CSCI 10: Introduction to Computer Science
Fall 2016 — Michael J. Bannister

Midterm Exam 2

October 31, 2016

all problems are of equal value

Name (please print): _____

Student ID: _____

Problem 1: In this problem you will be reading complete programs to find errors and to determine their behavior.

Part A: What is the output of the following C++ program? Please box your answer to separate it from your scratch work.

```
#include <iostream>

using namespace std;

int kang(int &q);
int kodos(int r);

int main() {
    int a = 3;
    int b = 5;
    cout << "a = " << a << "; b = " << b << endl;
    b = kang(a);
    cout << "a = " << a << "; b = " << b << endl;
    a = kodos(b);
    cout << "a = " << a << "; b = " << b << endl;
    return 0;
}

int kang(int &q) {
    q = q * 2;
    return q + 1;
}

int kodos(int r) {
    r = r + 1;
    return r * 2;
}
```

Part B: The C++ program given below has two errors in it, both related to scoping. Circle the errors and briefly describe why each violates the scoping rules of C++ and how you recommend the programer fix their error. *You are now the grader! Give good feed back!*

```
#include <iostream>

using namespace std;

int max(int a, int b);

int main() {
    for (int i = 0; i < 5; i++) {
        cout << i << " : ";
        for (int j = 0; j < 5; j++) {
            cout << "X";
        }
        cout << " : " << j;
        cout << endl;
    }

    int x = 0;
    int y = 0;
    cin >> x;
    cin >> y;
    max(x, y);
    cout << "The max of " << x << " and " << y << " is " << m << "." << endl;

    return 0;
}

int max(int a, int b) {
    int m = 0;
    if (a > b) {
        m = a;
    } else {
        m = b;
    }
    return m;
}
```

Problem 2: In this problem, you will be printing a specific pattern. Your code must use two nested for-loops to print a `n`-by-`n` box filled entirely with `X`s, except for the corners. The corner should be printed with the: upper-left as `A`, upper-right as `B`, lower-left as `C`, lower-right as `D`. An example of what should be printed when $n = 5$ is given to the right. *Some code is already given to you. Add your loops where specified.*

```
AXXXB
XXXXX
XXXXX
XXXXX
CXXXD
```

```
#include <iostream>

using namespace std;

int main() {
    int n = 0;
    cout << "Please enter a number greater than 2: ";
    cin >> n;
    // Add your code below this line









    return 0;
}
```

Problem 3: For this problem you will write a function that takes as input two integer arguments and returns the sum of the numbers between these two numbers. For example, if the input integers are 5 and 10, then the function returns $5 + 6 + 7 + 8 + 9 + 10 = 45$. If the first integer argument is less than the second argument then the function should return zero. For example, if the input integers are 8 and 3, then the function returns 0.

Give function(s) and variables informative names.

Problem 4: For this problem you will write a function that takes as input two integer arguments and returns both the maximum and minimum of the two numbers. Since this function must return two values, you will need to use call-by-reference to return the maximum and the minimum. Additionally, the function will return, in the usual way, true if the two input values are equal and false if they are not equal.

Give function(s) and variables informative names.

Problem 5: In this problem, you will be writing code to count the number of 0s in an array. A program is already given to you that randomly fills an array with 0s and 1s, and you will be adding your code where specified. After the the number of 0s in the array has been counted, this value must be printed.

```
#include <iostream>
#include <cstdlib>
#include <ctime>

using namespace std;

int main() {
    // Fill the array A with a 100 random 1s and 0s
    srand(time(0));
    rand();
    const int sz = 100;
    int A[sz];
    for (int i = 0; i < sz; i++) {
        A[i] = rand() % 2;
    }
    // Add your code below this line









    return 0;
}
```