Overview

• Exam 1 will be in class on Thursday, October 12, 2017 from 2:00-3:45PM (please arrive early and sit with empty seats next to you on both sides).

• Exam 1 will be 105 minutes; therefore, if you have 50% additional time, you will have 160 minutes; if you have 100% additional time, you will have 210 minutes.

• Exam 1 will count as 10% of your final course grade.

• You may bring one double-sided (or two single-sided) 8.5”x11” crib sheets containing anything you would like; crib sheets will not be collected.

• Exam 1 will be handed back and reviewed on Monday, October 23, 2017.

• Grade grievances must be made no later than Monday, November 2, 2017 by handing your exam back to Professor Goldschmidt (after class or during office hours).

• Exam 1 will cover everything we have done thus far this semester.

Sample Exam 1 Questions

1. Describe three best practices for writing quality code. For each, illustrate by using a coding example of 5-10 lines of code in a language of your choosing.

2. Using C, write a function to determine the longest palindrome in a given string. Be sure your code is quality code.

3. Using the regex syntax from the first two homework assignments, write patterns to match HTML tags, phone numbers, email addresses, words consisting of two or more alphanumeric characters, etc.

4. Describe three side effects of code reviews, i.e., what other benefits to code reviews have aside from improving the quality of the reviewed code?

5. An example of software quality is correctness. Aside from correctness, describe three aspects of software quality. For each, provide an example and a means of measuring such quality. For example, for correctness, the measure could be the number of unit test cases passed.

6. Breaking a large function into smaller sub-functions is an example of refactoring. Aside from this, describe three other refactoring approaches. For each, provide an example.
7. Given the C specification below, write a comprehensive set of unit tests. Next, write C code to implement the function.

```c
#define SCALENE 1
#define ISOSCELES 2
#define EQUILATERAL 3

#define ACUTE 1
#define RIGHT 2
#define OBTUSE 3

/*
 * The valid_triangle() function determines whether the given
 * triangle (identified by its three lengths) is a valid triangle
 * or not. Further, if valid, this function also determines
 * the type of triangle and the type of its largest angle
 *
 * Inputs:
 * -- len1, len2, and len3 represent edge lengths
 * -- triangle_type is to be filled in as SCALENE (no sides equal),
 *     ISOSCELES (two sides equal), or EQUILATERAL (all sides equal)
 * -- angle_type is to be filled in as ACUTE (less than 90 degrees),
 *     RIGHT (exactly 90 degrees), or OBTUSE (greater than 90 degrees)
 *
 * Output: 1 if the triangle is valid; 0 if invalid
 */
int valid_triangle( double len1, double len2, double len3,
                    int * triangle_type, int * angle_type );
```

8. Aside from unit testing, describe three other types of software testing.
9. (a) Given the following C program, what is the exact output?
(b) Given that the findmin() function is supposed to find the minimum value in a given array containing len elements, circle and identify at least four defects in the given code.
(c) Rewrite the code for findmin() to ensure it is both correct and of high quality.

```c
#include <stdio.h>
#include <stdlib.h>

int findmin( int a[], int len );

int main()
{
    int min;

    int a[] = { 5, 10, 0, 4, 5, 15 };
    min = findmin( a, 6 );
    printf( "min is %d\n", min );

    int b[] = { 0, 5, 10, 4, 5, 15 };  
    min = findmin( b, 6 );
    printf( "min is %d\n", min );

    int c[] = { 5, 10, 4, 5, 15, 0 };  
    min = findmin( c, 6 );
    printf( "min is %d\n", min );

    int d[] = { 5, 10, 4, 5, 15, 1 };  
    min = findmin( d, 6 );
    printf( "min is %d\n", min );

    return EXIT_SUCCESS;
}

int findmin( int a[], int len )
{
    int i = 0, p = a[0], q = a[0];

    while ( i < len )
    {
        q = a[++i];
        if ( p > q ) p = q;
    }

    return q;
}
```
10. Describe three measures of success for a search engine.

11. What is precision? What is recall? How do both of these apply to measuring the success of a search engine?

12. In general text processing of English documents, the top six most frequently occurring words account for approximately what percentage of all word occurrences?

13. In general text processing of English documents, the top 50 most frequently occurring words account for approximately what percentage of all word occurrences?

14. In a corpus containing 200 documents, each of which contains 10,000 words, how many words would you expect to occur only once throughout the entire corpus?

15. Describe three roles that webgraphs play in a search engine.

16. Why are HTML links so important to a search engine?

17. Given an inverted index covering a corpus of 200,000 documents, what approach could you take to identify the “interesting” words and phrases (i.e., words and phrases that users would be interested in searching for)?

18. What is proximity matching? Write pseudocode to implement proximity matching that will match two keywords that are at distance 10 words of one another.

19. Given the document below, construct an inverted index that shows the word position of each word. Ignore all HTML tags and punctuation; further, convert everything to lowercase. Also show extent lists for the document title.

```
<title>THE MOUSE AND THE LION</title>
<h1>The Mouse and the Lion</h1>
<h2>by Aesop</h2>

Once when a Lion was asleep a little Mouse began running up and down upon him; this soon wakened the Lion, who placed his huge paw upon him, and opened his big jaws to swallow him. &quot;Pardon, O King,&quot; cried the little Mouse: &quot;forgive me this time, I shall never forget it: who knows but what I may be able to do you a turn some of these days?&quot; The Lion was so tickled at the idea of the Mouse being able to help him, that he lifted up his paw and let him go. Some time after the Lion was caught in a trap, and the hunters, who desired to carry him alive to the King, tied him to a tree while they went in search of a wagon to carry him on. Just then the little Mouse happened to pass by, and seeing the sad plight in which the Lion was, sent up to him and soon gnawed away the ropes that bound the King of the Beasts. &quot;Was I not right?&quot; said the little Mouse.

&quot;LITTLE FRIENDS MAY PROVE GREAT FRIENDS.&quot;
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