Work with your neighbor. (This will be graded for participation only.)

1. Below is a recursive function `zip(a,b)` where `a` and `b` are lists of any type. The function `zip(a,b)` returns a list of 2-tuples where the first tuple is `(a[0],b[0]))`, the second is `(a[1],b[1])`, etc. Zipping stops when the shorter list runs out. For example, if `len(a)` is `3` and `len(b)` is `2`, then `len(zip(a,b))` is `2`.

   Example calls:

```
zip([1,2,3],[4,5,6])        →   [ (1,4), (2,5), (3, 6) ]

zip([1,2,3,4,5],['a','b','c','d','e']) →
           [(1, 'a'), (2, 'b'), (3, 'c'), (4, 'd'), (5, 'e')]

zip([2,4,6], ['fall','leaves'] → [(2, 'fall'), (4, 'leaves')]

zip([], [4,5,6])             → []
```

```
def zip(a,b):
    if a == [] or b == []:
        return []
    else:
        return list((a[0], b[0])) + zip(a[1:], b[1:])
```

   Now let's rewrite `zip` using a helper function. We will call `zip(a,b)` as before, but the new version will call a helper function `zip_helper(a,b,result)` that takes an additional list argument called `result`.

   Before each recursive call, `zip_helper(a,b,result)` will modify `result` by concatenating the new tuple of `(a[0], b[0])` to `result` and then pass the modified `result` list to the recursive call.

```
def zip(a,b):
    # call the helper function with an empty list
    return zip_helper(a,b,[])

def zip_helper(a,b,result):
    # your code goes here
```

2. Tree terminology:

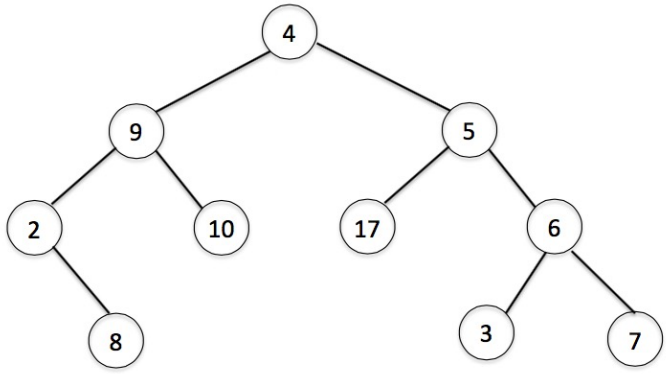
   sibling – a set of nodes that all share the same parent

   degree – the number of children a node has

   edge/path – the line that connects a parent to its child

   level – the number of "edges" from the root to a node

   height – the maximum of the levels of the nodes in the tree (or, the length of the longest path in the tree)



   What are the leaves of this tree? _____

   Which nodes have multiple children? _____

   Which nodes have multiple parents? _____

   What is the root of this tree? _____

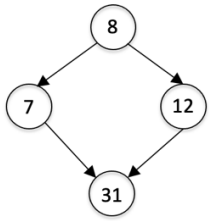
   Which nodes are siblings of 10? _____

   What is the level of 6? _____

   What is the height of this tree? _____

3. Draw the tree that represents the main folders (directories) and files on your computer.

4. Is the following a tree? Discuss with your neighbors. Explain why or why not.



5. Draw a binary tree with 7 nodes. Make it as wide as you can, so that the tree is as short as possible.

   How many nodes are at each level?

   How many nodes would you need to add in order to fill up another level?

6. Using the same 7 node values as the tree above, draw another tree but make it has tall as possible.