CSC-122: Data Structures and Algorithms
Written Assignment 3
Spring 2024

Question 1. Every Fall has a Rise

Line #	Code
1	`def f(n):`
2	`    if n == 0:`
3	`        print("Base Case 🔄 ")`
4	`    else:`
5	`        print("Descending towards  base case ⬇️")`
6	`        f(n-1) # recursive call`
7	`        print("Ascending away from base case ⬆️")`

Use the function above to fill the **trace table** below for the function call `f(5)`

Feel free to *add/remove/edit rows or columns* as you deem fit.

Line #	n	Print statement on screen

Question 2. Head-recursion

Line #	Code
1	`def head(n):`
2	`    if n == 0:`
3	`        print("Lift off!")`
4	`    else:`
5	`        head(n-1) # recursive call`
6	`        print("🚀")`

Use the function above to fill the **trace table** below for the function call:

`head(5)`

Feel free to *add/remove/edit rows or columns* as you deem fit.

Line #	n	Print statement on screen

Question 3. Tail-recursion

Line #	Code
1	`def tail(n):`
2	`    if n == 0:`
3	`        print("Lift off!")`
4	`    else:`
5	`        print("T-", n)`
6	`        tail(n-1) # recursive call`

Use the function above to fill the **trace table** below for the function call:

```
tail(5)
```

Feel free to *add/remove/edit rows or columns* as you deem fit.

Line #	n	Print statement on screen

Question 4. Head-recursive length

Line #	Code
1	`def head_len(data):`
2	`    if data == []:`
3	`        return 0`
4	`    else:`
5	`        subdata = data[:-1]`
6	`        sub_len = head_len(subdata)`
7	`        sub_len = sub_len + 1`
8	`        return sub_len`

Use the function above to fill the **trace table** below for the function call:

```
head_len([3, 1, 4, 1])
```

Feel free to *add/remove/edit rows or columns* as you deem fit.

Line #	data	subdata	sub_len

Question 5. Tail-recursive length

Line #	Code
1	`def tail_len(data, acc=0):`
2	`    if data == []:`
3	`        return acc`
4	`    else:`
5	`        subdata = data[:-1]`
6	`        acc = acc + 1`
7	`        return tail_len(subdata, acc)`

Use the function above to fill the **trace table** below for the function call:

```
tail_len([1, 9, 8, 4])
```

Feel free to *add/remove/edit rows or columns* as you deem fit.

Line #	data	subdata	acc

Question 6.

Pick at least one question from Programming Assignment 4.1. that you have written the code for but still find confusing or challenging and make a trace table for it, similar to ones in Questions 1 - 5.