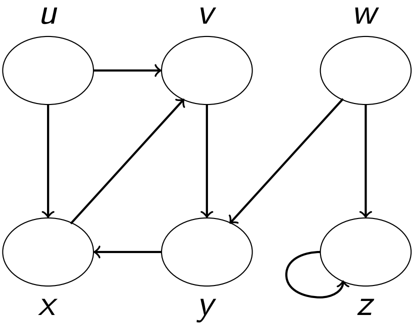
Outline

Example



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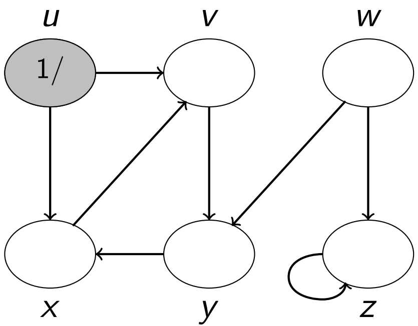

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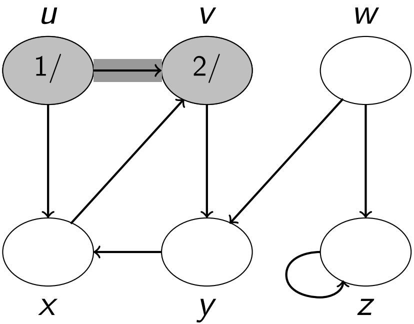

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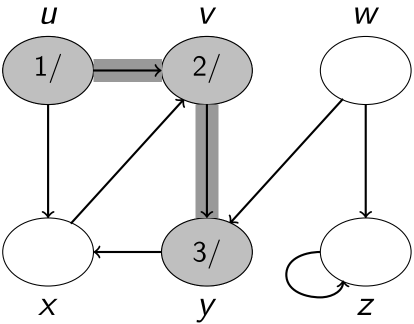

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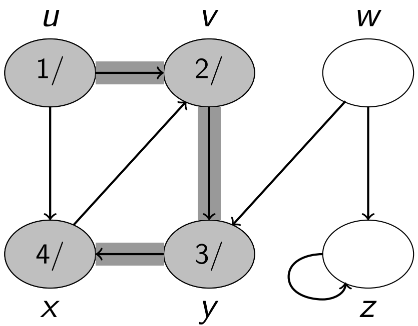

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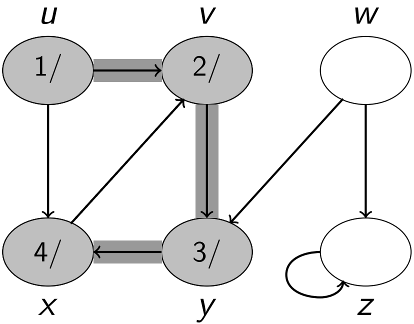

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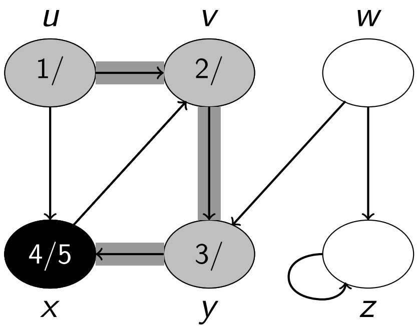

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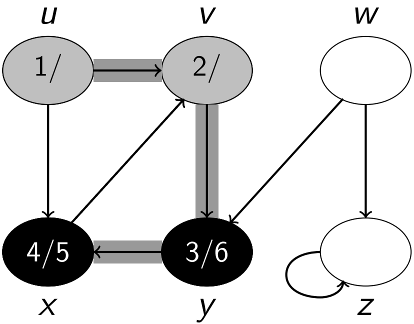

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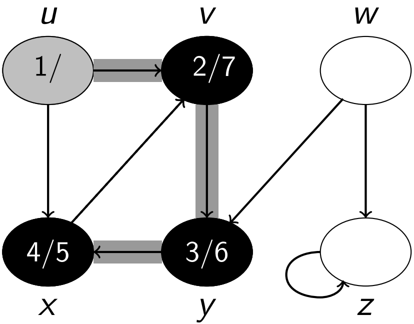

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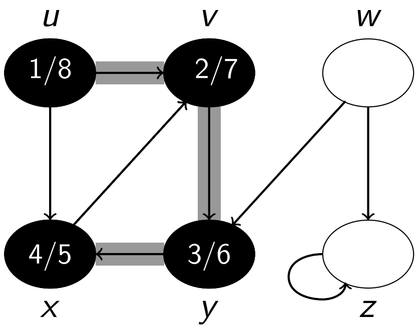

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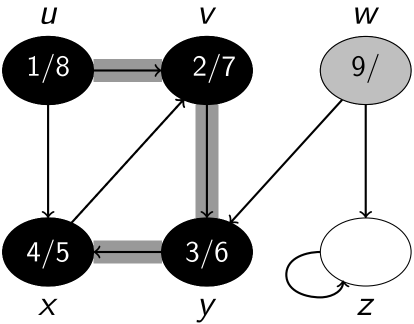

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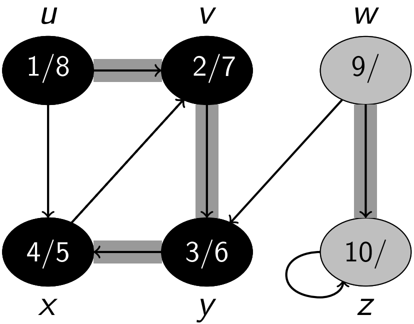

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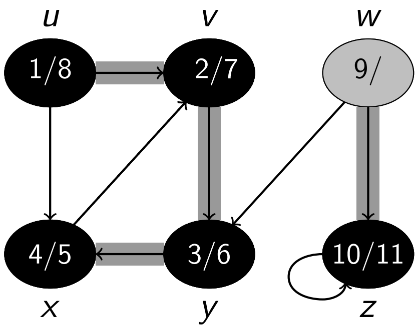

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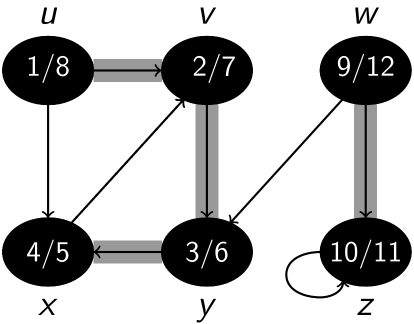

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- Loop of line 2-5 take $\Theta(V)$
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- Loop of line 5-9 executes $|Adj[v]|$ times.
- The preocedure DFS-VISIT is called exactly once for each vertex $v \epsilon V$.
- Total cost of executing lines 5-9 of DFS-VISIT is :
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Finally

The running time of DFS is therefore $\Theta(V + E)$

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- Detecting cycle in a graph
- Path finding
- Topological sorting
- Finding strongly connected components
- Solving mazes

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Procedure

- call DFS(G) to compute finishing time $v.f$ for each vertex v
- as each vertex is finished,insert it onto the front of a linked list
- **return** the linked list of vertices

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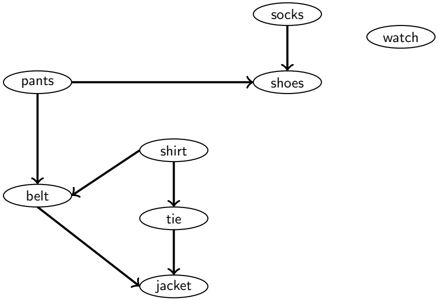

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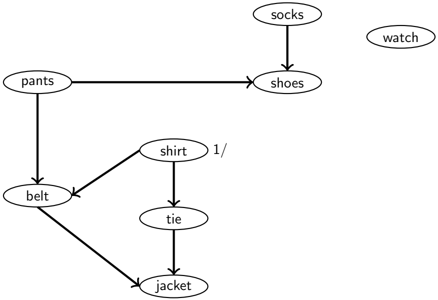

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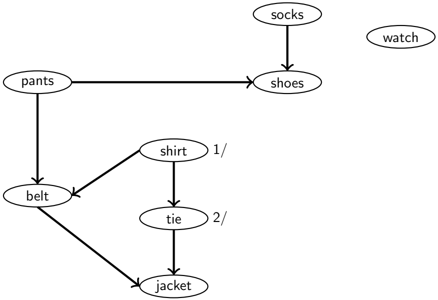

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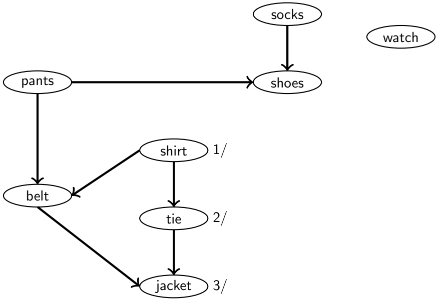

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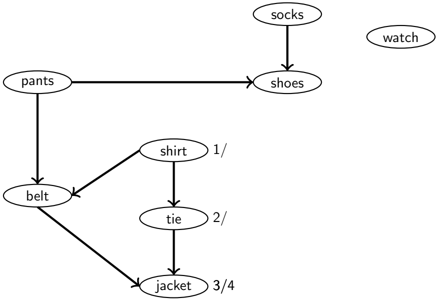

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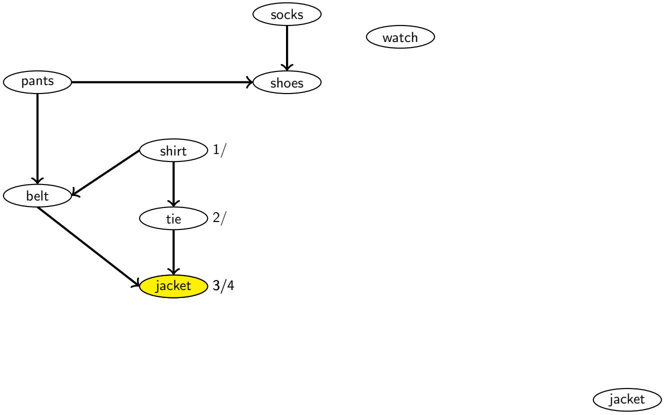

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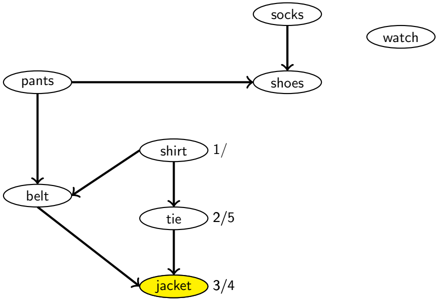

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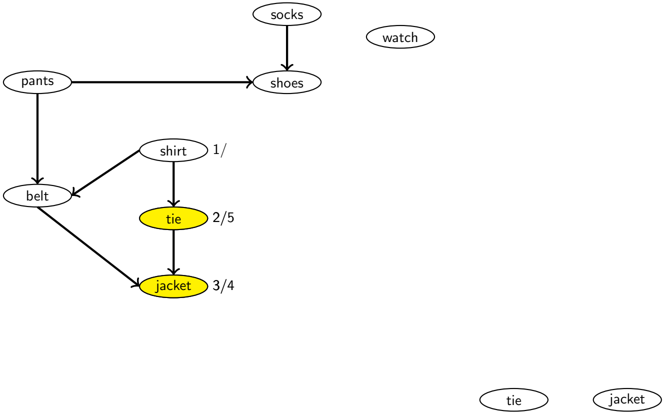

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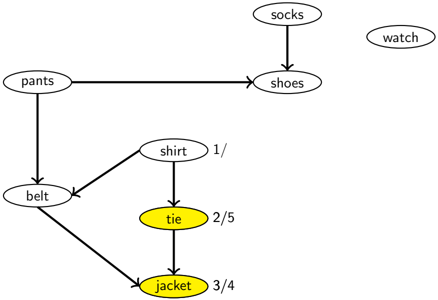

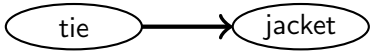

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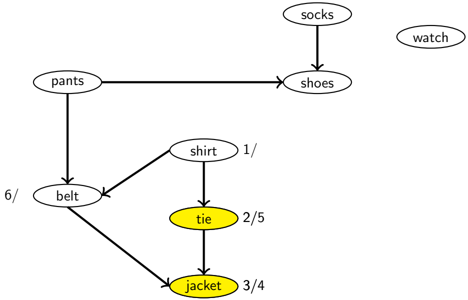

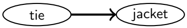

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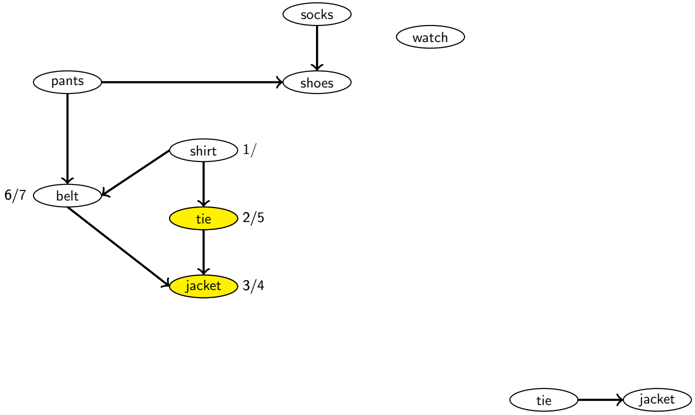

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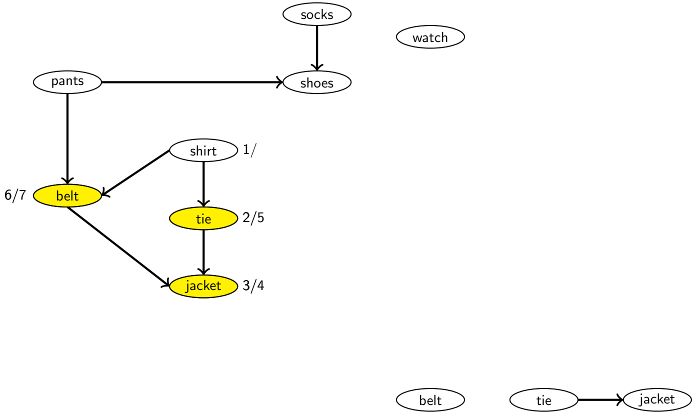

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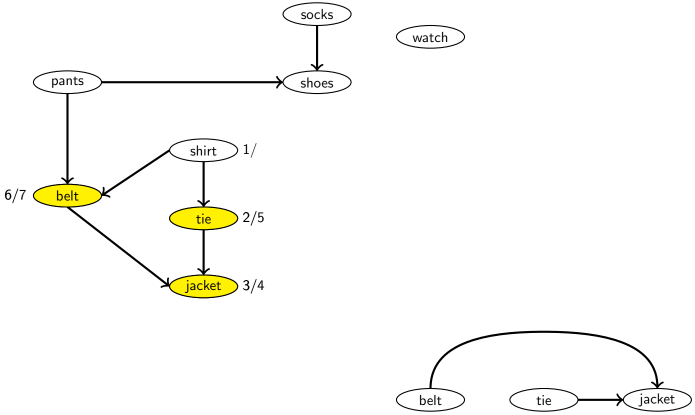

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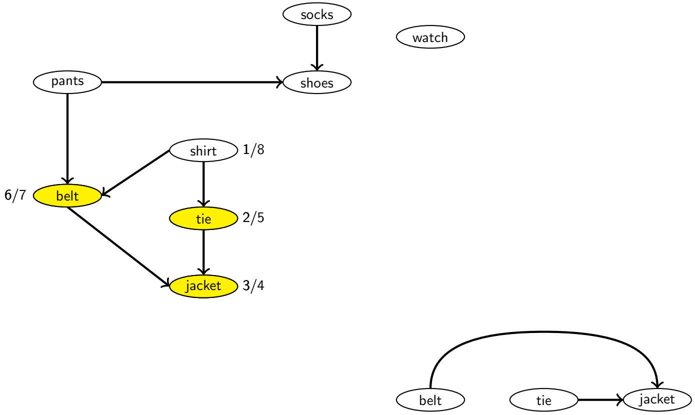

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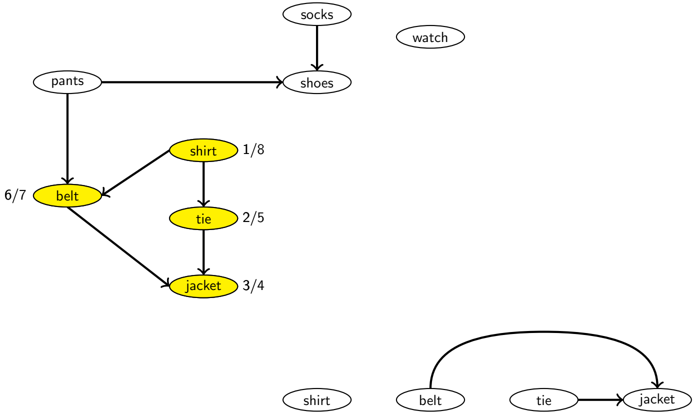

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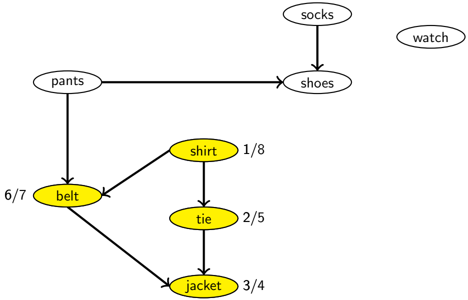

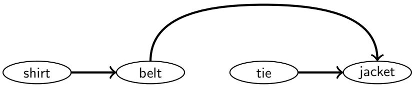

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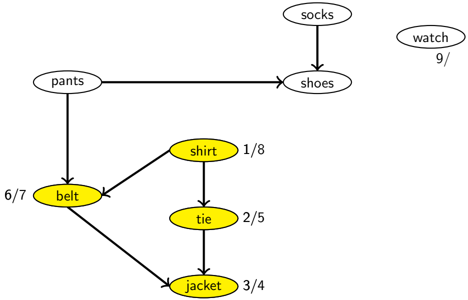

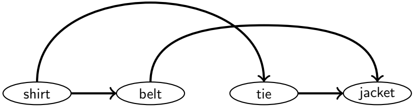

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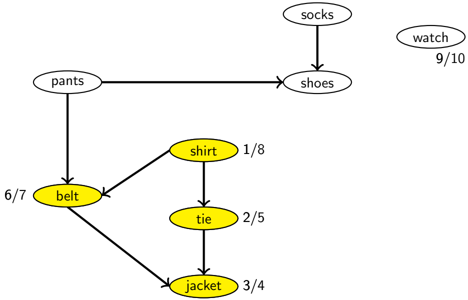

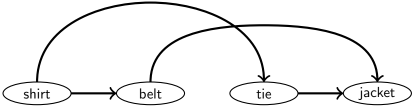

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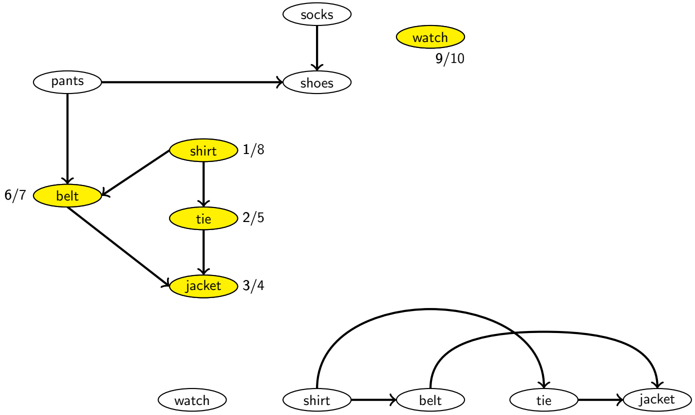

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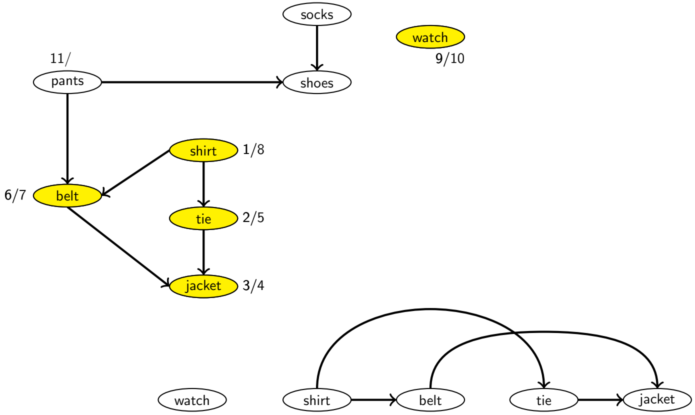

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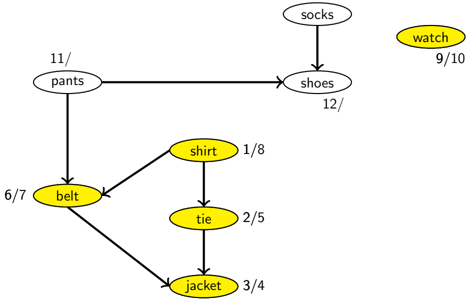

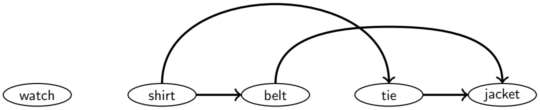

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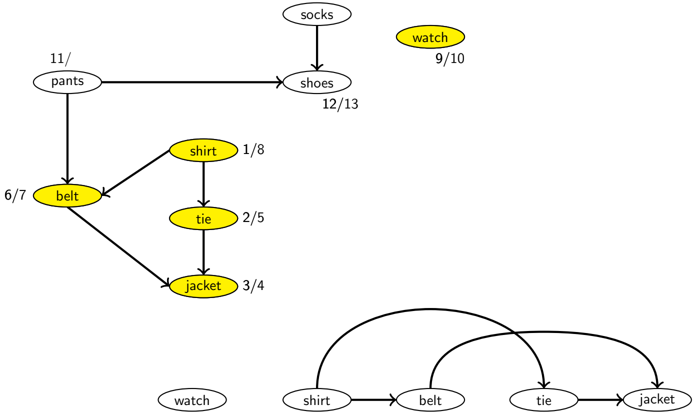

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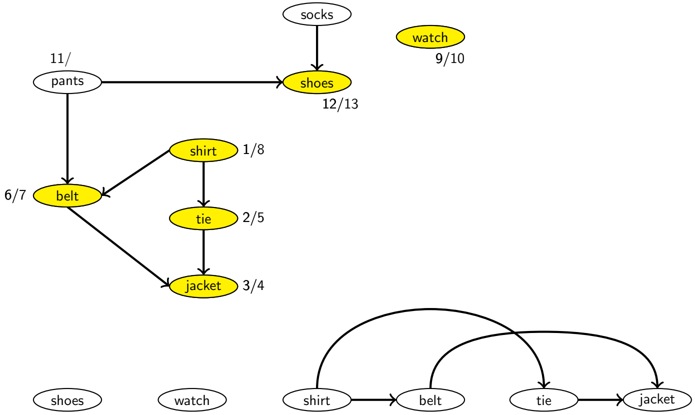

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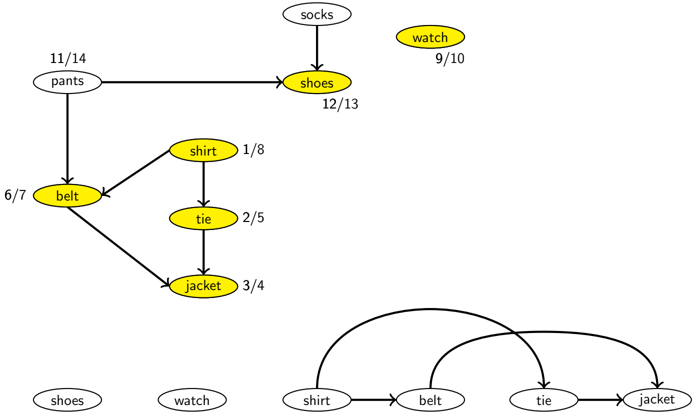

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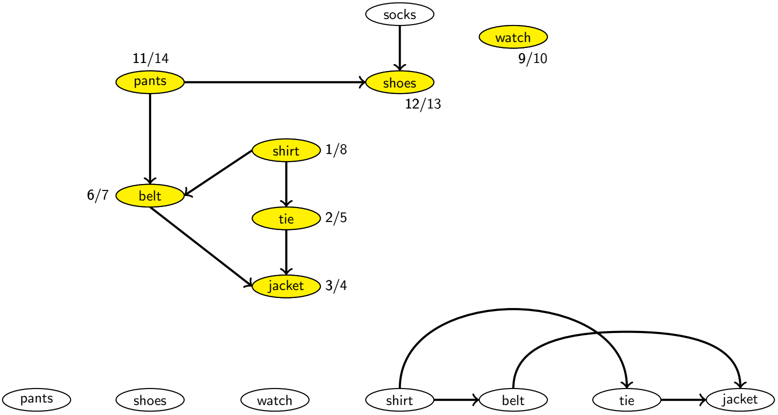

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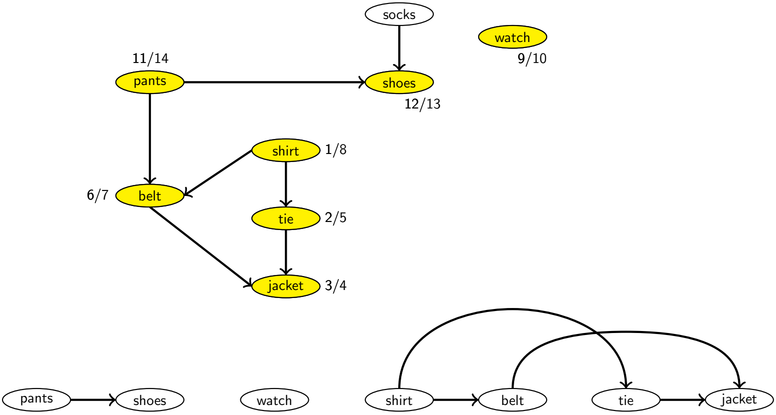

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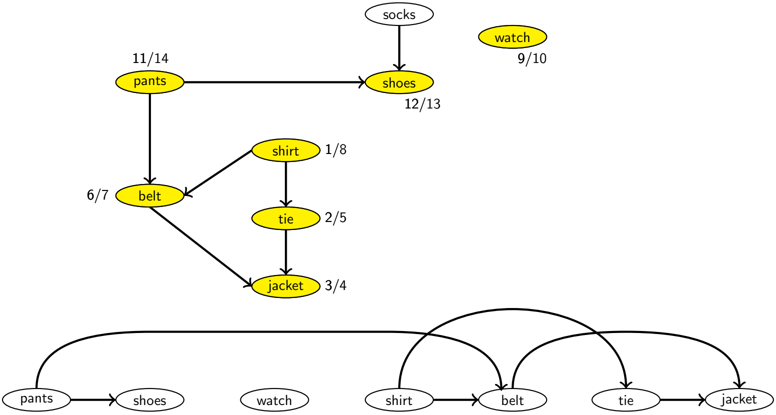

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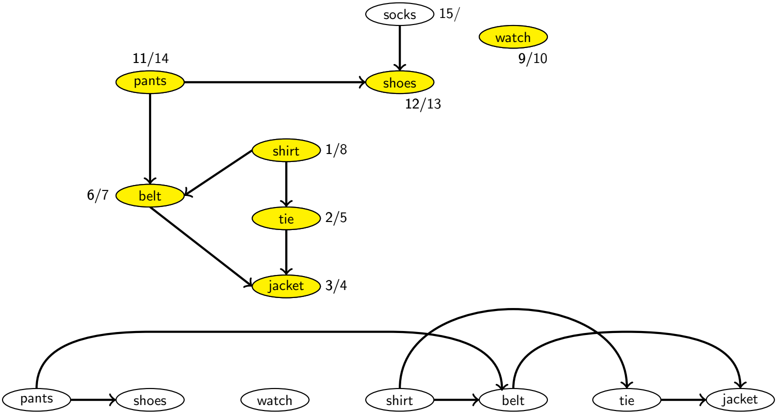

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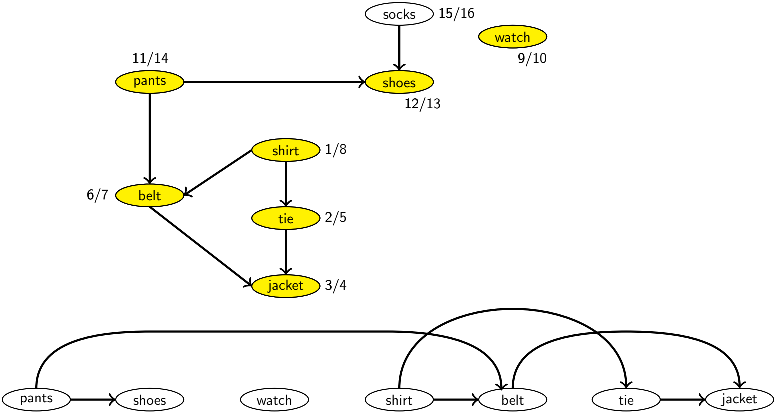

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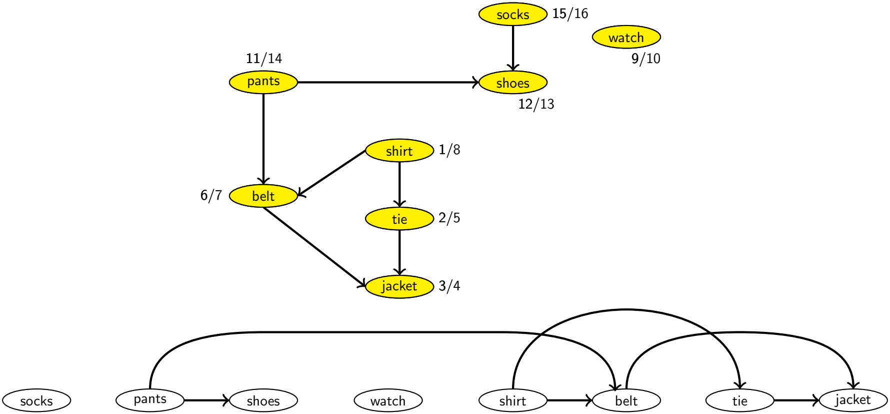

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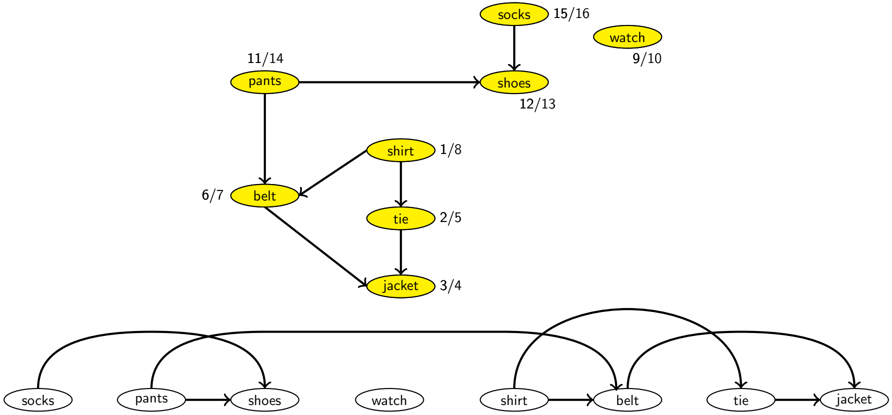

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Acknowledgement

- Introduction to Algorithms by Thomas H.Cormen,Charles E.Leiserson,Ronald L.Rivest and Clifford Stein.

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Conclusion