

RECURSION AND TREE RECURSION

CS 61A GROUP MENTORING

July 2, 2018

1 Recursion

Every Recursive function has three things.

1. One or more base cases
2. One or more ways to break the problem down into a smaller problem
 - E.g. Given a number as input, we need to break it down into a smaller number
3. Solve the smaller problem recursively; from that, form a solution to the original problem

1. What is wrong with the following function? How can we fix it?

```
def factorial(n):  
    return n * factorial(n)
```

2. Complete the definition for `all_true`, which takes in a list `lst` and returns `True` if there are no `False`-y values in the list and `False` otherwise. Make sure that your implementation is recursive.

```
def all_true(lst):  
    """  
    >>> all_true([True, 1, "True"])  
    True  
    >>> all_true([1, 0, 1])  
    False  
    >>> all_true([])  
    True  
    """
```

3. Write a function `is_sorted` that takes in an integer `n` and returns `true` if the digits of that number are nondecreasing from right to left.

```
def is_sorted(n):  
    """  
    >>> is_sorted(2)  
    True  
    >>> is_sorted(22222)  
    True  
    >>> is_sorted(9876543210)  
    True  
    >>> is_sorted(9087654321)  
    False  
    """
```

4. Draw the environment diagram that results from running the code.

```
def bar(f, x):  
    if x == 1:  
        return f(x)  
    else:  
        return f(x) + bar(f, x - 1)
```

```
f = 4  
bar(lambda x: x + f, 2)
```

5. Write a function that takes as input a number, n , and a list of numbers, lst , and returns true if we can find a subset of lst that sums up to n .

```
def add_up(n, lst):  
    """  
    >>> add_up(10, [1, 2, 3, 4, 5])  
    True  
    >>> add_up(8, [2, 1, 5, 4, 3])  
    True  
    >>> add_up(-1, [1, 2, 3, 4, 5])  
    False  
    >>> add_up(100, [1, 2, 3, 4, 5])  
    False  
    """  
    if _____:  
        return True  
  
    if lst == []:  
        _____  
  
    else:  
        first, rest = _____,  
        _____  
        return _____
```