

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 the 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 to average and 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 numbers 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 (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, both 0-indexed. 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:

$4 \neq 1 + 2 \Rightarrow$ Print "Not perfect."

$5 \neq 1 \Rightarrow$ Print "Not perfect."

$6 = 1 + 2 + 3 \Rightarrow$ 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. Given an input integer, N , find an integer x such that $2^x \leq N < 2^{x+1}$.

Sample Input:

200 \Rightarrow Should output 7, since $2^7 = 128 \leq 200 < 2^8 = 256$.

20 \Rightarrow Should output 4, since $2^4 = 16 \leq 20 < 2^5 = 32$.