

601.220 Intermediate Programming

Summer 2022, Meeting 11 (July 1st)

Today's agenda

- Review of exercises 17 and 18
- Work on midterm project

Reminders/Announcements

- Midterm project (code) is due by 11pm **this evening**
 - Only one team member needs to submit
- Midterm project individual contributions survey: complete by 11pm on **Sunday, July 3rd**
- Midterm exam: in class on **Wednesday, July 6th**
 - Exam details:
 - *Synchronous*, i.e., you *must* attend the Zoom meeting
 - You will work in a breakout room with your camera on
 - Access to internet resources, editor/compiler, etc. is allowed
 - Communication with or help from other people is prohibited
 - Review session: details TBA, but probably 5–6 pm on Tuesday, July 5th

Exercise 17 review

Node data type:

```
typedef struct Node_ {  
    char data;  
    struct Node_ *next;  
} Node;
```

The typedef allows us to refer to the “struct Node_” type as just “Node”.

Exercise 17 review

```
// length function, while loop version
int length(const Node *n) {
    int count = 0;
    while (n != NULL) {
        count++;
        n = n->next;
    }
    return count;
}
```

Note: `const Node *n` means “`n` is a pointer to `const Node`”.
Function is saying that it won't modify the object that `n` points to.

Exercise 17 review

```
// length function, recursive version
int length(const Node *n) {
    if (n == NULL) {
        return 0;
    }
    return 1 + length(n->next);
}
```

A linked list can be considered as a *recursive* data structure.
Assume *n* is a pointer to a linked list node. Cases:

- ❶ *n* is NULL: the list is empty
- ❷ *n* points to a node: nonempty list, *n->next* points to a smaller list (with one fewer nodes than the overall list)

Exercise 17 review

```
void add_after(Node *n, char value) {  
    const Node *node = malloc(sizeof(Node));  
    node->data = value;  
    node->next = n->next;  
    n->next = node;  
}
```

Trace:

Exercise 17 review

```
void reverse_print(const Struct Node *n) {  
    // Pseudo code:  
    // if (n is the empty list)  
    //     do nothing, return  
    // else  
    //     print the rest of the list in reverse order  
    //     print the value of the first element  
}
```


Exercise 18 review

```
void remove_after(Node *node) {  
    Node *removed = node->next;  
    if (removed == NULL) { return '?'; }  
  
    node->next = removed->next;  
    char result = removed->data;  
    free(removed);  
    return result;  
}
```

Trace:

Exercise 18 review

```
char remove_front(Node **list_ptr) {  
    if (*list_ptr == NULL) { return '?'; }  
  
    Node *removed = *list_ptr;  
    *list_ptr = removed->next;  
    char result = removed->data;  
    free(removed);  
    return result;  
}
```

Trace:

Exercise 18 review

```
void remove_all(Node **list_ptr, char val) {  
    if (*list_ptr == NULL) return; // reached end of list?  
  
    if ((*list_ptr)->data == val) {  
        // remove first element  
    } else {  
        // skip first element  
    }  
    remove_all(list_ptr, val); // remove remaining occurrences  
}
```

Exercise 18 review

```
Node *insert(Node **list_ptr, char val) {  
    if (*list_ptr == NULL || val < (*list_ptr)->data) {  
        add_front(list_ptr, val);  
        return *list_ptr;  
    } else {  
        // recursion  
  
    }  
}
```

Work on midterm project!

- You can also ask questions about exercises and/or exam review material
- Breakout rooms 1–10 are “social”
- Use Slack to let us know if you have a question
 - This is preferred: the CAs have no way of seeing the Zoom “ask for help” feature