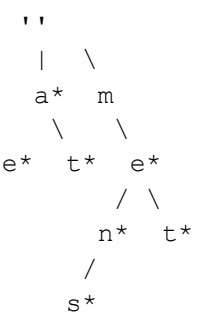
Problem: Implement a trie with find, insert, remove, and list_words methods.

Constraints

- Can we assume we are working with strings?
  - Yes
- Are the strings in ASCII?
  - Yes
- Should `find` only match exact words with a terminating character?
  - Yes
- Should `list_words` only return words with a terminating character?
  - Yes
- Can we assume this fits memory?
  - Yes

Test Cases
root node is denoted by ''



find

* Find on an empty trie
* Find non-matching
* Find matching

insert

* Insert on empty trie
* Insert to make a leaf terminator char
* Insert to extend an existing terminator char

remove

* Remove me
* Remove mens
* Remove a
* Remove has

list_words

* List empty
* List general case

Algorithm

find

- Set node to the root
- For each char in the input word
    - Check the current node's children to see if it contains the char
        - If a child has the char, set node to the child
        - Else, return None
- Return the last child node if it has a terminator, else None

Complexity:

- Time: O(m), where m is the length of the word
- Space: O(h) for the recursion depth (tree height), or O(1) if using an iterative approach

insert

- set node to the root
- For each char in the input word
    - Check the current node's children to see if it contains the char
        - If a child has the char, set node to the child
        - Else, insert a new node with the char
            - Update children and parents
- Set the last node as a terminating node

Complexity:

- Time: O(m), where m is the length of the word
- Space: O(h) for the recursion depth (tree height), or O(1) if using an iterative approach

remove

- Determine the matching terminating node by calling the find method
- If the matching node has children, remove the terminator to prevent orphaning its children
- Set the parent node to the matching node's parent
- We'll be looping up the parent chain to propagate the delete
- While the parent is valid

    - If the node has children
        - Return to prevent orphaning its remaining children
    - If the node is a terminating node and it isn't the original matching node from the find call
        - Return to prevent deleting this additional valid word
    - Remove the parent node's child entry matching the node
    - Set the node to the parent
    - Set the parent to the parent's parent

Complexity:

- Time: O(m+h), where where m is the length of the word and h is the tree height
- Space: O(h) for the recursion depth (tree height), or O(1) if using an iterative approach

list_words

- Do a pre-order traversal, passing down the current word
    - When you reach a terminating node, add it to the list of results

Complexity:

- Time: O(n)
- Space: O(h) for the recursion depth (tree height), or O(1) if using an iterative approach