CS 115 Midterm 1 SOLUTIONS, Spring 2009

Rules

• You may use one handwritten 8.5 x 11” cheat sheet (front and back). This is the only resource you may consult during this exam.

• You must show your work/explain your answers in order to receive partial credit for incorrect answers.

• All snippets of code can be assumed to be enclosed within int main(). You can assume that the iostream, fstream, iomanip, string, and cmath libraries have been included at the beginning of the program.

• When you are asked to write a snippet of code, you may also assume that it is enclosed within int main() and that any necessary libraries have been included.

• When you are asked to write a complete program, you must write the #include statements, the int main(), etc. in your solution to receive full credit.

• A line consisting solely of “…” represents one or more unspecified C++ statements, some of which may change the values of program variables.
Problem 1: 24 points.
What does each of the following snippets of code print to the screen?

(a) string w = "world";
cout << "Hello ";
cout << w << endl;

Hello world

(b) int a = 2;
cout << a++ << endl;
cout << a << endl;
2
3

(c) float a = 5 / 2;
cout << a << endl;
2

(d) bool b = true;
cout << (b && b) << endl;
1

(e) int i = 2;
do {
    cout << "cat" << endl;
i--;
} while (i);
cat
cat

(f) for (float f = 1; f <= 1.61; f += 0.2) {
cout << f << endl;
}
1
1.2
1.4
1.6
Problem 2: 16 points.
State whether each segment of code is valid C++. If it is not valid C++, fix it so that it will compile. (Valid C++ means that it will compile without errors.)

(a) int a;
   cin >> a;
   if (cin.fail == 1) {
       cout << "You messed up!" << endl;
   }

Invalid – should be
   if (cin.fail() == 1)

(b) float f = 4.5;
    int i = 0;
    double q = f + i;

Valid

(c) for (int i=5; i >= 0; i--) {
    for (int j=0; j < 200; j++) {
        cout << i << "," << j << endl;
    }
}  

Valid

(d) int i = 25;
    int j = 100;
    cout << sqrt(i,j);

Invalid – should be
    cout << sqrt(i) << "," << sqrt(j);
Problem 3: 30 points.

Write short snippets of code to accomplish the following tasks:

(a) **Assume:**
- An integer variable \( N \) has already been declared and defined.
- Its current value is greater than 0.

**Your task:**
- Print all the odd numbers between 1 and \( N \), inclusive.
- Each number should be printed on a separate line.

```c++
for (int i=1; i <= N; i += 2) {
    cout << i << endl;
}
```

(b) In an infinite loop:
- Ask the user to type their name.
- Greet them by printing "Hello, " followed by the name they typed.
- Each greeting should be printed on a separate line.

```c++
string name;
while (true) {
    cout << "Type your name." << endl;
    cin >> name;
    cout << "Hello, " << name << endl;
}
```

(c) **Assume:** Float variables price and budget have been declared and defined.

**Your task:**
- If price is greater than budget, print Sorry!
- Otherwise, print Yay!

```c++
if (price > budget) {
    cout << "Sorry!" << endl;
}
else {
    cout << "Yay!" << endl;
}
Assume: Integer variables $a$, $b$, and $c$ have already been declared and defined.

Your task: Print the value of the smallest of these three variables.

Fine print: If two or more of the three variables are tied for the smallest value, you should only print the value once.

```cpp
if ( (a <= b) and (a <= c) ) {
    cout << a << endl;
} else if (b <= c) {
    cout << b << endl;
} else {
    cout << c << endl;
}
```

Problem 4: 30 points.
For this problem, you must write a complete program that does the following:

- Asks the user to enter an integer
  *Note: You can assume that the user's input is valid.*

- If the number is less than 1, prints *Goodbye* and exits the program using `return 0;`

- Using a loop, computes the sum of the integers between 1 and the user's number, inclusive

- If the computed sum is equal to $N \times (N+1) / 2$ (where $N$ is the user's number):
  - Prints *The shortcut works!*
  - Prints the computed sum

- Otherwise, prints *Oops!* and does not print the sum

Solution on next page.
#include <iostream>
using namespace std;

int main( ) {
    int userInput, sum=0;

    cout << "Enter an integer: ";
    cin >> userInput;

    if (userInput < 1) {
        cout << "Goodbye!" << endl;
        return 0;
    }

    for (int i=0; i <= userInput; i++) {
        sum += i;
    }

    if (sum == userInput * (userInput+1) / 2) {
        cout << "The shortcut works!" << endl;
        cout << sum << endl;
    }
    else {
        cout << "Oops!" << endl;
    }
    return 0;
}