breadth-first search

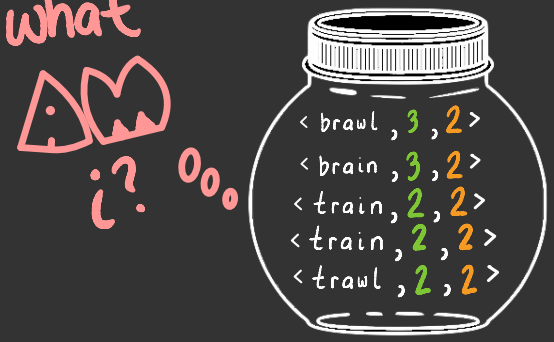
14 sept 2022

CSCI 373

SEARCH$(M = (Q, \Sigma, \Delta, q_0, F, w), H)$:

- container = new Container()
- container.put($\langle q_0, 0, H(q_0) \rangle$)
- repeat:
  - if container.empty() then return ∞
  - n = container.get()
  - if $q(n) \in F$ then return $g(n)$
  - let $\text{successors}_{M,H}(n) = \{ \langle q', g(n) + w(q(n), \sigma, q'), H(q') \rangle \mid (q(n), \sigma, q') \in \Delta \}$
  - for $n' \in \text{successors}_{M,H}(n)$:
    container.put(n')

"visit" a node



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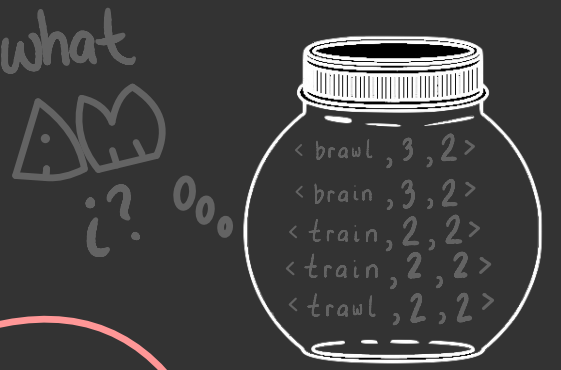
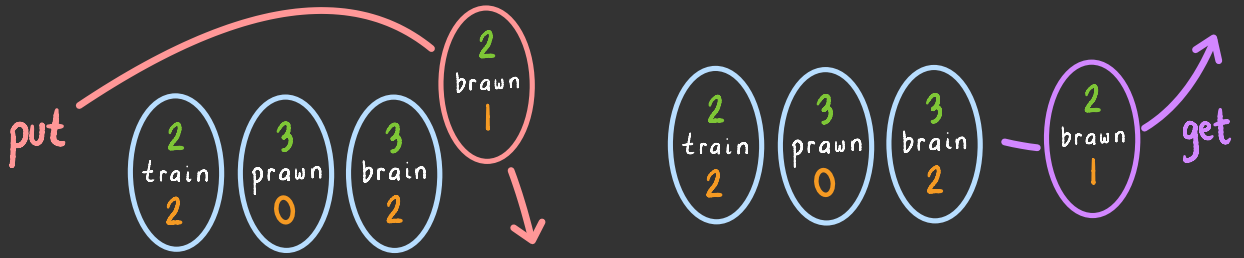


a container is a data structure that supports these methods

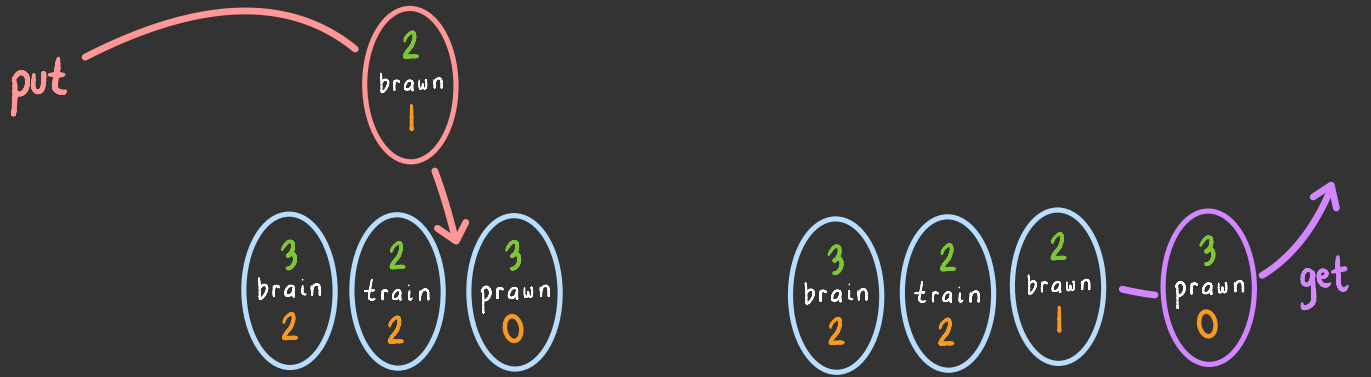
example containers

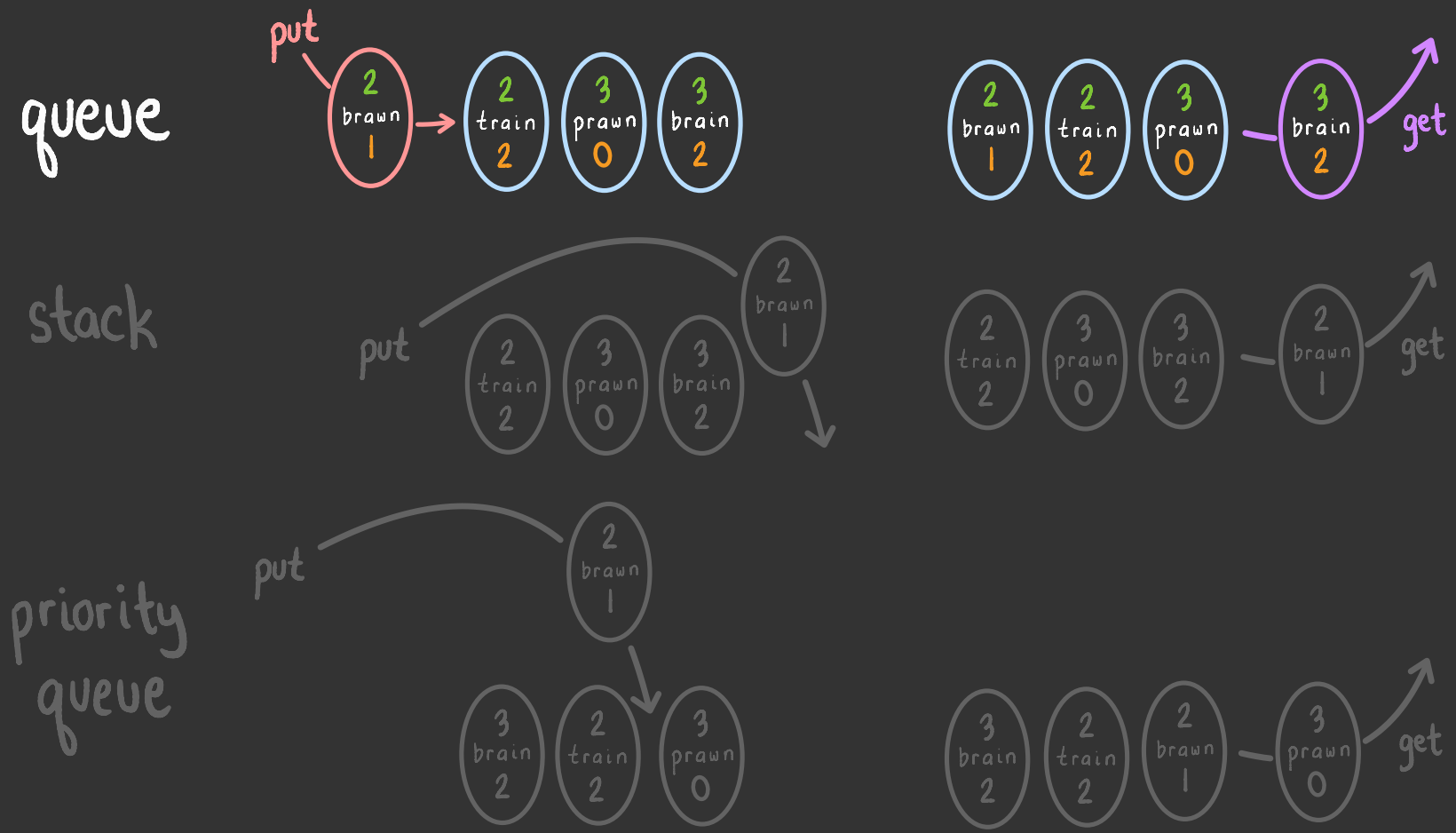
queue

stack



priority queue




queue
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brawn
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priority queue
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brain
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train
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2
brawn
1
3
prawn
0
get

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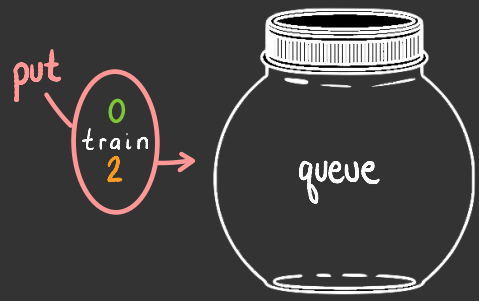
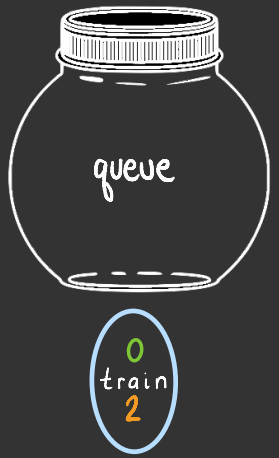
"visit" a node

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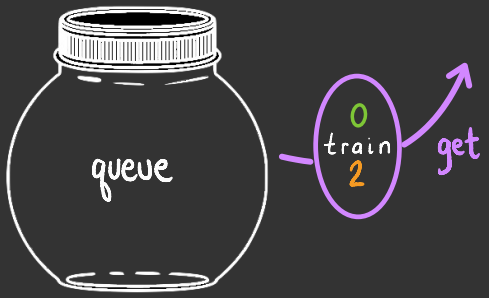
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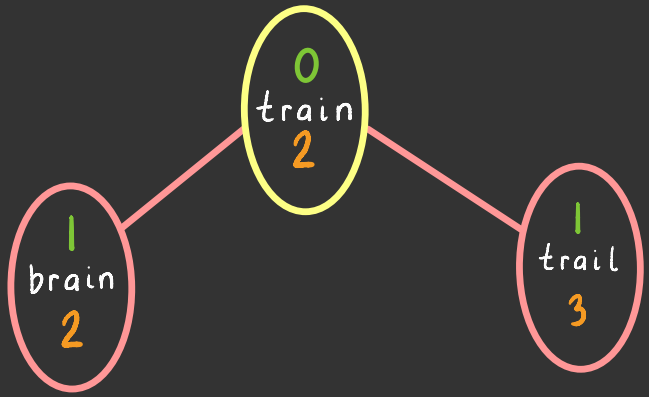
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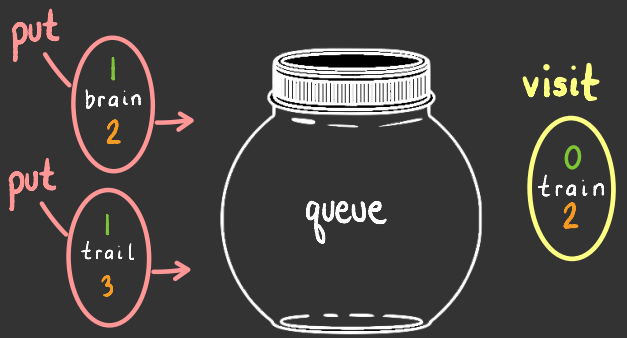
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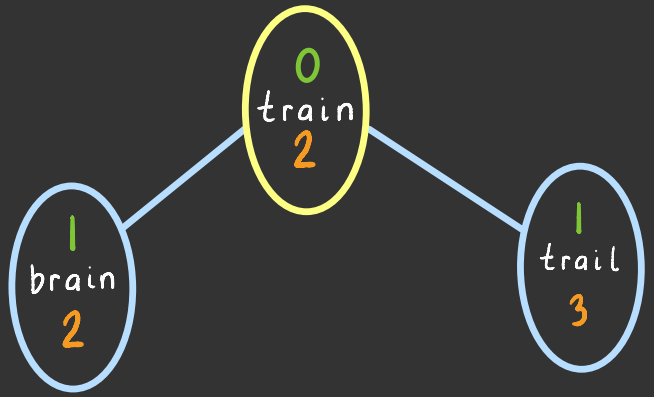
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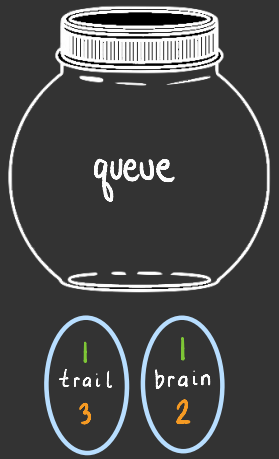
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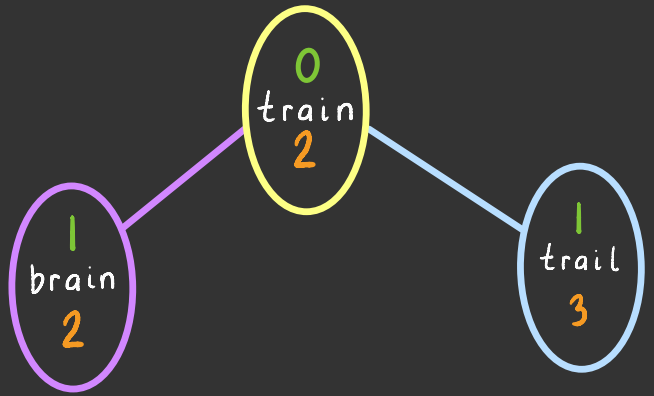
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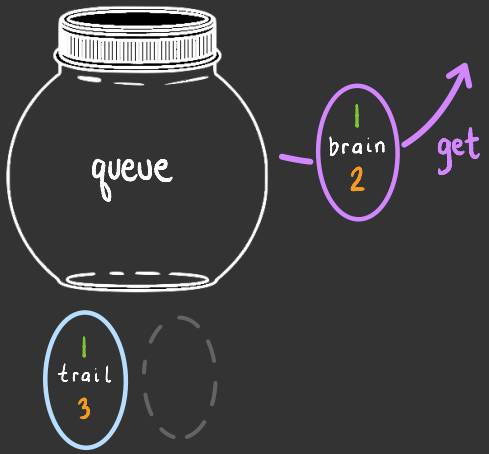
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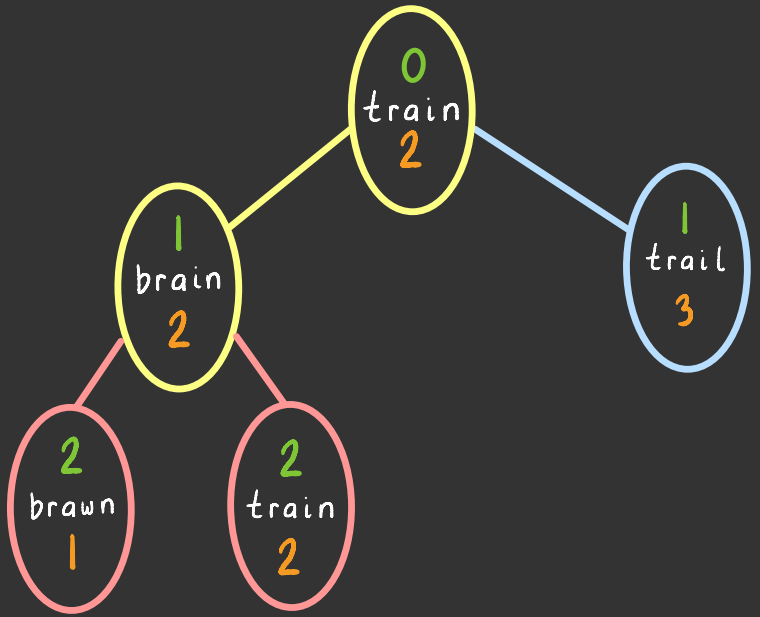
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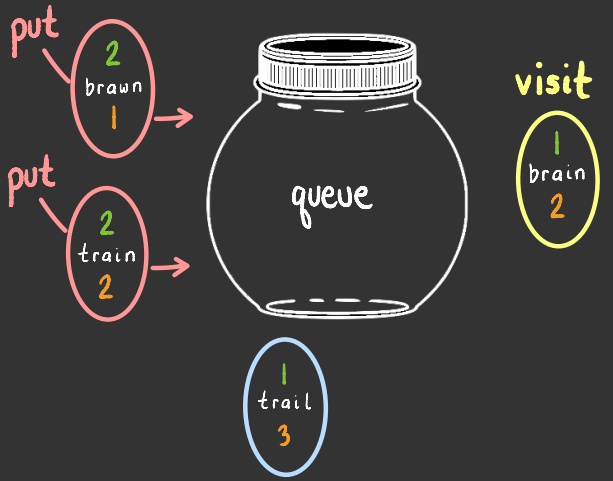
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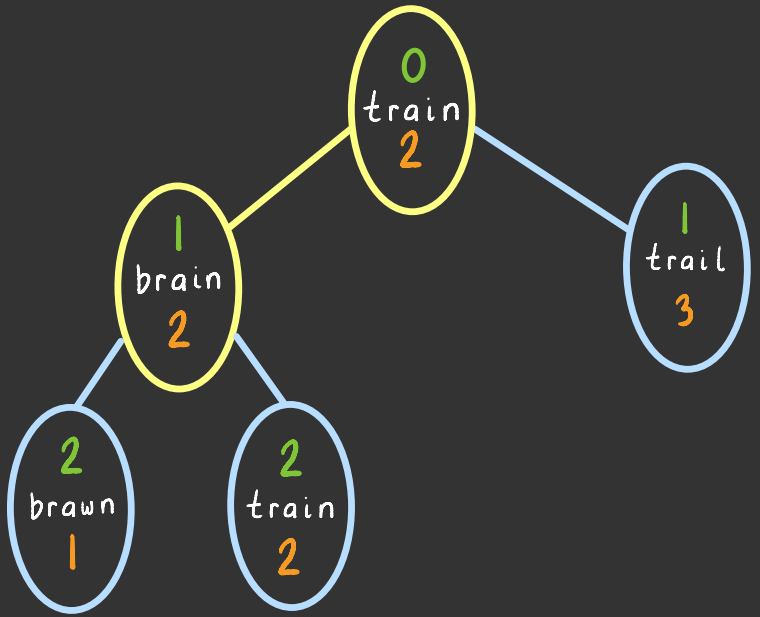
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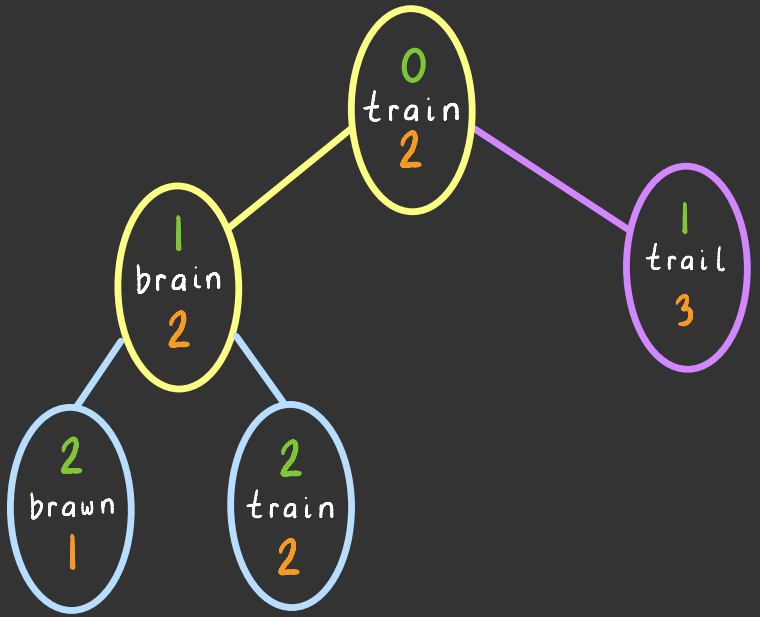
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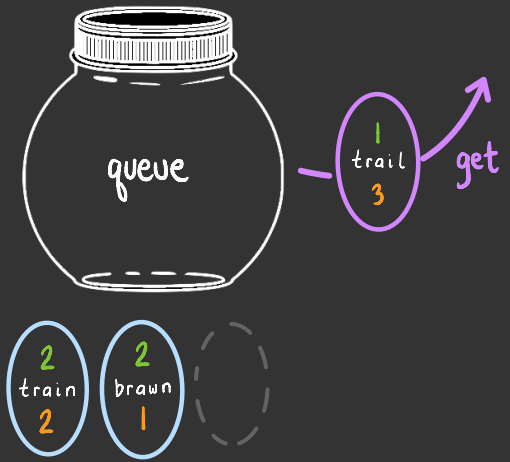
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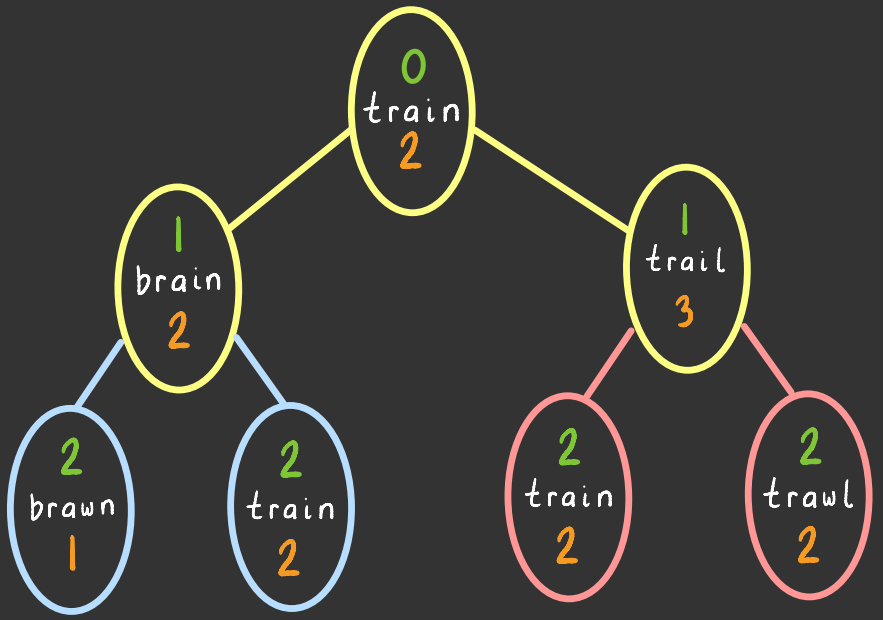
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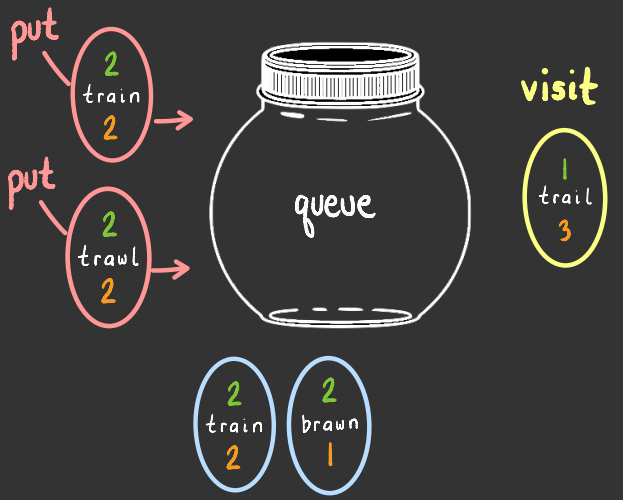
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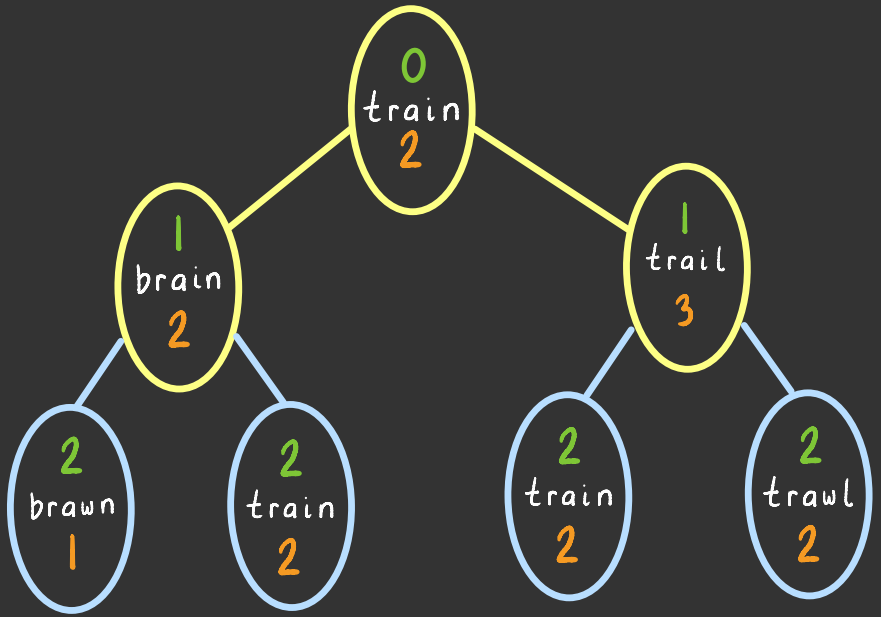
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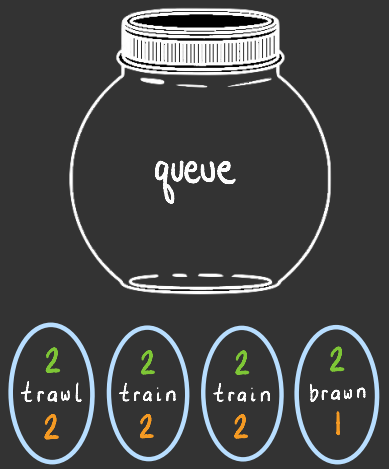
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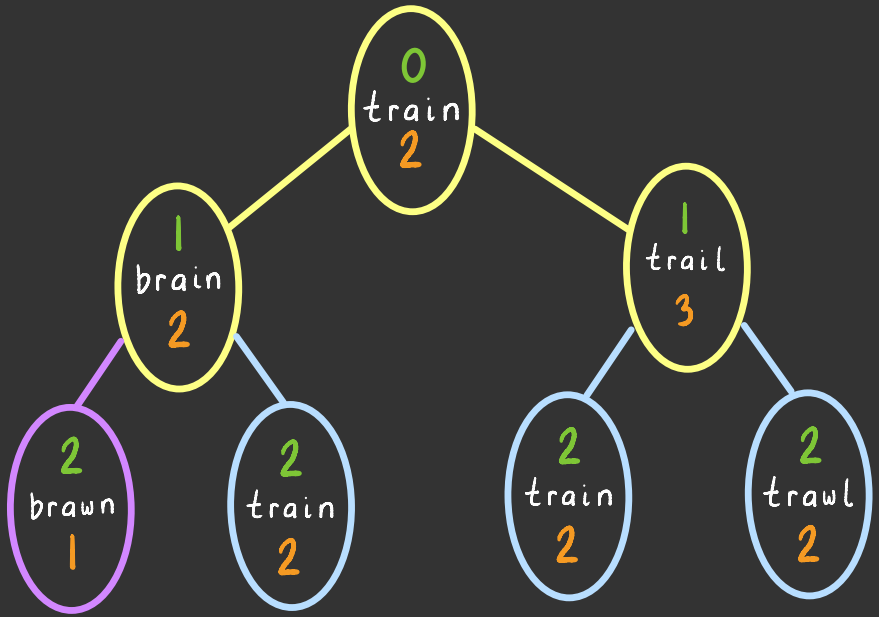
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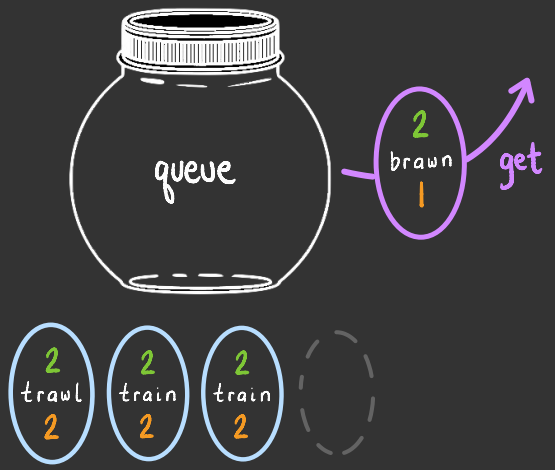
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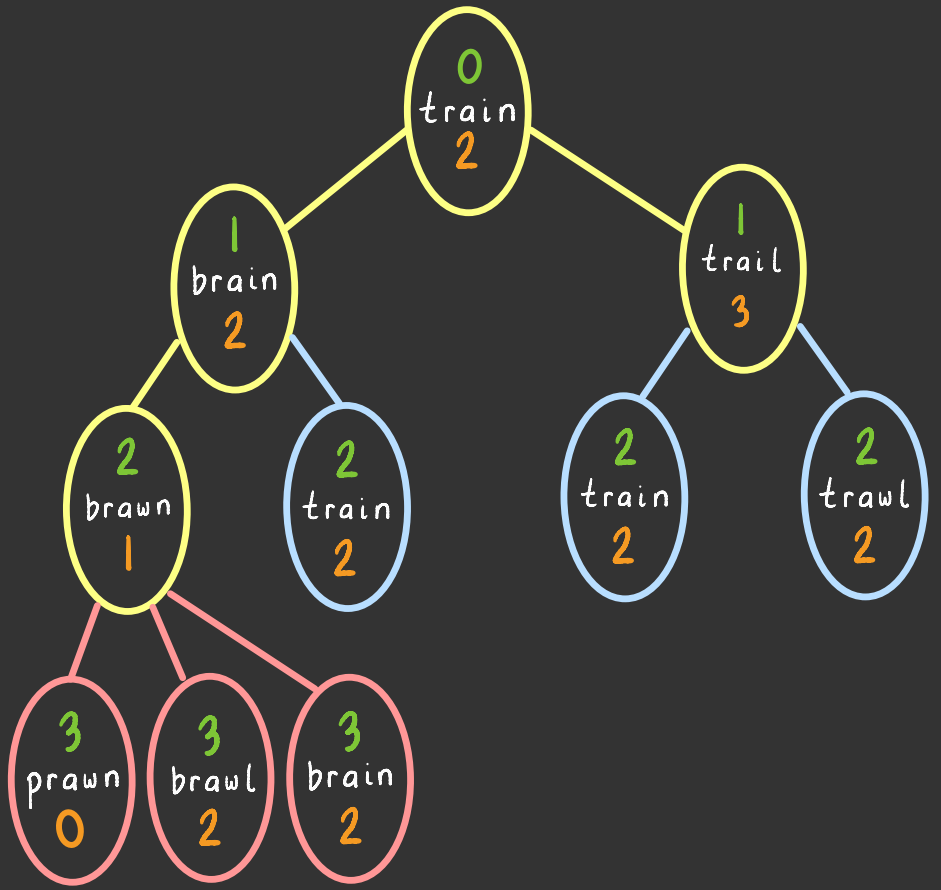
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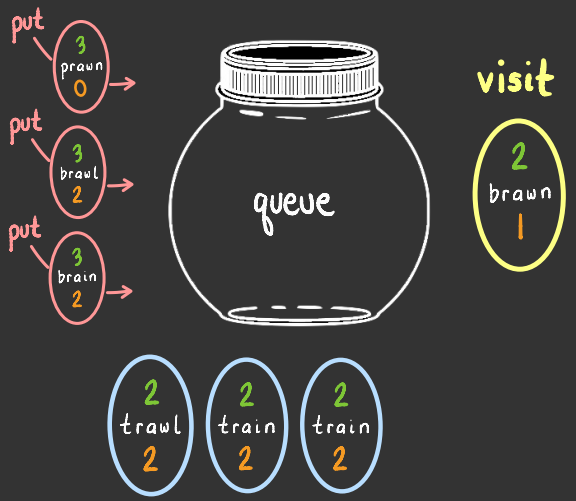
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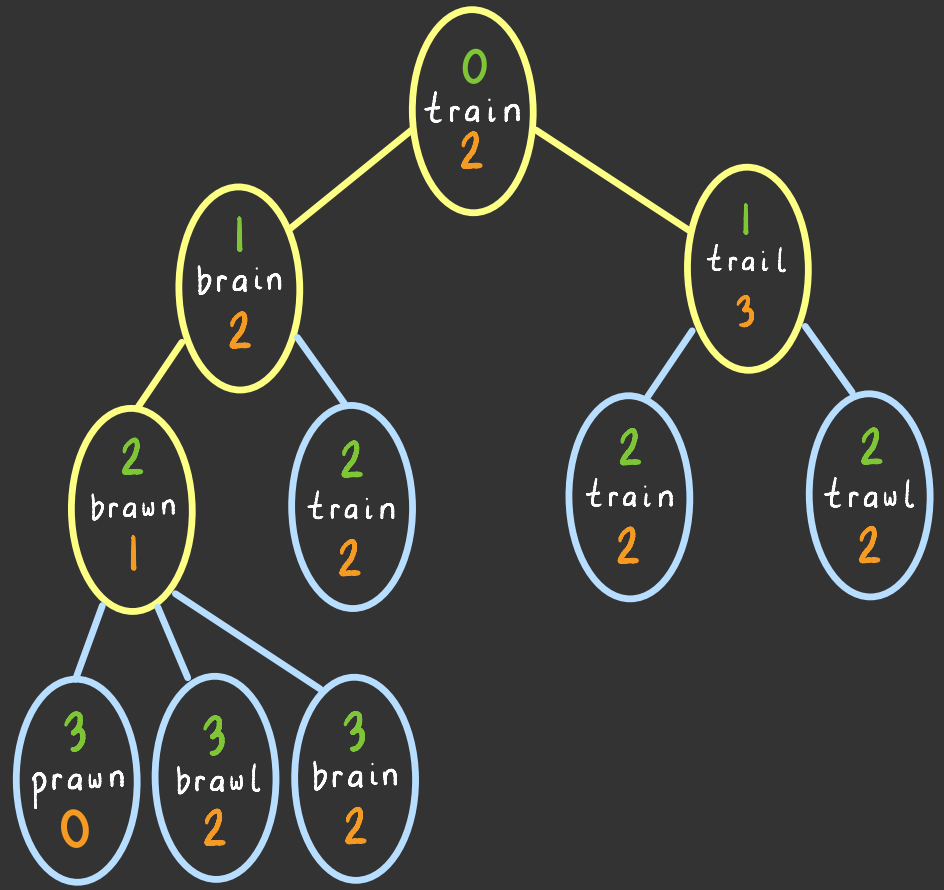
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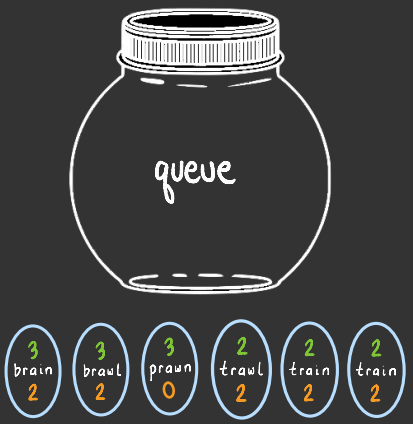
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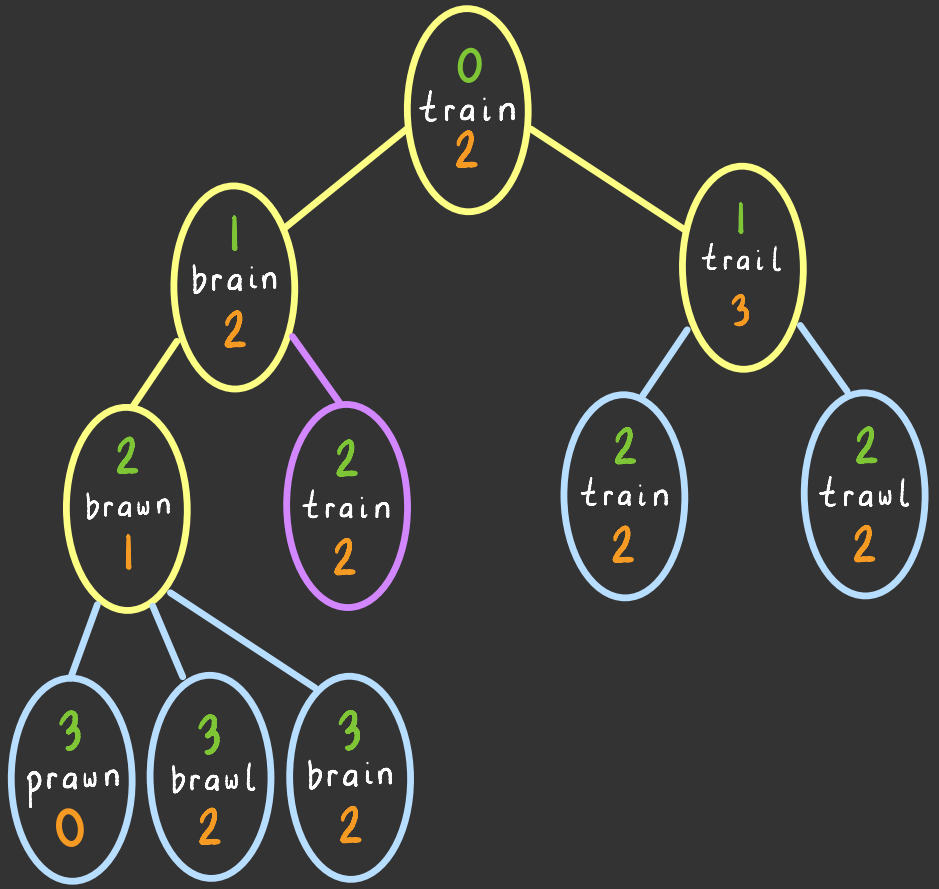
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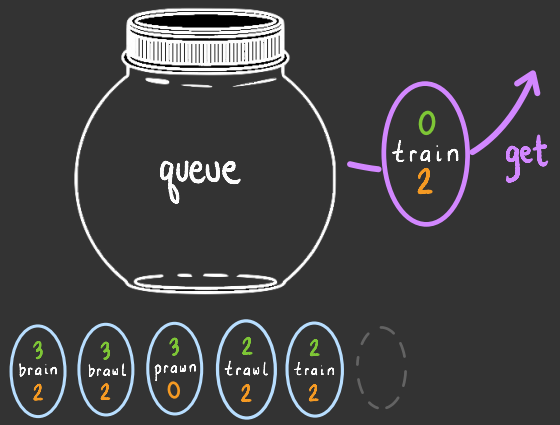
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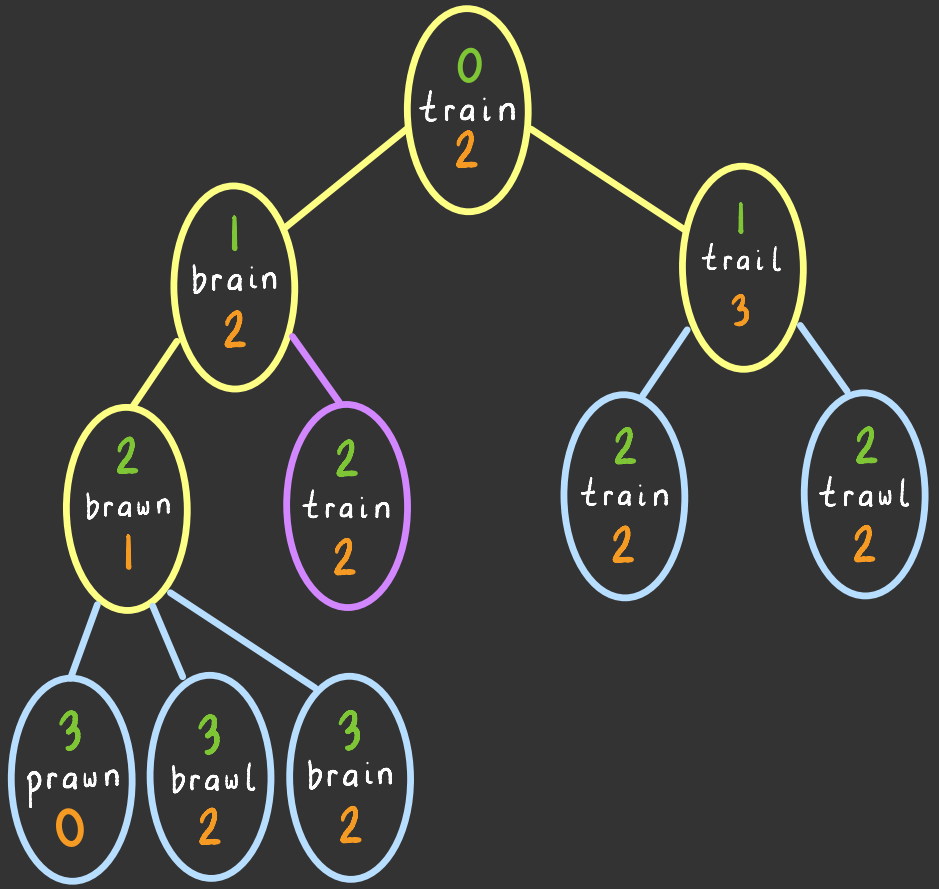
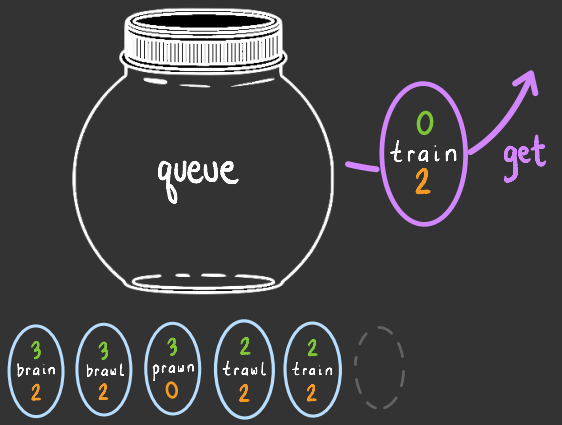
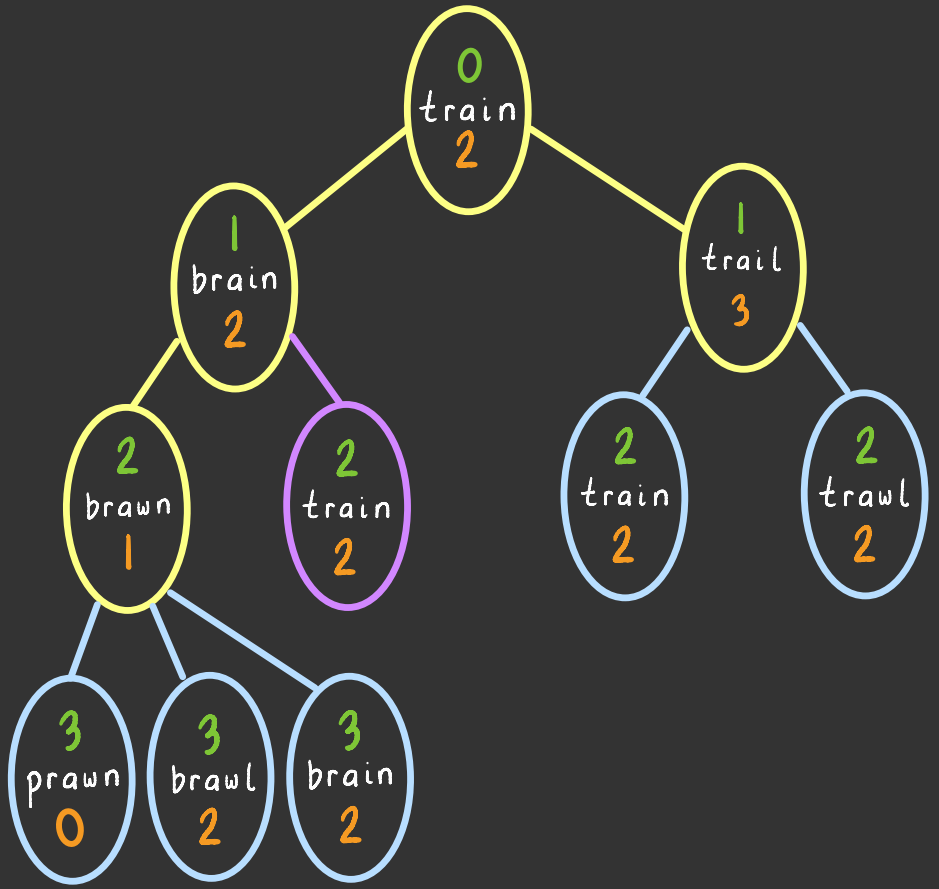
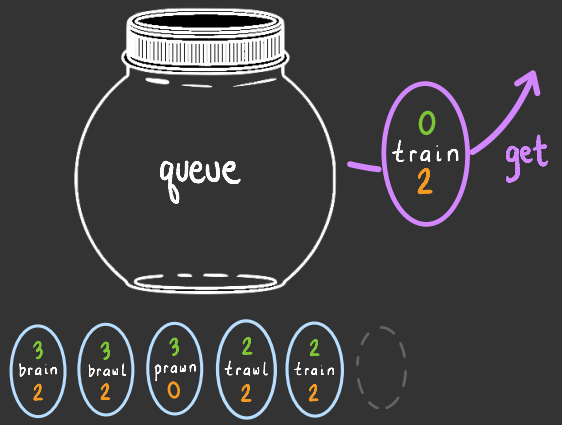




in what order are the nodes visited?

your answer here





in what order are the nodes visited?

if $j < k$, then every node at search depth j is visited before any node at search depth k

SEARCH($M = (Q, \Sigma, \Delta, q_0, F, w)$, H):

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  - for $n' \in \text{successors}_{M,H}(n)$:
    container.put(n')

"visit" a node

if we use a 

as the container, the algorithm is called breadth-first search, abbreviated BFS