

Northern Michigan University (Marquette Co, MI)

CS201-01-22F: Programming In C++ (Andrew A Poe)
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Name: _____

Friday 9 December 2022 11:00 A.M. EST

Time: 50 minutes

For the following programs, write the code as directed. Do not worry about #include files or minor syntactic errors such as semicolons or matching braces. However, your code should be as correct as possible. Make sure all special cases are handled correctly. Make sure you call and use all methods correctly. If you write more than one method to solve a problem, make sure you declare your headers correctly, but you don't have to worry about prototypes.

1. Consider these classes:

```
class LL {
private:
    LLN *head;
};

class LLN {
private:
    string word;
    LLN *next;
};
```

which form a linked list.

Write a method string LL::BackwardCat () which pastes the strings in reverse order and returns that pasted string. For example, if the linked list were MY-->DOG-->HAS-->FLEAS , this method would return "FLEASHASDOGMY". Use no loops; use recursion only.

```
string LL::BackwardCat () {
    if (head) return head->BackwardCat();
    return "";
}

string LLN::BackwardCat();

if (!next) return word;
return next->BackwardCat()+word;
}
```

2. Using the above definitions, write a method void LL::RemoveX() which removes all nodes that contain an X (upper or lowercase) in them somewhere. For example, if the linked list were MY-->TREX-->HAS-->EXTRA-->TEETH , after running, the list would be MY-->HAS-->TEETH. You can use a loop if you want when checking for the X, but you cannot use loops to traverse the list; use recursion for that. Do not worry about memory leaks.

```
void LL::RemoveX() {
    if (head) head->RemoveX (nullptr,this);
}

void LL::RemoveX (LLN *prev, LL *L) {
    if (next) next->RemoveX (this,L);
    for (int i=0; i < word.length(); i++)
        if (word[i]=='X' || word[i] == 'x') {
```

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```
    if (prev) prev->setnext (next);  
    else L->sethead (next);  
    break;  
}  
}
```

3. Write code for the following method:

```
void BackwardPrint (string newfl, string orig);
```

This opens an existing text file whose name is in orig, and creates a file whose name is in newfl. It reads lines one at a time for from the existing file, and prints those same lines backwards in the created file. For example, if the file were:

Why
am
I
here?

The created file would be

yhW
ma
I
?ereh

```
void BackwardPrint (string newfl, string orig) {  
  
    ofstream out (newfl);  
    ifstream in (orig);  
    string line;  
    while (getline(in,line)) {  
        for (int i=line.length()-1; i >=0; i--)  
            out << line[i];  
        out << endl;  
    }  
    in.close();  
    out.close ();  
}
```

4. Given the following class:

```
public class Stuff {  
  
    virtual int cmp (Stuff *b) = 0; //a->cmp (b) returns negative if a < b,  
                                     //positive if a > b, 0 if a=b  
    virtual void print () = 0;      //prints myself out.  
};
```

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write the method `int matches (Stuff ** A, int Alen, Stuff *x)` which returns the number of times `x` appears in array `A`.

```
int matches (Stuff **A, int Alen, Stuff *x) {  
  
    int ct = 0;  
    for (int i=0; i < Alen; i++)  
        if (A[i].cmp(x)==0) ct++;  
    return ct;  
}
```