1. Draw box-and-pointer diagrams for the following:
   >>> a = [1, 2, 3]
   >>> a

   >>> a[2]

   >>> b = a
   >>> a = a + [4, 5]
   >>> a

   >>> b

   >>> c = a
   >>> a = [4, 5]
   >>> a

   >>> c

   >>> d = c[0:2]
   >>> c[0] = 9
   >>> d
2. Draw the environment diagram that results from running the code.

```python
def reverse(lst):
    if len(lst) <= 1:
        return lst
    return reverse(lst[1:]) + [lst[0]]

lst = [1, [2, 3], 4]
rev = reverse(lst)
```
3. Write a function that takes in a list `nums` and returns a new list with only the primes from `nums`. Assume that `is_prime(n)` is defined. You may use a `while` loop, a `for` loop, or a list comprehension.

```python
def all_primes(nums):
```

4. Write a function that takes in a list of positive integers and outputs a list of lists where the i-th list contains the integers from 0 up to, but not including, the i-th element of the input list.

```python
def list_of_lists(lst):
    
    >>> list_of_lists([1, 2, 3])
    [[0], [0, 1], [0, 1, 2]]

    >>> list_of_lists([1])
    [[0]]

    >>> list_of_lists([])
    []
    
```
**Things to remember:**
```python
def tree(label, branches=[]):
    return [label] + [branches]
def label(tree):
    return tree[0]
def branches(tree):
    return tree[1:] #returns a list of branches
```

As shown above, the tree constructor takes in a label and a list of branches (which are themselves trees).

```
tree(4,
    [tree(5, []),
     tree(2,
         [tree(2, []),
          tree(1, [])]),
     tree(1, []),
     tree(8,
         [tree(4, [])]))
```

The above expression constructs a tree that looks like this:
```
        4
       /|
      / |\
     5 2 1
    /   |
   2    |
   |     |
   |      |
   |      4
   |      /
   |     1
   |    /  
```

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1. Construct the following tree and save it to the variable \( t \).

![Tree Diagram]

2. What would this output? If the output is a tree, write the expression that would create that tree (i.e. \( \text{tree}(\ldots, \ldots) \))

```python
>>> label(t)
```

```python
>>> branches(t)[2]
```

```python
>>> branches(branches(t)[2])[0]
```

3. Write the Python expression to return the integer 2 from \( t \).

4. Write the function `sum_of_nodes` which takes in a tree and outputs the sum of all the elements in the tree.

```python
def sum_of_nodes(t):
    """
    >>> t = tree(...) # Tree from question 2.
    >>> sum_of_nodes(t) # 9 + 2 + 4 + 4 + 1 + 7 + 3 = 30
    30
    """
```