CS 31 Worksheet 1

This worksheet is entirely **optional**, and meant for extra practice. Some problems will be more challenging than others and are designed to have you apply your knowledge beyond the examples presented in lecture, discussion or projects. All exams will be done on paper, so it is in your best interest to practice these problems by hand and not rely on a compiler.

Concepts

Loops, If Statements, Cin, Variables, Doubles, Ints

Reading Problems

1. Circle where the bug occurs and explain what incorrect behavior will happen. What do you think this program will output? Add a fix.

```
cout << "Enter your name: ";
getline( cin , name );

cout << "\nEnter your UID: ";
int UID;
cin >> UID ;

cout << "\nEnter your Major: ";
getline( cin , major );

cout << "\nEnter your residence hall: ";
getline( cin , hall );
```

2. What is the output of the following code?

```
int a = 10;
int b = 22;
while (a / 2 >= 1) {
  a--;
  cout << a << endl;
  if ((a + b) % 2 == 0) {
    a--;
    cout << a << endl;
    b /= 2;
```

```
  }
}
```

3. This code snippet tries to print all prime numbers between 3 and a given input *n*. Find the 3 bugs contained in the code and fix them.

```
int n;
cin >> n;
for (int candidate = 3; candidate < n; ++candidate) {
     bool isPrime = true;
     for (int x = 2; x < n; x++) {
          if (candidate % x = 0){
               isPrime = false;
          }
     }

     if (isPrime) {
          cout << n << " ";
     }
}
```

Programming Problems

1. Write a program that takes in a number as an int and outputs the sum of all of the digits in that number

Sample Output:
Enter a number: 184
The sum of the digits in your number is 13!

2. Write a program that takes in N numbers outputs the average of the N numbers.

Sample output:
How many numbers do you want to average? 5
Number: 4
Number: 2
Number: 8
Number: 9
Number: 7
The average is 6

3. Write a program that takes in N integers and outputs the sum of the even numbers.

Sample output:
How many numbers are you entering? 4
Enter a number: 2
Enter a number: 9
Enter a number: -3
Enter a number: 6
Result: 8

4. Write a program that takes in two numbers and a command of type string (“Add”, “Subtract”, “Multiply”, “Divide”). Inputting an invalid command should cause the program to ask for a valid command.

Sample output:
Enter your first number: 3
Enter your second number: 7
Enter your command: Multiply
Result: 21

5. Write a program that reads in an integer N and prints an NxN box where the (i,j)th character is as follows:

```
'.'   if j > i
i + j   otherwise
```

Where i is the row number and j is the column number (starting at 0, not 1). For Example, if the input is 4, it should print:

```
0 . . .
1 2 . .
2 3 4 .
3 4 5 6
```

6. Write a program that reads in an integer and prints whether that number is a perfect number. A perfect number is defined as a number that is equal to the sum of all factors excluding itself.

Example:
4 != 1 + 2 => Print “Not perfect.”

5 != 1 => Print “Not perfect.”
6 = 1 + 2 + 3 => Print “Perfect.”
12 != 1 + 2 + 3 + 4 + 6 => Print “Not perfect.”
28 = 1 + 2 + 4 + 7 + 14 => Print “Perfect.”

7. Write a program that takes in an integer N where N > 0, and outputs a comma-separated list of all the factors of N.

Sample input:
12
Sample output:
1,2,3,4,6,12

8. Write a program that given an input integer N, finds an integer x such that $2^x <= N < 2^{x+1}$. The program should ask for user input and print the integer x it finds. If there exists no such x, it should print “error”.

Sample Input:
200 => Should output 7, since $2^7 = 128 <= 200 < 2^8 = 256$.
20 => Should output 4, since $2^4 = 16 <= 20 < 2^5 = 32$.