# CSCA48 Final Exam

Fall 2020

Part 1

- You do not need to worry about bad inputs. All function inputs will be sensible and of the correct type.
- You will not be directly marked on your documentation but commenting may allow us to give part marks for otherwise incorrect solutions.
- Once the test begins, you may not approach or touch your computer or any other electronic device **in any way** unless specifically instructed to do so by an invigilator.
- If you have a question, simply **raise your hand** and you will be taken to a breakout room where you can talk to an instructor.
- Please **leave your volume and microphone on**, but at a low level. This way, this limits the background noise in addition to allowing you to hear us if necessary.
- This test consists of 6 questions across 2 parts. You will have 60 minutes for each part, with a short break in the middle.

Question #1 (5 marks)

Draw the memory model representing the following tree.

```
struct Node {
    int value;
    struct node* left;
    struct node* right;
}Node;
```
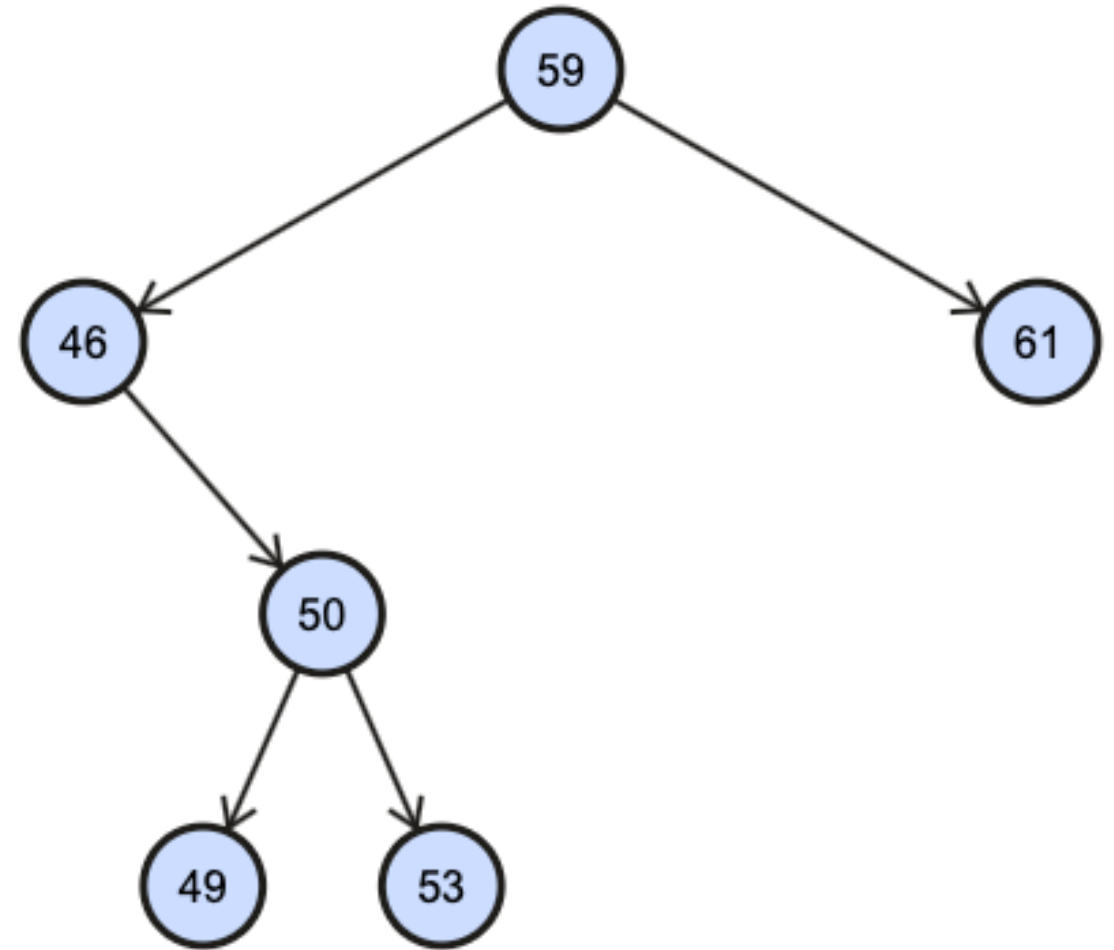
Question #2 (15 marks)

Consider a linked list structure where every node has a pointer to the next item in the list, as well as a pointer to the first item in the list with the same value. If this is the first node in the list with that value, then the pointer will be NULL. Refer to the image below for an example.
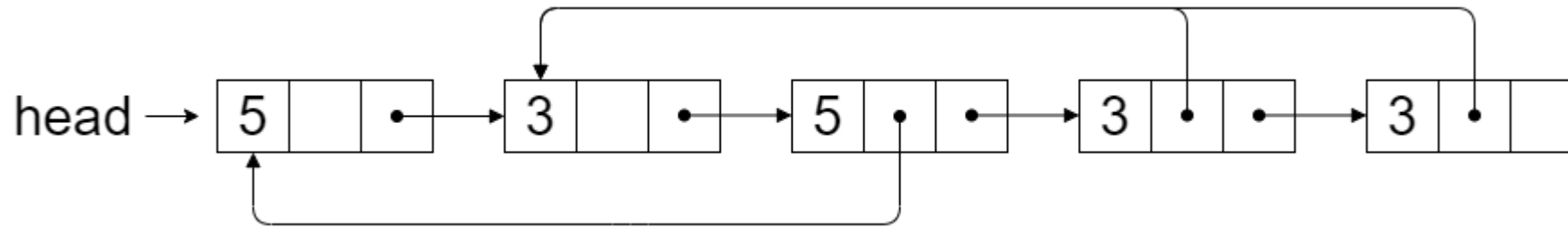
Write the following functions:

`insert(Node *head, int x)` insert a new node with the value x into the list

`delete(Node *head, int x)` delete the first occurrence of x in this list

Question #3 (10 marks)

Write the output of the following function:

```c
int my_function(int x) {
    int r;
    if (x < 1) {
        printf("DONE %d\n", x);
        r = 0;
    } else {
        r = my_function(x - 1);
        if (r < 5) {
            r = r + 5;
            printf("SMALL %d %d\n", x, r);
        } else {
            r = r - 7;
            printf("BIG %d %d\n", x, r);
        }
    }
    return r;
}
```

```c
int main() {
    printf("VALUE = %d\n", my_function(4));
}
```