

CS140 Midterm – Spring, 2014 – James S. Plank – March 11

When writing programs, don't bother with the include statements or "using namespace std"

Question 1:

Part A: Suppose you are looking up a value in a hash table that has 100 elements, and the hash table is pretty full. The hash function for the value returns 847298. You are using linear probing – what are the first four indices that you will test when you look up the value?

Part B: Now, suppose you are using quadratic probing. What are the first four indices that you will test?

Part C: Now, suppose you are using double-hashing, and the second hash function returns 92821. What are the first four indices that you will test?

Question 2:

Suppose I want to define a class. The class will have data and methods. I want to implement the methods in one file, and I want to have a program that uses the methods in another file. Finally, I want to make sure that any program that uses the class can only use the methods – it cannot directly access or modify the data.

Explain to me:

- **A:** How to use a header file to connect the two files.
- **B:** How I set up the class in terms of how I define the methods and data.
- **C:** How I compile the files together.

Go ahead and make up example file names to make your explanation clearer.

Question 3:

The standard template library allows you to erase an element from the beginning of a vector. Tell me precisely why that is a bad idea, and what data structure you should use instead of a vector.

Question 4:

Write a program that uses the list data structure from the standard template library to print the lines of standard input on standard output in reverse order.

Question 5:

Write a program that reads two doubles on the command line, and prints their sum. If the command line is not composed of two doubles, have the program print the word "Bad\n" and exit.

Question 6:

Write a procedure called **a()** that has one parameter – a reference parameter to a string – and returns a string that is a copy of the parameter with all upper-case letters converted to lower-case.

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Question 7:

Solve the following Topcoder-like problem:

Problem Statement

You are given a vector of strings called **text**, each element of which contains a single word. Modify the text by removing all vowels ('a', 'e', 'i', 'o', 'u') from every word that contains at least one non-vowel. If a word consists only of vowels, leave it as is. Return the result as a vector of strings, where the i^{th} element is the modified version of the i^{th} element in **text**.

Definition

Class: WordModifier

Parameters: vector <string>

Returns: vector <string>

Method signature:

```
vector<string> ModList(  
    vector <string> text);
```

(be sure your method is public)

Constraints

text will contain between 1 and 50 elements, inclusive.

Each element of **text** will contain between 1 and 20 lowercase letters ('a'-'z'), inclusive.

Examples

```
0):  
{ "hello", "world" }  
Returns: { "hll", "wrld" }
```

```
1):  
{ "a", "b", "c" }  
Returns: { "a", "b", "c" }
```

```
2):  
{ "he", "who", "is", "greedy", "is", "disgraced" }  
Returns: { "h", "wh", "s", "grdy", "s", "dsgrcd" }
```

Question 8: Tell me the output of the following program:

```
main()  
{  
    int a, b;  
    int *c, *d;  
  
    a = 22;  
    c = &a;  
    b = *c;  
    a += 10;  
    cout << "A: " << a << endl;  
    cout << "B: " << b << endl;  
    cout << "*C: " << *c << endl;  
  
    c = new int;  
    *c = 88;  
    d = c;  
    a = *c;  
    *c = 77;  
    b = a;  
    b = b + 5;  
  
    cout << "A: " << a << endl;  
    cout << "B: " << b << endl;  
    cout << "*C: " << *c << endl;  
    cout << "*D: " << *d << endl;  
    exit(0);  
}
```