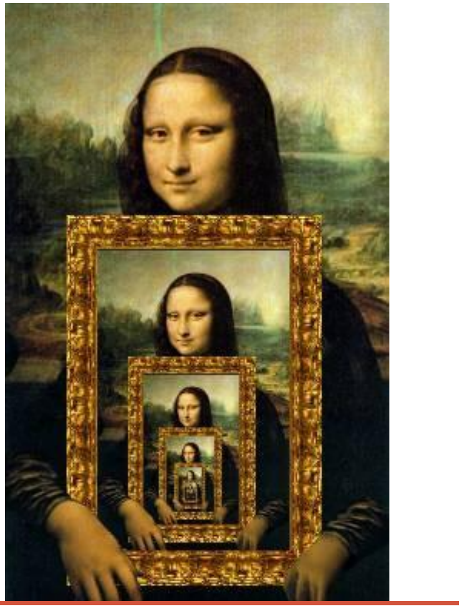
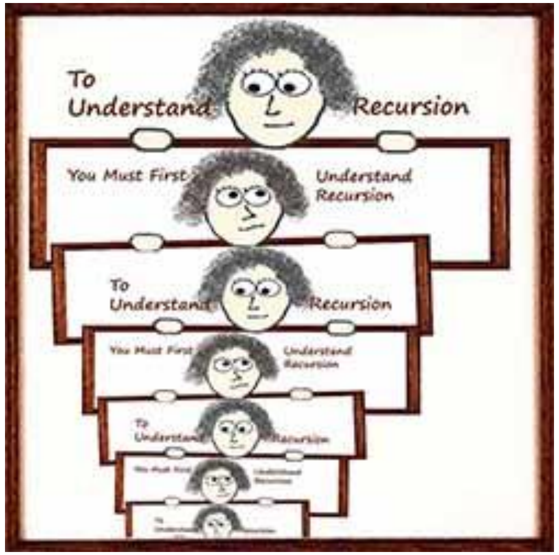
RECURSION AND FINAL REVIEW



Problem Solving with Computers-I

https://ucsb-cs16-wi17.github.io/


To Understand Recursion
You Must First Understand Recursion
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To Understand Recursion

Final Exam!

- Thursday (03/23) 4pm to 7pm NH 1006 and CHEM 1171
- Assigned seating will be posted on Piazza
- Everything we have covered so far is on the exam
- Duration: **3 hours**
- Closed book: no calculators, no phones, no computers
- Only 1 sheet (***double***-sided is ok) of written notes
  - Must be no bigger than 8.5” x 11”
  - You have to turn it in with the exam

How do you feel after the last two labs ?

A

B

C

D

E

Lab 08: When should you use a helper function?

```
bool isPalindrome(const char *s1) //recursive
```

deTartraTED

WasItACarOrACatISaw

Do we need a helper function for a recursive implementation of the above function?

A. Yes
B. No

Steps towards a recursive solution:

1. Identify the recursive structure in your input and or problem
2. Write the recursive step in plain English
3. Do you need a helper function?

Lab 08: Thinking recursively!

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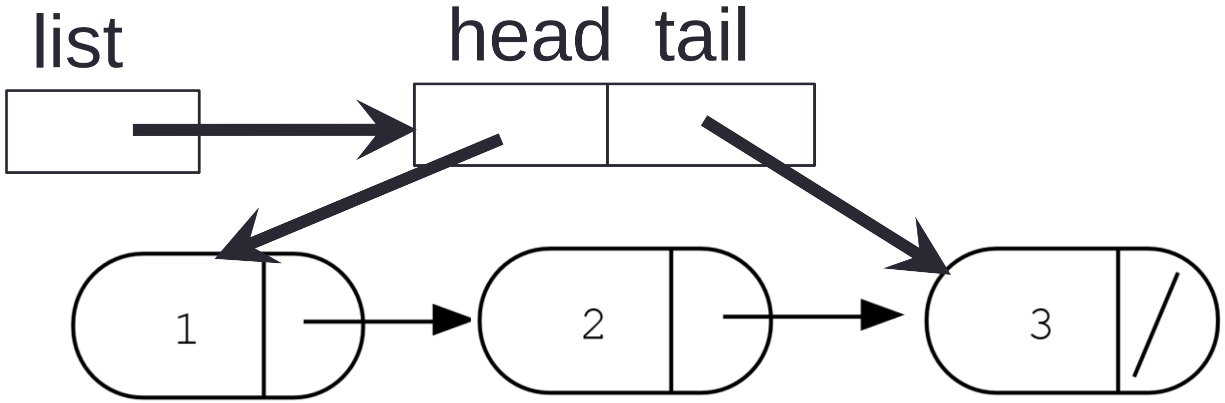
WasItACarOrACatISaw

```
bool isPalindromeHelper(const char *s1, int len) //recursive
```

Steps towards a recursive solution:

1. Identify the recursive structure in your input and or problem
2. Write the recursive step in plain English
3. Do you need a helper function?
4. Implement (and test) the base case
5. Believe that you already have a correct implementation of the function that works on all smaller size inputs
6. Implement (and test) the recursive case

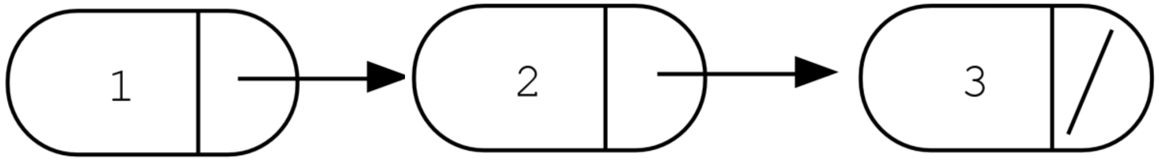
Recursion on lists: compute the sum of all elements



```
int sum(LinkedList *list)
```

Recall the steps towards a recursive solution

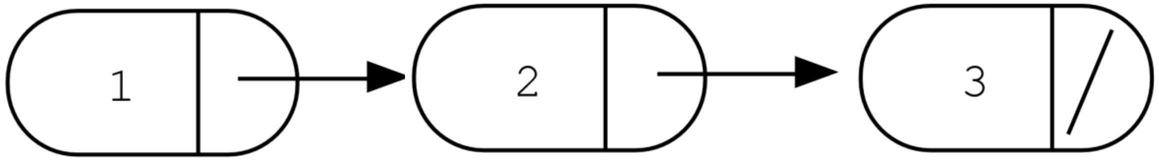
Recursion on lists: compute the sum of all elements



```
int sumHelper(Node *head)
```

1. Identify the recursive structure in your input and or problem
2. Write the recursive step in plain English
3. Do you need a helper function?
4. Implement (and test) the base case
5. **Believe that you already have a correct implementation of the function that works on all smaller size inputs**
6. Implement (and test) the recursive case

Recursion on lists: compute the sum of all elements



```
int sumHelper(Node *head){
   if(head!=NULL)
      head->data+sum(head);
}
```

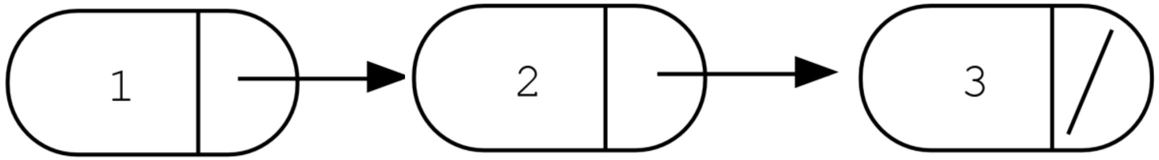
Which of the following is true about the given implementation?

A. It is correct

B. It will not return the correct sum

C. It will result in a segfault

Under the hood of recursive calls (review)

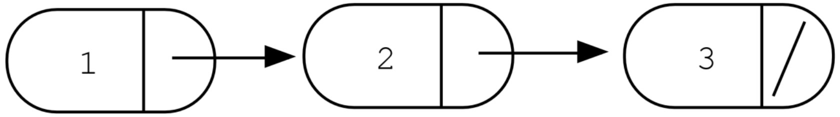


```
int sumHelper(Node *head){
   if(head==NULL)
      return 0;
   return head->data+sum(head);
}
```

```
int sum(LinkedList *list){
        sumHelper(list->head);
}
```

Recursion on lists: delete a value recursively

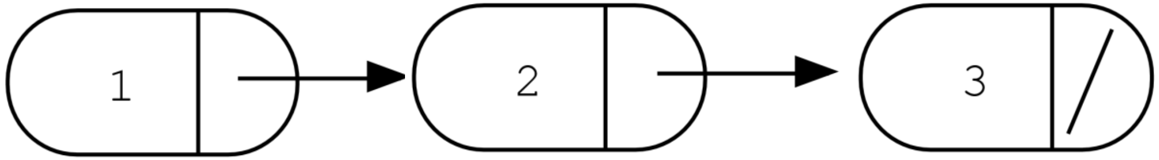
void deleteNodeRecursive(LinkedList *list, int value)



Node* deleteNodeRecursiveHelper(Node *head, int value)

Recall the steps towards a recursive solution

How do you decide which data structure to use?



1	2	3

Searching for a value in a sorted array

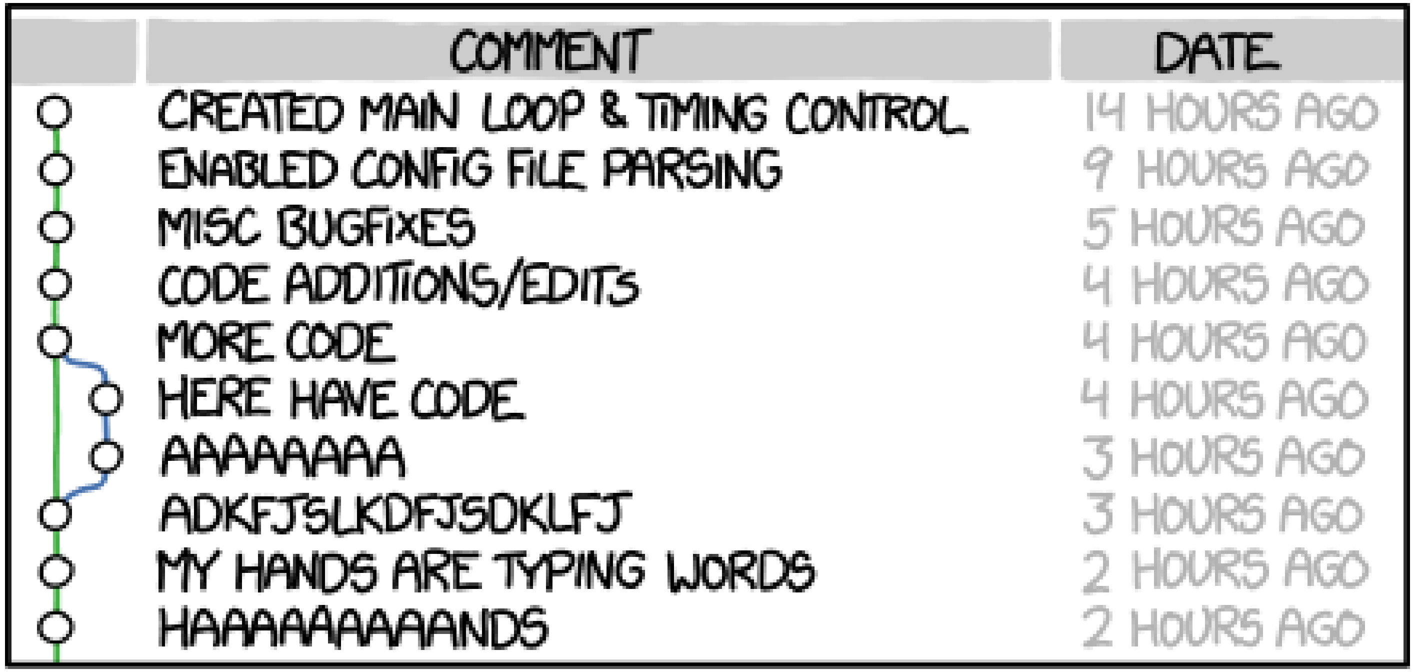
10	20	30	40	50	60	70	80
0	1	2	3	4	5	6	7

Searching for a value in a sorted array

10	20	30	40	50	60	70	80
0	1	2	3	4	5	6	7

Recall the steps towards a recursive solution

Some comic relief…

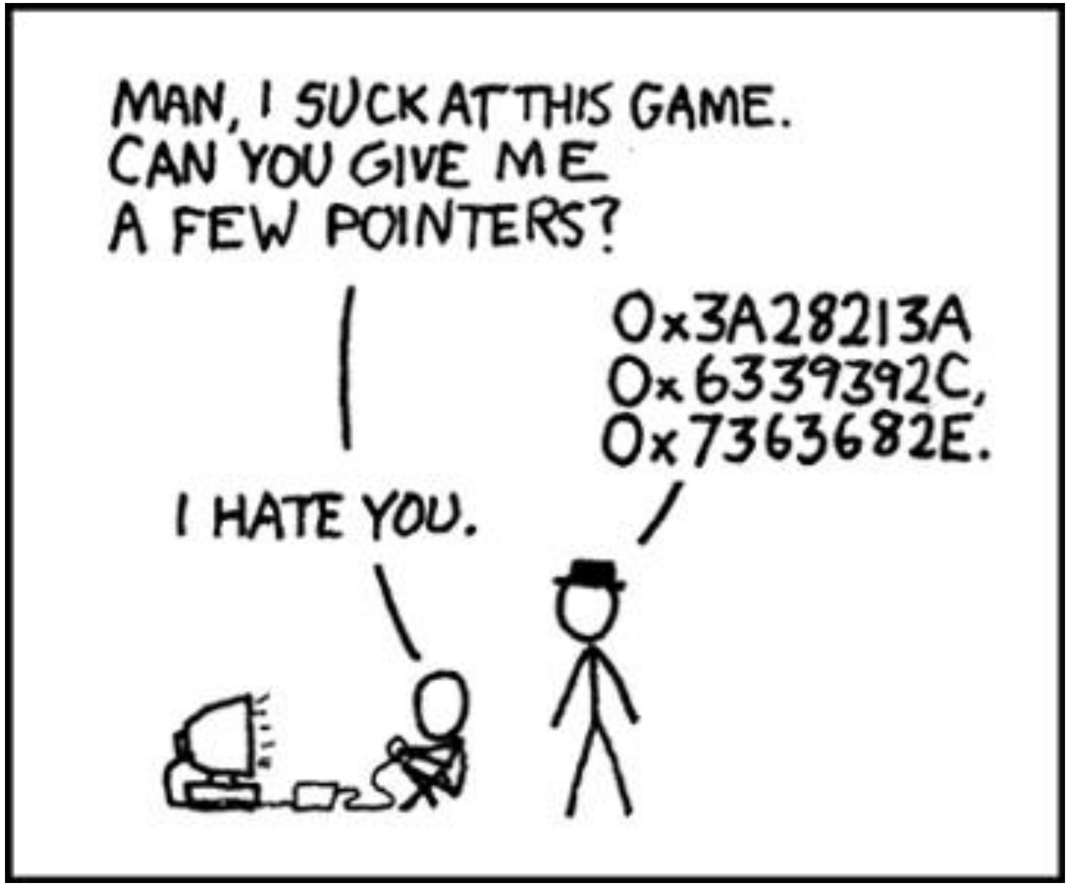


	COMMENT	DATE
○	CREATED MAIN LOOP & TIMING CONTROL	14 HOURS AGO
○	ENABLED CONFIG FILE PARSING	9 HOURS AGO
○	MISC BUGFIXES	5 HOURS AGO
○	CODE ADDITIONS/EDITS	4 HOURS AGO
○	MORE CODE	4 HOURS AGO
○	HERE HAVE CODE	4 HOURS AGO
○	AAAAAAAA	3 HOURS AGO
○	ADKFJSLKDFJSDKLFJ	3 HOURS AGO
○	MY HANDS ARE TYPING WORDS	2 HOURS AGO
○	HAAAAAAAANDS	2 HOURS AGO

AS A PROJECT DRAGS ON, MY GIT COMMIT MESSAGES GET LESS AND LESS INFORMATIVE.

HTTP://XKCD.COM/1296/

Some comic relief


MAN, I SUCK AT THIS GAME. CAN YOU GIVE ME A FEW POINTERS?
0x3A28213A 0x6339392C, 0x7363682E.
I HATE YOU.

HTTP://XKCD.COM/138/

Final words…

Which concepts do you need more help with?

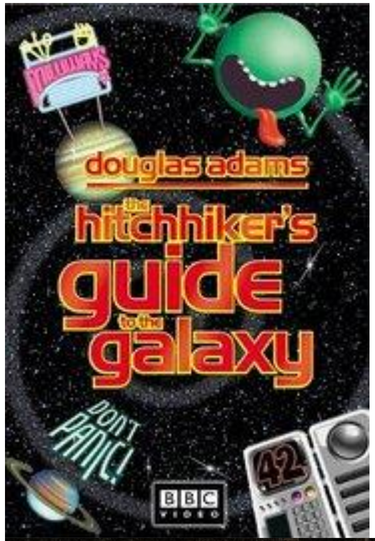
Stay posted on Piazza

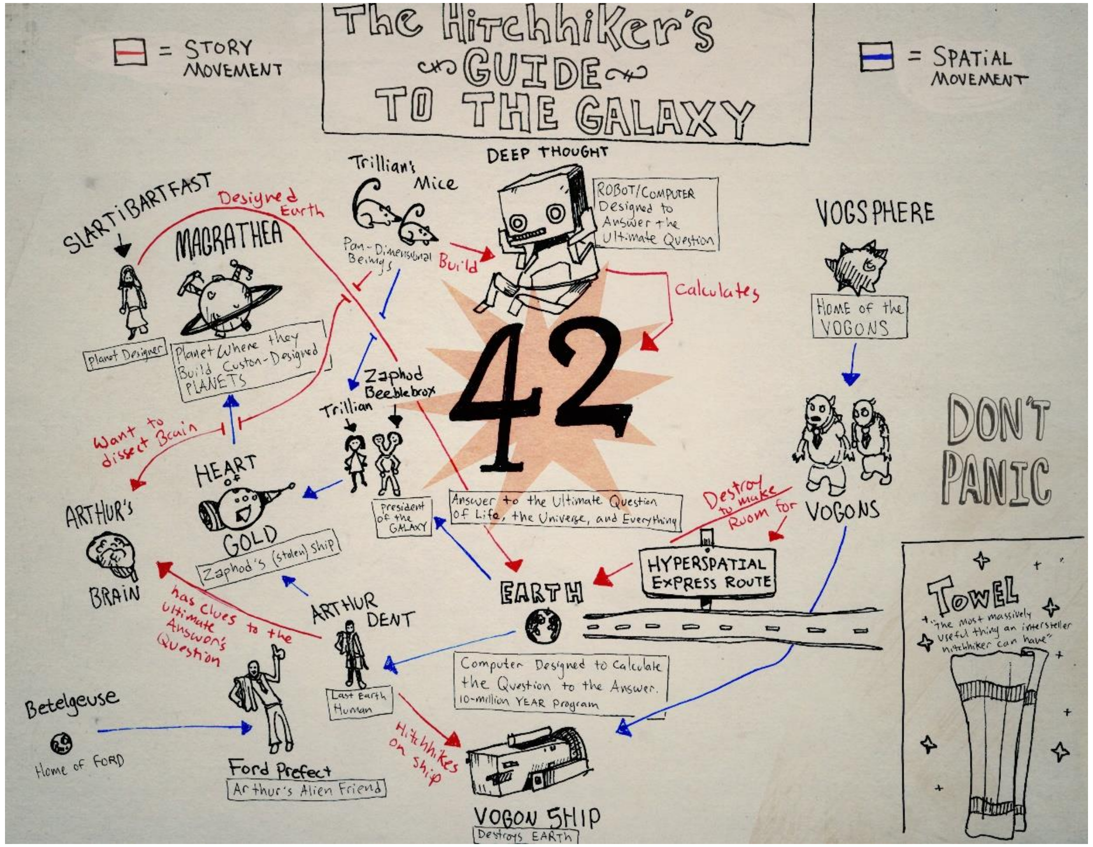
- Tutor lab hours tomorrow in CSIL
- Extended office hours next week
- Seating arrangement for exams (you may be in a different exam hall)

Final words

- You can debug your code!
- …….But you have to write it systematically!

Good luck with the final and PA8!




The Hitchhiker's GUIDE TO THE GALAXY
= STORY MOVEMENT
= SPATIAL MOVEMENT
DEEP THOUGHT
ROBOT/COMPUTER Designed to Answer the Ultimate Question
Calculates
42
Answer to the Ultimate Question of Life, the Universe, and Everything
Trillian's Mice
Pan-Dimensional Beings
Build
SLARTIBARTFAST
Designed Earth
Planet Designer
MAGRATHEA
Planet Where they Build Custom-Designed PLANETS
Zaphod Beeblebrox
Trillian
President of the GALAXY
Want to dissect Brain
HEART OF GOLD
Zaphod's (stolen) Ship
ARTHUR'S BRAIN
has Clues to the Ultimate Answer's Question
ARTHUR DENT
Last Earth Human
Betelgeuse
Home of FORD
Ford Prefect
Arthur's Alien Friend
Hitchhikes on Ship
EARTH
Computer Designed to Calculate the Question to the Answer. 10-million YEAR Program
VOGON SHIP
Destroys EARTH
Destroy to make Room for
HYPERSPATIAL EXPRESS ROUTE
VOGSPHERE
Home of the VOGONS
VOGONS
DON'T PANIC
TOWEL
"The most massively useful thing an interstellar hitchhiker can have"