

MORE ON GDB AND RULE OF THREE RECURSION INTRO TO PA01

Problem Solving with Computers-II

C++

```
#include <iostream>
using namespace std;

int main(){
    cout<<"Hola Facebook\n";
    return 0;
}
```



Announcements

- PA01 will be released tomorrow (04/18), due (05/07)
- Lab02 due tomorrow Thursday (4/18)
- Midterm next week (Wed)(04/24) - All topics covered so far.

For more details visit <https://ucsb-cs24.github.io/s19/exam/e01/>

- TAs and Tutors will hold review sessions on Monday and Tuesdays (1p-2p).

Look out for announcements on Piazza

PA01: Card matching game with linked lists

Alice:



Bob:



Review PA01: Card matching game with linked lists

Correct output after running `make && ./game alice_cards.txt bob_cards.txt`:

Alice picked matching card c 3
 Bob picked matching card s a
 Alice picked matching card h 9

Alice's cards:
 h 3
 s 2
 c a

Bob's cards:
 c 2
 d j

Note: 0=10, a=ace, k=king, q=queen, j=jack

Contents of `alice_cards.txt`:



Contents of `bob_cards.txt`:



GDB: GNU Debugger

- To use gdb, compile with the -g flag
 - Setting breakpoints (b)
 - Running programs that take arguments within gdb (r arguments)
 - Continue execution until breakpoint is reached (c)
 - Stepping into functions with step (s)
 - Stepping over functions with next (n)
 - Re-running a program (r)
 - Examining local variables (info locals)
 - Printing the value of variables with print (p)
 - Quitting gdb (q)
 - Debugging segfaults with backtrace (bt)
- * Refer to the gdb cheat sheet: <http://darkdust.net/files/GDB%20Cheat%20Sheet.pdf>

Behavior of default copy assignment

```
void test_copy_assignment(){
    LinkedList l1;
    l1.append(1);
    l1.append(2);
    LinkedList l2;
    l2 = l1;
    TESTEQ(l1, l2, "test copy assignment");
}
```

Assume:

destructor: overloaded

copy constructor: overloaded

copy assignment: default

What is the output?

- A. Compiler error
- B. Memory leak
- C. Segmentation fault
- D. Test fails
- E. None of the above

Write another test case for the copy assignment

```
void test_copy_assignment_2( ){
```

```
}
```

Overloading Binary Comparison Operators

We would like to be able to compare two objects of the class using the following operators

`==`

`!=`

and possibly others

Last class: overloaded == for LinkedList

Overloading input/output stream

Wouldn't it be convenient if we could do this:

```
LinkedList list;  
cout<<list; //prints all the elements of list
```

Overloading Binary Arithmetic Operators

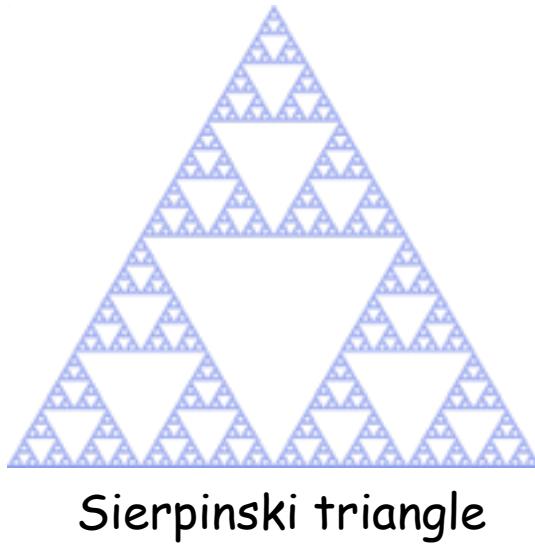
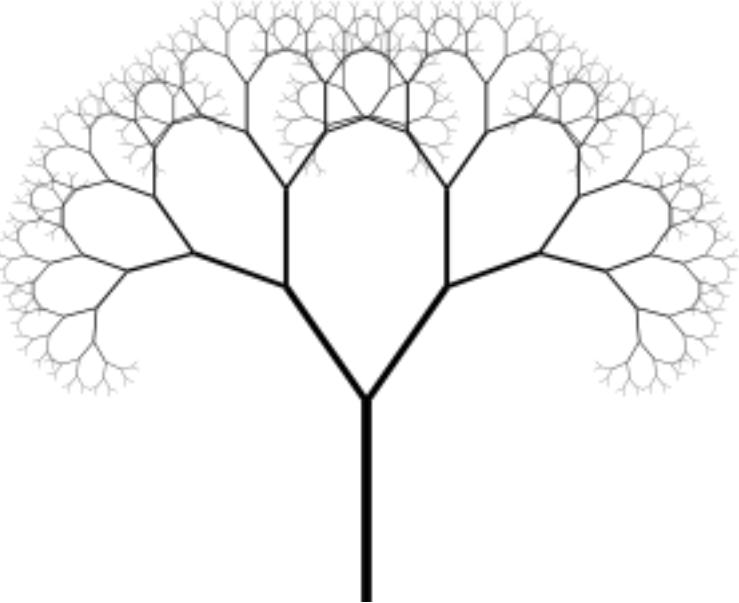
We would like to be able to add two points as follows

```
LinkedList 11, 12;
```

```
//append nodes to 11 and 12;
```

```
LinkedList 13 = 11 + 12 ;
```

Recursion



Sierpinski triangle



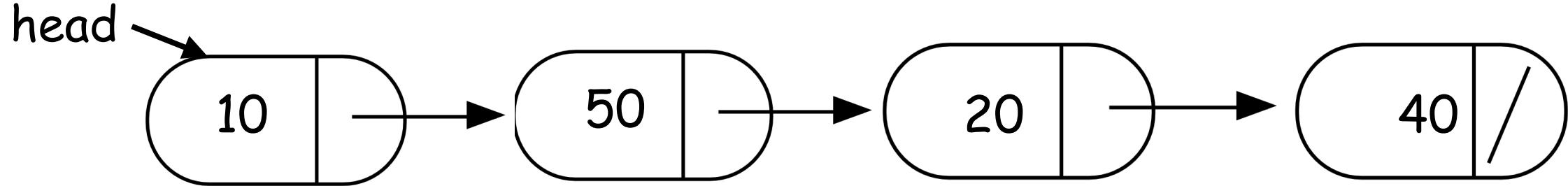
Zooming into a Koch's snowflake



Describe a linked-list recursively

Which of the following methods of `LinkedList` CANNOT be implemented using recursion?

- A. Find the sum of all the values
- B. Print all the values
- C. Search for a value
- D. Delete all the nodes in a linked list
- E. All the above can be implemented using recursion



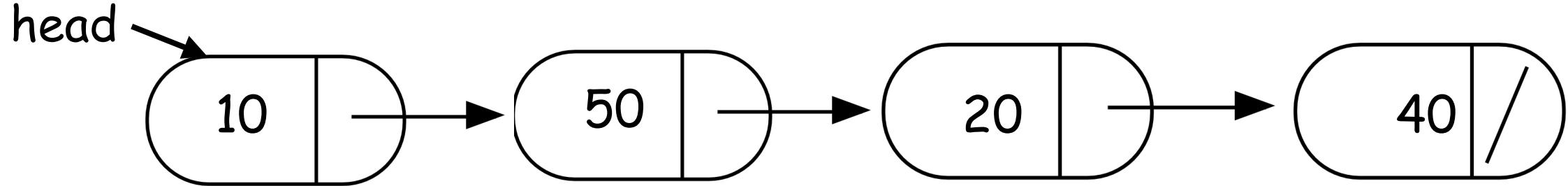
```
int IntList::sum() {  
    //Return the sum of all elements in a linked list  
}
```

Helper functions

- Sometimes your functions takes an input that is not easy to recurse on
- In that case define a new function with appropriate parameters: This is your helper function
- Call the helper function to perform the recursion
- Usually the helper function is private

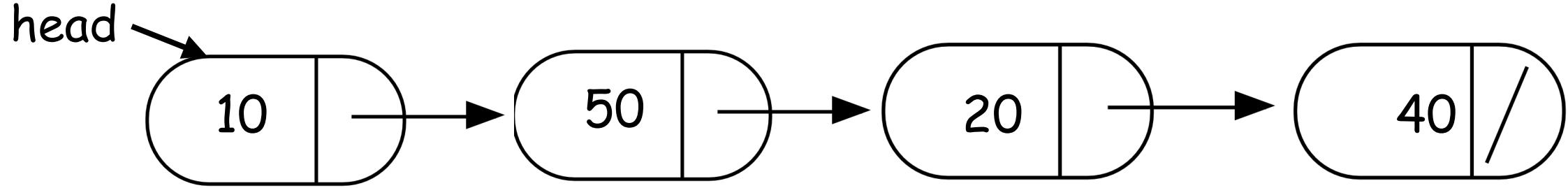
For example

```
Int IntList::sum( ) {  
  
    return sum(head);  
    //helper function that performs the recursion.  
}
```



```
int IntList::sum(Node* p) {
```

```
}
```



```
bool IntList::clear(Node* p){
```

```
}
```

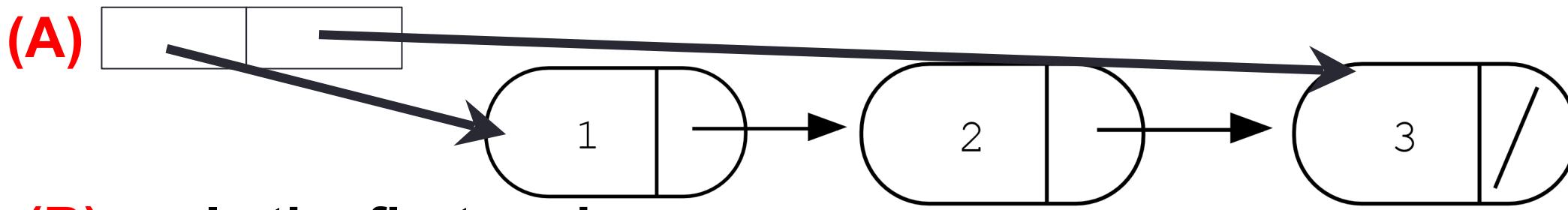
Concept Question

```
LinkedList::~LinkedList(){
    delete head;
}
```

```
class Node {
public:
    int info;
    Node *next;
};
```

Which of the following objects are deleted when the destructor of Linked-list is called?

head tail



(B): only the first node

(C): A and B

(D): All the nodes of the linked list

(E): A and D

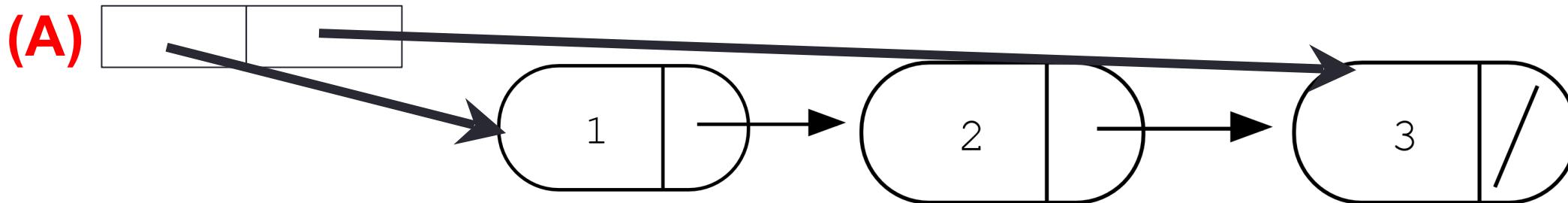
Concept question

```
LinkedList::~LinkedList(){  
    delete head;  
}
```

```
Node::~Node(){  
    delete next;  
}
```

Which of the following objects are deleted when the destructor of Linked-list is called?

head tail



(B): All the nodes in the linked-list

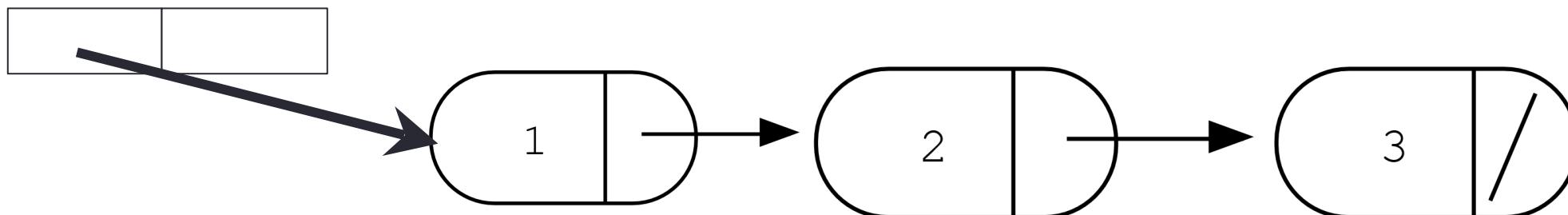
(C): A and B

(D): Program crashes with a segmentation fault

(E): None of the above

```
LinkedList::~LinkedList(){
    delete head;
}
```

head tail



```
Node::~Node(){
    delete next;
}
```



Next time

- Binary Search Trees